

69th ANNUAL ILA CONFERENCE PROCEEDINGS

International Conference on

Building the Future: Transforming Libraries for Sustainability through Capacity Building

Chief Editors
Dr. O. N. Chaubey & Dr. Pardeep Rai

Editors
Dr. Dharam Kumar
Dr. Abhijeet Sinha
Dr. Sanjay Kumar Singh

Organised by
Indian Library Association, New Delhi,
Department of Library and Information Science, Gauhati University, Guwahati,
Krishna Kanta Handiqui Library, Gauhati University,
and
Assam Library Association (ALA), Guwahati

2024

Building the Future: Transforming Libraries for Sustainability through Capacity Building

Proceedings
69th Annual ILA Conference

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1-3 February 2024

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Indian Library Association
A/40-41, Flat No. 201, Ansal Building
Dr. Mukherjee Nagar, Delhi-110009
2024

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ISBN: 978-81-956643-9-9

Price: India: ₹ 3500/-; Overseas: US$ 175; Printed at: Anand Sons, Delhi-92

FOREWORD

Indian Library Association - a strong and old organization working tirelessly for many years for the upliftment of library professionals and all libraries at the national level, is organizing its 69th Annual Conference (International) during 1st to 3rd February 2024 at Gauhati, Assam in collaboration with Department of Library and Information Science, Gauhati University, Krishna Kanta Handiqui Library, Gauhati University, and Assam Library Association (ALA). The theme of the conference is **Building the Future: Transforming Libraries for Sustainability through Capacity Building.**

Libraries play a central role in all educational, research as well as all types of government institutions. Along with social and technological changes, the size, nature of services and also its look are also changing. But its main role has not changed. Any institution without library means a body without the soul and it is accepted by all the experts through various commissions and committees constituted by the government time to time.

If we study the history of development of libraries, we will notice that libraries have transformed from ancient libraries to modern digital libraries. The journey of the transformation of libraries begins in ancient times. There have been many revolutionary changes in the intermediate period and today we are experiencing digital and virtual libraries. In the twenty-first century, the pace of revolution was at its highest. As Information and Communication Technology (ICT) is revolutionizing rapidly and continuously, it is having a tremendous impact on libraries. We professionals have to sustain ourselves and our library in this storm of technological revolution. Not only to survive but also to stand strong in future competition. Other outsiders especially IT professionals are trying to capture our field. We must compete them by making ourselves strong in IT and at the same time without forgetting the basic fundamental concept of library.

Indian Library Association (ILA) provides this forum of 69th annual conference to discuss how libraries of tomorrow can be best positioned for sustainable library transformation. For this, today's young and also experienced library professionals have contributed their thoughts in the form of excellent articles in this pre-conference proceeding on the below-mentioned issues.

- Digital Transformation for Sustainability
- Sustainable Collection Development
- Community Engagement for Sustainability

- Green Partnerships and Collaboration
- Resilience and Adaptation
- Sustainable Innovation and Technology
- Sustainable Architecture and Design
- Sustainable Data Management

It is hoped that these articles, when they will be presented in various technical sessions during the conference, will be discussed in depth and guide the new generation on how to create sustainable libraries of the future.

I must appreciate the contribution done by the young, enthusiastic and experienced library professionals in terms of contributing papers on the theme of this conference.

I offer my very best wishes for the 69th conference of Indian Library Association organized at Gauhati during 1st to 3rd February 2024 a great success.

Dr. Mohan R.Kherde

President, Indian Library Association

PREFACE

The 69th International Conference of ILA is one of the notable event as the association has completed 90 years of its existence, since it was established in the year 1933. It is organizing 69th International Conference on a very appropriate and exciting theme **"Building the Future: Transforming Libraries for Sustainability through Capacity Building"**. The theme and all the subthemes selected for the conference are very appropriable and apt to present situation. It provided a very good platform for Library and Information Professionals to participate in discussions on various issues related to Technological Applications in Libraries and Information Services. Total Eight themes were identified on various issues related to emerging Technologies and their application, primarily concerned with the theme of Sustainability. Conferences had been providing a wide platform to Library & Information Professionals to present their ideas and views.. Out of total 200 received research communications total 98 were accepted through peer-review process. During conference the researchers would found great opportunity to express their research ideas and explorations through this nationwide platform of LIS profession. All the accepted papers were distributed under the following sub-themes for the purpose of presentation in the conference in Offline and Virtual mode.

1. Digital Transformation for Sustainability
2. Sustainable Collection Development
3. Community Engagement for Sustainability
4. Green Partnerships and Collaboration
5. Resilience and Adaptation
6. Sustainable Innovation and Technology
7. Sustainnable Architecture and Design
8. Sustainable Data Management

The advent of embedded technologies has great impact on technological applications of libraries e.g. the Content Development. The Integrated Library Management Systems are now integrating discovery facilities with the use of CMS and the Library Networking has gradually started removing the compartmentalization of different types of libraries. The new technology has taken place in the leadership and we have to build the capabilities among our professionals to handle the new technologies effectively and efficiently for sustianability. The digital age has unlimited potentiality to import technologies and social media facilities into library

services. The Library professionals have been facing challenges of managing hybrid resources. The users' needs are also changing as more and more young users have gained technological knowledge and discovered enough capabilities that can offer them improved and point to point services. The patterns of library use are also on the verge of new demands and horizons. Keeping this in mind, the conference chooses a topic that is contemplated over again and again whether the professionals are required to face new challenges under the sub- themes, Digital Transformation, Collection Development, Community Engagement, Green Partnership, Architecture and Design, Big Data Management and others. The Libraries have been adopting technologies since their early days and therefore technological advances which have been embedded in the spirit of adoption to changes. These changes demand new services and to manage the new information and knowledge resources to suit the changing needs of the users. The impact of emerging technologies on libraries and the growth of web and digital resources needs to augment the users with relevant skills and the demand for information literacy is growing from a very early stage. The quality of services needs some benchmarking and to adopt best practices. The papers included in this volume and the authors of these papers have addressed these issues and this International Conference has provided them a suitable platform for proposing these issues for discussion by the learned delegates.

The Organizers of this conference, especially the Indian Library Association, New Delhi, Department of Library & Information Sc. Gauhati University, Gauhati Krishna Kanta Handiqui Library, Gauhati University and Assam Library Association, need special mention for selecting this wonderful and thought provoking theme for 69th Conference of the ILA. It is time to look forward on this auspicious occasion to see the transformation of library and information Science Profession in the digital age as its future has many challenges and equally opportunities to discover new professional avenues.

The Editorial Committee has spent their useful hours in reviewing/editing the papers and offering their support to organize the papers theme-wise. The Editors acknowledge their help and thank them profusely in this context. We thank all the authors for contributing to this 69th International Conference of ILA and enriching the professional knowledge with their scholarly papers.

Thank you one and all

Place: Delhi

Date: 2nd Jan, 2024 Editors

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Digital Transformation for Sustainability

Technological Paradigms: A Path To Sustainable Libraries Through Digital Transformation

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ABSTRACT: This paper explores the transformative journey of libraries towards sustainability through digitalization. Focusing on the paradigm shift from traditional book repositories to dynamic information hubs, the study delves into the multifaceted role of libraries in promoting environmental responsibility. The concept of sustainable digital transformation is elucidated, emphasizing long-term preservation, open access initiatives, green IT practices, and the carefulbalance between privacy and accessibility. The paper identifies key technological enablers, including Internet of Things (IoT), blockchain, artificial intelligence, renewable energy, and green building technologies, illustrating how they contribute to the eco-friendly evolution of libraries. The integration of virtual and augmented reality further enhances sustainability by reducing physical resource dependence. The conclusion underscores the imperative for libraries to embrace these technologies, ensuring their relevance and leadership in fostering a greener, more sustainable world.

1. Introduction

For millennia, libraries have been essential to community, education, and knowledge. The function of libraries is shifting to suit the increasing need for sustainability and environmentalresponsibility in today's world of fast change. In order to build the future, libraries must becomecentres of sustainability, serving as both informational resources and active contributors to theglobal effort to create a more sustainable society.

The idea that libraries are only spaces for books and quiet study has changed dramatically throughout time. Contemporary libraries are vibrant, multipurpose establishments that provide their communities with a vast array of materials and services. Libraries are taking on a new role in promoting sustainability and environmental stewardship in response to the urgent globalconcerns of resource depletion, climate change, and environmental degradation.

Libraries are embracing sustainability by reevaluating their physical infrastructure and implementing green building practices, using energy-efficient materials and renewable energy sources. They are also rethinking their holdings, focusing on renewable energy, conservation, climate change, and environmentally friendly living. Libraries serve as knowledge centres forsustainability and environmental concerns. Libraries are promoting sustainability through community involvement, organizing public education events, workshops, and programs on ecological conservation and sustainable living techniques. The digital revolution has significantly aided their progress, reducing the environmental impact of printing, distributing, and disposing of materials, and increasing knowledge accessibility and lowering carbon footprints.

2. Sustainable digital Transformation

In the context of libraries, "sustainable digital transformation" refers to the continuous process of incorporating digital technology and strategies into operations and services in a way that is socially, economically, and ecologically responsible. With this strategy, libraries should be ableto adjust to rapidly evolving technology without suffering undue harm to the environment or society and without losing their financial stability. The following are some essential elements of a long-term digital transformation in libraries:

Libraries must ensure long-term digital preservation through data archiving, backup, and migration, while prioritizing inclusivity and accessibility for all users, including those with disabilities, by providing assistive technologies, alternate formats, and screen reader compatibility.

2.1 Open Access and Open Data

Libraries can promote sustainability by promoting open access publications and data initiatives, reducing duplication of content, and implementing energy-efficient practices. They can also promote digital literacy and educate users about responsible digital practices. Collaboration with other libraries, institutions, and organizations can also help reduce duplication and share resources, ultimately supporting sustainability.

2.2 Green IT Practises

Libraries can lessen their carbon footprint by implementing Green IT ideas, such as cloud computing, virtualization, and energy-efficient hardware. This involves appropriately handlinge-waste.

Libraries must balance privacy and intellectual property protection with access, implementingappropriate digital rights management measures. They must ensure long-term financial stabilitythrough user fees or grants. Regular evaluation of the environmental, social, and economic impacts of digital transformation projects is crucial, based on user feedback and performance indicators.

3. Various Technologies for Digital Transformation for Sustainability in Libraries

3.1 Internet of Things

The term "Internet of Things" (IoT) describes how physical systems, devices, and objects are connected to one another over the internet so they can exchange and gather data. By monitoring, controlling, and automating procedures, this data can improve workflows and openthe door to new services and applications.

Libraries could undergo a number of changes as a result of the Internet of Things, including increased efficiency and sustainability. Libraries can use IoT technologies to track resources, monitor and optimise energy use, improve space utilisation, and improve user experiences. IoTalso facilitates smart maintenance, security, accessibility, digital collection management, and sustainability reporting in addition to environmental monitoring.

IoT sensors can improve energy efficiency in libraries by monitoring occupancy and environmental conditions, optimizing HVAC and lighting systems, and reducing operating expenses. They also provide real-time insights into library space usage, enabling data-driven decisions to maximize resource allocation, reduce operational expenses, and minimize environmental impact.

IoT technology can enhance library operations by monitoring media and book usage, automating inventory management, and reducing waste. It can also monitor environmental factors like temperature, humidity, and air quality, reducing the risk of damage and preservingvaluable collections, ultimately achieving sustainability goals and prolonging resource life.

IoT technologies can improve library experiences by enhancing user experience through wayfinding systems and smart signage, and assistive technology, such as braille displays. Additionally, IoT can enhance security and safety by real-time detection and reporting of potential threats, reducing the risk of loss or damage.

IoT can improve the management of digital collections by monitoring usage patterns and guaranteeing equitable access. In order to show their dedication to

sustainability, abide by thelaw, and notify stakeholders, libraries can also benefit from tracking sustainability metrics likeenergy use and emissions reductions.

3.2 Blockchain Technology

Blockchain technology records transactions over a network of computers in a decentralised, secure digital ledger. It builds a chain of blocks with a list of transactions in each block using cryptography. Blocks in the chain are unchangeable once they are added, guaranteeing trust and transparency in a variety of applications—especially supply chain management andfinancial transactions.

By encouraging ethical content distribution, resource authentication, decentralised cataloguing,responsible sourcing, and efficient processes, blockchain technology improves sustainability efforts in libraries and eventually creates a more transparent and sustainable library ecosystem.

3.2.1 Transparent Supply Chain

Libraries can track the origin and movement of materials thanks to blockchain technology, which guarantees sustainable and ethical sourcing. By being transparent, it guarantees that resources are obtained through ethical methods, like sustainable printing and ethical paper sourcing.

3.2.2 Digital Rights Management (DRM)

Blockchain technology can be utilised to control the digital rights of digital content in libraries, including e-books. This strengthens copyright defence, guarantees writers receive just compensation, and encourages the responsible sharing of digital content.

3.2.3 Provenance and Authentication

By using blockchain technology, libraries can verify the provenance of valuable or rare materials, lowering the possibility of fraud and boosting the reliability of their holdings. The authenticity of historical artefacts and documents can be trusted by visitors.

3.2.4 Smart Contracts

Blockchain-based smart contracts can automate various library processes, such as copyright licensing and interlibrary loan agreements. This streamlines administrative tasks, reduces paperwork, and ensures that agreements comply with sustainability policies and ethical guidelines.

3.2.5 Decentralized Cataloguing

Blockchain can support a decentralized and community-driven cataloging system where userscontribute to the accuracy and completeness of library records. This crowd-sourced approach promotes sustainability by reducing duplication of effort and making library resources more accessible and useful.

3.3 Artificial intelligence

Giving computers the capacity to reason and learn on their own, thereby imbuing them with human-like intelligence, is known as artificial intelligence, or AI. It all comes down to buildingmachines that are capable of performing tasks like pattern recognition, problem solving, and language comprehension that normally call for human intelligence.

A key component of the digital transformation that libraries are undergoing for sustainability is artificial intelligence (AI). The following are the top five ways AI can help with this change:

3.3.1 Enhanced Search and Discovery

Artificial intelligence (AI)-driven search engines and recommendation systems have the potential to dramatically enhance how library users find resources. Artificial Intelligence (AI) can make recommendations for books, articles, and digital materials based on user behaviour and preferences. This facilitates the process of finding information for users. In addition to improving user experience, this promotes resource efficiency by lowering the need for paper and physical copies, which is consistent with sustainability objectives.

3.3.2 Digitization and Preservation of Content

Artificial Intelligence can expedite the process of digitising physical materials found in libraries, including historical manuscripts, rare books, and archival documents. Digital content can be effectively converted from analogue formats into digital ones using advanced AI-driven optical character recognition (OCR) and image recognition technologies. In addition to preserving priceless materials, this digitization also lowers the need for physical storage space,which promotes environmental sustainability.

3.3.3 Predictive Maintenance

Libraries frequently depend on a variety of infrastructure and technical tools. By keeping an eye on the condition of these systems, AI can be utilised for predictive

maintenance. Artificial Intelligence (AI) can anticipate when equipment requires maintenance or replacement through sensors and data analysis, minimising downtime and avoiding resource waste. This proactive maintenance strategy supports sustainability initiatives and guarantees the longevity of assets

3.3.4 Inventory Control and Resource Allocation

AI systems are capable of optimising library resource allocation. Purchasing, using, and deaccessioning books and digital materials are all part of this. AI can suggest the removal of underutilised resources by examining usage patterns, which will cut down on waste and excessinventory. AI can also help with resource acquisition choices, enabling libraries to spend money on materials that meet user demand and sustainability goals.

3.3.5 Environmental Monitoring and Energy Efficiency

AI can be used to keep an eye on and control the lighting, humidity, and temperature in the library. AI systems are able to make the best use of resources by continuously evaluating thesefactors and adjusting lighting and HVAC systems. This lessens the library's carbon footprint, which promotes sustainability in addition to lowering energy consumption and operating expenses.

Renewable energy technologies, such as solar panels, wind turbines, and hydropower systems,harness the power of natural resources like the sun, wind, and water to generate electricity without harming the environment. These sustainable solutions offer a clean alternative to fossil fuels, contributing to a healthier planet. In the context of libraries and their evolving role as digital information hubs, renewable energy plays a vital role in supporting sustainability. Embracing these technologies allows libraries to enhance services and minimize environmental impact, aligning with the broader trend of digital transformation for a more sustainable future.

libraries, reliant on digital infrastructure, can reduce their carbon footprint by adopting renewable energy sources like solar and wind power. Integrating these technologies into building design enhances overall energy efficiency, utilizing smart systems for climate control and lighting. Beyond internal sustainability, libraries serve as educational hubs by showcasing renewable energy solutions, engaging the community through exhibits and seminars. Collaborating with local renewable initiatives further contributes to community sustainability. While the initial investment in renewable tech may seem high, it ensures long-term cost savings and aligns with the cultural shift towards sustainable practices.

3.4 Green Building Technology

In order to reduce the impact on the environment, green building technology focuses on the environmentally friendly design, construction, and operation of structures. It emphasises sustainable materials, renewable energy sources, and energy efficiency. Energy-saving technologies include solar energy, intelligent climate control, and effective insulation. The three main goals of green building are reduced waste production, maximum space utilisation, and resource conservation. The objective is to design buildings that support environmental sustainability. To achieve this, cutting-edge systems and materials are frequently incorporated to guarantee effective resource use throughout the building's lifecycle.

Green building technologies are essential to libraries' digital transformation towards sustainability as they improve their operational efficiency and environmental impact. The following five main ideas show how these technologies support a more technologicallysophisticated and environmentally friendly library ecosystem:

3.4.1 Infrastructure with Low Energy Use

The goal of green building technologies is to design buildings that use less energy. To cut down on energy use, libraries can incorporate smart climate control systems, energy-efficient windows, and advanced insulation. This reduces the carbon footprint of the library while also guaranteeing that the servers and computer systems that make up its digital infrastructure run in an energy-efficient environment. Libraries improve their digital capabilities and adhere to sustainable practises by integrating these technologies.

3.4.2 Integration of Renewable Energy

Libraries can use renewable energy systems to lessen their reliance on traditional energy sources. Clean, sustainable energy can be produced by integrating geothermal systems, solar panels on rooftops, and wind turbines in strategic locations. In addition to providing energy fordigital technologies, this move towards renewable sources demonstrates the library's commitment to a sustainable future by serving as an example for the neighbourhood.

3.4.3 Smart Building Management Systems

Resource-saving smart building management systems are a common feature of green building technologies. These systems can be used by libraries to control temperature, lighting, and ventilation in response to occupancy and outside factors. This guarantees effective resource utilisation in addition to improving library

users' comfort. By enabling libraries to adjust dynamically to usage patterns, smart technologies help to reduce energy waste and promote sustainability in general.

3.4.4 Collaborative Technologies, Digital Learning Spaces, and Green Buildings

Green building principles go beyond the physical infrastructure to include collaborativetechnologies, interactive displays, and virtual learning environments. These digital innovationshelp libraries become more dynamic hubs for learning while using less traditional, resource- intensive materials. Libraries that embrace digital transformation in their offerings not only stay relevant but also help to create a more sustainable

3.4.5 Data-Driven Sustainability Monitoring

Libraries can enhance sustainability through data-driven monitoring systems embedded in green building technologies. These tools track resource consumption, enabling continuous assessment and improvement of environmental initiatives. By analysing data on energy use, water consumption, and waste generation, libraries can make informed decisions to boost overall environmental performance. This technology-driven, data-centric approach aligns with the principles of ongoing sustainability improvement and digital transformation.

3.5 Virtual Reality (VR) and Augmented reality

Virtual reality (VR) immerses users in computer-generated worlds, fostering interactive experiences. Augmented reality (AR) overlays digital elements onto the real world, offering ablend of physical and computer-generated objects. Both VR and AR play crucial roles in advancing digital transformation for sustainability in libraries. Here are five key ways they enhance library sustainability:

3.5.1 Enhanced Education

VR and AR create immersive learning environments, replacing traditional methods with virtual classrooms, simulated experiments, and 3D visualizations. This reduces reliance on physical resources like paper, aligning with sustainability goals.

3.5.2 Virtual Resource Access and Collaboration

These technologies enable users to access library resources virtually, reducing the need for physical visits. Users can collaborate in shared virtual environments, minimizing environmental impact and improving accessibility. Digitization of resources also aligns with sustainability goals.

3.5.3 Environmental Education

Libraries can use AR and VR to increase public awareness of environmental issues through interactive exhibits, virtual tours of eco-friendly buildings, and climate change simulations. This foster understanding and encourages sustainable practices.

3.5.4 Green Building Design

AR and VR aid in the design and planning of green building projects, allowing visualization and simulation of eco-friendly materials and sustainable designs. Libraries can optimize their physical spaces for sustainability using these technologies.

3.5.4 Virtual Community Engagement

AR and VR enable libraries to host digital meetings, workshops, and events, reducing the environmental impact of physical gatherings. Online book clubs, environmental discussions, and collaborative projects promote a sense of community without the same environmental footprint.

Conclusion

Digital transformation in libraries is crucial for promoting sustainability and reducing paper consumption. It reduces energy usage, promotes eco-friendly practices, and ensures accessibility. The integration of digital transformation technologies, such as blockchain, IoT, renewable energy, green building technology, and artificial intelligence, enhances operational efficiency and aligns with ecological goals. Blockchain ensures transparency and trust, IoT enables smart resource management, and renewable energy sources reduce carbon footprints. Green building technologies promote energy-efficient structures and resource conservation. Artificial intelligence enhances information retrieval, optimizes resource allocation, and automates routine tasks. These technologies redefine the modern library landscape, emphasizing sustainability as a core principle. As libraries evolve, embracing these technologies will ensure their relevance in the digital age and position them as leaders in a greener, more sustainable world.

References

1. Bradley, K. (2007). Defining Digital Sustainability. *Library Trends, 56*. https://doi.org/ 10.1353/lib.2007.0044

2. Chowdhury, G. G. (2016). How to improve the sustainability of digital libraries and information Services? *Journal of the Association for Information Science and Technology, 67*(10), 2379–2391. https://doi.org/10.1002/asi.23599

3. Internet of Things: What It Is, How It Works, Examples and More. (n.d.). Retrieved october 25, 2023, from https://justcreative.com/internet-of-things- explained

4. Igbinovia, M. O., & Okuonghae, O. (2021). Internet of Things in contemporary academic libraries: application and challenges. Library Hi Tech News, 38(5), 1–4. https://doi.org/10.1108/LHTN-05-2021- 0019

5. Atzori, L., Iera, A., networks, G. M.-C., & 2010, undefined. (n.d.). The internet of things: A survey. Elsevier. https://doi.org/10.1016/j.comnet.2010.05.010

6. Baker, D. (2016). Making sure things can never be the same again: Innovation in library and information services. Advances in Library Administration and Organization, 35, 1–44. https://doi.org/10.1108/S0732- 067120160000035007

7. Wortmann, F., Engineering, K. F.-B. & I. S., & 2015, undefined. (2015). Internet of things. Springer, 57(3), 221–224. https://doi.org/10.1007/s12599-015-0383-3.

8. Coghill, J. G. (2018). Blockchain and its implications for libraries. Journal of Electronic Resources in Medical Libraries, 15(2), 66–70. https://doi.org/10.1080/15424065.2018.1483218.

9. Debbie, G. (2017). Law and the Blockchain by Debbie Ginsberg. Retrieved June 27, 2019, from https://ischoolblogs.sjsu.edu/blockchains/law-and-the- blockchain-bydebbie-ginsberg

10. Deloitte, & Riddle\&Code. (2018). IoT powered by Blockchain: How Blockchains facilitate the application of digital twins in IoT, 20.

11. Lastovetska, A. (2019). Blockchain Architecture Basics: Components, Structure, Benefits & Creation. Retrieved October 30, 2023, from https://mlsdev.com/blog/156-howto-build-your-own-blockchain-architecture

12. Ways to Use Blockchain in Libraries. (2017). Retrieved October 27, 2023, from https://ischoolblogs.sjsu.edu/blockchains/blockchains-applied/applications/

13. Zheng, Z., Xie, S., Dai, H. N., Chen, X., & Wang, H. (2018). Blockchain challenges and opportunities: a survey. International Journal of Web and Grid Services, 14(4), 352. https://doi.org/10.1504/IJWGS.2018.095647

14. Hoy, M. B. (2017). An Introduction to the Blockchain and Its Implications for An Introduction to the Blockchain and Its Implications for Libraries and Medicine.

Medical Reference Services Quarterly, 36(3), 273–279. https://doi.org/10.1080/02763869.2017.1332261

15. Khan, S.; Muhammad, K.; Mumtaz, S.; Baik, S.W.; de Albuquerque, V.H.C. Energy-efficient deep CNN for smoke detection in foggy IoT environment. IEEE Internet Things J. 2019, 6, 9237–9245.

16. Nguyen, H.; Veluchamy, A.; Diop, M.; Iqbal, R. Comparative Study of Sentiment Analysis with Product Reviews Using Machine Learning and Lexicon- Based Approaches. SMU Data Sci. Rev. 2018, 1, 7.

17. Reis, J., Amorim, M., Melao, N., & Matos, P. (2018). Digital Transformation: A Literature Review and Guidelines for Future Research (pp. 411–421). https://doi.org/10.1007/ 978-3-319-77703-0_41.

18. Tandon, A., Dhir, A., Islam, A. K. M. N., & Mantym ¨ ¨ aki, M. (2020). Blockchain in healthcare: A systematic literature review, synthesizing framework and future research agenda. Computers in Industry, 122, Article 103290. https://doi.org/10.1016/j.compind.2020.103290

19. Sivarajah, U., Irani, Z., Gupta, S., & Mahroof, K. (2020). Role of big data and social media analytics for business to business sustainability: A participatory web context. Industrial Marketing Management, 86, 163–179. https://doi.org/10.1016/j.indmarman.2019.04.005

20. Lee, H.-T., Song, J.-H., Min, S.-H., Lee, H.-S., Song, K. Y., Chu, C. N., & Ahn, S.-H. (2019). Research Trends in Sustainable Manufacturing: A Review and Future Perspective based on Research Databases. International Journal of Precision Engineering and Manufacturing-Green Technology, 6(4), 809–819. https://doi.org/10.1007/s40684- 019-00113-5

21. Nambisan, S., Wright, M., & Feldman, M. (2019). The digital transformation of innovation and entrepreneurship: Progress, challenges and key themes. Research Policy, 48(8), Article 103773. https://doi.org/10.1016/j.respol.2019.03.018

22. Nulman, E., & Ozkula, ¨ S. M. (2016). Environmental nongovernmental organizations' digital media practices toward environmental sustainability and implications for informational governance. Current Opinion in Environmental Sustainability, 18, 10–16. https://doi.org/10.1016/j.cosust.2015.04.004

A Case Study of DMB Library in the Context of Digital Transformation for Sustainability

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ABSTRACT: This is the modern era and every field is changing and trying to cater best services to users. This paper comprehends various library activities and many digital reformations, particularly in the DMB Library many changes occured. In this study this research paper describes the term like 'Digital Transformation', 'Need of digital resources', 'Technological innovations for digital content development and its accessibility' and the study focuses on the digital transformation of DMB Library from its inception (1st stage 1990 to 2014), Middle state (Stage 2 - 2014 to 2023) and its modern stage (Stage 3 - 2023 onwards). What are the issues and solutions for the implementation of a good digital environment for the better services to end users. This paper analyzed three stages by its content of digital transformation. This case study may be helpful for the future of catering better services to end users. In this paper the current status of the DMB library is reviewed and forecasted in a digital environment.

KEYWORDS: DMB – Doodhsakhar Mahavidyalaya Bidri, OPAC- Online Public Access Catalog IRs - Institutional Repositories.

1. Introduction

Doodhsakhar Mahavidyalaya Bidri is one of the leading colleges in hilly and rural areas, which is affiliated to Shivaji University Kolhapur Maharashtra. This college completed 3 rd cycle and is accredited by NAAC with B grade. The library has adopted so many best practices by considering the user as the Centre point. DMB library promises a one-step, equitable and timely access to a vast number of diverse resources in a shared mode in a given specialty, lifting traditional barriers of time and space. www is an unorganized collection of documents, many of them ephemeral information which does not have any durability or lasting value. DMB library is accepting new technological changes for catering better services to users. As a part of it this case study is important to see digital reformation of DMB Library.

Kagal is a hilly and remote Tahsil in the district Kolhapur. It is a tehsil divided into several streams by the ranges of the Sahyadri Mountain. Being hilly and scantily populated, people here remained ignorant about the changes taking place around in the developed world. The modern means of communication and transport were yet to be made available for the people when Hon. Shri. Dinkarrao Jadhav founded Shri. Doodhsakhar Shikshan Prasarak Mandal Bidri in 1990. The sanstha runs a primary School, secondary school, Junior College and a Senior College. The sanstha functions with the chief objective of all round development of students. The motto of our sanstha is "Vidya Param Bhushanam" which means education has vital importance in everybody's life and it is the best or highest ornament or jewel. In the age of explosion of knowledge, the students of kagal, bhudargad, radhanagari and karvir Tehsil remained deprived of even the functional higher education. It is with the establishment of Doodhsakhar Mahavidyalaya, Bidri, in 1990 Hon. Shri. Dinkarrao Jadhav was able to bring a large group of students deprived of higher education into the mainstream. The first batch of this college began with 61 students of BA and 24 for B.Sc. total 85 students. Today more than 1000 students are availing higher education in the senior wing.

DMB Library

Library is the 'Heart' of the institute. Teaching and learning systems are supported by libraries through reading material and library resources. DMB college library was established in the year 1990. It plays an important role in the development of the institution. Library is considered as an important part of the institution which is the major learning source for the students and staff. As per the changing time, the role of libraries is also being changed. Advanced technology has been utilized by the library to provide library services. The main aim of the library is to avail the various reading material and learning resources to the students and work for the amusement and imbibe values in the readers by reading various autobiographies of great leaders. Students get inspiration and life-force for their future life by reading.

The college has a well equipped up-to-date Library with varieties of books. More than26000 Textbooks and Reference books are available in the Library. 08 daily newspapers of state and National level both in Marathi and English and 15 Periodicals on various disciplines are subscribed. Book bank facility is an important part of the college. Due to the rising cost of the book's students are Unable to purchase such books therefore a book bank facility is provided to meet the reading thrust of the students. Textbooks are provided to the students after admission in the college. The library intends to continue to provide an inviting physical environment, where students, faculty and staff can obtain needed information

quickly. Library is using the OPEN ACCESS System for all users. Library assists library users through orientation to fully utilize the resources and services of the library in view of developing information literacy skills. The library has developed an excellent collection of books, journals, magazines and newspapers. The library has also developed a non book collection which includes e-journals, e-books, CDs. Besides this it also maintains a separate collection of reference books, bound volumes journals and project reports. The entire collection has been classified using 19 th Ed. Of Dewey Decimal Classification Scheme. Library is automated with the software. Library patrons can search resources through OPAC.

Concept of Digitization and Digitalization

Digital transformation is the process by which Libraries embed technologies across their services to drive fundamental change. The benefits? Increased efficiency, greater services agility and, ultimately, the unlocking of new value for library staff, patrons and stakeholders. Many different paths lead to digital transformation and each organization's journey will be unique. For example, a library might introduce AI or cloud computing to enhance its user's experience. In every case, though, starting a digital transformation journey requires a new mindset. It is a chance to reimagine how libraries do things, often from the ground up.

Two concepts related to digital transformation are digitization and digitalization.

Digitization is the process of translating analogue information and data into digital form—for example, scanning a photo or document and storing it on a computer. Digitalization is the use of digital technologies to change business processes and projects—such as skilling employees to use new software platforms designed to help launch products faster. While digital transformation might include digitization efforts, it goes beyond the project level and affects the entire organization.

For most libraries, digital transformation requires a shift away from traditional thinking and toward a more collaborative, experimental approach. These new ways of approaching work reveal new solutions which, in turn, can improve customer experience, drive employee innovation and spur company growth at the fundamental level.

Need of the Study

The pressures to lower costs, reduce cycle times, raise quality and, in general, make workplace processes more productive & intensive. Things are changing in today's world to become digital. In order to meet the information needs of the

user community, the library should in this case become a digital library. Only when emerging technologies, or ICT, are used appropriately, is it feasible. The article explains in detail why, in the modern world, libraries must become digital libraries, resources must become digital or electronic resources, and library services must become digital services.

Why Digital Transformation for Sustainability?

The unprecedented surge of activities and interest in digital library can generally be attributed to the following three factors:

I. Emergence of Internet and web technologies as a media of information delivery and access. The Internet, particularly world wide web (WWW), allows rapid access to a wide variety of networked information resources extending a uniform interface to a vast number of multimedia resources. The web, being a hypermedia-based system, allow linking amongst electronic resources;

ii. Availability of highly evolved, extraordinarily simple and intuitive user interface, i.e., Internet Explorer and Netscape Navigator for all prevalent platforms; and

iii. Advances in online storage technologies enabling storage of large amounts of contents at increasingly affordable cost. The digital library offers significant and unparalleled improvement and value addition to library services while providing workable solutions to problems traditionally associated with the management of print-based collections in traditional libraries. Improved information retrieval and enhanced document delivery capabilities are widely acclaimed strengths of digital libraries. Moreover, the cost of creating, storing, manipulating and transmitting digital information has decreased considerably providing necessary impetus to the digital library initiatives worldwide.

DMB Library Activities and Services:

DMB Library plays an essential role in the development of rural students. In general, we observe that students are engaged with their study and other activities. DMB Library gives following services:

- Library website
- Library YouTube Channel
- Library Facebook Page
- Library blog
- Telegram channel

- In-out management System
- Library circulation service
- OPAC service
- Newspaper Clipping Service
- Current Awareness service
- Reference service
- Referral service
- Surrogate cards
- Internet service
- NLIST Database service
- Reprography service
- Swayam mentor service
- Career guidance and counseling
- Guidance for competitive exams

DMB Library in the Context of Digital Transformation

The following analysis is based on the questions asked the librarian and some analyzed data given below:

Description	Stage 1 (1990 to 2014)	Stage 2 (2014 to 2023)	Stage 3 (2023 onwards)
Searching	Card Catalog	OPAC	Web OPAC
Circulation	Card (Physical)	Automated + Card	Automated
Circulation Technology	Card	Barcode	RFID
Software for Automation	Not Introduced	Automation Done by KOHA	Modifications will be Carried out
New Arrival	Mainly by printed book or Periodical	Photocopy, Abstract, Social Digital Media	Independent Media
Library Services	Offline	Online	Cloud Based Services
Website	Not independent Website	Independent Free Website	Cloud based website
Library Work	Manually	Based on automation	Artificial Intelligence based, IoT, Chatbot

Description	Stage 1 (1990 to 2014)	Stage 2 (2014 to 2023)	Stage 3 (2023 onwards)
Information Retrieval	One Way	Two Way	Interactive
CMS			May introduced Drupal, Joomla, Alfresco, Labs
LMS			May introduced Moodle, OLAT, Openelms, ATutor
Digital Library Software	Not Introduced	Social Media tools introduced: Facebook Page, Whatsapp Group, Telegram Channel, YouTube Channel, Blog etc.	Suitable Software may introduced DSpace, Greenstone, Eprints, FEDORA

Conclusion

The digitization process has already begun in many large universities and libraries in order to make the content available to users inside and outside of the institution. Digital transformation is for the further necessary benefits like make a wide variety of Content Access, latest and updated resources can be served to users, allow readers to access materials on demand, make readers find resources instantly, no opening or closing hours or 24/7 open access, multiple and simultaneous access, library management automation, real-time interactions, eliminate deterioration of resources, preserve knowledge for the future generation. In rural and hilly areas also it is started and users are also taking interest in this digital content. DMB Library is the best example that they are trying to enhance themselves for digital transformation.

In the present digital era the libraries must respond positively to the changing environment by implementing continuous management of change for better digital content services effectively and efficiently.

References:

1. Balasubramany. (2013). *Re-Engineering of Library and Information Services Re-Engineering of Library and Information Services Re-Engineering of Library and Information Services.* NASINPROSE 2013.

2. http://www.dmbidri.edu.in/library/

3. https://sites.google.com/view/dmblibrary/about-library/library-collection

4. https://www.ugc.ac.in/

5. Kothari, C. (2004). *Research Methodology: Methods and Techniques.* New Delhi: New Age. *****

Role of NLIST Resources in the Implementation of NEP 2020: Bridging the Gap in Academic Resources in College Libraries of Assam

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ABSTRACT: The education policy of a country refers to the principles, rules, and plans that govern a country's education system for the development of the society. NEP 2020 is a vibrant education policy that will fundamentally reshape higher education in India by shifting it from the traditional learning environment of the single faculty trend to a multidisciplinary system.It is challenging for HEIs to implement NEP2020 with limited funds, infrastructure, learning resources, and manpower. NLIST e-resources can play a significant role in filling multidisciplinary academic resource gaps in implementing the NEP 2020. This paper will examine the role of NLIST resources in bridging the gap in multi-disciplinary resources to implement NEP2020 in the colleges of Assam.

KEYWORDS:

1. Introduction

An education policy is the set of rules and guidelines that govern an education system of the country. Since independence, several education policies have been implemented in India; However, NEP 2020 have special features to transform the existing education system and play a significant role in rebuilding its foundations. To implement NEP 2020 will require 2020 adequate multidisciplinary academic resources for technology-driven teaching and learning process to upgrade Indian education. The policy envisages multidisciplinary holistic education in higher education institutions where adequate multidisciplinary academic resources are needed to implement the policy successfully. The National Library and Information Services Infrastructure for Scholarly Content (NLIST) is a consortium-based project providing e-resources to colleges around the country, a reliable source of e-resources for students, faculty, and research scholars. NLIST resources appear to more or less reflect multidisciplinary content as envisaged in NEP2020, which can play a significant role in policy implementation by providing multidisciplinary academic content. Moreover, the multidisciplinary academic content of NLIST resources will have a significant impact on policy implementation and the

usability of the resources can be expected to increase in the near future. In this context, NLIST resources will play a significant role in bridging the gap of academic resources for content development in implementing the NEP 2020.

2. Literature Review

NEP2020 aims to transform the entire landscape of higher education into a multidisciplinary choice-based structure. Multidisciplinary approaches to course curriculum will surely develop in all-round of an individual across the subject disciplinary knowledge (Roy, 2022, p.a645).

According to Rani (2022), NEP2020 is a revolutionary shift in education approach with great cognitive advantages for students in multidisciplinary learning. As Jadhav (2022, p.189) indicated, NEP 2020 envisages multidisciplinary holistic education with imaginative and flexible curricular structures. According to Nagpal (2023, p. e831), NEP 2020 is a comprehensive, visionary policy to transform the Indian education system into a globally competitive ones. As Panda (n.d.) mentioned, NEP 2020 seeks to revolutionize structural reforms in Indian higher education into flexible multi-disciplinary ones. Mungekar (2022) in his speech mentioned that NEP 2020 seeks to replace single-disciplinary institutes with flexible multidisciplinary ones. According to Bai (2022, P.f733), the new policy will carve out exponential exchange and development of the future India for the young generation. Parmar(2017) emphasized on users education and for more utilization of NLIST resources. The consortia base e-resources services including NLIST programme have had an immense impact on the quality of education and radically transformed the library services (Kaushal,2017, p185)

3. Objective of the Study

The study objectives are as follows:

1. To explore the NLIST programme of Inflibnet
2. To explore the key factors of NEP 2020 implementation.
3 To explore the NLIST resources
4. To explore the utilities of NLIST resources in NEP 2020 implementation.

4. Methodology

This study aims to explore the role of academic usability of the NLIST resources in NEP 2020 implementation. It will be reviewed the goals, objectives,

and challenges of academic usability of the NLIST resources and its role in NEP2020 implementation. In this context, the literature survey method would be the most appropriate to reach the research problem and provide an adequate scientific explanation. For this purpose, 20 articles on NLISTprogramme, Assam colleges, and 12 articles on NEP2020 were scanned from various databases and websites including Scopus, Researchgate, academia, Google Scholar, DOAJ, J-STORE, Shudhganga, etc. Publishers' websites were visited to obtain information on subscribed e-resources from different publishers and to explore the multidisciplinary coverage of e-resources available there. The Keyword search methods are used for effective searching of related literature. The paper is divided into three broad disciplines of knowledge namely NLIST Programme, NEP2020, and Colleges of Assam and attempts to explain the near future academic usability of NLIST resources in the implementation of NEP2020.

5. Brief Introduction to the NLIST Programme

NLIST programme is a project for e-resources of scholarly contents of e-books, e-journals, and bibliographic databases. The project was launched by Shri Kapil Sibal, Union Minister of Human Resource Development, on 4th May 2010. It is an initiative of NMEICT and is being jointly executed by the INDEST-AICTE Consortium, IIT, Delhi and UGC-INFONET-DL Consortium, INFLIBNET Centre, Ahmedabad (Kaushal, 2017).

- NLIST provide e-resources to the government/ government-aided colleges under the UGC Act of 12B are eligible to take benefit with a membership/ renewal fee of Rs.5900/- (Rs.5,900/- [Rs.5,000/- membership fee +9,00/- GST]). The private and Non-aided colleges can get the benefit of accessing the NLIST resources as associate members by paying a fixed amount annual membership/renewal fee [Rs.34,000/-(Rs.30,000/- membership fee +4,000/- GST)][1].
- The Engineering, Medical, Agriculture, Nursing, Management, Dentistry, and Pharmaceutical Institutions are not eligible for membership[2]
- The NLIST project was subsumed under the e-ShodhSindhu consortium to provide scholarly content in colleges for the usage of academic purposes in 2014[3]. The INDEST-AICTE Consortium, and UGC-INFONET-DL consortium are merged as an e-ShodhSindhu consortium and initiated NLIST programme

1 https://nlist.inflibnet.ac.in/vabout.php

2 https://nlist.inflibnet.ac.in/vabout.php

3 https://nlist.inflibnet.ac.in/vabout.php

as colleges componentto facilitate the e-resources of scholarly literature, peer-reviewed journals, e-books, databases, and others bibliographic information for education, research, and development (Kushal, 2017, p.3).

- The Consortium subscribed e-resources for cross-use, i.e. subscribed e-resources of the INDEST-AICTE for Universities, and UGC-INFONET-DL Consortium resources for technical institutions.
- The NLIST provides scholarly content to faculty, students, and research scholars and beneficiaries can access the resources with full-text directly from publisher's site through INFLIBNET server.

5.1 Components of NLIST:

Following are the four components of NLIST programme

1. To subscribe and provide the e-resources of e-ShodhSindhu to institutions (IISERs, NITs, IITs, and IISc) under INDEST-AICTE Consortium.
2. Subscribing e-resources for accessing selected e-resources of universities under UGC- Infonet-DL consortium by INDEST-AICTE consortium.
3 To subscribe to selected scholarly e-resources to provide access to the Govt./Govt. aided colleges under the 2(f) & 12B act of UGC as the college component of e- ShodhSindhu.
4. The INFLIBNET Centre on behave of the project monitor and imparting organized training, awareness, and evaluating, and promote effective use of NLIST resources in colleges. The centre is engaged in the deployment of appropriate modern tools & techniques for the effective management of the project[4].

Both INDEST-AICTE & UGC-Infonet consortia are responsible for the activity list 1 & 2. Inflibnet centre is responsible for the activity list 3 & 4[5].

6. Higher Education: NEP 2020 Envisions key changes to the Present System:

NEP 2020 envisions the education system contributing to transforming India with quality education to build a vibrant knowledge society by providing high quality education to make India a global knowledge superpower. It attempts to develop the curriculum syllabus with a deep respect for fundamental duties and constitutional values and a conscious awareness of responsibility to the nation. The policy aims at the deeply rooted Indian spirit, and sustainable development to

4 https://nlist.inflibnet.ac.in/vabout.php
5 https://nlist.inflibnet.ac.in/vabout.php

live as responsible citizens with developmental, spiritual, knowledge, intellectual, and skills along with action.

1. Develop higher education standards to develop thoughtful, inclusive, and creativestudents.
2. A student emphasizes being able to study in-depth knowledge areas of student interest. Focuses on the all-round development of students i.e. character, moral and ethical values, intellectual curiosity, creativity, scientific mindset, and innovativeness.
3. Emphasis on disciplines such as professional, technical, and vocational education along with general knowledge based education such as arts, sciences, humanities, and social sciences.
4. To provide multidisciplinary courses in HEIs and to emphasize Indian-based and local languages as medium of instruction.
5. To provide the multi-disciplinary undergraduate education with choice base course for holistic education.
6. Restructure course curriculum, pedagogy, assessment, and student support processesat the institutional level with quality learning resources to compete in the era of globalization.

This Policy recommends the extensive use of technology in teaching-learning, removing language barriers, and communication gaps, and increasing accessibility to among Dibiang students. The policy recommends alternative methods of education when the traditional system is not possible and recommends expanding distance education, blendedlearning, as well as MOOCs to contribute to achieving a 50% increase in the total enrollment ratio. The policy further recommends that ICT-based initiatives and existing digital platforms in education be optimized to address current and future challenges to ensure quality education for all.

7. Restructuring Learning Resources in Colleges of Assam: Issues and Problem:

This policy envisages the restructuring of all Higher Education Institutions (HEIs) into multidisciplinary institutions by 2040. The goal is to have at least one large multidisciplinary institute or autonomous degree-awarding college (AC) in every district by 2030. However, there will be many problems and challenges in the restructuring of higher education institutions in Assam according to NEP2020. However, there will be a lot of issues andchallenges in the restructuring of higher education institutions in Assam according to NEP2020. Here, some key issues

and challenges for implementing the policy in the collegesof Assam are discussed briefly.

1. The majority of colleges in Assam are single-stream disciplinary e.g. Arts, Science, and Commerce only. The Collections of college libraries specify only single-stream subjects, which do not support multidisciplinary courses.
2. The majority of colleges do not offer vocational and skilled-based courses in Assam. In this regard, academic learning resources in vocational, skilled-based, or applied science are limited or nil.
3. ICT infrastructure in colleges is incompatible with a multidisciplinary coursecurriculum.
4. At present state college libraries do not have adequate academic e-resources for a multidisciplinary program.
5. Majority of colleges have not digital repositories, digital library and adequate e- resources to support MOOC,s courses.

8. NEP 2020: Holistic Multi-disciplinary Education

NEP 2020 is quite different from India's previous education strategy and envisages a multi- disciplinary holistic education to initiate a complete transformation in the foundation of higher education. The policy envisages a holistic and multi-disciplinary education with innovative and all-around development of students across subject disciplines like science, arts, humanities, social sciences, technology, management, professional, vocational & skilled base, soft skills, etc. Colleges need adequate academic learning resources reflectingmultidisciplinary and interdisciplinary subject content to implement NEP2020. However, at present, the college library collection of books and journals is not sufficient for the curriculum of multidisciplinary courses.

9. NLIST Resources: Multidisciplinary Coverage

E-ShodhSindhu consortium subscribes to the 6,000+ e-journals, and 1,99,500+ e-books under the NLIST programme. The project pursues two types of contracts with publishers such as purchasing on an annual subscription basis (e.g. e-brary) or on a "one-time payment and perpetual access basis" (e.g. Oxford Scholarships, McGraw-Hill, and NetLibrary). The NLIST resources reflected more or less multidisciplinary academic content, which would complement the shortage of multidisciplinary academic content in the NEP 2020 Policy.

1. Annual Reviews is a non-profit academic publishing company that publishes 51 peer- reviewed journals covering multidisciplinary areas i.e. life science, biology, biochemistry, physics, plant science, microbiology, psychology, applied science, nuclear science, astrophysics, social science, etc., and from where 33 journals are available in NLIST.
2. JSTOR (Journal Storage) is a digital library (founded in 1994) containing books and journals from more than 900 publishers, covering 75 subject disciplines, and in a database archive of 12 million articles and more than 2,500 titles accessible through NLIST.
3. Cambridge University Press (CUP) provides access to 224 titles of scholarly journals and 1800 tiles (e-books) covering a wide range of subjects, including humanities, social Sc. and science & technology.
4. Oxford University Press (OUP) publishes 500+tiles of academic journals and 40,000 academic books covering multidisciplinary content in 40 languages i.e. Sciences, Humanities, Social Sciences, Law, Medicine, Psychology, English language, and literature, from where more than 262 titles journals, 1402 titles of e-books are accessible in NLIST programme.
5. Indian Journal is a hub for interdisciplinary and multidisciplinary research papers from scholarly journals. A pan-global online platform for sharing and exposing research publications featuring 332 open-access journals and subscriptions. INFLIBNET hosts 180 titles of Indian journals.
6. EBSCO-OmniFile Full Text Mega is a full-text database of research publications across many disciplines of academic journals, magazines, newspaper articles, videos, audio, files, and images covering areas like Arts, humanities, education, law, Psychology, social science, ethics studies, history, women's studies, science, and technology, etc[6]. There are 3000+ titles accessible from EBSCO-OmniFile Full Text Mega including Indexing and Abstracting databases.
7. Ebrary is an online digital library of databases collection that serves a combined group of 435 academic, professional and commercial databases. ProQuest acquired it in 2011, replacing ProQuest Ebook Central. NLIST beneficiaries have access to 185000 scholarly e-books across various disciplines from ProQuest.
8. The Springer Publishing Group publishes over 1,400,000 eBooks, 2000 journals, and 7000 new books every year in areas such as science, technology, medicine, business, transport, and architecture. There are 2,300 e-book titles available through the NLIST program.

6 https://www.ebsco.com/products/research-databases/omnifile-full-text-mega

9. Sage publishes more than 1000 scholarly journals and 800 e-books yearly crossing the disciplines of subject areas Humanities, Social Science, science & technology, Medicine, Management, Counseling, and criminology. Sage Publications is an American publisher and founder member of "Open Access Scholarly Publishers. NLIST programme subscribed to 1000 titles of e-books from Sage.
10. The Taylor & Francis Group (founded in 1852) publishes more than 145,000 e-books and 2700 scholarly journals across many disciplines. More than 1800 titles of Taylor & Francis e-books are accessible in the NLIST programme.
11. McGraw Hill (founded in 1888) is a multidisciplinary publisher of academic content on engineering, medicine, and business and trades. The NLIST program provides access to more than 1124 McGraw-Hill e-books through My Library Platform.
12. World Library Foundation (founded in 1996) is a global archive hub for history, archives, classic literature, cultural heritage works, encyclopedias, and series. NDL on the INFLIBNET server provides access to more than 3000000 titles of e-books with multidisciplinary content.
13. The South Asia Archive is a digital library of South-East Asian Studies comprising 289826 titles of e-books on different topics of history, sociology, political science, economics, cultural studies, ideology, law, education, philosophy, archaeology, anthropology, in English and vernacular languages. The documents were collected by the South Asian Research Foundation (SARF) from India, Afghanistan, Bangladesh, Burma, and Pakistan. SARF provide access to 600000 titles of e-books through NLIST.

10. College Libraries in Assam: Challenges NEP 2020 Implementation

There are 578 colleges in Assam where including private, government, and provincialized offering general degrees, postgraduate, law, and B.Ed. degree which are affiliated to different universities i.e. Gauhati University (325 colleges), Dibrugarh University (176 colleges), and Assam university (77 colleges). Out of 578 colleges 7 colleges are under full government administration, 301 government provincialized colleges, and other remaining are private and the public by control of the local body. At present 232 colleges are active in status out of 280 registered institutions as per Inflibnet site record on 26th August, 2023. NLIST resources are the only reliable e-resources for the academic activities of these colleges, enhancing libraries' collections and services as multi-disciplinary resources in libraries. The global price escalation of e-resources has a significantly great impact

on small and single-stream institutions, which cannot afford the huge subscription costs of e-resource packages. NLIST's interdisciplinary and multi-disciplinary resources are the only trusted source for college libraries of to implement NEP 2020.

Conclusion

NEP 2020 is a vibrant education policy that fundamentally reshapes higher education from a single to holistic multi-disciplinary system based on the pillars of access, equity, quality, affordability and accountability with the aim of transforming India into a knowledge superpower. Learning resources and knowledge infrastructure is a great question for the implementation of NEP 2020 and the sustainable development of HEIs according to policy. The INFLIBNET, an inter-university centre of the country and, its scholarly e-resources project already cover all universities and colleges under the 2(f) & 12B Act of the UGC.

NLIST's multidisciplinary e-resources can play a key role as the foundation of knowledge infrastructure in HEIs for the implementation of NEP2020 by bridging the gap in educational resources. NLIST resources will become important in multi-disciplinary curricula and the implementation of ENEP 2020 will significantly enhance the academic utility of the resources in the near future.

References

1. Azeez, A. (2018, March). UGC-Inflibnet for bridging the digital divide in academia [chapter]. Researchgate. p32-43. Available at https://www.researchgate.net/publication/323551626_ UGC-INFLIBNET_for_Bridging_the_Digital_Divide_in_Academia.

2. Bai, K.A. (2022, Jan). Importance of multidisciplinary studies in Indian higher education. International Journal of Creative Research Thoughts (IJCRT), 10(1), f723- f734. Available athttps://ijcrt.org/papers/IJCRT2201644.pdf.

3. Besselaar, P.V.D. & Heimeriks, G. (2014, Nov 13). Disciplinary, multidisciplinary, interdisciplinary: concept and indicators. Researchgate. Available at https://www. researchgate.net/publication/267939164_Disciplinary_Multidisciplinary_Interdisciplinary_Co ncepts_and _Indicators.

4. Jadhav, N. (2022, May-June). Issues and challenges of National Education Policy (NEP) 2020 implementation in teacher education. *International Journal of Enhanced Research in Educational Development (IJERED*, 10(9),pp.188-191.

Available at https://www.researchgate.net/publication/362538441_issues_and_Challenges_of_National_Education_Policy_NEP_20 20_ implementation_in _Teacher _Education.

5. Kaushal, S. (2017). *Usage of the N-LIST e-resources: an evaluative study of select degree colleges affiliated to Panjab University, Chandigarh* [Ph. D thesis, Panjab University, Chandigarh]. Shudhganga, INFLIBNET. Available at https://shodhganga.inflibnet.ac.in/handle /10603/206037 (access on 27th Aug, 2023).

6. Mungekar, P. (2022, May 3). National education policy 2020 implementation challenges. Available at https://www.stayfeatured.com/post/national-education-policy-2020- implementation-challenges. Access on 28th Aug, 2023.

7. Manjunatha S. History of education policy in India. E-PG pathsala, Inflibnet. Available at http://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000033SO/P000300/M013097/ET/145258955205ET.pdf.

8. Ministry of Human Resource Development, Govt. of India. National education policy 2020.Available at https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_ English_0.pdf .

9. Nagpal, P.(2023, Jan). Implementing the National Education Policy 2020: challenges and solutions in school Education in India. International Journal of Creative Research Thoughts (IJCRT), 11(1), e829-831. Available at https://www.ijcrt.org/papers/ IJCRT2301593.pdf.

10. Panda, R. NEP 2020: Implementation challenges. Available at https://www.education world.in/nep-2020-implementation-challenges/.

11. Parmar, P. T. (2017, April). *Use and utilization of N-LIST programme in affiliated colleges of Veer Narmad South Gujarat University and Hem Chandra charya North Gujarat University of Gujarat: A comparative study* [Ph. D.,Veer Narmad South Gujarat University, Surat], Shudhganga, INFLIBNET. Available at https://shodhganga.inflibnet.ac.in/handle/10603/353540 (Access on 21st Aug 2023)

12. Puttamadappa K. B. (2018). *Use of N-LIST e-resources by the faculty in first grade colleges affiliated to the University of Mysore: a study* [Ph. D. thesis, Mysore University, Mysore]. Shudhganga, INFLIBNET. Available at https://shodhganga.inflibnet.ac.in/handle /10603/246702 (Access on 17th Aug 2023).

13. Puttamadappa, K. B & Begum, K. J. (2018, Jan-Mar). Role of college librarians in promotingN-LIST e-resources usage in first grade colleges affiliated to the University of Mysore: A study. *International Journal of Library and Information Studies*, 8(1), 231-241. Available at https://www.ijlis.org/articles/role-of-

college-librarians-in-promoting-nlist-eresources-usagein- first-grade-colleges-affiliated-to-the-university-of-my.pdf. (Access on 17th Aug, 2023).

14. Rani, R. (2022). National Education Policy-2020: Issues and Challenges. *Quest Journals Journal of Research in Humanities and Social Science.* 10(2), pp:06-09. Available at https://www.questjournals. org /jrhss/papers/vol10-issue2/Ser-2/B10020 609.pdf.

15. Ravikumar, S. (2018, Aug). *Usage of INFLIBNET N-LIST services by the students of arts andscience colleges affiliated to Madurai Kamaraj University: An empirical study* [Ph. D. thesis, Madurai Kamaraj University, Madurai]. Shudhganga, INFLIBNET. Available at https://shodhganga. inflibnet.ac.in/handle/10603/305607 (Access on 22nd Aug 2023).

16. Roy, K. (2022, April). Multidisciplinary Approach in Teacher Education Programme: A Study. Journal of Emerging Technologies and Innovative Research (JETIR), 9(4), p.a645- a649. Available at https://www.jetir.org/view?paper=JETIR2204082.

17. Singh, J. (2017, Dec-july). *Use of electronic resources in N-LIST programme by the undergraduate students of four Postgraduate colleges of Jalandhar District, Punjab: A study. Indian Journal of Information Sources and Services*, 7(2), 1-8. Available at https://trp.org.in/wp-content/uploads /2017/08/IJISS-Vol.7-No.2-July-December-2017 -pp.1- 8.pdf. (Access on 03th sept, 2023).

18. Singh, T. P. (2020). *Modernizing college libraries with e-resources under N-LIST Programme in Manipur* [Ph. D. thesis, Manipur University, Imphal]. Shudhganga, INFLIBNET. Available at https://shodhganga.inflibnet.ac.in/handle/10603/363446. (Access on 17th Aug 2029).

19. Sinha, M. K. & Bhattacharjee, S. & Bhattacharjee, S. (2013). ICT and internet literacy skills for accessing to e-resources available under N-LIST programme: a case study of college library users of Barak valley, south Assam. *Library Philosophy and Practice (e-journal).* 948. Available at https://digitalcommons.unl.edu/libphilprac/948 (Access on 29thAugust, 2022).

20. Solanki, M. (2016, May-June). Access pattern of e-resources under N-List programme amongusrs. *Journal of Research in Humanities & Soc. Sciences*, 4(4), 41-46. Available at http://www. raijmr.com/ijrhs/wp-content/uploads/2017/11/IJRHS_2016 _vol04_issue_04_ 07.pdf (access on 25-08-2023).

21. UGC. Salient features of NEP 2020: Higher education. Available at https://www.ugc.gov. in/pdfnew /5294663_Salient-Featuresofnep-Eng-merged.pdf.

22. Zhuravlova, D.L. (2019, Jan 13). Interdisciplinary, multidisciplinary and transdisciplinary research strategy for speech development of primary school pupils with disgraphy. International Academy Journal Web Scholar, 2(I-31), 17-24. DOI: https://doi.org/10.31435/rsglobal_wos/ 31012019 /6315.

23. Uppal, G.K. (2018, Oct-Dec). Use of n-list e-resources by the users of govt. aided college library of phagwara: A study. *IJRAR- International Journal of Research and Analytical Reviews*, 4(5), 295-298. Available on https://www.researchgate.net/publication/344946702 (Access on 21stAug, 2023).

Digital Transformation of Library Resources in Open Universities of India: A Comparative Analysis

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ABSTRACT: Everything is evolving, trends are rapidly changing. In today's world every single thing is advancing towards digital transformation, with uninterrupted internet access students can read or access any materials without even visiting a library. As of changing demands from students, teachers, professors and research scholars the traditional methods of libraries are bound to change. Digital transformation, it doesn't only signify to implement some digital technologies but to select right technology using right process and right scope. In case of digital transformation one should be careful as of how far and how fast an institution or organization should go for their Digital transformation.

KEYWORDS: Digital Transformation, Internet, Digital Technology, Institute, Organization

Introduction

India has incredibly effective education systems. Digital transformation in library means to implement models or techniques through which print or physical documents can be converted to electronic or online formats. This paper deals with the current digital transformation of library resources in open universities of India. As it is already known that open universities provide distance learning for students, research scholar etc. For availing online resources of a library by just sitting at home, a library needs to digitize their resources electronic format. The libraries have dramatically changed over a period of time with the current necessity for digital transformation. Those days were gone past when libraries used their traditional manual methods, the present scenario needs a digital change in library resources and services. For open universities it's a must to have a vast collection of e-resources and digital library for seamless access to their users. In this paper a comparison is done between eight out of 14 open universities library e-resources. We have used purposive sampling technique as to separate seven open universities library based on NAAC 'A' grade. This paper mainly focuses on the e-resources collection supplied by these Open University libraries.

Digital Library

A Digital Library is also called online library which includes a collection of electronic documents consisting of born digital and digitized materials, CD-DVD disks, images, audio files, videos etc. as it is 24x7 accessible to the library users through web. Paul Otlet and Henri La Fontaine's first attempted to start a digital library in 1895, though the visions of the digital library were perceived a century later during the prominent expansion of internet. The main characteristic of a digital library is the convenient access of digital collection by millions of users at the same time.

In this digital period there are different types of e-resources available, but the commonly used e-resources are:

- **E-Books**: Electronic books or e-books are electronic version of printed books that could be accessed anytime, anywhere through internet. There are two major categories of e-books, the first one is which are available online via internet and offline which is via CDs DVDs etc.
- **E-Journals**: Electronic journals are available electronically via online or offline, some needs subscriptions while some can be free to access. Nowadays e-journals have become the main origin of electronic information.
- **E-Database**: Electronic databases are one of the most significant digital resources. They are available in various forms such as bibliographic database, full-text database and reference database.
- **E-Consortia**: E-consortia provide smooth access to hundreds and thousands of e-journals, e-books, databases. Some of the well known e-consortia are UGC Infonet, INDEST, AICTE consortium etc.

Advantages of digital collection

- Provides remote access
- Can be access by multiple users at a same time
- Provides different search options
- Saves the printing and postage cost
- Doesn't need physical processing
- Can be easily preserved with a low cost budget

Disadvantages of digital collection

- High installation cost
- Needs specific equipments for access
- Causes concern regarding copyright

Objectives of the paper

The specific objectives make a paper more meaningful so the following has been framed for the study of this topic:

1. To find out the availability of electronic resources in those eight open university libraries.
2. To have a comparison between e-resources in all eight Open University Libraries.
3. To find which one of the library has best e-resources collection.

Methodology

For the present study, the required information or data has been collected by the researcher via library annual records, online digital library collection and the same was recorded for analyzing the data and also presented in form of tables and graphs.

Data Analysis and Interpretation

The total of eight open universities are selected out of 14 open universities on the basis of NAAC 'A' grade accreditation. Those seven open universities are Indira Gandhi National Open University (IGNOU), Dr. B. R. Ambedkar Open University (BRAOU), Yashwantrao Chavan Maharashtra Open University (YCMOU), Dr. Babasaheb Ambedkar Open University (BAOU), Netaji Subhas Open University (NSOU), Tamil Nadu Open University (TNOU), Pt. Sunderlal Sharma Open University (PSSOU) and Karnataka State Open University (KSOU). A table and graphs are presented having the information about the electronic resources available in these libraries.

Table 1: Total number of E-Resources available at eight Open University libraries

E- Resources	IGNOU	BRAOU	YCMOU	BAOU	NSOU	TNOU	PSSOU	KSOU
E-Books	1,96,078	77,698	2,05,000	63,065	20,349	26,795	15,029	1,21,000
CD- DVDs	4,207	3,914	2,947	3,214	124	154	117	2,534
Theses/ Dissertations	948	228	535	326	3,434	1,432	224	300
Course Materials	2,265	1,414	737	-	1,461	-	-	-
Study center books	120	5,992	-	114	-	-	-	-

E- Resources	IGNOU	BRAOU	YCMOU	BAOU	NSOU	TNOU	PSSOU	KSOU
E- Journals	348	35	1,700	34	25	23	1,926	3,387
E- Databases	8	6	3	1	6	6	6	10
Question papers	645	-	1,446	485	-	1,418	-	853

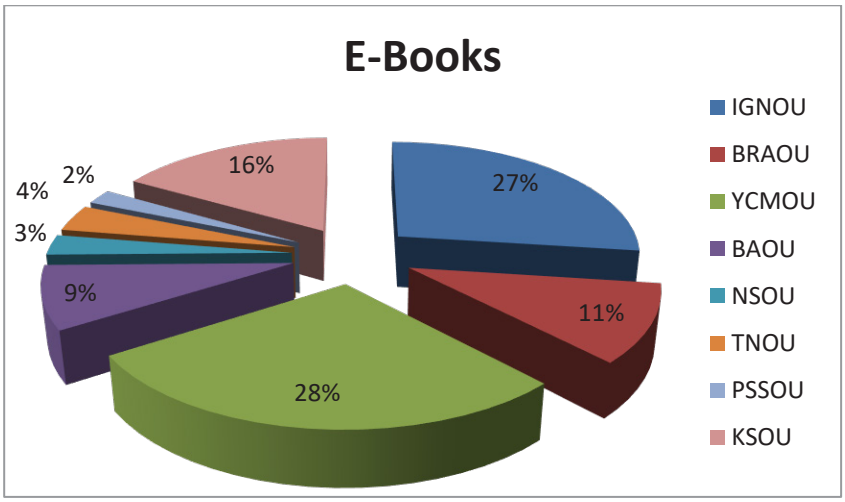


Figure 1: Total number of E-Books present in all eight Open University Libraries

From figure 1 we can see that YCMOU has the 28% that is the highest number of digitally transformed e-books and PSSOU has 2% that is the lowest number of e-books available for users.

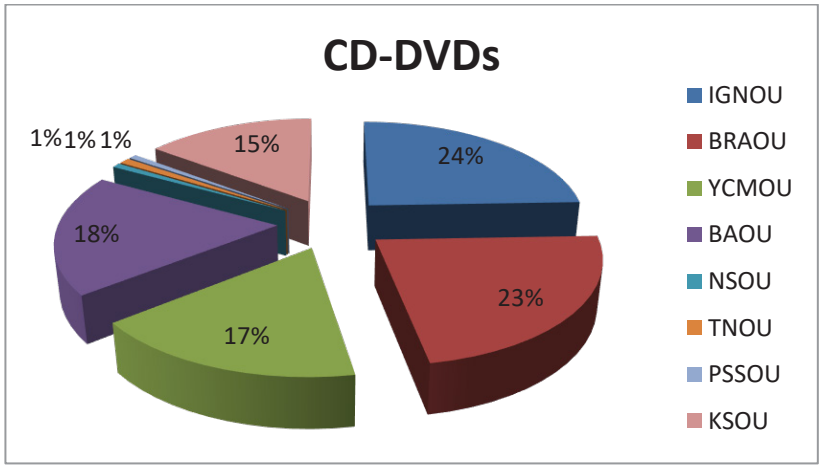


Figure 2: Total number of CD-DVDs present in all eight Open University Libraries

From figure 2 we can see that IGNOU has the highest number of CD-DVDs that is 24% are present whereas NSOU, TNOU and PSSOU has the lowest number of CD-DVDs are present.

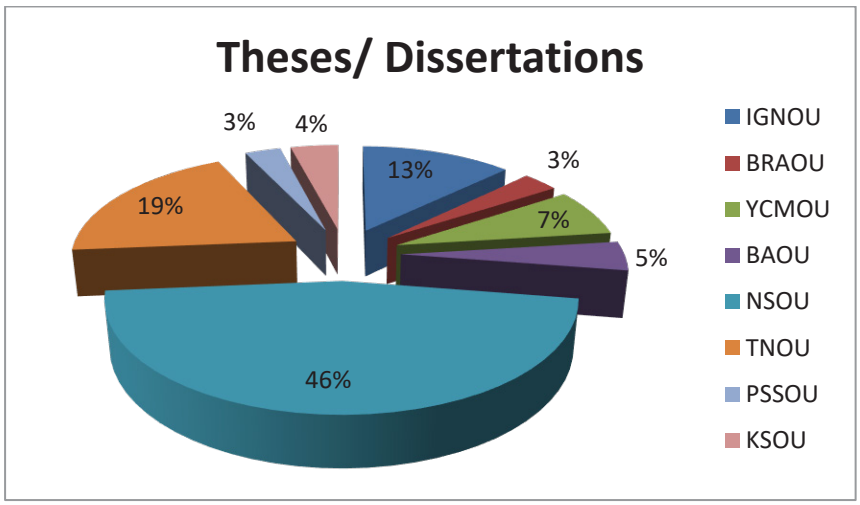


Figure 3: Total Number of Theses/ Dissertations available electronically at the eight Open University Libraries

From figure 3 we can see that NSOU has the highest number of theses/Dissertations that is 46% whereas BRAOU and PSSOU has the lowest number that is only 3% theses/ Dissertations available electronically.

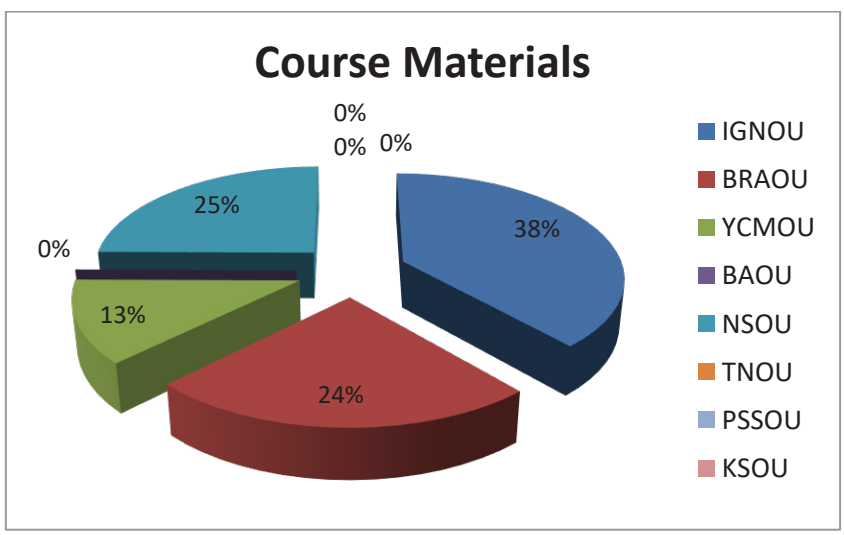


Figure 4: Total number of Course materials available electronically at all the eight Open University Libraries.

From figure 4 we can see that IGNOU has the highest number of course materials that is 38% are available electronically whereas BAOU, TNOU, PSSOU and KSOU doesn't have course materials available electronically.

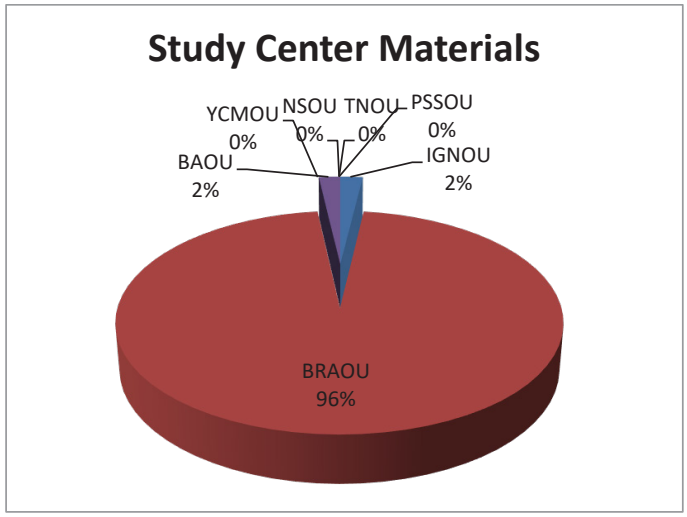


Figure 5: Total Number of Study Center Materials available electronically in all eight Open University Libraries

From figure 5 we can see that BRAOU has the highest number of study center materials present electronically, that is 96% followed by IGNOU and BAOU each 2% whereas YCMOU, NSOU, TNOU, PSSOU and KSOU doesn't have study center materials available electronically.

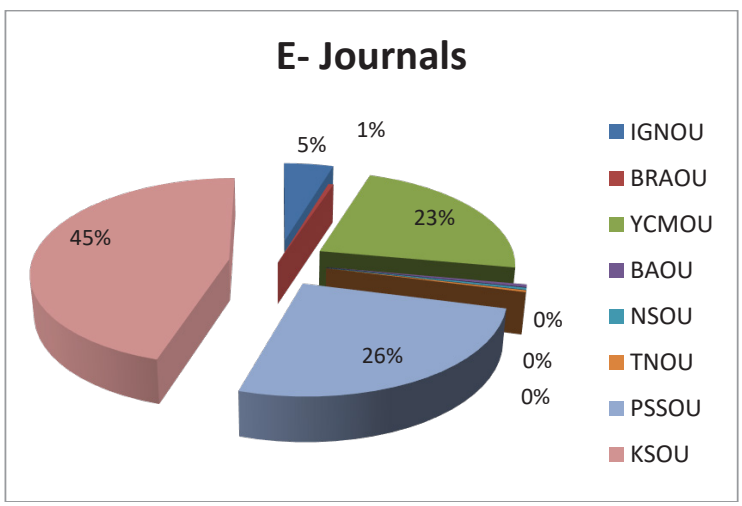


Figure 6: Total Number of E-Journals available in all eight Open University Libraries

From figure 6 we can see that KSOU has the highest number of E-Journals present, that is 45% followed by PSSOU, YCMOU, IGNOU, BRAOU whereas BROU, NSOU and TNOU has the lowest number of subscribed E-Journals.

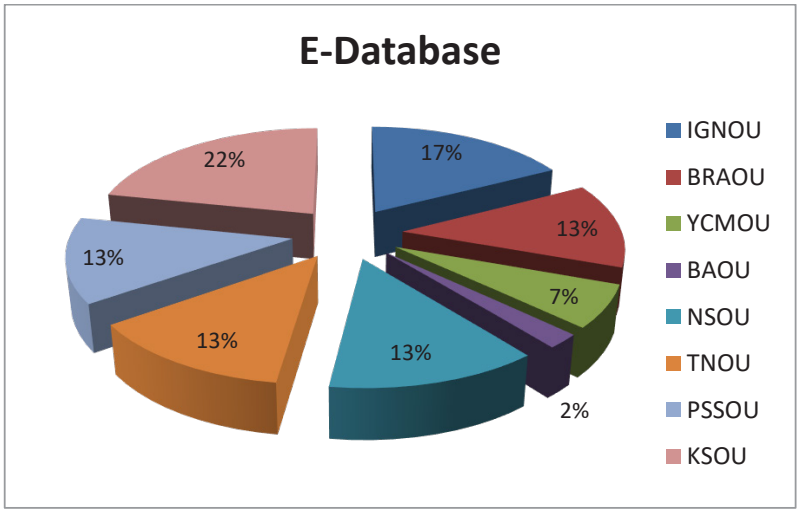


Figure 7: Total Number of E-Databases available in all eight Open University Libraries

From figure 7 we can see that KSOU has the highest number of E-Databases present in their library whereas BAOU has the lowest.

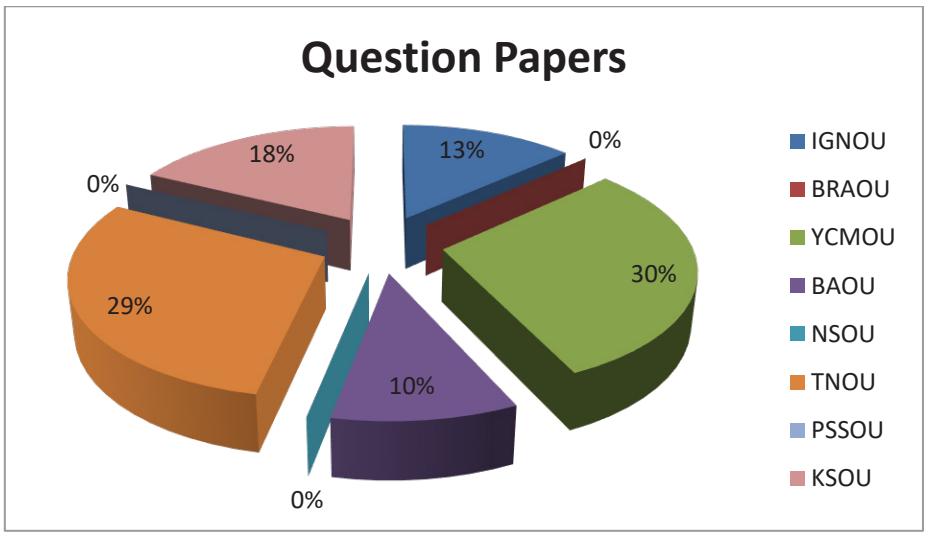


Figure 8: Total Number of Question papers present electronically in all eight Open University Libraries

From figure 8 we can see that YCMOU has the highest number of previous years question paper present electronically followed by TNOU, KSOU, IGNOU and BAOU whereas BRAOU, NSOU and PSSOU doesn't have question papers available electronically.

Findings

From the study it is found that common electronic resources such as E-Books, CD/DVDs, Theses/Dissertations, E-Journals and E-Databases are available in all eight Open University libraries but few electronic resources are not accessible or open for everyone electronically such as:

- Course materials are not present in BAOU, TNOU, PSSOU and KSOU.
- Study Center books are not present in YCMOU, NSOU, TNOU, PSSOU and KSOU.
- Online Question Papers are not present in BRAOU, NSOU and PSSOU.

By comparing the E-Resource present in all eight Open universities we can see that:

- YCMOU has the best collection of electronically available books that is 28% followed by IGNOU (27%) and KSOU (16%) .
- IGNOU has the best collection in case of CD-DVDs that is 24% followed by BRAOU (23%), BAOU (18%), YCMOU (17%) and KSOU (15%) whereas other three Open Universities has subsequently less number of CD-DVDs collections.
- NSOU has the highest number of theses/ dissertation collections that is 46% followed by TNOU (19%), IGNOU (13%) and YCMOU (7%) whereas other four Open University has subsequently less number of collection.
- IGNOU has the highest number of course materials present electronically that is 38% followed by NSOU (25%), BRAOU (24%) and YCMOU (13%) whereas other four Open Universities does not have Course materials available electronically.
- BRAOU has the highest number of study center materials that is 96% followed by IGNOU (2%) and BAOU (2%) the rest five Open Universities doesn't have any electronic study center materials.
- KSOU has the highest number of electronic journals that is 45% followed by PSSOU (26%) and YCMOU (23%) the rest five Open Universities has less number of e-journals.

- KSOU subscribed in highest number of E-Database that is 22% followed by IGNOU (17%) whereas BRAOU, NSOU, TNOU and PSSOU have 13% each.
- YCMOU has the highest number of electronically available question papers that is 30% followed by TNOU (29%), KSOU (18%), IGNOU (13%) and BAOU (10%) whereas the other three Open Universities does not have electronically available question papers.

Hence, we can see that YCMOU has the best collections of e-resources followed by IGNOU and KSOU. In other hand PSSOU has the lowest number of E-Resources compared to all eight Open University Libraries.

Conclusion

Digital Transformation of E-Resources is important in libraries of developing countries. Though it is a complex, multifaceted process it helps an organization or institution to reach new heights in this era where millions and millions of people depends on digitally available tools. Today, library professionals are facing different obstacles in where they have to fulfill the needs of users according to the changing and evolving trends. Digitally transformed e-resources are a must for Open University Libraries as they have vast number of users who can be present at any corner of the world. Though there are e-resources present at these Open University Libraries but still there's a great need for digitally transformed e- resources in Open Universities to overcome modern information services in addition to increase the usefulness of the library resources. From this study one can strengthen the E-Resources collection in library according to their needs and purpose.

References

1. Anuradha, P. (2020). Digital transformation of academic libraries: Opportunities and challenges. *IP Indian Journal of Library Science and Information Technology*, *3*(1), 8–10. https://doi.org/10.18231/2456-9623.2018.0002

2. Singh, B. P. (n.d.). Digital Transformation of library services in the Mobile World: The future trends. *Publishing Technology and Future of Academia*.

3. Ikenwe, I. J., & Udem, O. K. (2022). Innovative digital transformation for dynamic information service sustainability in university libraries in Nigeria. *Folia Toruniensia*, *22*, 67–86. https://doi.org/10.12775/ft.2022.004

4. Singh, K. K., Asif, M., & Ugc-Net, M. A. (2022). Emerging trends and technologies for digital transformation of libraries. *ResearchGate*. https://www.researchgate.net/publication/364387539

Sustainable Development Goals and Their Impact on Libraries: A Comprehensive Analysis

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ABSTRACT: The globe is currently dealing with a number of issues that are seriously impeding the attainment of sustainable development in the developing countries. Making sure that nations strive towards the Sustainable Development Goals (SDGs) of the UN is one way to address these issues. The library and information industry is one of the stakeholders who must step in if these issues are to be resolved for the good of humanity. This research paper examines the intersection of Sustainable Development Goals (SDGs) and libraries, exploring the evolving role of libraries in contributing to the global sustainability agenda. The paper delves into the various ways libraries are aligning their activities with the SDGs, fostering community engagement, and promoting environmental, social, and economic sustainability. Through a thorough literature review and case studies, the research aims to provide insights into the impact of SDGs on libraries and the reciprocal influence libraries can have on achieving sustainable development.

KEYWORDS: Sustainable Development Goals, libraries, community engagement, technology, education, advocacy, partnerships

1. Introduction

Background: The Sustainable Development Goals, adopted by United Nations member states in 2015, set forth a comprehensive agenda to address global challenges, including poverty, inequality, environmental degradation, and more. Libraries, as information hubs and community spaces, play a crucial role in supporting and advancing these goals. In an era defined by interconnected global challenges and a collective pursuit of sustainable development, the United Nations' Sustainable Development Goals (SDGs) have emerged as a comprehensive framework guiding efforts toward a more equitable and sustainable future. At the heart of this global agenda, libraries stand as pivotal institutions that transcend traditional roles, evolving into dynamic hubs for community engagement,

information dissemination, and the promotion of knowledge as a catalyst for positive change.

The SDGs, comprising 17 interlinked goals and 169 targets, provide a blueprint for addressing a myriad of complex issues, from poverty and hunger to education, gender equality, climate action, and beyond. Within this expansive framework, libraries play a crucial role as catalysts for social transformation. As vibrant community spaces, they not only facilitate access to information but actively contribute to the realization of SDGs by adapting their services, programs, and resources to align with the diverse challenges and opportunities outlined in the global goals.

This connection between libraries and the SDGs signifies a paradigm shift in the perception of libraries—from static repositories of knowledge to dynamic agents of change. Libraries are increasingly recognized as catalysts for sustainable development, fostering inclusivity, digital literacy, cultural preservation, and environmental awareness. Through strategic partnerships, innovative programming, and community-focused initiatives, libraries are actively contributing to the achievement of SDGs, turning their spaces into epi-centers of learning, empowerment, and community development.

In this context, this exploration aims to delve into the intricate relationship between libraries and the SDGs, examining how libraries around the world are embracing this global agenda, adapting their services to local contexts, and contributing meaningfully to the pursuit of a more sustainable and equitable world.

2. Objectives

This paper seeks to:

(a) Examine the alignment of libraries with specific SDGs
(b) Analyze the impact of SDGs on the development of library services and programs.
(c) Investigate the reciprocal influence of libraries in achieving sustainable development.

3. Literature Review

In a comprehensive analysis of the impact of Sustainable Development Goals (SDGs) on libraries, the American Library Association (ALA) provides a valuable resource with its guide titled "Libraries' Guide to the 2030 Agenda: A Toolkit

for Public Libraries" (ALA, 2018). This toolkit outlines practical strategies for libraries to align their services with the SDGs, offering examples and case studies that highlight successful initiatives around the world.

According to Bradley (2014), an informed public greatly aids in the eradication of poverty and the advancement of the country because it makes information resources and services available and accessible. This fosters peaceful and inclusive societies for sustainable development, ensures that everyone has access to justice, and creates inclusive, accountable, and effective institutions at all levels.

Additionally, the IFLA Journal features an article by Chowdhury (2019) titled "Libraries and the United Nations 2030 Agenda: A Toolkit for Library Professionals," which delves into the role of libraries in advancing the SDGs. The article provides insights into how libraries can contribute to sustainable development, with a focus on practical tools and approaches for library professionals.

Hirsh's work on "Social Responsibility in Librarianship: Essays on Equality" (2017) and the collaborative effort of Jaeger, Taylor, Gorham, Bertot, and McClure in "Libraries, Human Rights, and Social Justice: Enabling Access and Promoting Inclusion" (2014) offer broader perspectives on the social responsibilities of libraries and their potential impact on achieving the goals outlined in the 2030 Agenda.

Public libraries are essential socially responsible institutions,according to Opara et al. (2021). They offer a variety of tools and services to help people and organisations meet their social responsibility objectives.

4. Leveraging Technology to Promote Sustainable Practices and Provide Innovative Solutions

- Libraries are leveraging technology in innovative ways to promote sustainable practices and provide solutions that align with the principles of sustainable development. The integration of technology not only enhances the efficiency of library operations but also expands the reach and impact of library services in contributing to global sustainability goals. Here are several ways in which libraries are harnessing technology for sustainable practices:

Digital Resources and Virtual Libraries:

- **Online Catalogs and Databases:** Libraries provide digital access to catalogs and databases, reducing the need for physical resources and promoting a paperless environment.

- **E-books and Digital Archives:** Libraries offer electronic books and digital archives, reducing the environmental impact of printing and transportation.

Digital Literacy Programs:

- **Online Learning Platforms:** Libraries use online platforms for digital literacy programs, educating users on technology skills and promoting inclusivity in the digital era.
- **Webinars and Virtual Workshops:** Libraries organize webinars and virtual workshops to disseminate information on sustainability, environmental practices, and other relevant topics.

Community Engagement through Social Media:

- **Social Media Platforms:** Libraries utilize social media to engage with the community, promote events, and share information on sustainable practices, fostering a sense of community and collective responsibility.

Energy-Efficient Technologies:

- **Smart Building Systems:** Libraries implement smart building systems to optimize energy consumption, including lighting, heating, and cooling systems, contributing to energy efficiency.
- **Renewable Energy Sources:** Libraries may adopt renewable energy sources, such as solar panels, to power their operations sustainably.

Digital Inclusion Initiatives:

- **Providing Internet Access:** Libraries offer free internet access to bridge the digital divide, ensuring that all members of the community have the opportunity to benefit from online resources.
- **Device Lending Programs:** Some libraries provide lending programs for digital devices, allowing community members to access technology even if they do not own personal devices.

Data Analytics for Decision-Making:

- **Data-Driven Sustainability:** Libraries use data analytics to measure the impact of their programs, allowing for evidence-based decision-making in line with sustainable development principles.
- **Resource Optimization:** Analyzing data helps libraries optimize resource allocation, reducing waste and improving the efficiency of services.

Online Collaboration and Partnerships:

- **Virtual Meetings and Conferences:** Libraries engage in virtual collaborations, meetings, and conferences, reducing the need for physical travel and promoting a more sustainable approach to networking.
- **Global Knowledge Sharing:** Technology facilitates global collaboration among libraries, allowing them to share best practices, resources, and innovative solutions for sustainable development.

Promoting Environmental Awareness:

- **Interactive Displays and Exhibits:** Libraries use digital displays and interactive exhibits to raise awareness about environmental issues, promoting education and sustainable behaviors.
- **Online Campaigns:** Libraries launch online campaigns to advocate for environmental conservation, recycling, and other sustainability initiatives.

5. Role of Libraries in Fostering Community Awareness and Participation in SDG-related activities

- Libraries play a crucial role in fostering community awareness and participation in Sustainable Development Goal (SDG)-related activities. As dynamic community hubs, libraries are uniquely positioned to engage diverse populations, disseminate information, and inspire collective action towards achieving the SDGs. Here are key aspects of the role that libraries play in this regard:

Information Dissemination:

- **Curating SDG Resources:** Libraries actively curate and provide access to a diverse range of resources related to the SDGs, including books, articles, reports, and multimedia materials. This facilitates community members' access to information on global challenges and solutions.

Educational Programs:

- **Workshops and Seminars:** Libraries organize workshops and seminars to educate the community about the SDGs, explaining the goals, targets, and the significance of each. These educational programs promote awareness and understanding among community members.
- **Lifelong Learning Initiatives:** Libraries offer educational initiatives that align with specific SDGs, encouraging community members to engage in continuous learning on topics such as environmental sustainability, gender equality, and social justice.

Community Engagement Events:

- **Discussion Forums and Panels:** Libraries host discussion forums and panel sessions where experts, community leaders, and activists share insights on SDG-related topics. These events foster dialogue and critical thinking within the community.
- **Film Screenings and Exhibitions:** Libraries organize film screenings and exhibitions focusing on SDG themes to engage community members in a visually compelling and interactive way.

Digital Platforms and Social Media:

- **Online Campaigns:** Libraries leverage digital platforms and social media to run awareness campaigns about specific SDGs. Through online channels, libraries reach a broader audience and encourage community members to participate in sustainable initiatives.
- **Virtual Events and Webinars:** Online platforms enable libraries to host virtual events and webinars, facilitating community participation irrespective of geographical constraints.

Partnerships and Collaborations:

- **Community Organizations:** Libraries collaborate with local community organizations, NGOs, and advocacy groups to amplify the impact of SDG-related initiatives. These partnerships enhance resources, expertise, and community outreach.
- **Schools and Educational Institutions:** Libraries partner with schools and educational institutions to integrate SDG themes into curricula, promoting awareness and understanding from an early age.

Civic Engagement Programs:

- **Voter Education and Participation:** Libraries engage in civic education programs that connect SDGs with civic responsibilities. They may provide information on voting, advocacy, and participation in community decision-making processes.
- **Community Surveys and Feedback Sessions:** Libraries conduct surveys and feedback sessions to understand community priorities related to SDGs, ensuring that local perspectives are considered in development initiatives.

Inclusive Initiatives:

- **Targeting Vulnerable Groups:** Libraries design initiatives that specifically address the needs of vulnerable or marginalized groups within the community, ensuring inclusivity in SDG-related activities.

- **Multilingual Resources:** Libraries provide multilingual resources and support to cater to diverse linguistic communities, promoting understanding and participation across language barriers.

Monitoring and Reporting:

- **Data Collection on Community Impact:** Some libraries actively engage in monitoring and reporting on the impact of SDG-related programs within their communities. This data helps assess the effectiveness of initiatives and informs future strategies.

6. Alignment of Libraries with specific SDGs

- The alignment of libraries with specific Sustainable Development Goals (SDGs) can vary depending on the goals of individual libraries, their communities, and the regions they serve. However, many libraries contribute to multiple SDGs through their various functions and services. Here's an examination of how libraries can align with specific SDGs:

SDG 4: Quality Education:

- Libraries play a crucial role in providing access to educational resources for all, promoting literacy, and supporting lifelong learning.
- They offer a diverse range of materials, including books, digital resources, and educational programs that contribute to formal and informal education.

SDG 9: Industry, Innovation, and Infrastructure:

- Libraries can support innovation by providing access to information, technology, and creative spaces.
- They often serve as hubs for technological resources, training, and skill development, contributing to building sustainable infrastructure.

SDG 10: Reduced Inequality:

- Libraries are inclusive spaces that promote equal access to information, irrespective of socio-economic backgrounds.
- They contribute to reducing inequality by providing resources and services that bridge the digital divide and support marginalized communities.

SDG 11: Sustainable Cities and Communities:

- Public libraries contribute to creating vibrant and sustainable communities by offering cultural programs, community events, and information on local resources.

- They provide a space for dialogue on urban issues and sustainable development.

SDG 16: Peace, Justice, and Strong Institutions:

- Libraries uphold principles of intellectual freedom, democracy, and access to information, fostering an informed and engaged citizenry.
- They often serve as spaces for community dialogue, promoting understanding and tolerance.

SDG 17: Partnerships for the Goals:

- Libraries can act as hubs for collaboration, bringing together diverse stakeholders such as government, NGOs, and businesses to address local and global challenges.
- They facilitate knowledge-sharing and support the development of partnerships to achieve sustainable development.
- It's important to note that the contribution of libraries to SDGs may vary based on their resources, geographical location, and community needs. Libraries, as information hubs, are well-positioned to support a broad spectrum of sustainable development initiatives, making them valuable partners in achieving the SDGs. Additionally, libraries can adapt their programs and services to address emerging challenges and contribute to new global goals as they evolve.

7. Impact of SDGs on the development of library services and programs

- The Sustainable Development Goals (SDGs) have had a significant impact on the development of library services and programs. Libraries, as information and community hubs, play a crucial role in supporting the global agenda outlined by the SDGs. Here's an analysis of the impact of SDGs on library services and programs:

Access to Information (SDG 16.10):

- SDG 16 emphasizes the importance of ensuring public access to information. Libraries contribute by providing free and open access to a wide range of resources, including books, digital materials, and databases.
- Libraries support the idea that access to information is a fundamental right, fostering informed and engaged communities.

Quality Education (SDG 4):

- Libraries are essential in supporting the goal of quality education by providing resources, study spaces, and educational programs for learners of all ages.

They often collaborate with educational institutions to complement formal education, promote literacy, and offer skill-building opportunities.

Digital Inclusion (Various SDGs):

- SDGs such as 9 (Industry, Innovation, and Infrastructure) and 17 (Partnerships for the Goals) highlight the importance of technology and partnerships. Libraries contribute by providing public access to computers, internet services, and digital literacy programs, bridging the digital divide.
- Libraries also partner with tech organizations and government agencies to enhance digital inclusion.

Community Engagement and Empowerment (Various SDGs):

- Libraries play a vital role in community development and empowerment, aligning with multiple SDGs. They serve as community centers, offering cultural programs, workshops, and events that promote social cohesion and inclusivity.
- By providing information on health, employment, and legal rights, libraries contribute to the achievement of various SDGs related to well-being and social justice.

Sustainable Development and Environmental Awareness (Various SDGs):

- Libraries increasingly focus on sustainability, supporting SDGs related to climate action, responsible consumption, and environmental awareness.
- They may organize programs on environmental conservation, provide information on sustainable practices, and promote awareness of global challenges related to climate change.

Global Partnerships (SDG 17):

- The emphasis on global partnerships in SDG 17 aligns with the collaborative nature of libraries. Libraries often engage in partnerships with local and international organizations to enhance their programs and services.
- They contribute to the global exchange of information and ideas, fostering a sense of interconnectedness among communities.

Inclusivity and Reduced Inequality (Various SDGs):

- Libraries actively contribute to goals related to inclusivity, diversity, and reduced inequality by providing resources and services that are accessible to all members of the community.
- Specialized programs may address the needs of marginalized groups, including refugees, persons with disabilities, and those facing economic challenges.

8 Reciprocal Influence: Libraries' Contribution to Sustainable Development

The reciprocal influence between libraries and sustainable development is a dynamic relationship where libraries contribute significantly to the achievement of sustainable development goals (SDGs) while simultaneously benefiting from the progress made in these goals. Here are several ways libraries actively contribute to sustainable development:

Access to Information and Knowledge (SDG 4):

- Libraries provide free and open access to a wealth of information, supporting formal and informal education. By facilitating access to knowledge, they contribute directly to SDG 4 (Quality Education).

Digital Inclusion (SDG 9):

- Libraries bridge the digital divide by offering free internet access, computer resources, and digital literacy programs. This promotes digital inclusion, aligning with SDG 9 (Industry, Innovation, and Infrastructure).

Community Empowerment and Engagement (SDG 11):

- Libraries serve as community hubs, providing spaces for engagement, dialogue, and cultural exchange. They contribute to the development of sustainable communities (SDG 11) by fostering social cohesion.

Environmental Sustainability:

- Libraries increasingly adopt eco-friendly practices, such as energy-efficient technologies, waste reduction, and promoting environmental awareness. These efforts align with SDGs related to climate action (SDG 13) and responsible consumption (SDG 12).

Promoting Inclusivity and Reducing Inequality (SDG 5, 10):

- Libraries are inclusive spaces that cater to diverse communities. They actively work toward reducing inequalities by providing resources and services accessible to all, regardless of socio-economic background or other demographics.

Cultural Preservation and Diversity (SDG 11, 16):

- Libraries contribute to the preservation of cultural heritage, fostering cultural diversity (SDG 11). They also play a role in promoting understanding and tolerance, aligning with SDG 16 (Peace, Justice, and Strong Institutions).

Support for Lifelong Learning (SDG 4):

- Libraries offer educational programs for people of all ages, supporting lifelong learning. This contributes directly to SDG 4 (Quality Education) by ensuring inclusive and equitable education opportunities.

Global Collaboration and Partnerships (SDG 17):

- Libraries engage in partnerships at local, national, and international levels, contributing to the spirit of SDG 17 (Partnerships for the Goals). These collaborations enhance the effectiveness of initiatives and promote knowledge-sharing.

Advocacy for Social Justice (SDG 5, 10, 16):

- Libraries often serve as advocates for social justice by providing information on human rights, gender equality, and other justice-related issues, aligning with several SDGs.

Public Health and Well-being:

- Libraries provide information on health and well-being, contributing indirectly to SDG 3 (Good Health and Well-being). This includes resources on mental health, disease prevention, and access to healthcare information.

9. Impact of SDGs on Libraries

The Sustainable Development Goals (SDGs) have had a notable impact on libraries, influencing their priorities, activities, and overall role within communities. Here are several ways in which SDGs have affected libraries:

Strategic Alignment:

Libraries are aligning their strategic plans with the SDGs. They are incorporating the goals into their mission statements, reflecting a commitment to contribute to broader global sustainability objectives.

Program Development:

- Libraries are developing programs that directly address SDGs. For example, they may organize events, workshops, and resources focusing on education, gender equality, environmental sustainability, and other specific goals.

Community Engagement:

- The emphasis on community engagement in the SDGs has prompted libraries to enhance their role as community hubs. They actively engage with local communities, addressing their specific needs related to sustainable development.

Digital Inclusion and Access to Information:

- SDG 9 emphasizes the importance of technology and infrastructure, and SDG 16 underscores the right to access information. Libraries respond by providing digital resources, internet access, and digital literacy programs, contributing to goals related to inclusivity and information access.

Advocacy for Literacy and Education (SDG 4):

- Libraries play a vital role in supporting educational initiatives. They advocate for literacy, provide resources for learning, and collaborate with educational institutions, aligning with the goal of ensuring inclusive and equitable quality education.

Cultural Preservation and Diversity (SDG 11 and 16):

- Libraries contribute to the preservation of cultural heritage, supporting SDGs related to sustainable cities and communities (SDG 11) and peace, justice, and strong institutions (SDG 16). They provide resources that promote cultural diversity and understanding.

Partnerships and Collaboration (SDG 17):

- Libraries actively seek partnerships with government agencies, NGOs, and other community organizations to amplify their impact. SDG 17, which focuses on partnerships for the goals, encourages libraries to collaborate for more effective sustainable development initiatives.

Environmental Sustainability:

- Libraries are increasingly adopting sustainable practices in their operations. They may implement energy-efficient measures, reduce waste, and promote environmental awareness through programs and resources, aligning with SDGs related to climate action and responsible consumption.

Advocacy for Social Justice (SDG 5, 10, 16):

- Libraries contribute to goals related to gender equality, reduced inequalities, and peace and justice. They serve as spaces for dialogue, information dissemination, and advocacy on issues of social justice.

Monitoring and Reporting:

- Some libraries actively engage in monitoring and reporting on progress related to the SDGs. They may collect data on the impact of their programs and services, contributing to the broader global monitoring efforts.

10. Challenges and Opportunities of SDGs in Libraries

implementing and aligning libraries with the Sustainable Development Goals (SDGs) presents both challenges and opportunities. Here are some key considerations:

Challenges:

Resource Constraints:

- Many libraries, especially those in under-resourced areas, may face challenges in acquiring the necessary financial and technological resources to effectively contribute to SDGs.

Digital Divide:

- Bridging the digital divide is a significant challenge. Libraries need to ensure that all community members have access to technology and digital literacy skills to benefit fully from information and educational resources.

Changing Roles and Perceptions:

- Libraries may face resistance or outdated perceptions of their role. Shifting from traditional views of libraries as book repositories to dynamic community hubs requires overcoming resistance and fostering a more progressive understanding.

Sustainability of Initiatives:

- Sustaining initiatives over the long term can be challenging. Many SDG-related projects require ongoing funding and community engagement to ensure their success and impact.

Cultural Sensitivity:

- Libraries need to navigate cultural sensitivity and tailor programs to the specific needs and values of diverse communities, particularly when addressing topics related to gender, culture, and social justice.

Data Privacy and Security:

- Libraries, especially in the digital age, need to navigate issues related to data privacy and security when collecting and disseminating information. This is particularly crucial when dealing with sensitive topics or personal information.

Opportunities:

Community Engagement:

- SDGs provide libraries with a framework for deeper community engagement. Libraries can use the SDGs to identify local needs, build partnerships, and tailor programs that directly address community-specific challenges.

Technology for Inclusion:

- Libraries can leverage technology to bridge gaps and promote inclusivity. Online resources, virtual programs, and digital literacy initiatives can reach a broader audience, including those in remote or underserved areas.

Advocacy and Awareness:

- The SDGs offer a platform for libraries to advocate for the importance of information access, education, and community development. Libraries can raise awareness about global challenges and inspire action at the local level.

Partnerships and Collaboration:

- SDG 17 emphasizes partnerships for achieving goals. Libraries can seize the opportunity to collaborate with local governments, NGOs, businesses, and other community organizations, amplifying their impact and resources.

Flexible Programming:

- Libraries can adapt their programming to align with evolving SDGs and address emerging challenges. This flexibility allows them to remain relevant and responsive to the changing needs of their communities.

Data-driven Decision Making:

- Libraries can utilize data to measure the impact of their programs and initiatives, aligning with the SDGs' emphasis on evidence-based decision-making. This helps in demonstrating the library's contribution to sustainable development.

Educational Initiatives:

- SDGs provide a platform for libraries to enhance educational initiatives. By developing programs that align with SDG 4 (Quality Education), libraries can contribute to building a knowledgeable and skilled community.

In summary, while challenges exist, the SDGs offer libraries numerous opportunities to deepen their impact, align their services with global development goals, and play a vital role in building more sustainable and resilient communities. The key is to leverage these opportunities effectively while addressing challenges in a strategic and adaptive manner.

11. Conclusion

Enhancing the synergy between libraries and the Sustainable Development Goals (SDGs) requires collaborative efforts from policymakers, library professionals, and the broader community. Here are recommendations tailored to each group:

Policymakers:Incorporate Libraries into Policy Frameworks:

- Include explicit references to the role of libraries in achieving SDGs in national and local policy documents related to education, information access, and community development.

Allocate Funding for SDG-Aligned Library Initiatives:

- Provide dedicated funding for libraries to develop and implement programs that align with SDGs, emphasizing inclusivity, education, and community engagement.

Promote Digital Inclusion:

- Support policies that enhance digital inclusion, ensuring that libraries have the resources to provide internet access, digital literacy programs, and technology for all community members.

Encourage Collaboration and Partnerships:

- Foster collaboration between libraries, government agencies, NGOs, and other community organizations to create integrated, sustainable solutions that address local and national development challenges.

Support Training and Professional Development:

- Invest in training programs for library professionals to enhance their skills in designing and implementing initiatives that align with SDGs, including sustainable practices.

Library Professionals:

Align Services with Local SDG Priorities:

- Tailor library programs to address specific SDGs that are priorities in the local community. Understand local needs and develop initiatives accordingly.

Advocate for the Role of Libraries:

- Actively advocate for the critical role of libraries in achieving SDGs, emphasizing the impact of libraries on education, inclusivity, and community development.

Promote Environmental Sustainability:

- Integrate sustainable practices within library operations, such as energy-efficient technologies, waste reduction, and eco-friendly initiatives. Educate the community on environmental sustainability.

Leverage Technology for Inclusivity:

- Use technology to promote inclusivity by providing digital resources, virtual programs, and online educational opportunities to reach a broader and more diverse audience.

Collaborate with Stakeholders:

- Actively seek and engage in partnerships with local organizations, schools, businesses, and government agencies to amplify the impact of library programs and services.

Broader Community:

Participate Actively in Library Programs:

- Encourage community members to actively participate in library programs that address SDGs, fostering a sense of ownership and engagement in sustainable development initiatives.

Provide Feedback and Input:

- Offer feedback on library services and programs to ensure that they align with community needs and address local SDG priorities effectively.

Utilize Library Resources:

- Take advantage of the diverse resources offered by libraries, including educational programs, information on health and well-being, and resources related to community development.

Promote Inclusivity and Diversity:

- Support initiatives that promote inclusivity and diversity within the library, ensuring that services are accessible to all members of the community.

Raise Awareness:

- Participate in awareness campaigns organized by libraries to promote understanding of global challenges, the importance of sustainable development, and the role of libraries in achieving SDGs.

Enhancing the synergy between libraries and SDGs requires a coordinated effort involving policymakers, library professionals, and the community. By aligning policies, empowering libraries, and engaging the community, stakeholders can collectively contribute to sustainable development at the local and global levels.

The findings from a comprehensive analysis of the impact of Sustainable Development Goals (SDGs) on libraries reveal a multifaceted and evolving role for libraries in sustainable development. Here's a summary of key insights:

Key Findings:

Diverse Approaches Globally:

- Libraries worldwide are taking diverse approaches to align with SDGs, addressing issues such as education, digital inclusion, environmental sustainability, and community development.

Programmatic Adaptations:

- Libraries are adapting their programs to address specific SDGs, showcasing a proactive response to global challenges. These programs often focus on quality education, inclusivity, and community well-being.

Digital Inclusion and Innovation:

- Libraries play a pivotal role in bridging the digital divide by providing access to technology, digital literacy programs, and online resources, contributing to SDGs related to innovation and infrastructure.

Community Hubs for Sustainability:

- Libraries are evolving into dynamic community hubs that foster social cohesion, inclusivity, and environmental sustainability. They are increasingly incorporating eco-friendly practices and promoting awareness of climate action.

Partnerships and Collaboration:

- Libraries actively engage in partnerships with various stakeholders, including government agencies, NGOs, and businesses. These collaborations enhance their capacity to address local and global challenges collectively.

Advocacy for Social Justice:

- Libraries serve as advocates for social justice, promoting information on human rights, gender equality, and peace. They contribute to SDGs related to justice, equality, and building strong institutions.

Cultural Preservation and Inclusivity:

- Libraries are instrumental in preserving cultural heritage, fostering cultural diversity, and creating inclusive spaces. These initiatives align with SDGs focused on sustainable communities and partnerships.

Data-driven Decision Making:

- Libraries increasingly adopt data-driven decision-making processes to measure the impact of their programs. This evidence-based approach contributes to the broader SDG agenda by emphasizing accountability and effectiveness.

Evolving Role of Libraries in Sustainable Development:

Shift from Information Repositories to Community Hubs:

- The role of libraries is evolving from traditional information repositories to dynamic community hubs that actively contribute to social, economic, and environmental sustainability.

Emphasis on Inclusivity and Accessibility:

- Libraries are placing a strong emphasis on inclusivity and accessibility, ensuring that their resources and programs are available to all members of the community, regardless of socio-economic background.

Promotion of Lifelong Learning:

- Libraries are increasingly recognized as key players in promoting lifelong learning. They support formal and informal education, contributing directly to SDG 4 (Quality Education).

Sustainable Practices within Library Operations:

- Libraries are adopting sustainable practices within their operations, including energy-efficient measures, waste reduction, and responsible consumption. This internal commitment aligns with SDGs related to environmental sustainability.

Global Connectivity and Knowledge Sharing:

- Libraries contribute to global connectivity by facilitating knowledge sharing and collaboration. They serve as bridges between local communities and the broader global network, supporting SDG 17 (Partnerships for the Goals).

In conclusion, libraries are dynamic entities that are actively shaping and being shaped by the global sustainability agenda. Their evolving role encompasses not only providing access to information but also actively participating in community development, inclusivity, and environmental stewardship. The findings underscore the vital contribution of libraries to achieving a more sustainable and equitable future.

References

1. American Library Association. (2018). Libraries' Guide to the 2030 Agenda: A Toolkit for Public Libraries. Retrieved from https://www.ifla.org/files/assets/hq/topics/libraries-and-the-un/ala_toolkit.pdf (accessed 17 November 2023)

2. American Library Association (2020a) ALA Task Force on United Nations 2030 Sustainable Development Goals. Available at: https://www.ala.org/aboutala/ala-task-force-united-nations-2030-sustainable-development-goals (accessed 20 November 2023).

3. American Library Association (2020b) *What is Community Engagement?* Chicago, IL: ALA.Available at: https://www.ala.org/tools/librariestransform/libraries-transforming-communities/engagement (accessed 21 November 2023).

4. Alam, A (2020) "Achieving Sustainable Development Goals (SDGs) in Bangladesh: The Role of Public libraries" Paper presented at the 1st Multidisciplinary International Conference on the Social and Life Sciences: Gender, Health, Information and the Environment (ICSL 2020) ,February 27–29, 2020 **http://iikm.ewubd.edu/icsl/**.

5. Abata-Ebire, B.D., Adebowale, J.A. and Ojokuku, B.Y. (2018). Achieving Sustainable Development Goals (SDGS) in Nigeria: The roles of libraries. International Journal of Applied Technologies in Library and Information Management. 4(2), 89-95.

6. Bradley, F. (2014). What are the United Nations SDGs and What do they Mean for Libraries?. The Hague: IFLA.

7. Bradley, F. (2016). A world with universal literacy: The role of libraries and access to information in the UN 2030 Agenda. *IFLA Journal*, **42**(2), 118–125.

8. Cox A, Brewster L (2020) Library support for student mental health and well-being in the UK: Before and during the COVID-19 pandemic. *The Journal of Academic Librarianship* 46(6): 102256.

9. Chowdhury, G. G. (2019). Libraries and the United Nations 2030 Agenda: A Toolkit for Library Professionals. IFLA Journal, 45(3), 166–175. Hirsh, S. (2017). Social Responsibility in Librarianship: Essays on Equality. McFarland.

10. Hider, P., Garner, J., Wakeling, S., & Jamali, H. R. (2022). Serving Their Communities: An Analysis of Australian Public Library Mission Statements. *Journal of Library Administration*, **62**(2), 190–205.

Synergy Between Technology and Sustainability in Universities: Fostering Innovation for a Greener Future: Sustainable Innovation and Technology

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ABSTRACT: This paper delves into the dynamic interconnection between technology and sustainability within the context of university establishments. It investigates how the integration of state-of-the-art technologies can stimulate creativity and endorse environmentally conscious practices in academic institutions. In the swiftly evolving landscape of higher education, the dynamic interplay between technology and sustainability has emerged as a transformative influence. The paper examines the intricate relationship between these two domains in the establishment of higher education, exploring the ways in which the adoption of advanced technologies fosters environmentally conscious behavior and acts as a catalyst for creativity. The exploration of key areas of synergy, challenges, and opportunities offers a comprehensive understanding of the pivotal role that technology plays in propelling sustainability initiatives on university campuses.

KEYWORDS: ****

1. Introduction

A major challenge to human-nature coexistence and balance has come from the effects of rapid economic expansion brought about by scientific and technological advancements. As a result, many people, including scientists and environmentalists as well as world leaders, are deeply concerned about the idea of sustainability as well as sustainable development and its goals. The literature that is now available indicates that awareness of sustainability-related issues started in the 1970s and persisted in being the subject of academic papers and conference themes, as well as the catchphrase of numerous projects and development plans that dealt with the environmentin the ensuing decades (Gamage et al., 2022).

Universities, as social and intellectual organizations, stand at the forefront of societal development, acting as incubators for new ideas, knowledge creation, and technological advancements. Their impact extends beyond the classroom,

influencing public discourse, policy development, and industry practices. This subsection emphasizes the influential role universities play in guiding the trajectory of progress and the responsibility that comes with such influence. Universities hold a special place in society. They are disseminators of knowledge and strong forces behind local, national, and international innovation that promotes community well-being and economic growth.

Thus, universities not only tremendously benefit from participating in the Sustainable Development Goals (SDGs), but also play a crucial role in their achievement. As part of a new sustainable development agenda, the United Nations (UN) approved the Sustainable Development Goals (SDGs), also known as the Worldwide Goals, on September 25, 2015. The target set was adopted as a worldwide call to action to eradicate poverty, safeguard the environment, and ensure prosperity for everyone. To guarantee that everyone lives in peace and prosperity by 2030, each aim includes important objectives that must be completed during the next 15 years.

Universities can serve as living laboratories for testing, refining, and implementing sustainable technologies. This subsection explores the concept of universities as dynamic environments where sustainable practices and technologies can be piloted before wider adoption. It discusses the potential for these institutions to model best practices for other organizations and communities.

2. Objectives:

The objectives of the present study are:

1. To investigate the existing technological and sustainability practices in universities.
2. To highlight the best practices and examples of universities successfully integrating technology to enhance sustainability efforts, specifically green building and green library
3. To identify the challenges universities face in adopting sustainable practices and integrating technology and explore opportunities where technology can overcome sustainability challengesin the university setting.

3. Methodology

For the present study, selected existing scholarly papers, articles, and policy documents were consulted to find out the synergy between technology and sustainability in university settings. Case studies of select universities that have

successfully integrated technology into their sustainability initiatives were examined as well.

4. Energy Efficiency and Smart Campus Solutions:

One of the primary ways technologies contribute to sustainability in universities is through the implementation of smart campus solutions. The integration of IoT devices, smart building systems, and energy management technologies enables universities to optimize energy consumption, reduce waste, and lower their carbon footprint. Case studies and examples showcase how smart technologies enhance energy efficiency on university campuses.

For example: despite being in a semiarid area with limited water supplies, JUST (Jordan University of Science and Technology) has led by example by using an action-oriented strategy to green its campus. It was discovered that the JUST campus has a per capita carbon emission of 1.33 metric tons of CO2 equivalent, which is fewer than the emissions from comparable university campuses across the globe. According to this survey, the average daily water usage perperson was 56 L, or around one-third of what students in US universities consume. Additionally, when considering the entire university community—students and staff—the study's findings showed that the average solid waste generation rate was 0.37 kg per student per day as opposedto 0.31 kg per capita per day. (Abu Qdais et al., 2019)

5. Renewable Energy Adoption and Technological Innovations:

Renewable energy sources are being used by universities more and more to power their campuses. University infrastructure is incorporating new developments in solar, wind, and other renewable technologies. In the same manner, cooperative projects and creative finance schemes encourage the use of renewable energy sources. Universities may find it difficult to finance renewable energy projects, but creative financial solutions are starting to appear to get around these issues. Different financing strategies, including crowdfunding, green bonds, and power purchase agreements (PPAs), are also being introduced on the campuses.

6. Digital Transformation for Sustainable Education:

The digital transformation of education, including online learning platforms, e-books, and virtual classrooms, not only enhances educational experiences but

also contributes to sustainability by reducing the need for physical resources. Universities are leveraging technology to create more sustainable and accessible learning environments. In higher education, including sustainability in teaching strategies is also crucial. Giving students the information, comprehension, and abilities they need to succeed, as well as cultivating the next wave of leaders and innovators, may bring about the necessary change and have a significant influence on the transition to a sustainable future. Many of the sustainable development goals can only be met with success if Science, Technology, Engineering, and Mathematics (STEM) and related industries continue to advance. For this reason, methods used to integrate sustainability into teaching and learning in STEM higher education programmes are noteworthy in a variety of ways (Abad-Segura et al., 2020).

7. Sustainable Campus Design and Green Building Initiatives:

The design and construction of sustainable university buildings and infrastructure are crucial for minimizing environmental impact. This section explores green building initiatives, eco-friendly construction materials, and smart design principles that promote sustainability on university campuses. Case studies showcase successful sustainable campus development projects.

7.1. Importance of Libraries Going Green

The main goal of green building is to develop and use sustainable, energy efficient resources in construction, maintenance, and the overall life of the structure. So, it is very important to take steps to go green, which will ensure sustainable development. (Bychkova et al., 2023)

Libraries considering green design will often look at the Leadership in Energy and EnvironmentDesign (LEED) rating systems. Brown (2003) identified the following green design elements, which can be incorporated into libraries:

1. Community collaboration makes sure that community assets are efficiently used andhelps to maintain public support.
2. Daylight pairs daylight with artificial lighting and reduces energy costs.
3. Green materials-use renewable materials like wood and bamboo.
4. Green roofs
5. Raised floor systems
6. Energy efficiency
7. Natural Ventilation
8. Green power and renewable energy

9. Indoor environmental quality

According to IFLA, going green has the following goals:

- Effect of climate change on libraries (modification of the conditions of storage andpreservation, buildings, insulation, impacts on library finances and management)
- Applications of environment- friendly practices in libraries
- Proposed environmental recommendations for the profession.
- Increasing and promoting sustainability- related library resources and services
- Increasing librarians' own awareness of environmental concerns.

7.2 Methods for Libraries to Go Green

There are many ways to go green; among them are the following:

- Proper way of using electric power: turning off lights during bright daylight or
- whenever you will be away for an extended period. Turning off fans and computerswhen not in use
- Water Usage Water should not be wasted unnecessarily. Taps should only be opened alittle. So that little water could be saved for the future.
- Reducing pollution Use public vehicles for transport. Avoid machines as much aspossible.
- Effective Ways of Paper Usage - Papers are prepared from wood. If a single piece ofpaper is saved, the tree is saved. Papers should not be wasted. Two sides of the papershould be utilized. Paper should be reused or recycled effectively.
- Cultivating more plants and trees on vacant lands helps to maintain the ecologicalbalance of the earth.
- Recycling non-biodegradable products: Put a separate container next to your trash canor printer, making it easier to recycle your bottles, cans, and paper. Plastics should be avoided. Reusable pens can be used instead of ballpoint pens. Polythene covers should be avoided consciously. This is also a way of saving the earth.
- Waste Management Waste should be thrown into the dustbin only. Even if people aretraveling or outside, they should be conscious not to throw the waste in common places. Creating Awareness. Libraries can inspire people by preparing and displayingcharts on conserving natural resources. Programmes, and competitions can be organized for the users.

7.3 Green Libraries in India

The Anna Centennial Library in Kotturpuram is Asia's largest and most sustainable library. The vast space can hold over a thousand readers at once and 1.5 million books. With lots of windows to the north-east, skylights, and an outdoor amphitheater on the roof, C.R. Narayana Rao's designmaximizes outdoor light. LED lights illuminate a massive indoor auditorium, cafeteria, and numerous reading and research areas. The library was designed with conservation in mind from the start. Special consideration was given to the selection of sustainable materials, with more than 60% being locally sourced and recyclable. Natural lighting is an important component ofthe design, as are large windows facing north and east to provide the best light without introducing heat. The south uses vegetation and shading to create heat buffer zones. Wastewater is reused on the grounds, and educational materials are strategically placed throughout the space to raise awareness of how the building functions.

Some other Green Library Applications in India

- Anna-Centenary Library, Chennai
- Perma Karpo Library,Ladahk
- National Library of India, Kolkata
- Karnataka University Library
- NIT, Library, Silchar, Assam, India
- NIT Trichy Library
- Delhi University Library
- Calcutta University Library
- Madras University Library
- Mumbai University Library

8. Waste Reduction Practices:

Technology plays a critical role in university recycling programme optimization. Waste monitoring systems must be put in place in order to provide insights into waste creation patterns and make well-informed judgments about waste reduction. One novel method is to monitor and analyze waste streams using Internet of Things (IoT) sensors and data analytics. In the age of digital innovation, universities are using technology to teach their communities about waste reduction techniques. Using digital resources, such as websites and mobile apps, to encourage sustainable practices and increase awareness among faculty, staff, and students is highly prioritized. Through the use of gamification techniques, virtual

trash audits, and interactive learning modules, the article investigates efficient methods for involving the university community in waste reduction initiatives.

9. Challenges and Opportunities in University Settings:

One significant way that university research supports societal development is through university technology transfer. The sustainable growth of the university and society is intertwined with the sustainability of university technology transfer. Technology is a combination of explicit and tacitinformation, according to the viewpoint of knowledge. Because it is an essential component of technology, university technology transfer will be directly impacted by implicit knowledge transfer. Therefore, to support the sustainable development of the university, research into the function that the inventor's tacit knowledge transfer plays in the sustainable development of university technology transfer is imperative. (Li et al., 2018)

While the synergy between technology and sustainability offers tremendous potential in university settings, challenges such as budget constraints, resistance to change, and the need for comprehensive planning must be addressed. This section also explores the opportunities for research, interdisciplinary collaboration, and student engagement in driving sustainability initiatives.

9.1 Budget Constraints:

One of the primary challenges to integrating technology and sustainability in university settings is the presence of budget constraints. Implementing energy-efficient technologies, adopting renewable energy sources, and overhauling infrastructure to meet sustainability standards can require significant financial investment. This section discusses the importance of strategic financial planning, seeking grants and partnerships, and demonstrating the long-term cost savings associated with sustainable practices.

9.2 Resistance to Change:

Resistance to change is a common barrier when introducing new technologies and sustainable practices on university campuses. Faculty, staff, and administrators may be accustomed totraditional methods, making it challenging to garner support for innovative initiatives. Strategies for overcoming resistance, such as targeted training programs, clear communication of benefits, and involving stakeholders in decision-making processes, are explored in this section.

9.3 Opportunities:

9.3.1 Comprehensive Planning:

Effective incorporation of technology and sustainability demands meticulous planning that takes into account the distinct requirements and organizational frameworks of individual universities. This entails formulating a strategy for sustainability projects, conducting in-depth assessments ofenvironmental impacts, and ensuring alignment with the strategic objectives of the institution. The study underscores the significance of engaging a diverse array of stakeholders in the planning phase and establishing a versatile framework capable of accommodating advancements in technology and evolving sustainability criteria.

9.3.2 Opportunities for research:

Universities serve as hubs for research and innovation, providing distinctive prospects to delve into the convergence of technology and sustainability. There's a great significance of research in pinpointing sustainable remedies, experimenting with novel technologies, and enriching the academic knowledge repository. It deliberates on the prospect of creating research centers specifically dedicated to sustainable technologies and cultivating a culture of inquiry that propelsongoing enhancements.

9.3.1 Interdisciplinary Collaboration:

Interdisciplinary collaboration is a key enabler of successful technology and sustainability integration. Bringing together experts from diverse fields such as engineering, environmental science, business, and social sciences can lead to holistic and innovative solutions. The paper explores examples of successful interdisciplinary collaborations within universities and highlights the benefits of breaking down traditional academic silos to address complex sustainability challenges.

9.3.4 Student Engagement:

Engaging students in sustainability initiatives not only enhances their educational experience but also creates a powerful force for change on university campuses. This section discusses the opportunities for student involvement in sustainability projects, eco-entrepreneurship, and leadership roles within sustainability-focused organizations. It explores how universities can empower students to be catalysts for positive environmental impact and advocates for sustainablepractices.

9.3.5 Community Partnerships:

Forming partnerships with corporations, government agencies, and local communities provides additional resources and support for sustainability initiatives. Leverages can come from community involvement, such as pooled resources, information sharing, and collaborative projects that advance the overall sustainability goals of the university and the local community.

10. Case Study: Assam Don Bosco University

Assam Don Bosco University in India has adopted agroforestry practices for sustainable land use and biodiversity conservation. Agroforestry involves the integrated management of trees and shrubs with crops and/or livestock on the same piece of land. This approach has several benefits, including increased biodiversity, improved soil health, and diversified income sources for farmers. Major initiatives have been undertaken to fully exploit the abundance of land available at the university campus by devoting the surplus land to various plantations: MOUs have been signed with 5 National Boards (Coffee, Rubber, Coconut, Cashewnut, and tea) for demonstrationplantations of 4 hectares each to serve the following purposes: demonstration of model plantation, seed and sapling production, extension work in the neighbouring villages, research onhybridization, mass multiplication, pest resistance in the university departments, etc. Threeplantations have already been established tea, rubber, and coconut. The rest are in various stages of completion. (Assam Don Bosco University, 2020)

Here are some key policies and implementations at the university:

1. Biodiversity Support: Agroforestry is recognized for its ability to support biodiversity more effectively than monocrop systems. By incorporating a variety of trees and crops, the university contributes to creating a more diverse and resilient ecosystem, especially at Tapesia campus of the university.
2. Demonstration Farms and Seed Gardens: The establishment of demonstration farms and seed gardens is crucial for promoting scientific research and showcasing sustainable farming practices. This not only benefits the university community but also serves as a model for local farmers.
3. Livelihood Projects:The cultivation of various crops such as tea, coconut, rubber, cocoa, cashew-nut, agar, cocoa, ginger, and turmeric as livelihood projects is a practical way to demonstrate the economic viability of

agroforestry. This hands-on experience can be valuable for students and local farmers alike.

4. Community Engagement: The university's plan to extend these practices to local villages and facilitate Farmers' Cooperatives is a great step toward community engagement. Providing managerial and marketing expertise will enhance the chances of success for these initiatives.
5. Utilization of Marginal Land: The use of marginal strips of unused land for a small kitchen garden and planting bananas and papayas at the Azara Campus is a sustainable way to utilize available resources efficiently.
6. Long-Term Sustainability:The focus on providing support and expertise to local farmers indicates a commitment to long-term sustainability. By transferring knowledge and skills, the university contributes to building the capacity of local communities for independent, sustainable agricultural practices.

11. Conclusion:

In conclusion, while integrating technology and sustainability in educational settings presents certain hurdles, the benefits—such as increased creativity, teamwork, and positive outcomes—far outweigh the drawbacks. Universities have the power to significantly contribute to the advancement of sustainability projects and the creation of a future that is more ecologically friendly. By examining the challenges, opportunities, and key areas of synergy, we have underscored the critical role that universities play in fostering innovation for a greener future. This can be accomplished by encouraging thorough, research-driven, and student-engaged methods, overcoming resistance to change, and resolving financial limits through strategic financial planning. The value of research, teamwork, and a persistent dedication to creating an academic environment that is more environmentally friendly andsustainable are emphasized.

By examining the challenges, opportunities, and key areas of intersection, we've underscored the crucial role that academic institutions play in fostering creativity for a sustainable tomorrow. Thorough planning that is customized to each institution's specific requirements is necessary for the successful integration of technology and sustainability. This entails creating sustainability roadmaps, evaluating the effects of activities on the environment, and coordinating them with strategic objectives. It has been emphasized how crucial it is to include a variety of stakeholders in the planning process and develop flexible frameworks that can accommodate changing sustainability requirements and technologies.

References

1. Abad-Segura, E., González-Zamar, M. D., Infante-Moro, J. C., & García, G. R. (2020). ustainable management of digital transformation in higher education: Global research trends. *Sustainability (Switzerland)*, *12*(5). https://doi.org/10.3390/su12052107

2. Abu Qdais, H., Saadeh, O., Al-Widyan, M., Al-tal, R., & Abu-Dalo, M. (2019). Environmental sustainability features in large university campuses: Jordan University of Science and Technology (JUST) as a model of green university. *International Journal of Sustainability in Higher Education*, *20(2)* https://doi.org/10.1108/IJSHE-06-2018-0102

3. Assam Don Bosco University. (2020). *Eco-Friendly Campus Policy*. https://dbuniversity.ac.in/pdfs/Eco%20Friendly%20Campus%20Policy.pdf

4. Bychkova, E. F., Klimova, M. A., & Silaeva, S. N. (2023). IFLA and Sustainable Development Goals: Reviewing the projects by IFLA Environment, Sustainability and Libraries Section. *Scientific and Technical Libraries*, *1*. https://doi.org/10.33186/1027-3689-2023-1-33-50

5. Brown, B. 2003. "The new green standard: With the LEED rating system in place it is easierto make sure your new library saves money as it treads lightly on natural resources" [Electron Version]. *Library Journal*, 128(20), 61-

6. Gamage, K. A. A., Ekanayake, S. Y., & Dehideniya, S. C. P. (2022). Embedding Sustainability in Learning and Teaching: Lessons Learned and Moving Forward-Approaches in STEM Higher Education Programmes. *Education Sciences*, *12*(3). https://doi.org/10.3390/educsci12030225

7. Hart, D. D., Bell, K. P., Lindenfeld, L. A., Jain, S., Johnson, T. R., Ranco, D., & McGill, B. (2015). Strengthening the role of universities in addressing sustainability challenges: the Mitchell Center for Sustainability Solutions as an institutional experiment. *Ecologyand Society*, *20*(2), art4. https://doi.org/10.5751/ES-07283-200204

8. Li, F., Zhang, S., & Jin, Y. (2018). Sustainability of university technology transfer: Mediating effect of inventor's technology service. *Sustainability (Switzerland)*, *10*(6).https://doi.org/10.3390/su10062085

9. Singh, S., & Ru, J. (2023). Goals of sustainable infrastructure, industry, and innovation: a review and future agenda for research. In *Environmental Science and Pollution Research* (Vol. 30, Issue 11). https://doi.org/10.1007/s11356-023-25281-5

10. Soliman, A. M. A., & Mehanna, M. A. (2023). Sustainable and Green Academic Buildingsin Al-Azhar University: Case Study. *International Journal of Renewable Energy Research*, *13*(1). https://doi.org/10.20508/ijrer.v13i1.13431.g8664

Use of Augmented Reality and Virtual Reality for Sustainable Digital Transformation of Libraries

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ABSTRACT: This study summarizes a comprehensive exploration of Augmented Reality (AR) and Virtual Reality (VR) applications in libraries for sustainable development. The text highlights the technological intricacies, potential benefits, and challenges associated with implementing AR-VR. It emphasizes on the diverse applications of AR-VR in library services, including enhanced learning, accessibility, digital archiving, and environmental education. The study delves into the distinctions between AR and VR, presenting an analysis of their respective features and impacts. The objectives of the research encompass an analysis of the current state of AR-VR, an examination of its potential in libraries and an exploration of how these technologies contribute to sustainability. The purpose of integrating AR-VR into libraries is underscored, with an emphasis on intensified user engagement and interactive access to information. The study concludes with recommendations for libraries to seamlessly incorporate AR-VR into their services and underscores the future perspectives of these technologies in promoting a sustainable economy..

KEYWORDS: Augmented Reality, Virtual Reality, Sustainability, Digital Library, Immersive Technologies

Introduction

In the modern world today, sustainability is becoming increasingly fundamental not only for the protection of environment but also for social and economic sustainability.

Digitalization of the education sector for sustainable development (ESD) has gained attention over the past decade. Particularly, technologies such as Augmented Reality (AR) and Virtual Reality (VR) offer new opportunities to implement educational themes on sustainable development by simulating real-world experiences and using immersive and interactive learning formats.

Similar to many other ICT solutions, AR/VR requires a combination of software and hardware based on many other technologies, such as 5G for connectivity, video standards for visualization, artificial intelligence for software algorithms and more. One technology relies on another, creating a layered environment that must be carefully managed. This is where implementing and nurturing an enabling environment is important, in order to ensure that the right problems are being addressed as necessary.

Most young people if asked about VR or AR, will likely tell us about the latest headset on the market to play video games or engage with social media. When in fact all of us have already come across the technology ourselves without realizing it. This includes virtual clothes shopping, virtual apartment visits, virtual tourism even high-end industrial solutions, such as professional flight simulators.

In the last recent years, technology has revolutionized the way libraries operate; AR has emerged as a favourable approach to boost library services. AR is an interactive technology that overlays digital content onto the physical world to provide users with an immersive and engaging experience. It has the potential to transform the way users interact with library resources and enable them to access information in an up-to-date and innovative ways.

Studies on AR-VR

Milgram et al. (1994) distinguish AR from virtual reality (VR) by integrating virtual content with the real world. Azuma's research (1997, 2001) elaborates on AR's integration of 3D virtual objects in real-time across all senses. In 1998, Zheng et al. broached a sensitive topic, stating that virtual reality (VR) is essentially a review of the real world.

In libraries, AR and VR has gained momentum as 'Smart Libraries' (Aittola et al., 2003). Zak (2014), Studies by Farkas (2010), Meredith (2015), Huang et al. (2016), Schmalstieg and Höllerer (2016) and Baumgartner-Kiradi (2018) highlighted AR and VR's applications in libraries, including enhanced patron wayfinding, shelf reading, library tours, instructional guides, photo collections, promotional games, augmented books, VR books, virtual storytelling, shelf maintenance, language translation, training & workshops, VR filmmaking and collaborative spaces as well.

The New Media Consortium Horizon Report (2016) categorizes augmented reality (AR) and Virtual Reality (VR) as mid-term adoption in higher education. In India, as reported by Times of India (2022), Tiruchi's Lalgudi Library, Tamil Nadu launched a VR library for the first time for the student community and aims

at bringing advanced technology to the students and is the first VR library in the state of Tamil Nadu.

A recent study has been conducted by Das (2023) that explored the effectiveness of AR strategies in libraries, utilizing tools like Wikitude, ARToolkit, Vuforiia, Blippar, ARLOOPA to enhance user engagement. The study also mentioned about the notable AR initiatives in libraries which included myLibrARy, ShelvAR, LibrARi, Ludwig II and SCARLET. According to the study, in India, initiatives like Timescape: Kolkata and the A-Frame WebAR prototype at IIT Kharagpur Library showed a growing interest in AR technology.

Augmented Reality vs Virtual Reality

Augmented reality (AR) refers to a technology that connects virtual components to the real world. These virtual components can appear in the form of text, images, 3D models or animations. They are usually displayed via smartphones or special AR glasses. AR can be used for various purposes including marketing, education, navigation and training.

Augmented reality uses the existing real-world environment and overlaps virtual information, images or even a virtual world on top of it to amplify the experience.

Augmented reality enhances the natural real-world environment by making visual changes to it or by adding new information or images over it. It can be used for a variety of purposes, including gaming, product visualization, marketing campaigns, architecture and home design, education, and industrial manufacturing as well.

Augmented reality is an interactive experience in which a real-world environment is enhanced with computer-generated visual elements, sounds, and other stimuli. It can provide a user with a heightened and more immersive experience that adds to the user's enjoyment or understanding.

Augmented reality is a technology that overlays a real-world environment with a computer-generated stimulus, enhancing the user's experience and shifting their perspective. It can be used in almost any field ranging from gaming and design to shopping and education. It is a form of mixed reality which means a combination of the real world with digital visual elements, unlike virtual reality, which is entirely digital.

Augmented reality technology combines a users' camera, phone screen, and computer system, to create and generate real-life visual enhancements that

overtops the real world. AR creates minor and subtle changes to the environmental and visual alterations, allowing users to experience a nearly authentic life-like visualization.

Virtual reality (VR), on the other hand, refers to a technology that creates a virtual world usually with the help of a headset or VR glasses that users can enter virtually. In a VR environment, users can also interact with objects, manipulate them and even perform physical movements. This flexibility allows the users to interact with the virtual world. VR can be used for various purposes, such as gaming, simulations, training and therapy.

Through a virtual reality headset, someone can walk around Paris as if they were there in person.

Virtual reality, unlike AR, eliminates this connection to the physical surrounding environment.

The difference between AR and VR is that AR add together virtual elements to the real-world environment. While AR is more of a supplement to the real world, VR provides a fully virtual immersive experience in a virtual world.

- AR users can control their presence in the real world; VR users are controlled by the system.
- While VR requires a headset device, AR can be accessed using a smartphone.
- AR augments both the virtual and real worlds while VR only enhances a fictional reality.

Objectives

(i) To study and provide a descriptive analysis of the current state of AR-VR in general;
(ii) To analyze the potential application of AR-VR in libraries;
(iii) To study how the application of AR-VR can be helpful in providing sustainability in the libraries.
(iv) To provide recommendations for libraries to incorporate AR-VR as one of their services.

Purpose and Need of AR/VR in Library

The purpose of administering AR/VR in libraries is to intensify user engagement, provide interactive and immersive access to information and resources and boost learning experiences. The need for AR/VR in libraries emerges from the

preferences to adapt to digital advancements, meet the evolving expectations of tech-savvy patrons, and remain at the forefront of innovative and user-centric library services. AR cultivates a deeper connection and relationship between users and library resources and at the same time fulfills the need for a dynamic and interactive approach to information dissemination.

Use of VR and AR in the context of libraries:

Early applications of AR in libraries included book stack identification, library navigation, checking of suggestions for users, user facial recognition for review, online exhibits of cultural heritage, library outreach exhibits and access of archival information. As AR and VR technology advanced, libraries expanded their use to complement educational programs, storytelling sessions, and guided tours, providing patrons with engaging and interactive learning experiences. The potential applications of augmented reality and virtual reality in libraries are vast and varied. Some exciting examples of how AR-VR can transform different aspects of library services and bring forth a multitude of benefits and advantages that can enhance the user experience and redefine the traditional library setting are as follows:

1. **Use of AR-VR for Enhanced Learning and Engagement:** AR and VR can provide immersive educational experiences for library users. For example, users can take virtual tours of historical archives or experience interactive 3D models of scientific concepts. This engagement can encourage a deeper appreciation for the library's resources and promote learning.
2. **AR-VR for Enhancing Accessibility:** Remote access to library resources can be provided by libraries using AR and VR technologies which can reduce the need for physical visits and in turn will help in decreasing carbon footprint associated with commuting. For individuals with disabilities, AR can enhance the reading experience by overlaying auditory descriptions on top of printed text, allowing visually impaired individuals to read independently.
3. **AR-VR for Digital Archiving:** Libraries are accountable for preserving historical documents and materials. AR and VR can assist in digitizing and preserving rare and fragile items, reducing the need for physical handling and supporting long-term conservation endeavours.
4. **AR-VR for Collaborative Spaces and Cost Efficiency:** AR and VR can create collaborative virtual spaces that allow researchers and students from around the world to collaborate in a shared environment, reducing

the need for physical travel and promoting global collaboration. It can also reduce operational costs and the need for physical space and materials with the help of virtual services.

5. **AR-VR for Environmental Education:** Libraries can use AR and VR to educate users about sustainability and environmental issues. For example, they can offer virtual tours of eco-friendly building designs or showcase the impact of climate change through immersive experiences.
6. **Use of AR-VR for Reducing Paper Usage:** Libraries can promote sustainable practices by offering digital alternatives to printed materials. Users can access e-books, e-journals, and digital resources, reducing paper consumption.
7. **AR-VR for Efficient Resource Management:** AR and VR can assist in the efficient management of library resources by optimizing space usage and tracking inventory digitally. This can help to reduce energy consumption and waste.
8. **AR-VR for Personalized Experiences:** AR and VR can help libraries customize experiences to individual users and recommend relevant materials and services. This personalization can reduce unnecessary resource consumption.
9. **AR-VR for Data Visualization:** Libraries can use AR and VR to create immersive data visualizations, helping users understand complex information related to sustainability and other topics such as visualizing and experiencing historical events, exploring distant places and immersing one in understanding abstract concepts. By integrating AR and VR, users can see 3D reconstruction of ancient times, virtually visit and explore historical ruins and which can spark curiosity and understanding among the users.
10. **Use of AR- VR for training and employee education:** Another implementation of VR and AR in the spirit of sustainability is the use of training and further education for employees. By using VR and AR, it allows to recreate hazardous or environmentally harmful work processes that can be replicated and undergo virtual drills without affecting and desecrating the real environment.
11. **Using AR-VR to promote virtual conferences and meetings:** With the use of VR and AR conducting conferences and meetings will no longer be required to take place in real physical presence. This will allow companies to save on travel costs and the associated CO2 (Carbon dioxide) emissions. In addition, virtual conferences and meetings can also lead to significant

efficiency and productivity gains which may prove AR and VR to be more time and cost-effective.

12. **Exhibits and displays**: In library outreach exhibits, AR applications can provide interactive displays and multimedia content to enrich the visitor's experience and increase engagement by providing additional information related to the library's collections and resources.
13. **Augmented Book:** The Augmented Book can assist students in library reading rooms to give access to rare books, manuscripts, and archives. It enriches the experience by combining physical and digital elements, providing sensory delights while providing additional multimedia content and related information to the viewed items.
14. **Guided tours:** In a library environment, AR-VR can be used to offer guided tours and enhance the visitor's experience by overlaying digital information, interactive elements, and multimedia content into the physical space, providing an immersive and informative exploration of the library's resources and services.
15. **Virtual Storytelling:** Augmented reality enhances traditional storytelling sessions by introducing digital elements and characters into the narrative. Children can witness their favorite stories come to life with animated characters, interactive illustrations, and immersive sound effects, encouraging deeper engagement with the story and fostering a love for reading.
16. **Shelf Maintenance:** In library shelf maintenance, augmented reality can assist librarians in efficiently organizing and sorting books by providing real-time digital overlays that display book information, classification, categorization, and placement instructions, streamlining the shelf management process.
17. **Searching for media/additional information:** The main goal of AR-VR applications for libraries is to create user-oriented tools with features such as media management (search, reservation, download), navigation support, library information (opening hours, contact details), user services (account management, wish list, reminders), integration with external services (bibliographic management, book trade, events), social media integration, services beyond the library such as literary walks, etc.
18. **Language Translation:** Augmented reality makes language learning easier by providing real-time translation and language assistance. Users can point their device's camera at a text or object, and AR will overlay translated content to help individuals learn new languages or understand foreign texts more easily.

19. **Optical Character Recognition**: This OCR application allows students to scan text documents such as course assignments, citations, book pages and library shelves etc. using their mobile phones. Once the scan is complete, the app provides users with suggestions related to library resources relevant to the scanned content, facilitating easy access to additional information and materials for their studies.
20. **AR Catalogue Card:** Through an AR application in library catalogue cards, users can scan the cards with their mobile devices to trigger augmented information such as book summaries, reviews, and related digital content to enhance the browsing experience and provide quick access to additional resources.

Benefits of AR in Libraries: Integrating augmented reality into libraries offers a variety of benefits that improve the user experience and redefine the traditional library environment. Some of the key advantages are as follows:

1. **Alternative of RFID Technology:** Bookshelf management can be possible with the help of RFID technology. However, its high cost puts it out of reach for many libraries. On the other hand, using specific AR applications can be a cost-effective alternative to RFID, as there are several free and customizable open-source AR solutions available.
2. **Enhanced Accessibility:** Augmented reality can break down barriers for individuals with disabilities by providing an alternative way to access information. Using audio descriptions, text-to-speech technology, and visual interactive elements, AR can create an inclusive environment where everyone can be engaged with library resources.
3. **Expansion of Physical Space:** Libraries often face constraints to accommodate an extensive collection of resources. Augmented reality can alleviate this constraint by digitally expanding the library's offerings. Users can access virtual bookshelves, browse through extensive digital collections, and experience virtual exhibitions without the need for physical storage.
4. **Preservation of Rare Artifacts:** Libraries often house rare manuscripts, delicate artworks, and historical artifacts. Augmented reality allows these valuable items to be preserved digitally, allowing users to examine and interact with them without compromising their physical integrity. AR can bring ancient documents to life, restore faded artworks, and provide an immersive experience of historical artifacts.
5. **Support Interactive Learning:** AR applications in libraries can enhance the learning experience by providing context-specific information and interactive content. Users can access supplementary materials, visual aids,

or simulations relevant to their current learning environment to provide a deeper understanding of the subject matter.

6. **Contextual and timely access to information:** With AR, library patrons can access information on-demand, anytime and anywhere. By scanning a book cover or physical objects with AR-enabled devices, users can instantly retrieve additional details, reviews, or related resources, eliminating the need for traditional catalog searches.
7. **Smooth workflow:** AR tools can streamline library operations by simplifying tasks such as organizing bookshelves, managing inventory, and resource retrieval. Librarians can use AR apps to quickly identify misplaced books quickly, track inventory, and organize materials efficiently, leading to improved workflow.

Challenges

Libraries will face several issues and challenges when opting or transitioning to AR and VR services. Some challenges include:

1. **Limited to handheld device/ headgear:** AR is basically limited to handheld devices, such as smartphones and tablets, as these devices serve as the main interface to interact with the augmented content in the physical world for users while VR relies on the headgear or headset in order to submerge oneself into the virtual world.
2. **User Adoption:** All library users may not be familiar and comfortable with using AR-VR technologies.
3. **Management:** For dynamic exhibits and interactive learning experiences, maintaining and updating AR content may require ongoing effort and an efficient content management system.
4. **Privacy and Data Security:** Because AR applications collect user data for personalized experiences, they may raise certain privacy and data security concerns that libraries must consider to protect user information.
5. **Accessibility:** Libraries should consider the accessibility of AR applications for users with disabilities to ensure inclusivity and equal access to AR-enhanced resources.
6. **Ethical Considerations:** To maintain library credibility and integrity, libraries need to address ethical issues regarding AR content and ensure that enhanced information is reliable, unbiased, and fact-checked.
7. **Technological hurdles and costs:** One of the biggest challenges when implementing VR and AR would be the technological hurdles and costs. Obtaining the relevant and suitable hardware and software can be expensive

and typically requires adjustments to the IT infrastructure. Furthermore, it can be tough to find qualified employees who can handle, operate and implement the technology appropriately. Therefore, the creation of high-quality AR content can be expensive, posing a challenge for libraries with limited or low budgets and resources.

8. **Integration into existing workflows and processes:** Another challenge in implementing VR and AR is integrating it into existing workflows and processes. It can be difficult to seamlessly integrate the technology into existing processes without disrupting or interfering with the present ongoing workflow. Additionally, it may also be necessary to adapt to existing workflows to make the best use of the technology.
9. **Training needs for employees:** Eventually, the need for training will also become a challenge when implementing AR-VR as these technologies require specialized technical expertise and knowledge, which may be inaccessible to the library staff. Employees need to be trained to use the technology effectively and to ensure they are able to maneuver the new workflows and processes rightly. This will require time and resources and can also emerge in additional costs.

Future perspectives of VR and AR in the sustainable economy

With the leap in remote work, VR/AR has the potential to create more immersive and collaborative virtual workspaces. These can reduce the need for travel, resulting in a lower carbon footprint and a more sustainable future. Additionally, VR/AR technology can play a vital role in promoting sustainable travelling by creating virtual travel experiences. This reduces the need for physical travel and lowers carbon emissions. VR/AR technology can help to raise awareness of sustainability issues and promote environmentally friendly practices by creating immersive and engaging virtual learning experiences. The following points have been suggested for the amplification of AR approach to library.

1. **User-Centric Approach:** Focus on creating AR experiences that are tailored to the needs and preferences of library patrons, delivering valuable, relevant content, seamless navigation, and interactive features.
2. **Collaboration with Developers:** Work with skilled developers and AR experts to ensure the successful implementation and smooth operation of AR applications within the library environment.
3. **Start Small and Expand:** Begin with pilot projects or limited-scale AR initiatives to understand user feedback, evaluate feasibility, and refine the implementation process before expanding to larger projects.

4. **Training and Support:** Provide training and support to librarians and staff on the effective use and management of AR technologies, ensuring they can assist patrons in utilizing these resources.
5. **Enhance Outreach and Engagement:** AR applications can be utilized for interactive library exhibits, guided tours, and educational programs to engross patrons and attract new visitors.
6. **Emphasize Accessibility:** AR applications can be made to ensure user-friendly and accessible to all patrons, including those with disabilities, by implementing features such as text-to-speech, voice commands and captioning.
7. **Encourage Collaboration with Institutions:** Collaboration with universities, museums, historical societies, and other cultural institutions can assist in developing AR experiences that foster interdisciplinary learning and shared resources.
8. **Continuously Assess and Update:** Regular assessment of the impact and effectiveness of AR applications in achieving library goals, and updating or enhancing them can also be of service based on user feedback and changing technology trends.
9. **Promote Awareness:** Library patrons can be educated about the availability and benefits of AR resources through promotional materials, workshops, and library events to encourage increased utilization and involvement of library services.

By implementing these recommendations, libraries can stay at the frontline of technological and digital evolution in the library domain and effectively get a grasp of AR technologies to broaden educational opportunities as well as enhance user experiences in the library.

Conclusion

Virtual reality and augmented reality technology have made significant advancements in recent years. And the momentum of innovation shows no signs of slowing down. As this technology evolves, it is expected to bring even more advantages to sustainability. The COVID-19 pandemic has shown that the education sector needs to be able to rely on a robust digital framework.

VR and AR technologies have the potential to make the world of work more sustainable. Nonetheless, when initiating these technologies, it is significant to consider the impact on the world of work and sustainability. VR and AR

technologies have the potential to fundamentally change the world of work and empower new ways of working.

Since augmented reality uses a real-world environment in coexistence with computer-generated visual elements, it may be seen as more authentic than virtual reality, which is 100% computer-generated. Therefore, for AR/VR to become common and popular, it is critical to establish the right and proper vision for the technology and to develop the appropriate strategies and policies to enable the various underlying technologies including 5G. Without these technologies, the necessary prerequisites for an immersive AR/VR experience will lag behind.

The younger generation in some connected and developed nations may argue that VR is already mainstream, but to take AR/VR in mainstream, policymakers, technologists, innovators, small and medium firms, and large organizations need to collaborate. Doing so has the potential to be a powerful navigator of progress towards all 17 Sustainable Development Goals (SDGs) and to create a fully inclusive digital society that empowers everyone. (Martin, 2021)

The possibilities of AR/VR systems are endless. However, for the moment, access and impact are limited to the very few communities who can afford and have access to them. More than half of those users who are considered as "connected" are still unable to enjoy the full digital experience, because of slow speeds and the high costs of devices and bandwidth. COVID-19 has shown us that we need to work harder to change this situation fast. This is where the proliferation of mainstream technologies such as AR/VR can play a critical role in delivering meaningful connectivity.

Virtual Reality and Augmented Reality technologies hold significant promise in promoting sustainability, and their further development could create even more opportunities for a greener and more sustainable future.

References

1. Aittola, M., Ryhänen, T., & Ojala, T. (2003). SmartLibrary – Location-Aware Mobile Library service*. In Lecture Notes in Computer Science, 411–416*. https://doi.org/10.1007/978-3-540-45233-1_38

2. Azuma, R. T. (1997). A survey of augmented reality. *Presence: Teleoperators and Virtual Environments, 6(4), 355-385*. http://www.cs.unc.edu/~azuma/ARpresence.pdf

3. Azuma, R., Baillot, Y., Behringer, R., Feiner, S., Julier, S., & Macintyre, B. (2001). Recent advances in augmented reality. *IEEE computer graphics and applications, 21, 34-47.* https://www.cs.unc.edu/~azuma/cga2001.pdf

4. Baumgartner-Kiradi, B., Haberler, M. & Zeiller, M. (2018). Potential of Augmented Reality in the Library. FMT, 30-37. https://ceur-ws.org/Vol-2299/paper4.pdf

Digital Transformation for Sustainable Libraries: Navigating the Green Frontier

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ABSTRACT: As libraries adapt to the demands of the digital age, the imperative for sustainable practices becomes increasingly pronounced. This research paper explores the intersection of digital transformation and sustainability within library environments. The study investigates how libraries can leverage digital technologies to cultivate environmentally responsible practices, reduce ecological footprints, and contribute to a greener future. A comprehensive literature review sets the stage, examining the evolving role of libraries, sustainable library practices, and successful cases of digital transformation for sustainability in library settings.

Looking to the future, the paper delves into emerging trends and potential advancements, such as AI-driven resource optimization, virtual and augmented reality applications, and the ongoing evolution of sustainable practices. The conclusion synthesizes key findings, underlining the critical importance of sustainable practices in libraries and the transformative potential of digital technologies to usher in a new era of environmentally responsible library services. This research provides practical recommendations for libraries seeking to embark on a sustainable digital transformation journey, ultimately offering a roadmap for navigating the green frontier..

KEYWORDS: ****

Introduction

In an era defined by rapid technological advancements and an increasing awareness of environmental challenges, libraries find themselves at the crossroads of innovation and sustainability. The evolution of digital technologies has ushered in a new paradigm for libraries, prompting a fundamental shift in their operations and services. Simultaneously, a growing global consciousness about the need for sustainable practices places libraries in a unique position to not only adapt to the digital age but also to contribute significantly to environmental stewardship.

This paper delves into the dynamic landscape where digital transformation and sustainability intersect, carving out a path for libraries to navigate what we refer to as the "Green Frontier." Digital transformation, marked by the integration of advanced technologies into every facet of library functioning, offers a

transformative opportunity for libraries to reenvision their role in the community and beyond. As libraries embrace this digital evolution, it is essential to consider the environmental impact of these changes and consciously chart a course that aligns with the principles of sustainability.

Digital Transformation in Libraries: Digital transformation in libraries refers to the comprehensive integration of digital technologies, processes, and strategies to fundamentally reshape and enhance library services, operations, and user experiences. It involves leveraging advanced technologies to streamline traditional library functions, optimize resource management, and facilitate innovative approaches to information access and dissemination. Key components of digital transformation in libraries include the adoption of digital catalogs, automation of library processes, digitization of collections, and the implementation of cutting-edge technologies such as artificial intelligence, machine learning, and data analytics to improve efficiency and user engagement.

Sustainability in Libraries: Sustainability in the context of libraries involves adopting practices that minimize the environmental impact of library operations and contribute to broader ecological goals. It encompasses a commitment to reducing resource consumption, minimizing waste, and promoting environmentally responsible practices in library management. Sustainable libraries strive to balance social, economic, and environmental considerations, addressing issues such as energy efficiency, waste reduction, and responsible procurement. This includes efforts to digitize collections to reduce paper usage, implementing energy-efficient technologies, and engaging in community education and outreach on environmental issues. In essence, sustainable libraries aim to operate in a way that meets present needs without compromising the ability of future generations to meet their own needs.

Intersection of Digital Transformation and Sustainability in Libraries: The intersection of digital transformation and sustainability in libraries involves using digital technologies to not only enhance operational efficiency and user services but also to minimize the ecological footprint of library activities. It emphasizes the role of technology in achieving both technological advancements and environmental responsibility simultaneously. For example, transitioning from physical to digital collections reduces paper consumption, while the implementation of energy-efficient technologies contributes to reduced energy consumption. This intersection represents a holistic approach where technological innovation aligns with sustainable practices to create libraries that are efficient, environmentally conscious, and better equipped to serve the evolving needs of users in the digital age.

Objectives:

- Examine the Landscape of Digital Transformation in Libraries
- Assess Sustainable Practices in Libraries
- Explore the Intersection of Digital Transformation and Sustainability
- Identify *Key Components of Digital Transformation for Sustainability*

Sustainable library practices:

Sustainable library practices encompass a range of initiatives and strategies aimed at minimizing the environmental impact of library operations and promoting responsible resource management. These practices align with broader sustainability goals, emphasizing the balance between social, economic, and environmental considerations. Here are key aspects of sustainable library practices:

Energy Efficiency:

Green Building Design: Implementing energy-efficient building designs and technologies to reduce energy consumption and environmental impact.

Energy Audits: Conducting regular energy audits to identify areas for improvement and optimize energy usage.

Waste Reduction and Recycling:

Paperless Initiatives: Promoting digital collections and reducing reliance on print materials to minimize paper consumption.

Recycling Programs: Establishing comprehensive recycling programs for paper, plastic, electronics, and other recyclable materials.

Digitization of Collections:

Digital Archives: Digitizing historical and archival materials to reduce the need for physical storage space and preserve documents in a more sustainable format.

E-books and Electronic Resources: Emphasizing electronic resources, such as e-books and online databases, to reduce the environmental impact of physical book production and transportation.

Environmental Awareness and Education:

Community Outreach: Engaging with the community to raise awareness about environmental issues and promote sustainable practices.

Educational Programs: Hosting workshops, seminars, and events focused on sustainability and environmental conservation.

Green Procurement:

Eco-friendly Purchasing: Prioritizing the procurement of environmentally friendly products, such as recycled paper, energy-efficient equipment, and sustainable office supplies.

Vendor Sustainability Criteria: Collaborating with vendors and suppliers who adhere to sustainable and ethical business practices.

Efficient Resource Management:

Automation and Technology: Implementing automated systems and technologies to streamline library processes, reducing the need for manual labour and optimizing resource utilization.

Space Optimization: Maximizing space efficiency through smart design and layout to minimize the environmental footprint of library buildings.

Sustainable Events and Programming:

Eco-friendly Events: Organizing events with a focus on sustainability, incorporating practices such as waste reduction, reusable materials, and carbon-neutral approaches.

Green Programming: Incorporating sustainability themes into library programs, book clubs, and exhibitions to inspire environmental consciousness.

Renewable Energy Sources:

Solar Power: Integrating solar panels and other renewable energy sources to power library facilities, reducing reliance on conventional energy grids.

Energy-Efficient Lighting: Installing energy-efficient lighting systems to further reduce energy consumption.

Collaboration and Partnerships:

Community Collaboration: Collaborating with local organizations, schools, and businesses to strengthen sustainable practices collectively.

Network Building: Participating in regional and national library networks focused on sustainability to share best practices and collaborate on shared initiatives.

Policy Development:

Sustainability Policies: Developing and implementing formal sustainability policies within the library to guide decision-making and institutionalize sustainable practices.

By incorporating these sustainable library practices, libraries can play a vital role in promoting environmental responsibility, fostering community engagement, and contributing to the broader goals of sustainability in the information and cultural heritage sector.

Digital Resource Management:

Challenges and Solutions: The digital transformation journey for sustainability in libraries is not without its challenges. Libraries encounter various hurdles as they strive to integrate digital technologies while maintaining a commitment to environmental responsibility. Here are some common challenges faced by libraries in their digital transformation journey for sustainability:

Financial Constraints:

High Initial Costs: Implementing digital technologies and sustainable infrastructure often requires significant upfront investments that may strain limited library budgets.

Cost of Digital Resources: Acquiring and maintaining digital resources, such as electronic databases and e-books, can be expensive and may pose financial challenges.

Technological Barriers:

Outdated Infrastructure: Many libraries, especially smaller ones, may have outdated technological infrastructure, making the integration of new digital systems complex and costly.

Digital Skills Gap: Staff may lack the necessary skills to navigate and manage advanced digital systems, requiring training and skill development.

Resistance to Change:

Cultural Resistance: Resistance to change among library staff and users who are accustomed to traditional methods and may be hesitant to embrace digital transformation.

Fear of Job Displacement: Concerns among staff about job displacement due to the automation of certain tasks, leading to resistance towards adopting digital technologies.

Data Security and Privacy Concerns:

Data Breaches: Libraries must navigate the risk of data breaches and unauthorized access to sensitive information when managing digital collections and user data.

Privacy Regulations: Adhering to evolving data protection regulations while maintaining open access to information poses a complex challenge.

Environmental Impact of Technology:

E-waste Management: The disposal and management of electronic waste (e-waste) generated by obsolete technology can pose environmental challenges.

Carbon Footprint: The energy consumption of digital technologies, including servers and data centres, contributes to libraries' carbon footprint, potentially counteracting sustainability efforts.

Digital Inequality and Access Disparities:

Digital Divide: Unequal access to digital resources and technology among library users due to socio-economic factors, limiting the inclusivity of digital services.

Limited Internet Access: Lack of reliable internet access in certain regions may hinder the implementation of digital services and initiatives.

Licensing and Copyright Issues:

Digital Licensing Costs: Ongoing and often increasing costs associated with licensing digital content, posing a financial challenge for libraries.

Copyright Limitations: Navigating copyright restrictions and limitations when digitizing and providing access to materials, which may impede certain sustainability initiatives.

Sustainability Metrics and Measurement:

Lack of Standardized Metrics: Difficulty in establishing standardized metrics to measure the environmental impact of digital transformation efforts and overall sustainability practices.

Resource Intensive Data Analysis: Comprehensive measurement and analysis of sustainability initiatives may require significant resources and expertise.

Lack of Clear Policies and Guidelines:

Policy Development Challenges: Establishing clear and effective policies and guidelines for sustainable digital practices may be challenging, impacting decision-making and implementation.

Compliance with Standards: Ensuring alignment with international and local standards for sustainable practices in libraries may pose difficulties.

Limited Collaboration Opportunities:

Isolation of Initiatives: Limited collaboration with other libraries, institutions, or governmental bodies on sustainability initiatives may impede progress.

Lack of Shared Resources: Insufficient sharing of resources, best practices, and lessons learned across the library community may hinder collective efforts.

Understanding and addressing these challenges are critical for libraries to navigate their digital transformation journey for sustainability successfully. Proactive strategies, collaboration, and a commitment to ongoing assessment and improvement can help libraries overcome these obstacles and achieve their sustainability goals.

Conclusion

In conclusion, this exploration of the intersection between digital transformation and sustainable practices in libraries has illuminated key findings that underscore the pivotal role libraries play in shaping a greener future. As libraries evolve in the digital age, the adoption of sustainable practices emerges not only as a responsibility but also as an opportunity to make a lasting impact on the environment.

The paper underscores the critical importance of integrating sustainable practices into library operations. Libraries, as community resources and knowledge hubs,

are uniquely positioned to influence positive environmental change. By embracing sustainable practices, libraries contribute to broader societal efforts in mitigating climate change, reducing waste, and fostering a culture of responsibility.

The potential impact of digital transformation on long-term environmental goals is monumental. As libraries embrace digital collections, automate processes, and implement energy-efficient technologies, they not only enhance operational efficiency but also significantly reduce their carbon footprint. The transition from physical to digital resources minimizes paper usage, while the adoption of renewable energy sources and efficient technologies aligns libraries with broader environmental sustainability objectives.

By championing the cause of sustainability, libraries not only fulfill their role as custodians of knowledge but also as stewards of the environment. The transformative journey explored in this research paper signals a paradigm shift that extends beyond library walls, influencing communities to embrace sustainable practices and fostering a collective commitment to a greener, digitally enriched future. As libraries continue on this path, the potential for positive, long-lasting change becomes not only a vision but a tangible reality.

References:

1. ABDUL KARIM FEROZ (2021) *Digital Transformation and Environmental Sustainability: A Review and Research Agenda; Sustainability;* 13(3), https://doi.org/10.3390/su13031530

2. ANA MARIA GOMEZ-TRUJILLO (2021) Digital transformation as a strategy to reach sustainability; Smart and Sustainable Built Environment 11(44)

3. ISOTILIA COSTA MELO (2023) Sustainable digital transformation in small and medium enterprises (SMEs): A review on performance; Science Direct; Volume 9, Issue 3, https://doi.org/10.1016/j.heliyon.2023.e13908

4. LEI WANG (2022) The Impact of Digital Transformation on Corporate Environment Performance: Evidence from China; Int J Environ Res Public Health. 19(19).

5. SHI CHEN (*2022*) Research on the impact of digital transformation on green development of manufacturing enterprises; *Frontiers in Energy Research, Volume 10* https://doi.org/10.3389/fenrg.2022.1045328

6. TARIQ ASHRAF (2022) Developing Sustainable Digital Libraries: Socio-Technical Perspectives http://pustaka.unp.ac.id/file/abstrak_kki/EBOOKS/LIBRARIES,%20DIGITAL%20Developing%20sustainable%20digital%20libraries,%20socio-technical%20perspectives.pdf

Sustainable Libraries in the Central University Libraries of the North-East Region Of India

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ABSTRACT The study discusses the components of a sustainable library in central university libraries in the NE region of India, revealing that out of six central university libraries, most institutions meet basic requirements for sustainable library, including green building standards. The study also explores the awareness of sustainable libraries among librarians at central universities of NE India. It discovers that the majority of librarians are devoted to making their libraries greener and educating students and communities about these initiatives. The study emphasizes the significance of green library criteria in academic library planning and management. The study also explores the future plans of Central University librarians of NE India for sustainable library initiatives. Despite adhering to the green building standards initiatives of major councils like IGBC (Indian Green Building Council), LEED (Leadership in Energy and Environmental Design), and so on, many are interested in establishing green libraries in their existing libraries. Some of the librarians have already submitted plans to their respective competent authority for multi-storey buildings with green features, such as solar power, rooftop gardens, and zero-noise zones.

Keywords: Sustainable Library, Green Building Standards, IGBC, LEED, NE India.

1. Introduction:

With the improvement of sophisticated technology in this modern era, the human lifestyle is developing day by day. Nowadays, the difference of time between demand and supply is relatively less. The interest and commitment towards innovative things are in a position to fulfill all our needs. So, in between innovation and technological things, we lose something important, which is a sustainable environment. So, the word Green has great significance for the healthy survival of human beings in today's world. In the past few years, every field of the universe of knowledge has been moving towards the green movement, and the library is also

one of them. Climate change is an intense problem in the world. So, to fix or reduce this problem, many researchers and scientists are working on different projects.

The concept of green library came out in the early 1990s, and it has become popular among the library and information science professionals around 2003. The concept of green libraries is possible by building sustainable or green buildings, by converting existing libraries into green or sustainable libraries, by providing green library services, by practicing sustainable things in the library, etc. The library professionals are also trying to develop an environment-friendly library to reduce electricity consumption, the use of papers, maximize the use of rainwater in library work, rooftop gardening, etc.

2. Objectives of the Study:

1. To find out the components of the sustainable library those are present in the central university libraries of the NE region.
2. To know the awareness of the librarians of central universities regarding the concept of sustainable library.
3. To know the future plans of the librarians about the sustainable library or green library initiatives.

3. Scope of the Study:

The scope of the present study is given in the table below:

Table 1: List of University Libraries taken for the study

Sl. No.	Name of the University	Name of the Library
1.	Assam University	Rabindra Library
2.	Tezpur University	Central Library, Tezpur University
3.	Mizoram University	Central Library, Mizoram University
4.	Sikkim University	Teesta-Indus Central Library
5.	Manipur University	Manipur University Library
6.	Nagaland University	Central Library, Nagaland University
7.	Rajiv Gandhi University	Central Library, Rajiv Gandhi University
8.	North Eastern Hill University	NEHU Central Library
9.	Tripura University	Central Library, Tripura University

4. Research Methodology:

The research methodology is a specific procedure or technique or method that helps to identify, select, process, and analyze the information about a particular topic. In a research paper, the methodology section allows the reader to critically evaluate a study's overall validity and reliability**.**

Data Collection Method:

Keeping in mind the scope and objectives of the concerned topic, the following data collection method is followed:

A. **Questionnaire Method:** A questionnaire was made consisting of the series of questions arranged in some definite order related to the topic, which were sent to the respective libraries to gather the data. For this research, a questionnaire was made with both open-ended and closed-ended questions, and a questionnaire was sent by email and WhatsApp to the various librarians of the respective libraries of the central universities.

B. **Telephonic Interview Method:** A telephonic interview is a data collection method when the interviewer communicates with the respondent over the telephone in accordance with the prepared questionnaires. A telephonic interview was done using the standardized questionnaires with both open-ended and closed-ended questions.

5. Review of Literature:

Antonelli, Monika (2008) in her study entitled 'The Green Library Movement: An Overview and Beyond' discussed the importance of the green library movement for human society. According to the California Integrated Waste Management Board, "a Green or Sustainable building is a structure that is designed, built, renovated, operated, or reused in an ecological and resource-efficient manner." Green Library buildings are measured by rating systems like LEED (Leadership in Energy and Environment Design), which was developed by the United States Green Building Council. It was developed in 2000 and has now become the national standard for buildings in the USA. Many Green library courses were introduced by LEED after 2008 to make society aware of Green Libraries. This paper also discussed the various Greening Library Associations under the ALA (American Library Association) and ACRL (Association of College and Research Libraries).

Connell, Virginia (2010) in his study entitled "Greening the Library: Collection Development Decisions" discussed the sustainability of collections with regards to increased prices, user needs, and format stability. Sustainable collection development mainly depends on the selection of the green collection materials, weeding out of outdated or worn-out monographs and other printed documents from the collection, the green collection format (print and electronic), and the implications of them in the library. The article considers three facets of collection development: the selection of materials whose content informs and assesses green practices; deselection processes that emphasize reusing and recycling materials; and the selection of a material format, mainly print or electronic, that honors the green dictum to reduce the carbon footprints an institution makes.

Purohit, Sangita (2013) in her article entitled "Green Library: A New Concept of Library" explained the concept of the green library in simple language. The author mainly gave suggestions for making Green Libraries. The author explained in her article that greening the libraries not only focuses on greening the buildings but also focuses on various sustainable things that can be achieved by the librarians. Some of the suggestions are given below: "turning off lights when leaving the office; using recycled paper; pulling the paper out of trash bins and using recycled jet bags; using stairs rather than elevators; eliminating personal printers and using networked printers; installing low-flush toilets, etc."

Malode, Amit V. (2014) in his article entitled "Green Library: An Overview" has discussed the concept of Green Library and its importance for human society. A Sustainable library is a contemporary word for Green Library. According to the Online Dictionary of Library and Information Science, Green Library is "a library designed to minimize the negative impact on the natural environment and maximize indoor environment quality through careful site selection, use of natural construction materials and biodegradable products, conservation of resources (water, energy, paper, responsible waste, disposal, recycling, etc)." The paper has also discussed the criteria for a Green Library and the elements required for greening libraries. After citing examples of green libraries, the author also discussed the importance of Green Libraries. By establishing green libraries, we can control global warming directly and also have environment-friendly libraries.

Rabidas, Sunil (2016) in his article entitled "Green Library Buildings: A Sustainable Process" discussed the LEED rating system for buildings and the levels of the certificates provided by them. LEED is the product of the United States Green Building Council, formed in 2000 to help owners and builders build sustainable and environmentally friendly buildings. Under LEED, there are four

levels of certificates given to buildings. These certificates are: 1) Platinum (80+ points) 2) Gold (60–79 points) 3) Silver (50–59), and 4) Certified (40–49). This article has also given examples of Green Libraries across the world, including India. At the end, the author also discussed the future of Indian buildings, citing the examples of USGBC, LEED, GRIHA, and TERI.

6. What is a Sustainable Library?

A sustainable library, also known as a green library, is a library built with environmental concerns in mind. Green libraries are part of the larger green building movement. Green libraries educate the public about environmental issues through their collections, sustainable and environmentally friendly facilities, and public library programs. Among other things, green libraries maximize the effects of natural elements like sunlight and natural air flow; they are designed while taking into account site selection, structural design, energy, and materials used, while also keeping in mind human health effects.

According to USGBC, "Green building is a holistic concept that starts with the understanding that the built environment can have profound effects, both positive and negative, on the natural environment as well as the people who inhabit buildings every day. Green building is an effort to amplify the positive and mitigate the negative impact of these effects throughout the entire life cycle of a building". (What Is Green Building? U.S. Green Building Council, 2014).

7. Standards for Green/Sustainable Library:

There are various standards related to the sustainability of buildings and green/ sustainable libraries. These standards councils are operating from the US and also in India.

7.1 USGBC Standards:

The full form of USGBC is the United States Green Building Council. It is a non-profit organization from the United States, founded in 1993. It developed the LEED 1.0 rating system in 1998 and LEED 2.0 in 2001. The main three people related to the formation of LEED were Rick Fedrizzi, David Gottfried, and Mike Italiano. LEED stands for Leadership in Energy and Environmental Design. It is an ecology-oriented building certification system that judges buildings sustainability and certifies them as platinum, gold, silver, and only certifies them by depending on major components. These 6 components are:

(i) Site Location.
(ii) Water Conservation.
(iii) Energy Efficiency.
(iv) Material and Resources.
(v) Indoor air quality.
(vi) Innovation and design process.

The four rating level of LEED are:

(i) Certified = 40-49 Points.
(ii) Silver = 50-59 Points.
(iii) Gold = 60-79 Points.
(iv) Platinum = 80+ Points.

7.2 Chicago Illinois Standards:

Chicago is one of the first cities to develop its own standards for the green or sustainable library. The Chicago Illinois standard is mainly influenced by the LEED Green Building Rating System.

7.3 Brown Green Standard:

Jerry Brown, Governor of California, discussed the emerging trend of green libraries and proclaimed that the libraries were on the cutting edge of Green design. New or renovated state buildings over 10,000 sq. feet will have to reach the U.S. Green Building Council's LEED Silver Certification or higher as well as incorporate clean energy generation.

7.4 Indian Green Building Council Standard:

IGBCS, part of the Confederation of Indian Industry (CII), was formed in 2001 to promote and rate sustainable or green buildings across India. This council helps in developing green or sustainable libraries, and it also provides certification services. It offers training in the program in the green library. In this way, this council is promoting the green building movement in India.

7.5 Leadership in Energy and Environmental Design (LEED-India):

The United States Green Building Council has established a LEED hub in India to accelerate the adoption of LEED in India. USGBC and IGBC are collaborating for the advancement of green building in India. IGBC certified the LEED India projects registered with IGBC until June 2014, and the Green Building Certification Institute (GBCI) certified LEED projects registered after June 2014.

8. Some of the Sustainable/Green Library Buildings in India:

According to the latest US Green Building Council report, India has been ranked third on the list of the top 10 countries in LEED (Leadership in Energy and Environment Design) outside the United States. Canada and China are the top two countries in this ranking in LEED (Leadership in Energy and Environment Design) outside the United States. Till date, there are 10 major Green Library Buildings in India.

8.1 Anna Centenary Library:

The Anna Centenary Library (ACL), a state-of-the-art library, was inaugurated on September 15, 2010, on the occasion of the 102nd birth anniversary of the former Chief Minister of Tamil Nadu, Dr. C. N. Annadurai, popularly called 'ANNA'. Because of his great interest in books and libraries, this library is named as 'Anna Centenary Library'. The foundation stone was laid on August 16, 2008, completed in a short span, and declared open to the public on September 20, 2010. It is a LEED Gold-certified library. It is one of the most sustainable libraries in India as well as in Asia. Its feature is that the library blocks at an angle that allows maximum daylight and is eco-friendly.

8.2 Karnataka University Library:

Karnataka University Library is situated in the Dharwad district of Karnataka and was established in 1950. This library is an example of an eco-friendly library. This library facilitates a green space for library users. The students are given all the facilities, like Wi-Fi, digital resources, drinking water, fresh air, etc. There are no book shelves, chairs, or tables, but benches are installed under the trees so that students can sit and read the books taken from the university library.

8.3 Delhi University Library:

It is housed in a four storey separate building in beautiful surroundings on an elevated site at the centre of the campus and offers a congenial environment for study and research. The olden-day building is naturally cool and pleasant, with broad openings for natural light. Windows are large, and too many are accelerating both fresh air and sunlight.

8.4 Perma Karpo Library, Ladakh in Indian Himalayas:

The Perma Karpo Library is located in Ladakh, in the Indian Himalayas. The library was designed by Arup for a small village in the Ladakh region. It is the perfect example of how good design, science, and local knowledge have worked together

to create a sustainable as well as beautiful building. Solar panels, surrounded by a white lotus garden and innovative technologies are the main features present.

8.5 Mumbai University Library:

Mumbai University Library is one of the oldest university libraries in India, established in 1880. The library is made of sustainable materials. The windows are made up of wood and are wide and large so that the user can get fresh air and natural light without disturbance. The library uses wood as stack material. The architecture itself makes it more environment-friendly, as it boasts lower-height, lower-width, and non-thick walls. Calina campus library also provides wood as stack material and/or provides enough space for the users.

8.6 Madras University Library:

Madras University is an Indian-British-style library established in the year 1907. The library uses sustainable things like wood in their stack areas, in the reference hall, in the periodical section, and in the reading hall. The windows are also made up of wood, which is also large and wide. The availability of proper light and fresh air is also a green component of this library. The existing library building is built in a symmetrical mixture of Indian and British architectural styles. Windows are large, and too many are accelerating both fresh air and sunlight.

The rest four green libraries are:

- National Library of India.
- NIT Library, Silchar.
- NIT Trichy Library.
- Calcutta University Library.

9. Ways to create awareness on Sustainable Library:

Some of the different beneficial ways to create awareness about sustainable libraries are discussed below:

9.1 Conducting Seminar presentation, conference, etc.:

Green Library is a newly emerging concept in the field of Library and Information Science. Many of the library professionals and library science students are not very aware of it. So it is the responsibility of renowned library professionals and topic experts to conduct seminar presentations, conferences, etc. to create awareness among other library professionals and library science students. It is also the responsibility of the Head of the Department of library and information science

departments across India to conduct seminars, presentations, and conferences. Associations like ILA, IASLIC, IATLIS, ALA, IFLA, UNESCO, and OCLC can also conduct seminars to raise awareness amongst the people.

9.2 Including Green /Sustainable Library as a topic in LIS syllabus:

Green Library as a topic is not included in the present syllabus of the Library and Information Science across India. It is important to include the green library as a topic in the syllabus to educate the students about the concept of a green or sustainable library. The Ministry of Education, UGC should make guidelines to include a green library as a topic in the syllabus of Library and Information science and also in the Environmental Science syllabus. LIS Departments can also include this topic in their own syllabus. In this way, awareness about the green library could reach students as and as library professionals.

9.3 Using Social Media:

Nowadays, social media is an important tool to create awareness among people. Because in today's world, everyone is using social media irrespective of ages, genders, castes, races, etc. We can also make people aware of the green library using social media like Facebook, WhatsApp, Snapchat, Twitter, Instagram, etc. by posting about the green library and its benefits to humankind and by creating the green library pages on social media.

9.4 Through green or sustainable practices:

"If we want to change the world, we must change first". So, this quote suggests that before creating awareness about the green library, we first have to practice the green or sustainable library. Because if we want to inspire others to develop a green library, then we must show them the advantages of a green or sustainable library by practicing on our own.

10. Benefits of a Sustainable Library:

Benefits of the green/sustainable library are discussed below:

10.1 Lowers the cost of a library:

A sustainable/green library can be made with a low budget because most of the materials or resources used in a sustainable/green library are recycled and reused. The green library, or sustainable library, generally uses locally available materials, so basically the cost will be less. Green Library urges the librarians to

use natural light instead of electric bulbs or lights. By using natural light, a green library is able to lower the cost of the library.

10.2 Environment friendly:

Sustainable/Green Library is an eco-friendly library. It lowers the negative impact of humans on the environment. The Green Library mainly uses environment-friendly or sustainable resources in its work. In the green library, the boundary is surrounded by trees, which can eliminate the pollution of the library and its nearby areas.

10.3 Conservation of Energy:

Sustainable/Green library uses natural light instead of electric light, natural air instead of electric fan thus it conserves the energy in the library.

10.4 Use of renewable sources of energy:

Sustainable/Green library mainly use renewable sources of energy in their library work. It uses a minimum of non-renewable sources of energy to minimize the negative effect on the environment. Thus, the green library conserves energy, either directly or indirectly.

10.5 Reduction in carbon footprints:

Sustainable/Green Library mainly uses sustainable things in their library, like wood, natural light, air, locally produced things, etc. Green Library urges users and their staff to use public transport instead of private to minimize pollution. Planting trees near the library is another work of the Green Library to reduce carbon footprints.

10.6 Reduction in pollution:

As we discussed earlier, by using public transport, pollution can be reduced. The use of less polluted material can also reduce pollution. Recycling and reusing waste paper is also a sustainable policy.

11. Analysis and Interpretation of the Data:

Data analysis is the most crucial and important part of the research. Data analysis is the summarization of the collected data. It also involves the interpretation of the data collected through the various methods of data collection. The analysis of the data should be made concerning the objectives of the study and also with

reference to the research problem. Interpretation means drawing inferences from the collected facts after the analytical study.

In this study titled "SUSTAINABLE LIBRARIES IN THE CENTRAL UNIVERSITY LIBRARIES OF THE NORTH-EAST REGION OF INDIA," data are collected from both primary and secondary sources. Primary data are collected using the survey method with the help of a questionnaire. Some of the data was collected from the telephonic interview. Secondary data related to central universities and their libraries is collected from the respective websites of the central universities and their libraries.

The questionnaire has been sent to the nine central university librarians, out of whom six have responded. Data collected from the secondary sources and questionnaire have been tabulated, organized, and analyzed to meet the objectives set for the study.

11.1 Elements of the Green Library which are Present and Not Present in the central university libraries:

The summary of the green library elements those are present and not present in university libraries are tabulated below:

Table 2: The above table shows the elements which are present and not present in various institutions' libraries. These are represented in the % (percentage) form.

Sl. No.	Elements of the Green Library	Present	Not present	Total Responses
1.	The Library building is located in the centre of the Institution	5(83.3%)	1(16.7%)	6
2.	The Library building is planned according to green building standards	6(100%)	0	6
3.	The transportation system of the library is good so that any person can able to visit the library easily	6(100%)	0	6
4.	Sufficient numbers of windows or glass windows are available for natural lighting and fresh air	6(100%)	0	6
5.	The Furniture of the library is largely made of wood.	1(16.7%)	5(83.3%)	6
6.	The Solar panel is present in the library for electricity generation	4(66.7%)	2(33.3%)	6

Sl. No.	Elements of the Green Library	Present	Not present	Total Responses
7.	The LED bulb is used to save energy consumption.	4(66.7%)	2(33.3%)	6
8.	Roof water harvesting and rooftop gardens are encouraged.	4(66.7%)	2(33.3%)	6
9.	The Furniture of the library is largely made of wood.	1(16.7%)	5(83.3%)	6
10.	Water is available 24/7 and the sanitation system runs properly.	6(100%)	0	6
11.	The Library has an open space for reading, sitting and Wi-Fi facilities, etc.	6(100%)	0	6
12.	Digitization of books and rare documents are available	6(100%)	0	6
13.	Pollution on the library campus is very low	5(83.3%)	1(16.7%)	6
14.	The Library is located far away from the noise zone, entertainment hall, and auditorium hall, and thus the user never gets disturbances from these and is able to concentrate on their reading.	4(66.7%)	2(33.3%)	6
15.	Construction materials of the libraryare largely eco-friendly materials.	5(83.3%)	1(16.7%)	6

11.1.1 Common green elements those are present in the selected libraries:

Table 3: Common green elements those are present in the selected libraries.

Sl. No.	Common green elements which are present in the selected libraries
1.	The Library is located in the centre of the Institution (83.3%)
2.	The Library building is planned according to green building standards (100%)
3.	The transportation system of the library is good so that any person can able to visit the library easily (100%)
4.	Sufficient numbers of windows or glass windows are available for natural lighting and fresh air (100%)
5.	The Solar panel is present in the library for electricity generation (66.7%)

Sl. No.	Common green elements which are present in the selected libraries
6.	The LED bulb is used to save energy consumption. (66.7%)
7.	Roof water harvesting and rooftop gardens are encouraged (66.7%)
8.	Water is available 24/7 and the sanitation system runs properly. (100%)
9.	The Library has an open space for reading, sitting and Wi-Fi facilities, etc (100%)
10.	Digitization of books and rare documents are available (100%)
11.	Pollution on the library campus is very low (100%)
12.	The Library is located far away from the noise zone, entertainment hall, and auditorium hall, and thus the user never gets disturbances from these and is able to concentrate on their reading (66.7)
13.	Construction materials of the library are largely eco-friendly materials. (83.3%)

11.1.2 Common green elements those are not present in the selected libraries:

Table 4: This table shows that most of the libraries do not have the furniture that is largely made of wood and mostly uses the furniture made of iron, plastic or other elements.

Sl. No.	Common green elements which are not present in the selected libraries :
1.	The Furniture of the library is largely made of wood. (83.3%)

12. Findings and suggestions:

12.1 Objective wise study:

Objective 1: To find out the components of the sustainable library those are present in the central university libraries of the NE region.

Findings: The collected data from the six central university libraries in NE India shows that most of the libraries of the institutions fulfill the basic requirements for becoming sustainable libraries. Almost all the library buildings are made according to green building standards. A sufficient number of windows are available for natural light and fresh air.

Most of the libraries are located at the centre of the institutions, except the Sikkim University Library, which is not at the centre of the institution and is nearer to the noise zone. In almost all universities, the furniture is largely not made of wood; instead, they use plastic or iron-made chairs for their own comfort.

Objective 2: To know the awareness of the librarians of central universities regarding the concept of sustainable library.

Findings: The collected data helped us to analyse whether all the librarians of the central university libraries are fully aware of the concept of a sustainable library. Almost all the librarians want their existing libraries to become greener, and for that, they have already taken steps to achieve the goals. Most of the librarians believe that all students and communities should be made aware of the green library initiatives. All the librarians believe that sustainable library initiatives will be able to reduce the negative impact on the environment and make the place a greener one. Regarding the administration and planning in the academic libraries, much attention has been paid to green library criteria by all the universities.

Objective 3: To know the future plans of the librarians about the sustainable library or green library initiatives.

Findings: Although all the Central University libraries are structured following the green building standard initiatives of the major councils like IGBC (Indian Green Building Council), LEED (Leadership in Energy and Environmental Design), and so on, to make the institution a better place for each and every individual and at the same time to protect the environment. The data analysis shows that all the librarians are interested in setting up a green library in their existing library in the near future. Some of the librarians planned a three-storey library building with all the facilities of a green library, like solar power, rooftop gardens and vertical gardens, zero-noise zones, an entertainment hall, etc., and already submitted it to the competent authority for immediate action.

12.2 Suggestions:

The following suggestions for sustainable libraries can be taken into consideration:

1. Libraries should focus on the implementation of the elements of sustainable/green library and green library standards in their libraries.
2. The respective libraries and librarians should also focus on the development of roof-top gardening, the implementation of rainwater harvesting, and the installation of solar panels.
3. Libraries must use recycled products and things in their respective libraries and libraries must facilitate the digitization of rare documents for their users.
4. Librarians should attend a seminar or webinar related to the green library or sustainable library. They should also read books or research papers to gather knowledge about the concept of a sustainable library. The most

important and fruitful way to gather knowledge about sustainable library is to visit the sustainable libraries located in various regions of the world.

5. It is also advisable that the librarians encourage other librarians to establish a sustainable library or to implement the elements of sustainable libraries in their respective libraries. The librarians should also encourage and teach the students about the concept of sustainable libraries and their benefits to the environment. By doing this, they can be able to develop a sustainable or green library movement.
6. The library committee should also take initiatives for the implementation of sustainable libraries in their existing libraries so that it can reduce the negative impact on the environment.
7. Higher authorities like the Central Government, State Government, Ministry of Environment, Forestry, and Climate Change,; Ministry of Education, UGC, etc. should also take initiatives for the implementation of sustainable libraries across the country.

13. Conclusion:

The green library, a sustainable library, or an eco-friendly library is a modern type of library that is designed to minimize the negative impact on the natural environment and maximize indoor environmental quality by means of careful site selection, use of natural construction materials and biodegradable products, conservation of resources like water, energy, paper, responsible waste disposal recycling, etc.

Nowadays, it is essential for all libraries to shift their existing libraries into sustainable ones. Librarians and library professionals should also take part in the green library movement. As many national and international bodies are helping the libraries go green, it is the responsibility of the librarians and the library authority to take advantage of this and establish a green library in their existing libraries.

In India, there are almost 10 libraries that have successfully gained the title of green library buildings. Some of these are the Anna Centenary Library, the National Library of India, the Karnataka University Library, the Mumbai University Library, and many more. It is the NIT Library, Silchar, from Assam, and the only one from the entire North-East region to make its place among the top 10. Many other libraries in India are also interested in turning their libraries into a green or sustainable library. From this, we can say that the green library movement has gained popularity in India.

At last, a little more support from the Central and State Government along with many other organizations, and the best efforts of the respective libraries and their parent institutions can help make almost all the libraries sustainable.

14. References:

1. *Anna Centenary Library | About us*. (n.d.). Retrieved November 15, 2023, from https://www.annacentenarylibrary.org/pages/view/About%20us
2. Antonelli, M. (2008). The Green Library Movement: An Overview and Beyond. *Electronic Green Journal*, *1*(27). https://doi.org/10.5070/G312710757
3. Connell, V. (2010). Greening the Library: Collection Development Decisions. *The Journal of the New Members Round Table, 1*(1). https://www.ala.org/rt/sites/ala.org.rt/files/content/oversightgroups/comm/schres/endnotesvol1is1/3greeningthelibrary.pdf
4. *Green library—New World Encyclopedia*. (n.d.). Retrieved November 15, 2023, from https://www.newworldencyclopedia.org/entry/Green_library

Sustaining Libraries in the Digital Transition: An Analytical Overview

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ABSTRACT Libraries need to adopt sustainable practices to survive continued resilience and ensure positive impact on the individual and communities they serve. The current study holds an important message for future sustainability of libraries and is accomplished through systematic literature review process. The main purposes are to make LIS professionals aware of their social commitments and responsibilities, government bodies to align with the global goals and to make the future a better world. A sustainable library needs to go beyond its traditional roles to handle the changing needs of its community. This study highlights the role of libraries to effectuate the sustainable development goals (SDGs) by the UN. To do so, meta-analysis of the SD goals, and libraries contribution to attain each of them is discussed in detail. It also emphasizes fundamental points where libraries can ensure sustainability in this digital era.

Keywords: ***

Introduction:

The father of Indian librarianship, Dr. S.R.Ranganathan, in his fifth law of library science, has termed libraries as a growing organism. To survive and sustain in this ever changing world, where emerging technological advances are coming up day to day, one needs to plan strategically. Here comes the role of formulating sustainable strategies to continue to run libraries in the coming ages. Libraries are a vital organ for societal development. They can act as a quantum energy to initiate reforms and positive outcomes for a sustainable environment, by channelizing their user community. Libraries ensure lifelong learning and interactivity through e-Learning platforms/portals. In this phase of digital transition, libraries have to collaborate, integrate and create a web among its networked libraries to facilitate new service models, continue with the provision of valuable services, shoulder environmental responsibilities and offer resources after community need assessment. The possible challenges and their probable solutions have been dealt with as we proceed further with this study.

Problem Statement

When change becomes an inevitable part of life, sustainability and longevity are challenging tasks. We LIS professionals are presently in a crosswalk situation, where we need to carefully embrace the new technological advancements for library productivity and reach. So, the question at hand is, how to maintain both in a balanced portion to grow and thrive in critical circumstances. Sustainability in libraries involves social, financial and environmental responsibilities. It is a holistic approach to enable libraries to become an integral part of overall enrichment and well-being of the community they target to serve.

Review of Literature

This work is guided by a systematic literature review method, conducted on the impact of digital transformation in sustaining library growth, action and activities. Related works on this present topic of discussion were thoroughly studied and analyzed, to grasp on the current effect of digital transition in sustainable development of libraries. Some of the most relevant articles are stated and discussed below.

Khalid, Malik and Mahmood gave a comprehensive view on the challenges faced for sustainable development of libraries. This paper puts forth some of the major problems such as lack of sustainable strategies and frameworks, absence of such educational courses in LIS curriculum, use of massive energy resources for long running hours of library, lack of proper building infrastructure and un-planned library operations. As a solution, the author suggests policy makers create a proper agenda to achieve sustainable development goals (Khalid et al., 2021). In 2021, a survey report outlines the sustainable strategies adopted by university libraries of Lucknow at the state level. It reveals interest among LIS professionals to follow green services and practices for library sustainability. The paper ends with a note on the government initiations which needs to be taken in this regard (Singh & Dixit, 2021). Singh and Mishra demonstrated various techniques for making sustainable library operability, by incorporating green services. This article discusses mainly on effective utilization of paper, ink and electricity to develop environment friendly practices (Singh & Mishra, 2019). Hauke, Charney and Sahavirta discussed the role and social responsibility of libraries in environmental sustainability keeping in mind the 2030 SDGs goal of the UN. It highlights the challenges of implementing sustainable policies in public libraries of six foreign countries such as Sweden, Kenya, Germany, Ukraine, China and Serbia through case studies. Further general studies on four international countries were carried out to find libraries' contribution in attaining sustainable goals (Hauke et al., 2018).

In 2017, a paper revealed that TIFF is the possible file format which is more likely to be used in memory institutions for storing sustainable digital resources. It is termed as a flexible format as it maintains high image quality even after compression, quantization. Such a conclusive decision was reached by analyzing 4 million cultural heritage objects stored in TIFF document formats (Fornaro et al., 2017). In 2016, a study showed how the university library of Monash has implemented e-learning strategies to contribute for a lifelong sustainable information research and activities. This work is a skeleton output which can be followed by any other institutions to build in-house e-learning practices (Han & Yates, 2016). Jankowska and Marcum highlighted the possible threats encountered by academic libraries to sustain in the future environment. They expressed concern in preserving digital information, changes in network infrastructure, facing digital transformation, maintaining sustainable library resources and building. A need to design an integrated framework for academic library sustainability was perceived (Jankowska & Marcum, 2010). Mitchell discussed open-source softwares and innovative projects for sustainability in academic libraries of California University. This paper depicts that, in recent times, collaborative libraries have taken into consideration technological systems to meet the scholarly education needs (Mitchell, 2005). It shows a way forward to adapt digital transformation for sustaining libraries in the long run.

Methodology

In this current study, to gather pertinent works on a particular topic of discussion systematic literature review (SLR) method is used. It is based on some predetermined eligibility criteria for seeking answers to research questions. The meta-analysis provides inferential and descriptive solutions to the specific topic of interest. These methods can be effectively used for knowledge generation in both qualitative and quantitative measures for various studies.

Step by step analysis of SLR method for this analytical overview are enumerated below with details:

1. Formulating the Problem:

   Keeping the research query in mind, the systematic literature review is processed in which terms like “Digital Transformation” AND “Libraries”; “Sustainable Strategy” AND “Libraries”; “Sustainable Development” IN “Libraries”; “Future of Libraries” OR “ Library Digitization” AND “Sustainability”; etc. were used in various combinations to search for the desired study.

2. Development of the Review Protocol:

   The current study is focused on gathering relevant papers on sustainable development of libraries for the upcoming future considering the present digital transition. This step details the qualitative analysis of the contents of these papers for an overall detailed plan of the systematic review.

3. Literature Search:

   In this step the searching of relevant papers has been done from different scholarly databases such as SCOPUS, LISA, Google Scholar and non-scholarly databases like websites of IFLA, OCLC, ALA and other available online papers. More than 70 papers were shortlisted.

4. Screening Literature on Inclusion and Exclusion Criteria:

   This step is crucial for narrowing down the review of literature by eliminating irrelevant papers. Some papers with the titles or keywords like "Sustainable", "Green Library'', "Digital Transformation", etc. are found to be insignificant to carry out the current study.

Inclusion Criteria:

- Papers published in peer-reviewed journals and conference proceedings.
- Papers in support of digital transition for library betterment.
- Resources highlighting digital transformation in library premises.
- Papers published as Annual report and White papers.

Exclusion Criteria:

- Papers on building sustainable library infrastructure.
- Papers not published in English language.
- Papers published in non peer-reviewed sources.
- Papers on library sustainability with no evidence-based support.

After full-text analysis and reading only 30 papers were found to be the most relevant ones.

5. Assessment of Resource Quality:

   Many sources and studies connected to scholarly and non-scholarly databases have been evaluated. This helps to incorporate the important themes and concepts of the study. A full text review is required to analyze whether the entire topic and area discussed in earlier chapters are adequately explained in the body of the document.

6. Extracting Required Information or Data:

   This step involves extraction of relevant information (or data) from the available sources and articles connected to evidence-based study on

"Libraries" and "Sustainability". Journal articles, well-known databases and annual reports from both national and international forums have been addressed because they are known to be reliable sources. This part discusses the need, importance, potentiality and benefits of the entire study topic.

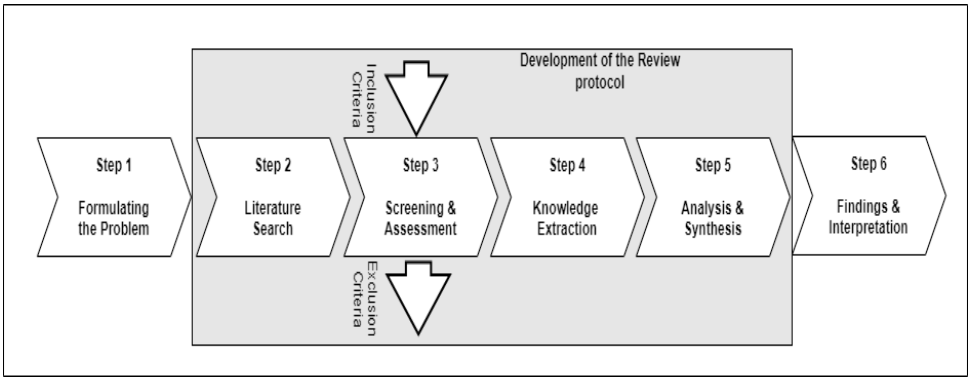


Figure: Methodology Steps and Workflow

7. Analysis and Synthesis:

   After the selection of several deemed to be important papers, an exhaustive study was conducted. These papers examined the importance of developing sustainable practices and policies in libraries. The formulation of "Library Growth" and "Sustainability" holds various notions and ideas. In order to provide a conducive view on the current study, several of them have been synthesized and summarized.

Finding of the Study:

The final phase is to emphasize the significance of the research being conducted. It is mainly based on a discussion of the feasible challenges, opportunities and benefits to be encountered while implementing sustainable development of libraries in the upcoming years. The conclusion was then reached based on the entire investigation, outlining the possible initiatives and frameworks to be undertaken.

Findings and Discussion

SDGs (Sustainable Development Goals) and Libraries:

The 17 Sustainable Development Goals or Global Goals by the United Nations, are designed to fulfill the objectives of interlinking peace and posterity between

people and the planet, both for the present and upcoming future days. Libraries as the central hub or node for knowledge dissemination and access also contribute in attaining the goals. They will continue to accomplish the goals (beyond 2030) by providing support to educational and research activities through access to authenticated and reliable sources. Libraries promise to empower the community for lifelong ages.

The section below briefly discusses how libraries can align themselves with some specific goals of Sustainable Development:

1. *SDG 4: Quality Education*

   Libraries contribute to community literacy and lifelong learning as information centers. They thrive to provide seamless access to digital resources and educational programs in institutions/organizations.
2. *SDG 5: Gender Equality*

   As a social institute, libraries can educate people by organizing events or programmes to address gender-biased issues and culminate the prejudices.
3. *SDG 8: Decent Work and Economic Growth*

   Libraries can promote economic growth by:
   - informing people about local business opportunities and encouraging them for indigenous businesses to showcase the cultural heritages.
   - guiding for career development, job search and entrepreneurship.
4. *SDG 10: Reduced Inequalities*

   Libraries promote diversity and support social inclusivity by providing information access to one and all members of the community.
5. *SDG 11: Sustainable Cities and Communities*

   Libraries ensure interactivity between diverse community groups and foster co-cultural, interdisciplinary learning.
6. *SDG 16: Peace, Justice and Strong Institutions*

   Libraries act as a strong justice institution by making citizens aware of legal resources and human rights. They can host events to spread dialogues, resolve conflicts between community members.
7. *SDG 17: Partnerships for the Goals*

   Libraries can effectively collaborate with local bodies, educational organizations, and business institutions to collectively attain sustainable development goals for fostering community enrichment.

In a broader sense, actualization of these goals will furnish healthy growth of libraries for ages to come.

Building Sustainable Libraries in Digital Era:

In this era of disruptive innovation, it is crucial to decide which technological inventions are inevitable for applicability. One needs to be evidence-based decision-driven to choose the appropriate digital tool for sustaining growth and enhancement in the near future. Role of libraries in this pace are:

1. *Open Accessibility to Digital Resources*:

   Libraries can support open access movement by providing freely available educational materials through OER (Open Educational Resources). Due to present demand for digital resources, libraries should prioritize their acquisition which also reduces environmental stress related to physical materials.
2. *Review of Collection Policy*:

   With passing time, libraries need to update their policy for building more inclusive collections to reflect the changes in the social community. This will guarantee their sustainability in the coming years, with more resilient features.
3. *Collaborative Partnerships*:

   Libraries need to partner with authors, publishers, and related institutes for wider outreach to their patron group. Network libraries can club together to provide enriched facilities and resource accessibility.
4. *Decentralization*:

   In case of weeding outdated or underutilized resources, libraries can perform deaccessioning like donating, recycling materials. This process of decentralization in libraries needs to be performed carefully.
5. *Practice Inclusivity in Diverse Society*:

   Libraries play a vital role in inculcating the values of togetherness and inclusion among diverse groups of people irrespective of their caste, sex, creed, abnormality, etc. They disperse collections of diverse nature based on different viewpoints, ideology, experiences and voice.
6. *Incorporating Adaptive and Resilient Features*:

   Libraries should embrace green services/practices such as use of recyclable materials in printing, follow sustainable publishing processes, use eco-friendly furnitures and other infrastructures within library premises, etc. The staff should be trained properly for such initiatives.

Conclusion

In the current milieu, sustainable development of libraries through digital transformation is a crucial step to be undertaken. It can be achieved by incorporating and leveraging the latest digital technologies to enhance library's capability, outreach and impact on social longevity. Digital transformation, when aligned with sustainable goals for libraries, has the potentiality of driving positive environmental and societal impact. It creates effective library operations, reduces energy consumption, empowers individuals and organizations to formulate long term plans with more sustainable and resilient features. The challenges and opportunities in implementing sustainable library activities are discussed in this study. In other words, it provides an overview on the varied environmental, social and economical challenges faced and addressed to create a sustainable eco-friendly future. To summarize the total study one can say, digital transition has fundamentally shifted the traditional libraries into a dynamic knowledge hub governed by emerging technology-driven tools. Libraries still thrive to provide access to information and foster learning with community engagement, but in a more effective and seamless manner.

References

1. Khalid, A., Malik, G. F., & Mahmood, K. (2021). Sustainable development challenges in libraries: A systematic literature review (2000–2020). *Journal of Academic Librarianship*, *47*(3). Scopus. https://doi.org/10.1016/j.acalib.2021.102347

2. Mitchell, S. (2005). Collaboration enabling internet resource collection-building software and technologies. *Library Trends*, *53*(4), 604–619. Scopus.

3. Han, Y., & Yates, S. (2016). eLearning integration in the library: A case study. *Library Management*, *37*(8–9), 441–453. Scopus. https://doi.org/10.1108/LM-04-2016-0025

4. Singh, P., & Mishra, R. (2019). Environmental sustainability in libraries through green practices/services. *Library Philosophy and Practice*, *2019*. Scopus. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85066079104&partnerID=40&md5=902dfd513af12c0e67ebffcabd98d2d5

5. Fornaro, P., Rosenthaler, L., & Zbinden, E. (2017). TIFF in archives: A survey about existing files in memory institutions. *Arch. - Final Program Proc.*, *2017-May*, 6–10. Scopus. https://doi.org/10.2352/issn.2168-3204.2017.1.0.6

6. Singh, M. P., & Dixit, S. (2021). Sustainable strategies towards green libraries: A study of state university libraries of Lucknow, Uttar Pradesh. *Library Philosophy and Practice*, *2021*, 1–21. Scopus.

7. Jankowska, M. A., & Marcum, J. W. (2010). Sustainability challenge for academic libraries: Planning for the future. *College and Research Libraries*, *71*(2), 160–170. Scopus. https://doi.org/10.5860/0710160

8. Hauke, P., Charney, M., & Sahavirta, H. (2018). *Going Green: Implementing sustainable strategies in libraries around the world: Buildings, management, programmes and services*. De Gruyter; Scopus. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85111419191&doi=10.1515%2f9783110608878&partnerID=40&md5=832b9cec7bd058105b975136d3e11eb4

Transformation of library services towards digital inclusion through ICT to attain Sustainable Development Goals

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ABSTRACT As the gateway to information and culture, libraries and information centers play a basic role in society. Books in this information age have different shapes, like printed books, e-books and audio books, etc. Not only books, libraries are place of data, providing individuals free access to the resources in different convenient form he or she can access. The resources and services library and information centres provide, produce opportunities for education and learning, and facilitate the new ideas and views that are central to an innovative society. Library and information centres facilitate the guarantee associated with authentic records of data created and accumulated by past generations. In a world without libraries, it might be troublesome to preserve the world's information and heritage for future generations. In this paper, a brief exploration is given about what can be the role of libraries and information centres in this information society to make it sustainably developed which will be a blessing for all living in the present age.

Introduction

The Sustainable Development Goals (SDGs), known as the Global Goals, were adopted by the United Nations in 2015 as a universal call to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity. There are 17 SDGs that are integrated and inter-connected-the action in one area will affect outcomes in others, and that development will balance social, economic and environmental sustainability.

The UN's 193 Member States adopted them in September 2015 and they came into force on 1 January, 2016. Countries have committed to prioritize progress for those who're furthest behind. The 17 Sustainable Development Goals (SDGs) which are an urgent call for action by all countries - developed and developing - in a global partnership. They recognize that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce

inequality, and spur economic growth, tackling climate change and working to preserve our oceans and forests. The 17 SDGs are:

SDG 1-No poverty

SDG 2-Zero hunger

SDG 3 Good health and well-being

SDG 4 Quality education

SDG 5 Gender equality

SDG 6 Clean water and sanitation

SDG 7 Affordable and clean energy

SDG 8 Decent work and economic growth

SDG 9 Industry, innovation and infrastructure

SDG 10 Reduce inequality

SDG 11 Sustainable cities and communities

SDG 12 Responsible consumption and production

SDG 13 Climate action

SDG 14 Life below water

SDG 15 Life on land

SDG 16 Peace, justice and strong institutions

SDG 17 Partnerships for the goals

History

The SDGs build on decades of work by countries and the UN, including the UN Department of Economic and Social Affairs. Here are the chronological sequences took place to make the goals:

- In June 1992, at the Earth Summit in Rio de Janeiro, Brazil, more than 178 countries adopted Agenda 21, a comprehensive plan of action to build a global partnership for sustainable development to improve human lives and protect the environment.
- In September 2000 at UN Headquarters in New York, at the Millennium Summit Member States unanimously adopted eight Millennium Development Goals (MDGs) to reduce extreme poverty by 2015.
- The Johannesburg Declaration on Sustainable Development and the Plan of Implementation, adopted at the World Summit on Sustainable

Development in South Africa in 2002, reaffirmed the global community›s commitments to poverty eradication and the environment and the Millennium Declaration by including more emphasis on multilateral partnerships.

- At the United Nations Conference on Sustainable Development in Rio de Janeiro, Brazil, in June 2012, Member States adopted the outcome document "The Future We Want" in which they decided, to launch a process to develop a set of SDGs to build upon the MDGs and to establish the UN High-level Political Forum on Sustainable Development.
- In 2013, the General Assembly set up a 30-member Open Working Group to develop a proposal on the SDGs.
- In January 2015, the General Assembly began the negotiation process on the post-2015 development agenda. The process culminated in the subsequent adoption of the 2030 Agenda for Sustainable Development, with 17 SDGs at its core, at the UN Sustainable Development Summit in September 2015.

Role of library and information centre

Libraries around the world offer a wide range of information products and services that promote the achievement of each and every one of the SDGs. From promoting literacy to offering free access to information, libraries are safe, welcoming spaces, at the heart of communities. They come with the indispensable support of a dedicated staff with a deep understanding of local needs. Today's Libraries are advanced in digital inclusion through access to Information and Communication Technology (ICT), internet connection and skills. Libraries promote innovation, creativity and access to the world's knowledge for current and future generations.

SDG 1 - End poverty in all its forms everywhere:

Information is the key to poverty eradication and library and information centre serve as the hub to make information available. Libraries provide opportunities for people to improve their own lives and support informed decision-making. Mobile libraries make books, services, and internet access available in rural and remote communities, providing opportunities to people that would otherwise be isolated.

SDG 2 - End hunger, achieve food security and improved nutrition and promote sustainable agriculture:

Agricultural libraries provide access to research and data on crops, market information, and farming methods that help to develop resilient, sustainable

production. Library and information centres use their resources to ensure proper functioning of food commodity by creating awareness and providing an enabling environment where information on sustainable agricultural practices in all its form can be accessed and used. Public and community libraries also promote literacy, provide ICT training, access to information in local languages, and a gateway to government services and funding for rural communities, as well as fostering partnerships to support local development.

SDG 3 - Ensure healthy lives and promote well-being for all at all ages:

Medical libraries and hospital libraries provide access to medical research that supports improved clinical and public health outcomes. Public access to health information in all libraries help people to make better lifestyle choices and to stay healthy. Public libraries have a key role in providing health information to the communities that include accessing reliable health information, developing health literacy skills, providing help in research and acquiring appropriate health insurance, and organising and participating in first aid training.

SDG 4 - Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all:

Libraries are the heart of academic institutions. Hands-on computer classes, after-school support, and programmes addressing subject areas with high failure rates are the examples of how libraries respond to local needs and take action to improve education. Public library and information centre provide information literacy skills and programmes and long-life learning for the public by educating and enlightening youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship. Libraries must organize and disseminate information that society will access and use to inform themselves on various issues of life and by empowering communities through knowledge and the ability to access information for themselves. Libraries act as facilitators in their communities, setting up local learning centres to support learning and provide a safe space for learning, and support researchers to access, apply and reuse research data to create new knowledge.

SDG 5 - Achieve gender equality and empower all women and girls:

Libraries offer programmes for women and girls to access information about their rights. They also provide ICT and literacy programmes and entrepreneurship training. Libraries provide a safe environment for women to read or pursue learning, access computers and the internet, undertake technology training, or talk with other women. The National Library of Uganda has an ICT training

program designed for female farmers, providing access to weather forecasts, crop prices, and support to set up online markets, in local languages. This programme increases the economic well-being of women through technology skills

SDG 6 - Ensure availability and sustainable management of water and sanitation for all:

Library and information centres facilitate access to hygiene-related information through raising awareness, campaigns, and symposiums. Libraries provide public access to information on water, energy usage and sanitation. They offer access to research and evidence for policy makers and organisations, to support the effective allocation of resources to sustainable water infrastructure and sanitation projects. Libraries support and strengthen the participation of local communities in improving water and sanitation management.

SDG 7 - Ensure access to affordable, reliable, sustainable and modern energy for all:

Library and information centres provide public access to ICT, study rooms and ensure universal access to affordable, reliable and modern energy services through library campaigns. Many public and community libraries around the world represent the only place where people can get reliable access to light and electricity to read, study and apply for a job. Libraries and library-like rural information centres can provide public-access computers, sometimes powered by solar panels or generators also.

SDG 8 - Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all:

People lacking access to a computer or the internet at home come to the library to find these, as well as skilled library staff who can help them write their CV, send online applications, scan certificates and diplomas, and find the right job. Some libraries offer employment clubs to share tips and resources with other job-seekers in the same area. Libraries particularly public libraries provide education and training for both the young and old to make sure that they have access to information in an affordable way. Public access to ICTs and training at libraries enable people to apply for jobs.

SDG 9 - Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation:

Libraries are at the heart of research, technology, innovation and academic life. Public libraries provide access to information technology and endeavour to provide affordable access to Internet facilities to less developed areas. They

provide access to research infrastructure, data and quality information to foster innovation. Some libraries operate business centres that offer entrepreneurship training as well as legal and financial advice to help entrepreneurs start-up their businesses. Open Science Lab hosted by the National Library of Finland enables access to research publications, research data and methods used in research by everyone.

SDG 10 - Reduce inequality within and among countries:

Library Services include information and support with applications for citizenship, residence, subsidized housing, government benefits and encourage safe and dependable mobility of citizens through a reliable migration policy. Libraries help to reduce inequality by providing safe, civic spaces open to all, in both urban and rural areas across the world. They foster community engagement and citizen participation through local programmes and partnerships with other civil society organisations and local governments.

SDG 11 - Make cities and human settlements inclusive, safe, resilient and sustainable:

Culture strengthens local communities and supports the inclusive and sustainable development of cities. Libraries provide and protect the cultural and natural heritage of a nation. Libraries have an essential role in safeguarding and preserving invaluable documentary heritage, in all forms, for future generations. It is the responsibility of the public library to develop and implement disaster risk management at all levels in the community. Libraries provide a safe space for older people, offering opportunities to socialise and take part in cultural activities.

SDG 12 - Ensure sustainable consumption and production patterns:

Libraries are sustainable institutions. they share resources within communities and across borders, to ensure that everyone has access to information. Libraries are the precursors of the new sharing economy, offering all kinds of materials for loan not only books, music, movies, and all kinds of information resources, but also tools, musical instruments, appliances, and more, that helps to reduce the carbon footprint and the impact on the environment. Libraries offering access to 3D printers and digital manufacturing skills allow people to develop their own creativity using recycled materials. This helps to raise awareness to sustainable consumption and production.

SDG 13 - Take urgent action to combat climate change and its impacts:

Libraries play a key role in providing access to reliable data, research and knowledge that supports informed research and public access to information

about climate change. They ensure access to environmental data and information for future generations through preservation strategies. School and public libraries help raise awareness among younger generations about the urgent need to protect our environment and to work together to mitigate and adapt to the effects of climate change.

SDG 14 - Conserve and sustainably use the oceans, seas and marine resources for sustainable development:

Scientific information on preservation and conservation techniques provided by libraries can increase use of the oceans, seas and marine resources for sustainable development. Libraries support decision-making by preserving and giving access to data and information related to the sustainable use of oceans, seas and other water bodies, appropriate fishing practices, and effective water management.

SDG 15 - Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss:

Through educating people with the skill set on the management of forest, land and ecosystem; its degradation and recovery, libraries play a great role to safeguard man and nature. Libraries foster research and help protect the earth's ecosystems by offering open access to biodiversity data and literature. Botanical and forest libraries help raise awareness among younger generations about the need to protect nature.

SDG 16 - Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels:

Libraries are a trusted information source, with skilled staff that help individuals, institutions and governments to communicate, organise, structure and use information in a meaningful way to promote development. Libraries are the key source of information for the public making internet access available to the community at no or low cost and ensure public access to information and protect fundamental freedoms, in accordance with national legislation and international agreements.

In Ukraine, protests in Kiev in 2014 around the Maidan put the National Parliamentary Library of Ukraine was at the midst of the clashes. The library opened its doors to those wounded during the clashes and people in need of some rest and a safe place.

SDG 17 - Strengthen the means of implementation and revitalize the global partnership for sustainable development:

Libraries strengthens societies by engaging and empowering citizens through partnership at all levels with local, regional and national civil society institutions, governments and organisations from private sectors to community-based programmes and services.

Indian Scenario

India holds the key to the success of the 2030 Agenda and made a paradigm shift to a "whole-of-society" approach with Government of India engaging sub-national and local governments, civil society organizations, local communities, people in vulnerable situations. India's commitment to the SDGs has reflected in its convergence with the national development agenda in the motto of Collective Efforts for Inclusive Growth (Sabka Saath Sabka Vikaas). The following narrative encapsulates India's progress across the SDGs.

Empowered and Resilient India (Sashakt Bharat - Sabal Bharat): India has successfully lifted more than 271 million people out of multidimensional poverty through economic growth and empowerment. Enhanced access to nutrition, child health, education, sanitation, drinking water, electricity and housing, has led to reduced inequalities especially among people in vulnerable situations.

Clean and Healthy India (Swachh Bharat - Swasth Bharat): Through a nationwide initiative triggered by the Clean India Campaign and the National Nutrition Mission, India achieved 100% rural sanitation and sharp reduction in stunting and child and maternal mortality rates. Ayushmaan Bharat is the world's largest health protection scheme which provides an annual cover of USD 7,000 to 100 million families, covering nearly 500 million individuals.The country has extended medical assistance to several countries and has operationalized the SAARC COVID-19 Emergency Fund with an initial contribution of USD 10 million.

Inclusive and Entrepreneurial India (Samagra Bharat - Saksham Bharat): Financial inclusion through Jan Dhan-Aadhaar-Mobile (JAM) trinity – near universal access to bank accounts aided by the Jan Dhan Yojana (National Financial Inclusion Scheme); Aadhaar card (National unique identity number) for over 90% of the population; and expansive access to mobile phones, has propelled new avenues of credit, insurance, and Direct Benefit Transfers (DBT) to the poor, including to over 200 million women, thereby accelerating their economic empowerment.

Sustainable India (Satat Bharat – Sanatan Bharat): India's climate action strategies call for clean and efficient energy systems, disaster resilient infrastructure, and planned eco-restoration. India has electrified 100% of its villages, reduced 38 million tonnes of CO2 emissions annually through energy efficient appliances, provided clean cooking fuel to 80 million poor households, and set a target to install 450GW of renewable energy and restore 26 million hectares of degraded land by 2030. Globally, India stands third in renewable power, fourth in wind power, and fifth in solar power.

Prosperous and Vibrant India (Sampanna Bharat- Samriddh Bharat): India is one of the fastest growing emerging market economies with a young population and business ecosystem. With a GDP of USD 2.72 trillion, India strives to become a USD 5 trillion economy by 2025, and pursue an inclusive and sustainable growth by stimulating manufacturing, building infrastructure, spurring investments, fostering technological innovation, and boosting entrepreneurship. In the spirit of South-South Cooperation, for realizing the 2030 Agenda, India supports developing countries through the USD 150 million India-UN Development Partnership Fund.

Conclusion

SDGs cover from fighting poverty and improving health to promoting justice and reducing corruption. The goals are not only designed to end poverty, hunger but also discrimination against women and girls. To achieve the SDGs in every context, technology and financial resources are necessary. The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet. While the SDGs are not legal binding, governments are expected to take ownership and establish national frameworks for the achievement of all of the Goals. Today, the Division for Sustainable Development Goals (DSDG) in the United Nations Department of Economic and Social Affairs (UNDESA) provides substantive support and capacity-building for the SDGs and their related thematic issues, including water, energy, climate, oceans, urbanization, transport, science and technology, the Global Sustainable Development Report (GSDR), partnerships and Small Island Developing States. In order to make the 2030 Agenda a reality, broad ownership of the SDGs must translate into a strong commitment by all stakeholders to implement the global goals.

References

1. Sustainable development goals. United Nations, Department of Economic and Social Affairs (2018). Retrieved from https://sdgs.un.org/goals on 25.03.2022

2. The SDGs in action. United Nations Development Programme (2022). Retrieved from https://www.undp.org/sustainable-development-goals on 25.03.2022

3. Bradley,F. (2014).What are the UN SDGs and what do they mean for libraries? Retrieved fromhttps://eifl.net/sites/default/files/resources/201511/3._eifl-fbradley-2030agenda.pdf on 14.4.2022

4. Kakar,N., Popovski,V. & Robinson, N.A. (2021).Fulfilling the Sustainable Development Goals: On a quest for a sustainable world. London: Routledge.

5. Open science opens up the library (2016). The National library of Finland Bulletin 2016.Retrieved fromhttp://blogs.helsinki.fi/natlibfi-bulletin/?page_id=261 on 15.4.2022

6. India: voluntary national review (2020). Retrieved from https://sustainabledevelopment.un.org/memberstates/india on 15.4.2022

AI-Enhanced Digital Transformation for Sustainability in State Central Libraries: A Comprehensive Research Perspective

Pogula Phani Bhargavi

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ABSTRACT This study examines the complex interplay between sustainability and digital transformation, paying particular attention to the function of artificial intelligence (AI) in the general setting of State Central Libraries (SCL). These cultural and knowledge archives have set out on a transformative journey with the goal of striking a balance between ecological responsibility and the effective distribution of knowledge. The paper provides a thorough review of tactics that assist State Central Libraries in becoming environmental advocates as well as knowledge centers by helping them drastically lower their ecological footprint and improve their resource efficiency.

1. Introduction

In a time when sustainability and technology are coming together, State Central Libraries are changing dramatically. These institutions, which are praised for their position as the keepers of culture and knowledge, have welcomed digital revolution with great enthusiasm. Their goals are to protect our common history and democratize information access. Concurrently, there's a growing focus on environmental responsibility, sustainability, and resource stewardship. This study highlights how State Central Libraries can be at the forefront of the transformative power of the digital age by exploring the future vision of seamless digital transformations, greatly enhanced by artificial intelligence (AI), to become champions of eco-friendly practices.

2. Digitalization: Exceeding the Physical Realm

State central libraries are situated at the nexus of tradition and innovation in the digital age. Although these ancient establishments have long functioned as archives of information and culture, the introduction of digitization and advanced technology has significantly broadened their scope. The digitization of collections is one such important advancement that has been enhanced by the addition of AI-driven recommendation systems.

2.1 Expanded Access to Collections:

Rare books, academic journals, historical manuscripts, and other priceless items are all kept in state central libraries. However, for a long time, only individuals who could visit the library in person could access these collections. This paradigm is fundamentally altered by digitization, which makes these resources accessible to users anywhere in the world and breaks down geographical barriers.

These state central libraries meticulously scan and can convert their physical collections into digital representations through the laborious digitization process. This shift to digital media involves more than simply format changes—it also involves accessibility changes. It is no longer necessary for users to be physically present within the library's walls in order to see academic articles or browse rare manuscripts. Rather, all it takes to access this information is a basic internet connection and one can do so from the convenience of their own home, a distant research center, or a school.

2.2 AI-Driven Recommendation Systems: Guiding Users to the Gems

The sheer amount of digital resources available can be exhausting. The task of making sure that users can effectively find and explore this digital treasure trove falls on state central libraries, given their vast collections. This is where recommendation systems powered by AI come into play. Recommendation systems powered by artificial intelligence (AI) and enhanced by machine learning algorithms and data analysis may analyze user preferences and behavior with amazing precision. AI recommendation systems are able to provide highly personalized recommendations by learning about a user's past searches, resource choices, and reading preferences. By directing users to resources that complement their unique interests and study objectives, these suggestions expedite the search process.

This greatly lessens the need for repeated searches while also saving consumers a great deal of time. Because of this, consumers may focus on the resources that are most pertinent to their needs right away, which lessen the impact of resource finding on the environment. AI essentially acts as a virtual librarian, providing users with personalized recommendations and streamlining the research process.

3. Environmental Impact Mitigation

Together with AI-driven recommendation systems, this digital revolution has significant environmental ramifications. State central libraries can lessen the accompanying environmental impact by lowering the requirement for physical access to library collections.

Additionally, digitization contributes to a decrease in resource replication. In the past, different users may have required different copies of a particular text or document to be printed or copied. Digitization eliminates the need for multiple printings or duplications because a single digital copy may meet the demands of several users. By doing this, the environmental impact of producing paper, using ink, and using energy is greatly reduced in addition to resource conservation. State central libraries can undergo a paradigm shift by utilizing AI-driven recommendation systems and digitization to enable greater access to resources. It's a path that reduces the environmental effect of transportation and resource reproduction while also improving user ease. It demonstrates how technology may be strategically used to support environmental sustainability while also making knowledge more accessible. State central libraries may pave the way for the future as well as conserve the past.

3.1 Reduced Physical Reproduction: Greener Path for State Central Libraries

By working together and utilizing AI-driven data analytics, state central libraries can usher in a transition that drastically lowers the need for repeated content replication. While AI brings an intellectual component to the process, this will streamline resource consumption and consequently also play a crucial role in waste reduction and the preservation of valuable materials.

3.2 Reducing Resource Consumption: The Replication Conundrum.

Unintentional duplication of resource reproduction has long been a problem in the world of libraries. There is a great deal of resource inefficiency in this circumstance. If two or more state central libraries choose to duplicate a particular rare manuscript, historical record, or academic book. This leads to a wasteful duplication of resources, including paper, ink, printing expenses, and energy usage.

There are environmental as well as financial ramifications to this duplication issue. Increased demand for paper due to resource reproduction across the globe affects the planet's forests and the energy needed for the manufacturing process. Furthermore, printing ink contains a variety of chemicals adding to pollution. State central libraries can collaborate more and more and digitize their resources to address these issues by sharing resources in an ethical and efficient manner.

- **AI's Role in Avoiding Duplication:**

While collaboration is a crucial tactic in and of itself, it gains even more potency when paired with AI-powered data analytics. In this setting, artificial intelligence (AI) plays the function of an astute observer and knowledgeable guide within the enormous world of library resources.

AI continuously tracks the acquisitions, usage trends, and needs across libraries taking part in a cooperative network thanks to its data analytics capabilities. Artificial Intelligence can determine which resources are widely used and which are not by monitoring user preferences and resource circulation.

Consider the following scenario: two state central libraries have each started the process of replicating a certain historical manuscript on their own. AI is able to determine through data analysis that there isn't much of a need for extra copies of this resource because it is already well-represented in the collaborative network. In this case, artificial intelligence (AI) intelligently advises both libraries to stop reproducing in order to save money and resources.

- **Waste Reduction and Material Preservation:**

The implications of AI's intervention and the ensuing cooperative endeavors are multifarious. First and foremost, one important result is waste minimization. State central libraries actively reduce waste of paper and ink by avoiding needless duplication of resources. As a result, there is less need for energy-intensive paper manufacturing operations and the resulting environmental impact.

Additionally, the cooperative and AI-driven strategy highlights state central libraries' dedication to maintaining priceless resources. Scholarly publications, historical accounts, and rare manuscripts are limited resources in addition to cultural riches. Preserving resources is a proactive measure to guarantee their continued availability and benefit to upcoming generations.

Reducing repetitious replication is essentially about maintaining the values of sustainability, resource stewardship, and the preservation of our cultural legacy. It has nothing to do with just managing resources effectively. State central libraries are bringing concrete environmental advantages and connecting their activities with these basic values through collaboration and AI. Its evidence of how technology may be used to preserve knowledge while also promoting the health of the earth.

4. Cost Savings in State Central Libraries

The primary driver of the synergy between AI-driven resource optimization and cooperative efforts across state central libraries can help in the cost reduction. Libraries set out on a path of shared financial accountability in this changing climate, gaining access to resources that would have otherwise been too expensive for individual libraries. The digital sentinel, artificial intelligence (AI), is essential to enabling prudent financial management and predictive budgeting, which helps libraries make the most of their resources.

4.1 AI's Role in Predictive Budgeting:

The introduction of AI to the library scene is revolutionary. AI takes on the role of budgetary and resource allocation navigator thanks to its data analytics skills. Artificial Intelligence can forecast which resources are likely to be in high demand by analyzing patterns of resource utilization and user demands across the cooperative network of libraries.

Predictive analytics powered by AI can predict allow libraries to deploy funds where there is a high chance of demand. Proactive budgeting avoids financial waste on less-demanding commodities while also optimizing resource allocation.

In this sense, artificial intelligence functions as a financial counselor for libraries, helping them to allocate their resources most wisely. State central libraries can carefully manage their finances through predictive budgeting, guaranteeing that they provide cost-effective and efficient services to their patrons.

4.2 Responsible Financial Management:

State central libraries can achieve mutual benefit through cooperation and AI-powered predictive budgeting. Libraries are able to offer their patrons higher-quality services because they have access to a wider variety of resources. However, they do so without having to bear the entire cost of these purchases. In addition to saving money, this helps libraries stay financially viable, especially those that may have had financial difficulties in the past.

Additionally, libraries demonstrate their commitment to ethical financial management by using AI for budgeting and resource efficiency. This entails spending money wisely, minimizing waste on things that aren't in high demand, and concentrating investments in areas where there is a greater need from users. Sustainable development and efficient use of resources are broader concepts that are consistent with responsible financial management.

State central library's collaboration and AI-driven resource optimization methodology, in essence, represent a strategic alliance that benefits both the libraries and their patrons. It's about expanding the scope of information that is available while maximizing the value of the funds that are available. These libraries are financial stewards dedicated to an effective and sustainable resource allocation system, not merely information repositories.

5. User Education in State Central Libraries

In an era in which digital technologies are advancing quickly, state central libraries are essential for information curation as well as teaching patrons about

ethical and sustainable behavior as well as the benefits of digital resources. AI shows promise as a powerful tool for delivering this information, encouraging environmentally conscious behavior, and advancing digital literacy among library patrons, especially through recommendation systems and chatbots.

5.1 AI-Powered Recommendation Systems: Nurturing Digital Literacy

The recommendation algorithms of AI-powered education are its core. These systems are independent instructors; they are not just content suggesters. Recommendation systems employ sophisticated algorithms to not only offer users personalized content suggestions but also educate them about the eco-friendliness of digital resources.

The recommendation system can encourage environmentally responsible choices by highlighting the digital version's availability when a user searches for a certain title. Additionally, it can offer details on how deciding for digital over print might lessen the impact on deforestation and carbon footprint. Users can make more sustainable decisions by using these instructive prompts.

The recommendation systems additionally advance digital literacy; they acquaint readers with the wide world of electronic books, journals, and digital repositories.

5.2 AI-Powered Chatbots:

- Promoting Eco-Friendly Behaviors User education is advanced with the usage of AI-driven chatbots. These virtual assistants encourage people to adopt eco-friendly behaviors by giving them access to real-time information on sustainable practices. Here's how AI-powered chatbots support this teaching program:
- **Environmental insights:**

  Chatbots have a plethora of information regarding the effects on the environment. The chatbots may answer questions from users on specific library policies, such printing guidelines, and provide information about the negative environmental effects of printing as well as alternate, more environmentally friendly methods, like taking notes digitally.
- **Digital Literacy:**

  Chatbots can help users navigate digital resources by providing instructions on how to use digital archives, e-books, and e-journals. They can equip users with the knowledge and abilities required for a digital environment by offering detailed instructions on how to utilize e-readers and access digital information.

- **Eco-Friendly Reading Devices:**

  Using eco-friendly reading devices, such as tablets and e-readers, is one of the biggest benefits of digital resources. When compared to traditional printed books, chatbots can inform customers about the environmental advantages of these gadgets, such as their lower carbon footprint and paper usage.
- **Sustainable Reading Habits:**

  Users are encouraged to think about sustainable reading habits via chatbots. This could include suggesting that people print on both sides, avoiding pointless printing, or using recycled paper when printing is required. They can also advocate for energy-saving measures like adjusting screen brightness.
- **Sustainability seminars:**

  Chatbots can notify users about forthcoming webinars, seminars, or library activities related to sustainability. These gatherings can explore environmental problems in greater detail and offer workable answers, encouraging a sustainable culture among library patrons.

AI-powered chatbots are always present to make sure consumers are aware of sustainable practices and encouraged to adopt them into their daily lives. They help users in real time by responding to inquiries, giving advice, and pointing them in the direction of wise decisions. AI serves as a catalyst for user education within the framework of state central libraries. It connects digital literacy, sustainability, and digital change. Libraries that incorporate chatbots and AI-powered recommendation systems are learning environments that support a community of knowledgeable, environmentally conscientious patrons, not merely information aggregators. The combination of AI with education enhances user experiences and gives consumers the ability to make sustainable, knowledge-driven decisions.

6. State Central Libraries Outreach and Mobile Libraries

Encouraging Sustainability in State Central Libraries via Digital Transformation and AI-Powered Mobile Libraries:

In addition to improving state central library's basic functions, digital transformation aims to expand those services to the general public. Outreach initiatives and mobile libraries are important means of achieving this. State central libraries may greatly minimize the need for people to go to libraries by bringing library services right to their doorstep. This promotes community participation and lowers carbon emissions, both of which are important aspects of sustainability.

Additionally, mobile library operations can be made more efficient by using AI to automate and streamline them.

The Impact of Outreach Initiatives and Mobile Libraries:

Cut Down on Travel: Users from neighboring areas must travel great distances to access central libraries, which are frequently found in urban centers. The related commuting strains the transportation system, increases traffic congestion, and raises carbon emissions. The necessity for such travel is lessened by outreach initiatives like mobile libraries, which bring library services closer to the user.

- Community Engagement: By reducing travel, these programs also promote community involvement. Libraries can take an active role in the communities they serve by establishing themselves in many communities and working with neighborhood organizations. Since it encourages information exchange, cultural preservation, and environmental awareness within the community, this participation is essential to sustainability.
- Accessibility: No matter where they are located, mobile libraries make sure that everyone can use the services they offer. This inclusivity guarantees that knowledge and cultural resources are easily accessible to a larger audience and is a characteristic of ethical resource utilization.
- Encouraging Sustainable habits: Outreach initiatives and mobile libraries can be used as venues to teach the public about sustainable habits. They can hold talks, gatherings, and displays aimed at bringing attention to environmental problems, preservation, and sustainable living. This encourages the community to take up environmentally beneficial practices.
- The Function of AI in Mobile Libraries: Artificial Intelligence is essential to improving the sustainability and efficiency of mobile library operations. This is how AI can be applied in this situation:
- Route Optimization: By considering variables like user demand, traffic patterns, and the locations of possible stops, AI-driven algorithms may identify the most effective routes for mobile libraries. This not only guarantees that library contents are more efficiently accessed by users, but it also lowers fuel consumption.
- Resource Tracking: AI can help monitor how resources are used on the mobile library. Libraries can maximize their content choices by analyzing which resources are underutilized and which are in high demand. This data-driven strategy minimizes resource waste by avoiding hauling extra stuff.
- User Engagement: By offering customized suggestions for library items, AI can efficiently engage users. This incentivizes community people to make

more regular and effective use of the mobile library services.

- Scheduling and Automation: AI is capable of automating repetitive processes like resource management, visit scheduling and tracking mobile library operations. As a result, there is less need for manual intervention, which saves time and money and guarantees a functional and well-organized mobile library system.
- Reduction of Environmental Impact: Using mobile libraries with AI assistance can greatly lessen the influence that library operations have on the environment. Lower carbon emissions result from fewer trips to central libraries. The environmental impact of mobile libraries is further reduced by using efficient routes and resource management, which also reduce fuel usage and resource waste.
- Cost Savings and Financial Sustainability: AI-driven mobile libraries help state central libraries save money by lowering travel expenses and enhancing resource management. The saved money can be put back into sustainability projects, increasing the financial sustainability of the library's operations and promoting environmental responsibility.
- Digital transformation is a potent tactic for encouraging sustainability in state central libraries, especially when combined with outreach initiatives and AI-driven mobile libraries. These libraries are essential for the preservation of information and culture as well as the protection of the environment because they diminish the need for travel, encourage community involvement, and support sustainable practices. Because AI can increase efficiency, resource efficiency is ensured in mobile library operations, which further encourages environmental responsibility.

7. Cloud Implementation in State Central Libraries

Unlocking Sustainability in State Central Libraries with Cloud Migration and AI Resource Management: Moving to cloud-based services can be a proactive move for state central libraries with enormous possibilities. This change not only lowers carbon emissions and energy use, but it also results in significant economic savings and a smaller environmental impact for the library. State central libraries can improve cloud resource management's sustainability and efficiency by integrating artificial intelligence (AI).

7.1 Cloud migration's financial and environmental benefits:

- Efficiency of Energy: Conventional data centers are energy-intensive buildings that can be located in state central libraries. For cooling,

ventilation, and running multiple servers, they need a lot of power. Cloud data centers, on the other hand, are built with energy efficiency in mind. To reduce energy usage, they integrate cutting-edge cooling systems, virtualization technology, and ideal server designs. Libraries can make significant energy savings by switching to cloud-based services.

- Reduction of Carbon Emissions: Reduction of carbon emissions is a direct result of cloud data centers using less electricity. This is in line with more general sustainability objectives and helps India in its attempts to lessen the effects of climate change. Migrating to the cloud reduces the central libraries carbon footprint and is an environmentally prudent decision.
- Cost Savings: Reducing costs is one of the cloud migration's key benefits. The high costs of buying, maintaining, and updating physical servers can be avoided via libraries. Libraries can pay for the resources they use by utilizing the scalable pricing structures that cloud service providers provide. The money savings can be put back into green projects, therefore lowering the library's environmental effect even further.

The Function of AI in Cloud Resource Administration:

In state central libraries, the use of AI in cloud resource management improves efficiency and sustainability. AI can improve cloud-based services in the following ways:

- Allocation of Resources: AI systems are able to examine demand trends and resource consumption in libraries. In order to guarantee that resources are used effectively—without overprovisioning or running idle servers—they dynamically distribute computing power. By minimizing energy loss and cutting back on needless resource use, this strategy promotes sustainability.
- Optimizing Costs: Libraries may keep track of their cloud-related expenses with the aid of AI-driven cost management. It offers information on where to implement cost-cutting strategies, like right-sizing resources, choosing affordable cloud storage solutions, and locating unused services. AI monitors the libraries' cloud expenditures on a regular basis to make sure that money is spent wisely.
- Energy Management: Artificial Intelligence can optimize cloud infrastructure's energy use. It can manage server workloads, monitor data center conditions, and optimize ventilation and cooling systems. AI lowers energy waste and contributes to the upkeep of a greener cloud environment by optimizing these parameters.

- Data security and disaster recovery: Strong data security and disaster recovery features are frequently included in cloud services. AI systems are able to keep an eye on these operations, making sure that data is safeguarded and easily restored in case of an emergency. This saves resources by reducing the need to replicate lost or damaged data.
- The Combination of AI Resource Management and Cloud Migration:

AI-driven resource management and cloud migration together provide state central libraries with a comprehensive approach to sustainability. Libraries actively contribute to environmental conservation by using cloud services to lower energy consumption and carbon emissions. In addition to lowering waste and advancing sustainable practices, AI-driven resource optimization assists libraries in effectively allocating their digital resources.

As a result of this synergy, State Central libraries are guaranteed to operate digitally efficiently and to set an example for responsible resource usage. Cloud migration combined with AI-enhanced resource management creates a sustainable route forward for these libraries by reducing their energy and environmental impact.

8. Green spaces and community gardens:

State Central Libraries (SCLs) in India have a unique opportunity to use artificial intelligence (AI) to the design and management of public gardens and green spaces on their property. Beyond their aesthetic value, these green spaces promote environmental conservation and community interaction, resulting in landscapes that are both aesthetically pleasing and long-lasting.

8.1 How AI might affect areas in SCLs:

- Efficient Design and Layout: AI can help with community garden and green area design and layout optimization on SCL property. Artificial intelligence (AI) algorithms can recommend the most practical and visually pleasant configuration of plants, trees, and seating spaces by examining the available space, sunshine exposure, soil conditions, and local climatic data. This guarantees that the green areas are not only aesthetically pleasing but also supportive of leisure and social interaction within the neighborhood.
- Water Management: Maintaining green areas requires effective water management. Artificial intelligence (AI) in irrigation systems allows them to track soil moisture content and weather patterns to calculate the exact amount of water needed. This guarantees that water is used effectively, cutting down on waste and protecting this valuable resource.
- Real-time plant health monitoring is possible with sensors driven by artificial intelligence. These sensors enable prompt intervention by

identifying early indicators of illnesses, pests, or nutrient deficits. SCLs can guarantee that their green areas stay lively and welcoming by taking care of the vegetation.

- Energy-Efficient Lighting: Green spaces can be equipped with AI-controlled lighting systems to guarantee energy-efficient lighting. The illumination levels can be changed by these systems according to user activity and the time of day. AI can save energy by, for instance, dimming the lights in the evening when no one is around.
- User Engagement: AI has the potential to enhance user interaction in green areas. Information about the different plant species, their cultural importance, and their advantages for the environment can be found on mobile apps or kiosks. Real-time details on events and sessions taking place in the green spaces are also available to visitors.
- Enhancement of Biodiversity: AI can assist SCLs in India in introducing indigenous plant species that support biodiversity. SCLs can support regional ecological balance and awareness by establishing habitat for native birds, insects, and wildlife.
- Community Involvement: AI-powered platforms for community participation can encourage communication among library patrons. They can facilitate plant adoptions, host gardening or eco-workshops, and provide people the opportunity to help maintain and enhance the green spaces.
- Data-Driven Decision-Making: AI systems are able to examine information about visitors' preferences and utilization of green spaces. SCLs may use this data-driven approach to help them make well-informed decisions about future renovations, maintenance, and landscaping.

8.2 Advantages of AI-Powered Green Areas in SCLs:

- Sustainability: AI makes sure that green areas are not only aesthetically pleasing but also energy and water-efficient.
- Community Engagement: AI encourages community involvement through information sharing, event hosting, and instilling a feeling of pride in library patrons.
- Educational Opportunities: By serving as instructional resources, green areas enable SCLs to inform guests about the local wildlife, plants, and environmental conservation.
- Aesthetic Appeal: AI-driven design can provide visually beautiful green areas that draw people in and improve the atmosphere of the library as a whole.

- Resource Efficiency: SCLs may optimize plant selection and garden management by using AI's data analytic capabilities to assist them make resource-efficient decisions.

8.3 **Obstacles and Things to Think About:**

- Initial Investment: There is a financial outlay necessary for the implementation of AI systems in green space management. SCLs ought to evaluate the cost-benefit ratio thoroughly.
- Maintenance: To guarantee that AI systems function properly, routine maintenance and monitoring are necessary. Resources must be set aside by SCLs for this reason.
- User Adoption: Education outreach and promotion may be necessary to motivate library patrons to engage with AI-driven features.

The establishment and administration of community gardens and green areas within State Central Libraries in India can greatly benefit from artificial intelligence. These areas encourage sustainability while also providing venues for learning, social interaction, and leisure. SCLs can benefit from the application of AI to build green spaces that improve user experiences and promote environmental responsibility.

9. Innovative Digital Initiatives:

AI-Powered Technology Innovation for Sustainability in State Central Libraries in India, State Central Libraries (SCLs) serve as both information centers and areas of rapid technological advancement. These libraries can use AI-driven technology to investigate new trends and apply creative solutions in order to foster sustainability within them.

Here's a look at how AI-powered advancements can drive SCLs in the direction of a more sustainable future:

- Digital Preservation Techniques**:** Libraries must prioritize digital preservation in order to save and preserve their extensive holdings for upcoming generations. AI is essential in this field since it improves and automates preservation procedures as follows:
- Content Analysis: By using AI algorithms to scan digital documents for indicators of deterioration, it is possible to replicate or restore deteriorating materials in a timely manner.
- Enhancement of Metadata: AI may improve metadata by automatically detecting and appending descriptive information, increasing the discoverability and accessibility of content.

- Format Migration: AI can recognize out-of-date file formats and automatically adapt them to more modern standards in order to avert obsolescence.
- Access Control: AI can assist in controlling permissions for access, protecting the confidentiality and security of digital assets.

9.1 Sustainable IT Infrastructure:

SCLs' IT infrastructure is vital to their operations; hence it must be made more sustainable. The following are some ways that AI-driven technologies support resource optimization and energy efficiency:

- AI-based systems are capable of monitoring and controlling energy consumption in libraries, ensuring that lighting, heating, and cooling systems are optimized to minimize their negative effects on the environment.
- Predictive Maintenance: AI can forecast when IT equipment might malfunction, enabling proactive maintenance to prolong device life and cut down on e-waste.
- Resource Allocation: AI can improve the distribution of IT resources, cutting waste and raising cost-effectiveness. It does this by analyzing data on resource consumption.
- Sustainable Collection Development: Artificial Intelligence-driven recommendation systems facilitate the long-term growth of library collections.
- User Preferences: AI is capable of analyzing user behavior and preferences in order to recommend pertinent resources for acquisition that are based on real demand as opposed to conjecture.
- Diversity and Inclusivity: AI can guarantee that the holdings of libraries are inclusive, diverse, and responsive to the changing requirements and preferences of the user base.
- Improved User Services: Chatbots and virtual assistants powered by AI are revolutionizing user services in libraries. They encourage sustainability by educating and involving users.
- Environmental Awareness: By informing users about eco-friendly habits and materials found in libraries, chatbots can raise awareness of environmental issues.
- User Assistance: AI-powered virtual assistants make it easier for users to access and utilize library resources and services, which lowers the demand for in-person support and the amount of resources required.
- Reports on Sustainability: AI helps produce comprehensive reports on

the sustainability efforts of the library, covering user interaction, resource optimization, and energy consumption. These reports are helpful for transparency and accountability.

9.2 The Advantages of Technological Innovation Driven by AI:

- Environmental Stewardship: AI encourages waste reduction and resource efficiency in order to conserve the environment.
- Resource Efficiency: By allocating resources as efficiently as possible, SCLs may make sure that funds are spent wisely.
- Community Engagement: By increasing awareness and promoting involvement, AI can involve people in sustainability activities.
- Long-term cost savings are achieved through resource management and sustainable IT.
- Obstacles and Things to Think About:
- Data Privacy: AI systems must strictly conform to data privacy laws and manage user data responsibly.
- The First Investment: Although there may be initial financial outlays associated with implementing AI-driven technology, they are frequently outweighed by the long-term advantages.
- Ongoing Training: To fully utilize AI-driven solutions, libraries must spend money on staff training.

Innovation in SCLs powered by AI greatly advances environmental initiatives. Libraries uphold their commitment to responsible resource management and environmental protection while simultaneously staying at the forefront of technology breakthroughs through the adoption of digital preservation techniques, sustainable IT infrastructure, and improved user services. AI drives innovation and leads SCLs into a more technologically sophisticated and sustainable future.

Conclusion

With digital transformation and artificial intelligence integration, state central libraries are well-positioned to play a leading role in protecting cultural heritage, ensuring fair access to information, and encouraging sustainability in the rapidly changing digital era. These libraries demonstrate how eco-friendly practices, AI-driven resource optimization, and knowledge distribution can coexist peacefully. Thus, their communities adopt sustainable lifestyles that preserve the environment and knowledge for future generations. By reducing waste, actively engaging the community, and utilizing AI-driven resource management, state central libraries can demonstrate their commitment to environmental

responsibility and a sustainable future. It is essential to address the related ethical challenges and moral dilemmas as AI becomes more and more integrated into library operations. Factors like data privacy, algorithmic bias, and closing the digital divide are essential to ensuring equitable, moral, and inclusive use of this technology in library settings. There is a bright future for artificial intelligence in public libraries. Adapting to the digital world, libraries can enhance services and operations through artificial intelligence (AI). Nevertheless, libraries must proceed cautiously in this changing environment, ensuring that AI is compatible with their core principles of openness, privacy, and intellectual freedom.

References:

1. Ashraf, T., Sharma, J., & Gulati, P. A. (2010). *'Developing Sustainable Digital Libraries: Socio-technical Perspectives.' information science reference*. ISBN: 9781615207688.

2. Griffey, J. (2019). *Artificial intelligence and machine learning in libraries*. American Library Association. ISBN: 9780838918142.

3. Jain, P. K., & Babbar, P. (2006). Digital libraries initiatives in India. International Information and Library Review, 38(3), 161–169. https://doi.org/10.1080/10572317.2006.10762717

4. Sahavirta, H., Charney, M., & Hauke, P. (Eds.). (2018). *Going green: Implementing sustainable strategies in libraries around the world: Buildings, management, programmes and services. De Gruyter*. ISBN: 9783110605990.

5. Artificial intelligence in libraries [Online]. https://www.researchgate.net/publication/338337072_Artificial_Intelligence_in_Libraries

Sustainable Practices and Approaches in Medical College Libraries of India: A Necessity

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ABSTRACT: The current generation of medical college libraries has mostly collections of digital objects that are typically organized and accessible via electronic systems and networks. These digital objects include a wide range of resources such as eBooks, e-journals, open educational resources, audio recordings, videos, images, manuscripts, reports, journal articles, datasets etc. The benefit of digital resources in medical college libraries is that they offer efficient and convenient access to information to busy clinicians, overburdened students, researchers, and other healthcare professionals at the point of need.

The fundamental actors in the operation of digital medical libraries are content creators, content consumers, content managers, digital library designers, digital library administrators and software developers. With the rapid advancements in research, technology and frequent innovations, medical science is continuously evolving coupled with the changing digital information landscape and publishing models, the scholarly communications are enriching the knowledge in this field. In such a scenario providing sustainable library services is being challenged. In 1987, the United Nations Brundtland Commission defined sustainability as "meeting the needs of the present without compromising the ability of future generations to meet their own needs." The sustainability of digital libraries is measured based on the economic, social, and environmental impact. Access to resources is a major factor leading to sustainable practices in an organization. Culture and diversity are also being looked upon as important elements in sustainable development of libraries. The academic as well as public libraries in the Western world have a number of policies and follow several approaches in their functioning where sustainability is addressed and practiced whether it is their collection development policy or their information access policies and services. These libraries are operating in line with the broader mission of their parent organization. In the paper, the studies that are relevant to the promotion of sustainable practices in libraries of the developing world have been identified and discussed.

Introduction

The word sustainability has gained much importance over the past few years. Sustainability creates an environment under which humans and nature exist in harmony. Chowdhury (2013) proposed a conceptual model and a theoretical research framework for the study of the economic, social, and environmental sustainability of digital libraries. He identified the various factors affecting the sustainability issues of digital libraries.

Research Gap

There are many studies from the developed world with respect to sustainability initiatives in libraries; however, in developing countries like India, especially medical college libraries, there are no established sustainable approaches reported in the literature.

Methodology

Relevant publications covering sustainability in libraries from the Web of Science were identified and reviewed for their sustainable practices and some of the latest publications of significance relevant for the Indian context are highlighted in this study. The publications from the year 2018-2023 have been reviewed.

Observations

We identified several publications on sustainability in the context of libraries. We observed that there were publications based on bibliometrics and systematic literature reviews, Green libraries, and surveys and most studies referred to economic, social and environmental sustainability. There were also few studies referring to Cultural sustainability.

Discussions

Economic sustainability: It includes cost efficiency and long-term planning and considering alternative scholarly publishing models for saving costs and benefits as well as considering the establishment of institutional repositories for their cost and value and open source applications. Open Access has enhanced the research and visibility of publications. Consortia-based approach is another sustainable

cost saving approach in libraries. Data archives, repositories and portals works towards that end.

Cultural sustainability: Digital preservation, Conservation, restoration, price of digital objects, risk, storage, experimentation, and management are the other areas of sustainability practices in libraries.

Social sustainability: it includes community engagement, diversity, inclusion, education and lifelong learning, inclusivity and ensures that library services are accessible to all members of the community

Environmental Sustainability in libraries is addressed in a variety of green practices and services. From library design to the reduced waste production, reduced energy consumption by installing energy efficient lighting, heating, ventilation and air conditioning systems, implement practices to reduce paper and water consumption and encourage recycling and minimizing waste generation. When constructing/ renovating library buildings consider using eco-friendly materials such as green roofs and other sustainable design features.

Sustainable development in libraries requires a holistic approach that recognizes the interconnectedness of social, economic and environmental factors. Accountability and our collective actions can help overcome wastage of resources, limiting our consumption of resources.

Conclusion

The management of medical libraries is complex and requires well-defined and up-to-date sustainable approaches whether it is in the design of library buildings, spaces or services or workflows in acquisition, metadata services or dissemination of information. There is a need to strengthen sustainable library processes and services to meet the growing information needs of library readers in the best possible manner according to the ideals of sustainable development.

References

1. United Nations General Assembly. (1987). Report of the World Commission on Environment and Development: Our common future Retrieved March 09, 2023, from http://www.un.org/en/sustainability/

2. Spink, Amanda. “Digital libraries and sustainable development?.” *DL*. 1995.

3. Chowdhury, G. Sustainability of digital libraries: a conceptual model and a research framework. *Int J Digit Libr* 14, 181–195 (2014). https://doi.org/10.1007/s00799-014-0116-0

4. Ensslin L, Dutra A, Ensslin SR, Moreno EA, Chaves LC, Longaray AA. Sustainability in library management in higher education institutions: a bibliometric analysis. International Journal of Sustainability in Higher Education. 2022 Nov 24;23(7):1685-708.

5. Beutelspacher L, Meschede C. Libraries as promoters of environmental sustainability: Collections, tools and events. IFLA journal. 2020 Dec;46(4):347-58.

6. Loach K, Rowley J. Cultural sustainability: A perspective from independent libraries in the United Kingdom and the United States. Journal of Librarianship and Information Science. 2022 Mar;54(1):80-94.

7. Pionke JJ. Sustainable library services for all. Library management. 2016 Aug 8;37(6/7):317-25.

8. Harrison J, Creaser C, Greenwood H. The status of health librarianship and libraries in the Republic of Ireland (SHELLI): a mixed methods review to inform future strategy and sustainability. *Health Info Libr J*. 2013;30(2):92-109. doi:10.1111/hir.12030

9. Mathiasson MH, Jochumsen H. Libraries, sustainability and sustainable development: a review of the research literature. Journal of Documentation. 2022 Oct 4;78(6):1278-304. https://www.webofscience.com/wos/woscc/summary/7ec6c501-60a3-4172-b6a3-5d624ead8cea-b09a059b/relevance/1

Considering SDGs, the themes it relates to were

Goal 3: Good Health and Well Being	21	Goal 12 Responsible Consumption and Production	5
Goal 13 Climate Action	12	Goal 14 Life Below Water	2
Goal 2 Zero Hunger	9	Goal 1 No Poverty	1
Goal 4 Quality Education	6	Goal 6 Clean Water and Sanitation	1
Goal 11 Sustainable Cities and Communities	6	Goal 8 Decent Work and Economic Growth	1
Goal 15 Life on Land	6	Goal 9 Industry Innovation and Infrastructure	1
Goal 7 Affordable and Clean Energy	2		

Circular Economy:

Perception of Sustainability among College Librarians in West Bengal, India: A study

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ABSTRACT: Sustainable development has three interconnected facets: social, environmental (or ecological), and economical. Sustainable development in the field of LIS research is gathering considerable impetus. The purpose of the present study is to ascertain how college librarians perceive and comprehend sustainability. The study was carried out among fifteen college librarians working at the State Government aided colleges affiliated to different universities of West Bengal, India. Using a Google form, a closed-ended questionnaire was distributed to the participants in order to get their thoughts on sustainability. The findings showed that the libraries under investigation have started a variety of sustainability initiatives. Actually, the extent to which college libraries are implementing socially, environmentally, and economically equitable aspects of sustainability has been evaluated. Furthermore, notions about potential barriers to creating a sustainable library and various approaches to raising user communities' understanding of sustainability have been examined. The findings of this study will stimulate scholars who are unfamiliar with the relationship between libraries and sustainability to do more research in the future.

1. Introduction

'Both academic, as well as public libraries, are important partners to act as agents for change [...] Moving forward from teaching information literacy to educating sustainability literacy that touches any and every circumstance of life seems to be the libraries' meaningful contribution to help achieve the Agenda 2030 goals' (Hauke, 2018).

The word "sustainability" was coined for the first time in 1953. It appeared in the journal Land Economics, in an article by Joseph L. Fisher (1953). Henk (2014) defines sustainability in terms of "ecology, equity and the economy", explaining that it is necessary to develop healthy economies while respecting the environment, with benefits distributed throughout society to support community self-sufficiency.

Amanda Spink (1995) was among the pioneers in introducing librarians and information scientists to the sustainability issue. Libraries play a crucial role in paving the way for sustainable development, as identified and elucidated by Boris Elepov and Olga Lavrik (1997).

As a library is a social institution that must encourage people to carry out their social duties, those employed there would need to adjust their attitudes if libraries wanted to promote environmental communication and awareness (Karioja, 2013). Libraries have been responsible for nurturing resilience, community regeneration and sustainability through "economically feasible" and "socially equitable and environmentally sound" practices (Tanner et al., 2019) built on sound policies. Consequently, the awareness and understanding of sustainability has become very crucial for the librarians of the higher academic institutions as they play a pivotal role in training of our next generation leaders by providing them the authoritative information, which enables these future leaders to be more effective sustainability educators, advocates, activists, agitators and most importantly to be agents of change (Charney, 2014). IFLA's adaption of the United Nations 2030 Agenda of "Transforming our world" and the UN Sustainable Development Goals (SDGs) exemplifies a growing focus on libraries and librarians working with or contributing to sustainability and sustainable development. (Mathiasson & Jochumsen, 2022).

In this context, the purpose of the present study is to ascertain how college librarians in West Bengal, India, perceive and comprehend sustainability.

1.1 Literature review

A crucial first step in any research project is a thorough examination of the body of knowledge already accessible on the topic under investigation.

The three components like environmentally sound practices, economically feasible practices and socially equitable practices have served as the framework for this study. The multidimensional issues of sustainability have also taken into consideration. A rising body of research has documented the relationship between libraries, sustainability, and sustainable development, starting in the late 1990s and intensifying during the 2010s.

A broad understanding of the environmental sustainability topics like green library building, environment friendly services, green librarianship, etc. found in several research publications (Fedorowicz-Kruszewska, 2020; Drahein *et al.*, 2019; Hauke, 2018; Huang & Chen, 2018; Aulisio, 2013; Antonelli & McCullough, 2012; Barnes, 2012; Chowdhury, 2012; Sahavirta, 2012; Jankowska & Marcum, 2010).

Upon perusing the papers categorized as economic, numerous inventive recommendations abound (Baada et al., 2019; Koukopoulos et al., 2019; Forbes et al., 2017; Michnik, 2015; Michael, 2010) regarding how libraries might accomplish more with minimal resources.

Some studies emphasized how information availability has the power to bring about changes and transformations on a socio-economic level especially in order to achieve sustainable growth, encourage inclusive and tranquil societies (Kosciejew, 2020; Ncube, 2017; Pionke, 2016; Abdullahi, 2015).

Publications (Atta-Obeng & Dadzie, 2020; Mbagwu et al., 2020; Li et. al., 2019) frequently stressed the value of libraries offering services and initiatives that are focused on the community. A few researches explicitly highlighted the proactive role that librarians play as change agents or catalysts (Williams et al., 2015; Charney, 2014).

Sustainability is understood to be a more comprehensive and multifaceted notion that encompasses environmental, social, and economic aspects in the day-to-day operations of its administration.(Purcell *et al.*, 2019; Kapitulcinová et al., 2018; Alghamdi et al., 2017; Amaral et al., 2015; Aulisio, 2013) Assessments of services and achievements of academic libraries using the UN SDG framework have started to take shape (Thorpe & Gunton, 2022; Missingham, 2021; Mori et al., 2019; Jankowska, Smith & Buehler, 2014).

On the other hand, there is a dearth of scholarly literatures on contribution of libraries to sustainable development in India. Some studies examined the theoretical frameworks and workplans pertaining to sustainability for Indian libraries (Vyas & Parmar, 2021; Sarkar, 2020; Singh & Mishra, 2019; Datta & Chaudhuri, 2018; Meher and Parabhoi, 2017; Chaudhuri, 2016). Sustainability related understanding, and practices of the university library professionals were also the subject of some research (Bincy & Vasudevan, 2023; Singh & Dixit, 2021; Datta & Chaudhuri, 2019; Seema, Navjyoti & Kaur, 2019; Suresh Kumar & Sofiya, 2019).

However, there is a dearth of study on the development and assessment of socially, environmentally, and economically equitable sustainable practices by college libraries in India. This paper focuses on how college librarians in West Bengal, India interpret sustainability.

1.2 Research Questions

The investigation has been guided by the following research questions:

1. What is the level of awareness on Sustainability and its library related issues among the college librarian?
2. Whether the library focused on all major socially equitable practices of SDG?
3. Whether the library focused on all major environmentally sound practices of SDG?
4. Whether the library focused on all major economically feasible practices of SDG?
5. What are the potential impediments for transforming into a sustainable library?
6. What are the strategies for providing awareness among user communities about sustainability?

2. Scope

The study was conducted on the college librarians of fifteen state government aided colleges affiliated to different universities of West Bengal. Table 1 shows the entire distribution of the research population as well as the institutions to which they belong.

Table 1: Profile of Colleges

SN	Name of the College	Affiliating University	Year of Establishment
1	Bagnan College	University of Calcutta	1958
2	Bankura Sammilani College	Bankura University	1948
3	Basirhat College	West Bengal State University	1947
4	Chandrakona Vidyasagar Mahavidyalaya	Vidyasagar University	1985
5	City College of Commerce and Business Administration	University of Calcutta	1961
6	Gobardanga Hindu College	West Bengal State University	1947

7	Kabi Sukanta Mahavidyalaya	University of Burdwan	1986
SN	**Name of the College**	**Affiliating University**	**Year of Establishment**
8	Kalna College	University of Burdwan	1943
9	Maynaguri College	University of North Bengal	1999
10	Netaji Satabarshiki Mahavidyalaya	West Bengal State University	2000
11	Sri Chaitanya Mahavidyalaya	West Bengal State University	1965
12	Sudhiranjan Lahiri Mahavidyalaya	University of Kalyani	1966
13	Syamaprasad College	University of Calcutta	1970
14	Vidyanagar College	University of Calcutta	1963
15	Yogoda Satsanga Palpara Mahavidyalaya	Vidyasagar University	1964

3. Methodology

A close ended questionnaire was circulated among the participants by means of Google form to elicit responses about the sustainability. A total 20 questionnaires were sent out on the basis of random sampling method, however 15 responses were returned. Multiple choice types of questions were incorporated in the questionnaire. The e-mail explained the purpose of the study and asked recipients to participate. Participants were given 10 days (October 9-October 18, 2023) to respond. Then collected data was analysed with the aid of MS-Excel software. The data was presented using frequencies, percentages, and various types of graphics, as well as narrative explanations.

4. Analysis

4.1 Perception about sustainability and its dimensions

As can be shown in figure 1, 86.7% of research participants had some awareness about sustainability.

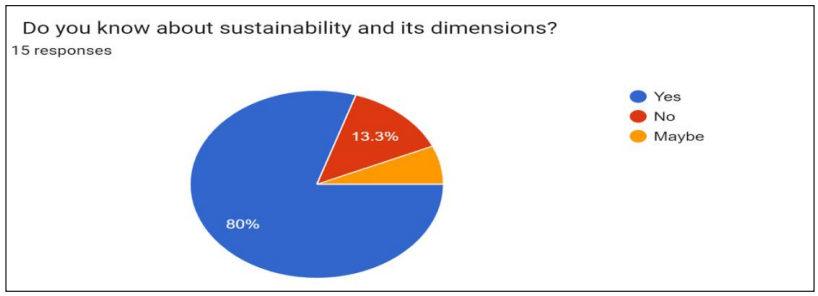


Figure 1: About Sustainability

Eighty percent respondents reported they have a thorough understanding of sustainability and its various aspects and 6.7 percent have elementary level of awareness. Just 13.3% of people do not know about sustainability.

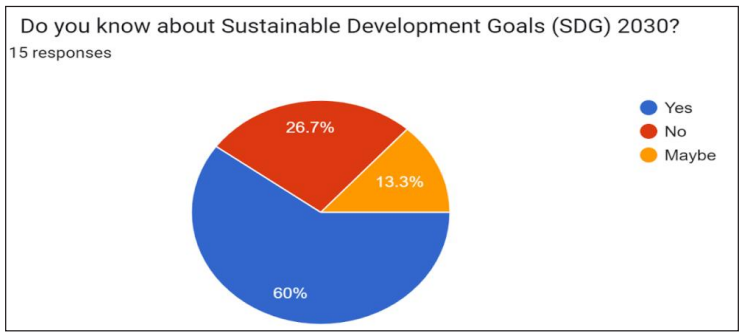


Figure 2: Notion of SDGs

Further, 60 percent of respondents are well-versed about the sustainable development goals (SDG-2030) set forth by the United Nation while 13.3 percent of respondents had at least rudimentary knowledge in the subject (figure 2). About 26.7 percent of respondents are still ignorant about the goals.

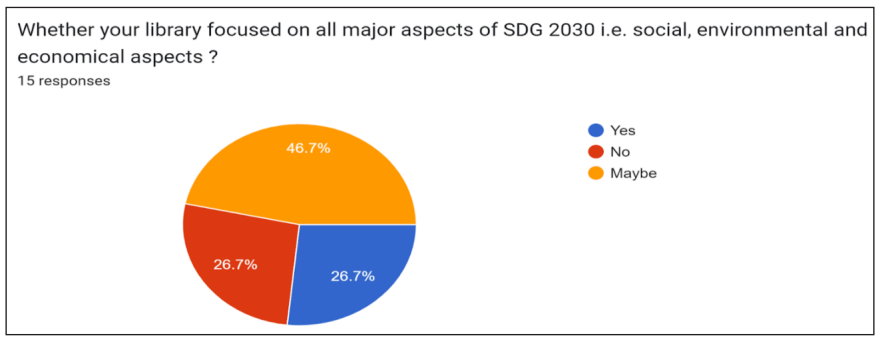


Figure 3: Major aspects of SDGs

When the librarians were asked to whether their library focused on major three core elements of SDG 2030 viz. social, environmental and economical aspects, about 46.7 percent respondents replied that they are confused about the specific areas of their library where facets of SDGs are relevant (figure 3). Only 26.7 percent respondents reported a positive feedback in this respect. While another 26.7 (n=4) percent replied their library never focused on sustainability.

4.2 Socially equitable practices

Researchers were eager to collect the data about whether the participant libraries focused on all major socially equitable practices of SDG. The following figure (figure 4) reveals that maximum number of respondents (n=14; 93.3%) agreed on 'ensuring access and infrastructure to all categories of users'. More than half of respondents (n=9, 60%) reported about the 'Professional development to all library employees'.

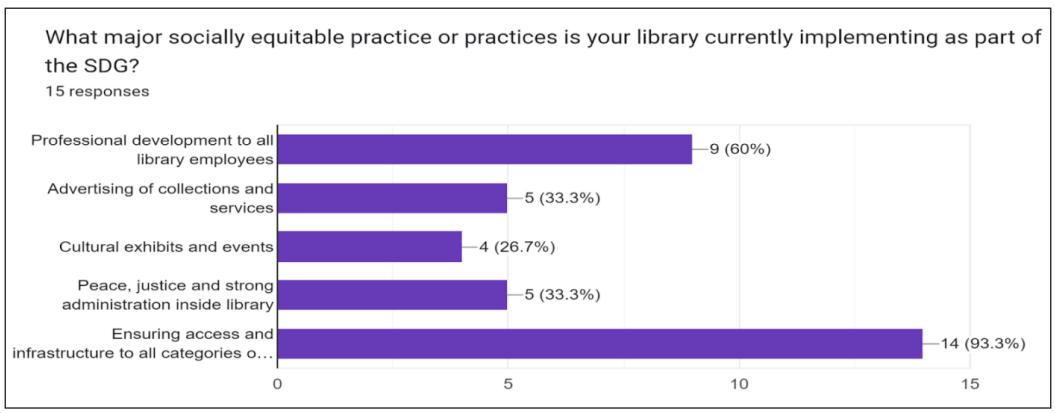


Figure 4: Socially equitable practices

About 33 percent respondents practiced socially equitable aspects like advertising of collections, and services and Promotion of peace, justice and strong administration inside library for sustainable development. About 26 percent respondents practiced aspect like 'Cultural exhibits and events' only.

4.3 Environmentally sound practices

In case of environmentally sound practices (figure 5), Reduction of use of carbon footprints (through less paper use, library automation, etc.) is the mostly (n=9, 60%) practiced by the respondents, followed by waste management including decreasing water waste aspect (n=6, 40%).

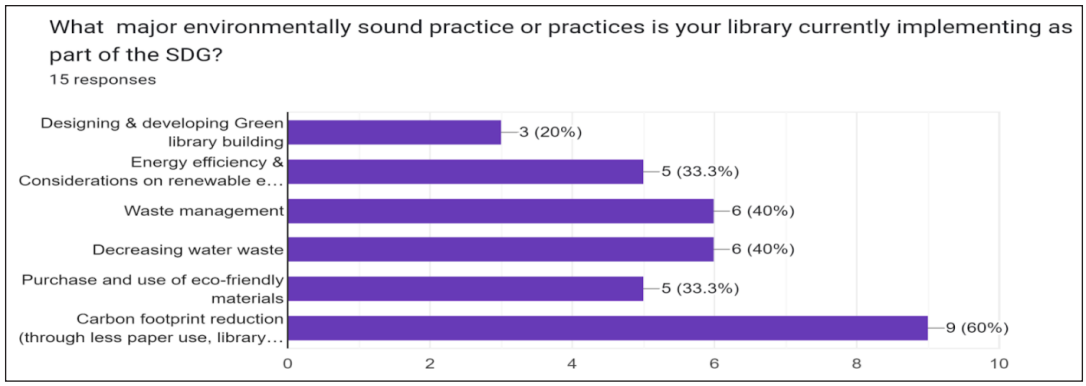


Figure 5: Environmentally sound practices

Energy efficiency & considerations on renewable energy usage and purchase eco-friendly materials are the two aspects which practiced by almost 33 percent (n=5) libraries. It is very much surprising that sustainability goal that extend to green library building design and construction has been carried out by 20 percent libraries only.

4.4 Economically feasible practices

Regarding economically feasible practices as shown in figure 6, the most preferred practice (n=14, 93.3%) according to respondents is encourage potential users to use e-resources as much as possible, followed by Lighting and energy consumption (energy efficient lighting, renewable energy procurement, etc.) with 53.3 percent, Purchase unlimited user access licenses for e-resources with 46.7 percent and Recycle programmes (electronics, batteries, ink cartridges, etc.) with 40 percent respectively.

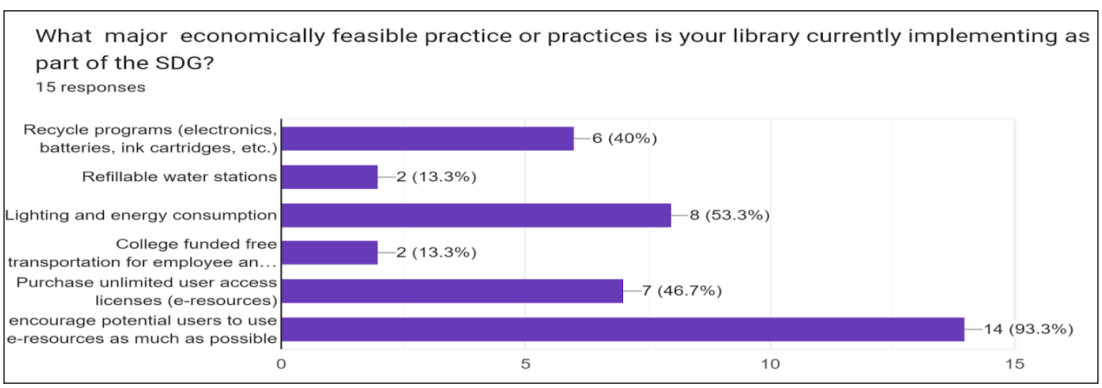


Figure 6: Economically feasible practices

The least preferred practices are Refillable water stations and College funded free local public transportation for employee and students with 13.3 percent only.

4.5 Challenges affecting the implementation of sustainability related activities

As far as the challenges (figure 7) faced by college librarians under study, it can be seen that maximum number of respondents (n=9, 60%) responded that they were faced all above mentioned challenges from time to time. About 33.3 percent (n=5) respondents agreed to consider Poor infrastructural facilities to support SDG programmes is another potential barrier. Issues like administrative bottleneck and Inadequate finance to cater for logistics and implementation (n=4, 26.7%) were other important challenges. On the other hand most of the respondents highly support in both the issues of resistance to change from user and poor knowledge and lack of enthusiasm of librarian about sustainability to consider them as the impediment of proper implementation of sustainability related activities.

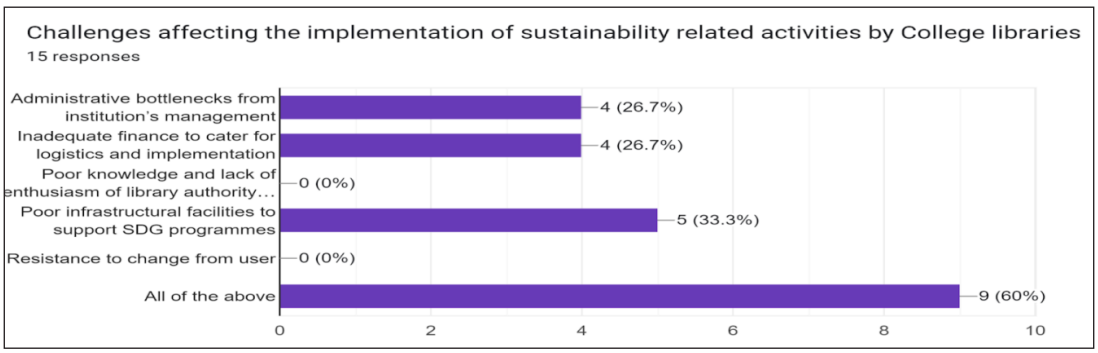


Figure 7: Major challenges for sustainability

4.6 Strategies for providing awareness among user communities about sustainability

When it came to strategies (figure 8) for providing awareness among user communities about sustainability, most respondents (n=11, 73.3%) expressed that whatever initiatives mentioned in the questionnaire, all are very much important and needs to be followed. There should be a provision of basic ICT training programmes for all is perceived by 33.3 percent of respondents. Organizing sensitization campaign (information literacy, etc.) on the different SDGs to user communities and Partner with various organizations (NGOs, etc.) in the implementation of many sustainability related programmes by the concerned library have also been reported as to some extent effective strategies by 20% and 13.3% respondents respectively.

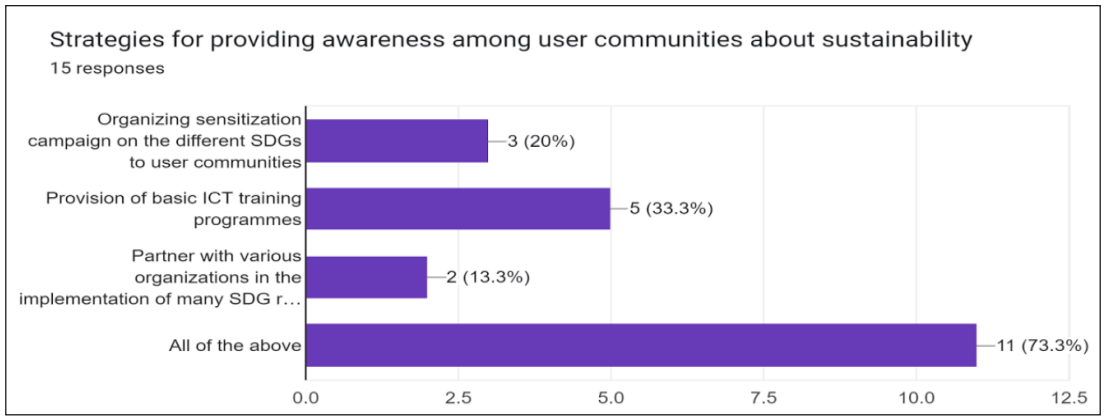


Figure 8: Major strategies for awareness

5. Major Findings and Discussion

The findings showed that the libraries under investigation have started a variety of sustainability initiatives. Eighty percent respondents reported about comprehensive understanding of sustainability. The results also indicated that Sixty percent respondents are well-versed about the sustainable development goals (SDG-2030) set forth by the United Nation. The results of this survey corroborated the observation made by Datta and Chaudhuri (2019) that the majority of respondents were unsure of the extent to which creating a sustainable library might either directly or indirectly meet some of the SDGs on behalf of libraries. In terms of setting aside budget for sustainability activities, the majority of participants (73.3%, n = 11) were uncertain, which is analogous to the results of the survey done by Tribelhorn (2023). The majority of respondents (n = 14; 93.3%) agreed that "ensuring access and infrastructure to all categories of users" is important in light of the findings pertaining to socially equitable features. "Reduction of use of carbon footprints (through less paper use, library automation, etc.)" is the environmentally good approach that is most frequently (n=9, 60%) implemented. The results in this section are consistent with a systematic literature review on sustainable development in libraries conducted by Khalid et al. (2021) which discovered that academic undertake a number of environmental initiatives, including switching from print to electronic resources and lowering their carbon footprint. In terms of economically viable activities, respondents said that encouraging potential users to use e-resources to the fullest extent possible is the most recommended strategy (n=14, 93.3%). The survey's findings showed that the majority of participants (n=9, 60%) encountered a

variety of difficulties, including sometimes insufficient funding for logistics and implementation, administrative bottlenecks from the institution's management, inadequate infrastructure to support SDG programs, etc. The results of this section of the study are in line with the previous research conducted by Masenya (2020) which asserted that significant obstacles to the implementation of sustainability include inadequate funding, scarce resources, and a lack of commitment from the leadership. According to survey respondents, their libraries typically offered few possibilities for raising awareness of sustainability-related issues.

6. Conclusions

It is evident that the ALA and IFLA have identified sustainability as one of their key values, not all libraries have adopted sustainability in its entirety (Tribelhorn, 2023). The analysis finds that college librarians nowadays have a rather high understanding of sustainability activities. Despite the fact that in order to become sustainable, college libraries must overcome some infrastructure obstacles. In order to overcome these obstacles, the sustainability policies should be included in the library to ensure accountability, commitment, and governance (Roos & Guenther, 2020). The purpose of this study was to ascertain the college librarians' awareness and comprehension regarding sustainability. Therefore, making fruitful decision about sustainability related initiatives could be the outcome of greater level of awareness and comprehension of sustainability. Researchers of the present study noted that a longer time frame for responses and distribution of the survey to a larger number of participants would have enhanced the depth of the findings. To conclude with the words of Fisher (2017) is 'To ultimately achieve sustainability, higher education institutions and their libraries need to have sustainability embedded in their practices, ensuring interpersonal connection; integration and continuity of practices, ideas and knowledge; and inclusiveness and equity'.

References:

1. Abdullahi, J. (2015). Policy framework on social welfare information management and services for Nigerian public libraries: promoting sustainable development. *Library Management*, 36 (4/5), 281-288. https://doi.org/10.1108/LM-08-2014-0088

2. Alghamdi, N., Heijer, A.D. & Jonge, H. (2017). Assessment tools' indicators for sustainability in universities: an analytical overview. *International Journal of*

Sustainability in Higher Education, 18(1), 84-115, https://doi.org/ 10.1108/ IJSHE-04-2015-0071.

3. Amaral, L.P., Martins, N. & Gouveia, J.B. (2015). Quest for a sustainable university: a review. *International Journal of Sustainability in Higher Education*, 16(2), 155-172, https://doi.org/10.1108/IJSHE-02-2013-0017.

4. Antonelli, M., & McCullough, M. (Eds.). (2012). *Greening libraries*. Los Angeles: Library Juice Press.

5. Atta-Obeng, L. & Dadzie, P.S. (2020). Promoting sustainable development goal 4: the role of academic libraries in Ghana. *The International Information and Library Review*, 52(3), 177-192. https://doi.org/10.1080/10572317.2019.1675445

6. Aulisio, G.J. (2013). Green libraries are more than just buildings. *Electronic Green Journal*, 1(35), https://doi.org/10.5070/G313514058.

7. Baada, F.N.A., Baayel, P., Bekoe, S. & Banbil, S. (2019). Users' perception of the quality of public library services in the greater accra region of Ghana: an application of the LibQUALþ model. *Library Philosophy and Practice (e-journal)*, https://digitalcommons.unl.edu/libphilprac/2496/

8. Barnes, L.L. (2012). Green buildings as sustainability education tools. *Library Hi Tech*, 30(3), 397-407, https://doi.org/ 10.1108/07378831211266546.

9. Bincy, O. K. & Vasudevan, T. M. (2023). Environmental sustainability: Awareness and practices among library professionals in University of Calicut. *The Journal of Academic Librarianship*, 49; 1-6. https://doi.org/10.1016/j.acalib.2023.102748

10. Charney, M. (2014). Academic Librarians and the Sustainability Curriculum: Building Alliances to Support a Paradigm Shift. *Collaborative Librarianship*, 6(1), 20-35. Available at: http://works.bepress.com/charney_madeleine/69/

11. Chaudhuri, S. (2016). *How Green is My Library? In Search of Sustainability*…In S. Banerjee & A. Maity (Eds.), Sustainability of Library and Information Services (pp. 26-35). Kolkata, India: Department of Library and Information Science, University of Calcutta.

12. Chowdhury, G. (2012). Building environmentally sustainable information services: a green is research agenda. *Journal of the American Society for Information Science and Technology,* 63(4), 633-647, https://doi.org/10.1002/asi.21703.

13. Datta, A. & Chaudhuri, S. (2018). *Transforming towards a sustainable society: a thematic framework based proposal of action plans for Indian libraries, heralding and fostering the change.* In S. Chakraborty (Ed.). Transforming the society:

libraries as the torch-bearer of change (pp. 108-115). Kolkata, India: Department of Library and Information Science, University of Calcutta.

14. Datta, A. & Chaudhuri, S. K. (2019). The Awareness and Understanding of Sustainability by the Academic Library Administrators: A Micro Level Investigation in Kolkata, India. *Library Philosophy and Practice (e-journal).* 2938. https://digitalcommons.unl.edu/libphilprac/2938.

Role & Implication of Library Automation in Digital Environment: A Study

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ABSTRACT: "This study focused on the role and Implication of Library Automation in digital environment . After the study we found the Library automation to use the Computer Library systems and software in Different Library service. It's manage to all Library function in automate way. Library automation provide the many task like a catalogue the books, Computerized Circulation, Computerized Library Patron Services, Library automation main purpose Improve efficiency and enhance all library services in digital way. This technology are many component like a Library software, Computer, Web OPAC, ILS, Digital Library , RFID Technology , Mobile Library services etc. This are few disadvantage like a Installation Cost, Maintain cost, Dependency in Technology , Data Security and Privacy etc".

1. Introduction

Library automation refers to the use of computer systems and software to manage and automate various library functions and services. This includes tasks such as cataloguing, circulation, inventory management and customer service. The main purpose of library automation is to streamline processes, increase efficiency and improve overall library services. They are some important features of library automation: Integrated Library System (ILS) Also known as library management or library automation system, ILS is the core technology that makes the library important. It usually includes standards for cataloguing, circulation, purchasing, inventory management, and sometimes the Online Public Access Catalog (OPAC). Online Public Access Catalog (OPAC): A public interface that allows library users to search and access library collections. OPAC has evolved from a simple search engine to a more user-friendly and useful engine that can include book covers, reviews and other information. RFID Technology: Radio Frequency Identification (RFID) is frequently used in library automation to track library materials efficiently and accurately. RFID tags on books and other items can be easily tracked, allowing for faster, more reliable shipping and inventory management, Self-service kiosks: Many libraries use self-service kiosks to allow patrons to borrow and return items independently. These kiosks can improve circulation and free up staff for other tasks. V. Digital libraries and electronic resources: Automation also includes the management of digital resources, including e-books, online databases, and other electronic resources. Libraries can use automated systems to manage

licensing, access, and authentication of these digital resources Interlibrary Loan Automation: Some library automation includes functions to manage loan requests and transactions, making it easier for users to access other libraries. . Data analysis: Libraries can use automation to collect and analyze data on usage patterns, popularity, and other metrics. This information can inform decisions about collection development and improve library services as a whole. Mobile applications and online services: Libraries may provide mobile applications and online services that allow readers to access, borrow, and update library resources from smartphones or computers.

2. Objective of Study

I. To Investigate role of Library Automation in Digital Era.
II. To find out Component of Library Automation
III. To Explore the Advantage of Library Automation .
IV. Find out the Challenges of Implication of Library Automation

3. Data analysis and finding :-



Following are Feature of Library Automation in Libraries.

Integrated Library System (ILS):

The core component of library automation, an ILS is software that manages the fundamental library functions. It includes modules for cataloging, circulation, acquisitions, and Barcode etc.

WEB OPAC

This is a user interface that allows users to search and access library collections. It provides information about the availability, location and other details of library materials

Computerized Cataloging Module

This module is used to create and manage library catalog information. Includes the ability to add textbooks, course lists, and other content.

Computerized Circulation module:

Manages the borrowing and return of library materials. Includes the ability to review incoming and outgoing items, refunds, and penalties. Some systems also support self-checkout and self-servic returns.

Online Book Procurement Module:

Helps manage the library's purchasing process. It includes functions for creating orders, tracking orders, and managing budgets.

Serial publication control module:

Manage subscriptions to serials, periodicals and other serial publications. It helps keep track of the number purchased, renewals, and manage information about the series.

RFID Technology:

Radio Frequency Identification (RFID) is often used to effectively track library materials. RFID tags on products can be easily inspected, providing fast and accurate tracking and stock control.

Digital resource management:

Manage electronic resources such as e-books, online databases and multimedia files. It includes authorization, access control, and functionality for organizing digital

Interlibrary loan module:

To supports the borrowing and lending of information between different libraries. Helps manage library loan requests, track transferred items, and store loan information.

User management module:

User registration, user account, credit history, etc. Manage user information including. Support functions such as issuing library cards and tracking user fines.

Generate Library Report and Data Analysis:

To Provides tools for generating reports and analyzing data regarding library operations. Libraries can use these features to make decisions about collection development, resource allocation, and other aspects of library management.

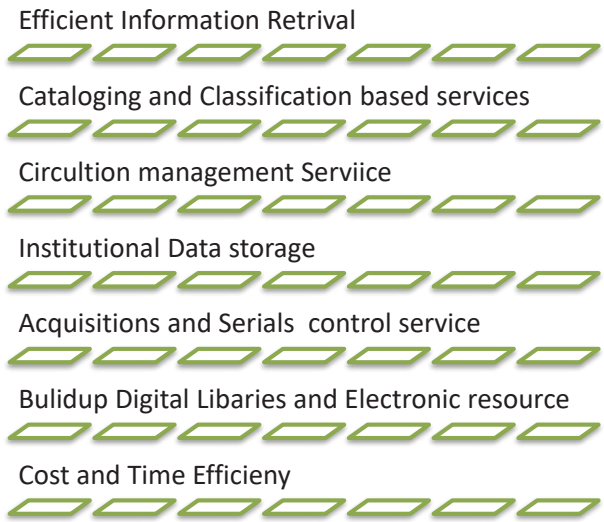
Self-service kiosks:

Allow to users to independently check and return information. These kiosks can be integrated with equipment for efficient self-service.

Mobile applications and online services:

Many modern automation libraries allow readers to access library catalogs, archives, transfer editing files, etc. from smartphones or computers. provides mobile applications and online services

4. Library Automatized based service



Efficient Information Retrieval: Automation facilitates the creation of Online Public Access Catalogs (OPACs), enabling users to search and locate library materials easily. This improves the efficiency of information retrieval for both patrons and library staff.

Cataloging and Classification based service Library automation systems automate the cataloging and classification processes. This ensures consistent and standardized records for library materials, making it easier to organize and manage the collection.

Circulation Management service- Automation simplifies circulation processes such as check-out, check-in, and renewals. Self-service kiosks and RFID technology can further enhance the speed and accuracy of these operations.

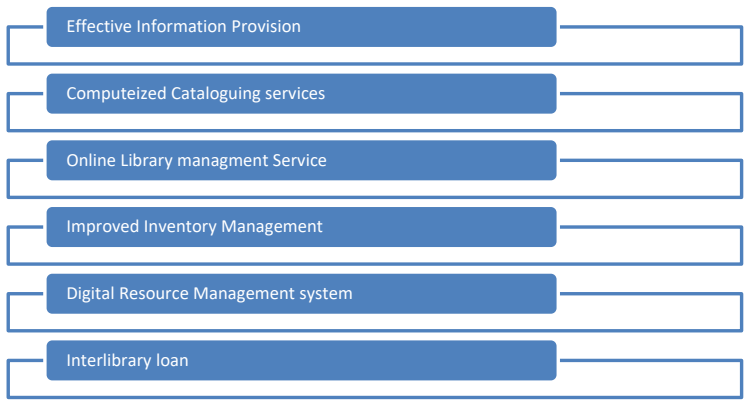
Institutional Data Storage- Automated systems help in tracking and managing the library's inventory efficiently. This includes real-time updates on the availability and location of items, reducing the likelihood of lost or misplaced materials

Acquisitions and Serials Control Service- Library automation streamlines the acquisition of new materials and the management of serials (periodicals, journals). It helps in tracking orders, receipts, and subscriptions, ensuring a well-maintained collection.

Digital libraries and electronic resources: Automation also includes the management of digital resources, including e-books, online databases, and multimedia files. It enables libraries to access a variety of electronic resources.

Cost and time efficiency: Thanks to routine work, libraries can reduce the time and effort required for the book process. This saves costs and allows library staff to focus on value-added services and user relations.

5. Benefits of Library Automaton



Effective information provision:

Automation allows users to easily and conveniently access library resources through the Online Public Access Catalog (OPAC). This speeds up the process of finding and finding information.

Computerized Cataloguing

Automation ensures consistency, accuracy and organizes information by streamlining the cataloging and distribution process.

Computerized Library management: Electronic systems speed up registration, registration and recycling. Self-service kiosks and RFID technology contribute to efficient management.

Improved inventory management:

Library automation systems provide instant inventory control, reducing lost or misplaced items. This improves overall collection control.

Digital resource management System

Automation helps organize and access digital resources, including e-books, online archives, and multimedia files. This expands the resources available to customers

Interlibrary Loan Automation:

By automating the interlibrary loan process, libraries can make it easier to lend and borrow information between libraries. This provides access to many services.

User Management:

An automated system manages user information, making it easy to register new users, track credit history, and manage fines. This helps provide a personalized and efficient experience.

Library Generate the Reporting and User Analysis: Automation can create reports and analysis that provide insight into library performance. Libraries can analyze circulation patterns, popularity and other metrics to inform decisions.

Cost and time efficiency: Library automation make a process assist routine work, libraries can save time and reduce costs. This allows staff to focus on more valuable tasks and services.

6. Following are Library Automation Challenges in digital era

Installation cost:

Implementing a library automation system can be expensive. Costs include purchasing software, hardware and RFID technology, as well as staff training. For small libraries with limited budgets, these startup costs can be a big problem.

Maintenance costs:

Libraries must also budget for maintenance, updates and support. Regular maintenance is essential to keep your system operating efficiently and compatible with evolving technology.

Technical Problem

Like any technology, library automation is susceptible to business problems such as software failure, hardware failure, or operational failure.

Dependency on technology:

The library relies on technology in its daily operations. If the system does not work, the library will experience disruption, which will affect user services and cause users to be frustrated.

Loss of personal interaction:

Improving productivity can reduce personal interaction between library staff and users. While automation increases efficiency, it is important to strike a balance to ensure personal service and guidance is still available when needed.

7. Conclusion

The role & Implementing library automation requires careful planning, staff training, and on-going maintenance. It can significantly improve the efficiency of library operations and enhance the overall user experience for patrons and provide the a digital platform among the users. Library automation is most important technology for library perspective Library automation is make a process of save the time of library staff and users. Its provide a computerized services to user. This study explores the importance of library automation and networking in digital Era. This technology adopt by library so Librarian should be well qualified and IT skills, so use this technology in Different Library section.

8. References:

1. Jayamma, K. V& Krishnamurthy. M. Automation of College Libraries in Bangalore City: A Study. International Journal of Advanced Research in Computer Science and Management Studies, 2015, 3(9), 32-40.

2. Takappa, R & Ramakrishna Reddy, K. Present Status of Library Automation in Polytechnic Colleges in Karnataka State: A Survey. International Journal of Digital Library Services, 2017, 7(2), 87-98.

3. Otunla, AderonkeOlufemi. Current Status of Automation in Academic Libraries in Osun State, Nigeria. Journal of Applied Information Science and Technology, 2016, 9(2), 29-39.

4. Upadhyay, Ashutosh; Pandey, Varsha & Shrivastava, B.P. A Review of Status, Problem and Prospects of Library Automation in Engineering Colleges of Jabalpur City, IOSR Journal of Computer Engineering, 2012, 3(5), 31-36.

5. Naveen, C.L & Nagesh, R. Status and Problems of Library Automation in Govt. First Grade Colleges of Hassan District, Karnataka: A Study, International Journal of Library & Information Science, 2016, 5(1), 28-35. https://en.wikipedia.org/wiki/Category:Library_automation

Digital Transformation for Sustainability by Librarian Using Open Educational Resources

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ABSTRACT: Open Educational Resources (OER) are a new solution to the requirement for open and reused educational materials that are freely available online. Creating a tool for learning 'open' means allowing other people to customize and reuse it in various contexts. Libraries can help the open schooling and achievement commons creating their own OER. Numerous libraries and library consortiums have taken the lead to create resources for everyone. With the passing of time, those working in LIS must keep abreast of emerging developments in the field of digital transformation for sustainability. In this research paper, the researcher has created an open educational resource for passing the SET NET exam in Library and Information Science on the website of Amdar Shashikant Shinde College Medha Library and Knowledge Resource Center. The website has been analyzed with the help of Google Analytics and concluded with suggestions.

Introduction

The past decade has seen enormous social, economic, educational, and institutional changes in every sector, including the library community. Information and communication technology (ICT) applications in terms of social relevance, responsibility, diversity and globalization must be considered to survive the onslaught of information overload . In the 21st century, libraries have a unique role to play in supporting all areas of research, scholarship and other essential areas related to development. The IT revolution has contributed enormously to user services, but it has also brought with it a number of forces that challenge the role of libraries themselves.

IT plays a vital role in the management and dissemination of digital information and is attractive to authors, publishers and libraries for this simple reason, it offers a revolutionary path to knowledge. knowledge, produced and disseminated to end users, generally in a timely manner. , timely and way efficient manner. The fields of information collecting and web-based services have expanded substantially as a result of IT, yet because there is so much material available online, librarians now have more duties. A growing amount of information is created digitally these days. The majority of people favor electronic forms and are engaged in knowledge production. Both a "digital librarian" and a certified IT librarian are required to manage digital information resources. (Desi, 2017). In this research paper, the

researcher has created an open educational resource for passing the SET NET exam in Library and Information Science on the website of ASSM Library and KRC.

Digital Transformation in Academic Libraries:

The first attempts at a digitized library appear because of Paul Otlet and Henri La Fontaine in 1895.He began to systematically classify all human knowledge, but the development of libraries institute number followed the evolution of the Internet service provider. The fundamental advantage of a digital library is that millions of people can access its digital collection coexisting on the World Wide Web.

Since the mid-1990s, Indest' creation of digital libraries has been seen as a means of preserving artistic and cultural convention. India ratified the UNESCO Universal Declaration on Cultural Diversity, which was overwhelmingly endorsed by the organization's General Assembly at its 31st session on 2 November 2001, to improve access to cultural diversity. access a wide range of affordable cultural resources across the country. The basis of the early programs was the development of an electronic card catalog known as the Online Public Access Catalog (OPAC) in the 1980s. The conventional card catalog is increasingly being displaced by the OPAC in university, public and specialized libraries. As a result, libraries have been able to promote resource sharing and increase access to library resources further the jurisdiction of constant libraries.

Transformation of Academic Libraries in changing environment:

Academic libraries in the twenty-first century go beyond the confines of their particular institutions to provide open access online knowledge spaces that cope with sophisticated Internet sharing tools, social networking, and communication technology. The personnel of academic libraries should also be able to assist varied and international university learning communities.

They should also be aware of and receptive to the needs of all foreign students who use the library, ensuring that they receive an equally high standard of service.

Academic library staff face new challenges in an environment where international education is expanding quickly, and these challenges necessitate investing in skill development and continuous improvement on the basis of providing effective, meaningful, interactive, flexible, and culturally aware library services and program. Traditional learning and teaching, on-campus online teaching (including MOOCs). Libraries remain important locales for learning and scholarly conditioning in academic institutions, and effective libraries must meet these needs. Considering

library manpower and the communities they serve can co-produce library services, this replaces outdated unilateral service models.

Role of Librarians in the digital resources Era:

The functions that academic libraries play in the discussion above have all been handled by librarians. Therefore, in order to provide services to students, academic librarians are expected to possess a variety of technological abilities. One needs information literacy for this reason. When we refer to teaching information literacy in the digital age, we mean teaching abilities that involve computer skills. There are many resources available to pupils today. Their reliance on technology is growing every day.

Review of Literature OER :

Bachalapur & Hugar (2021). Conducting a descriptive survey on librarians' awareness of open educational resources in India. Open educational resources (OER) are openly licensed and freely accessible texts, media, and other digital assets that are useful for teaching, learning, and assessment as well as other research purposes. In conclusion, library professionals need to carry out more and more awareness and training on OER in all higher education institutions in India.

Crozier (2018). Today, libraries not only provide books but also information in many formats to users. They provide a number of services in the digital age, such as institutional repositories, electronic resources, links to open educational materials, and more.Libraries are experts in curating educational resources available in all formats and providing information to users.Library and information professionals with knowledge of copyright and publishers are deeply involved in promoting the use of OER.Librarians can play a vital role in helping educators adopt OER and helping their students use OER, as well as engaging them with innovative teaching and learning tools with affordable cost.

Dill & Cullen (2020). "Not only are librarians authoritative in the OER movement, but the OER movement has also impacted librarians in their roles as educational collaborators, facilitators of information literacy, and mentors of future librarians and educationist (2020). This study examined college students' attitudes toward the use of OERs among college students and the influence of gender and field of expertise on their attitudes toward their use.The research uses quantitative descriptive research method.Three research questions were developed and

answered.The 398 respondents were randomly sampled from three purposively selected professional fields.Frequency numbers, percentages, rank orders, and averages were used to answer research questions 1 through 3.

Upneja (2020). Examines the contribution of libraries and library professionals in addressing OER in India. A self-designed structured questionnaire was distributed online via blogs, discussion forums, social media groups, and personal emails among library professionals, faculty, and students to collect data. The results of this study revealed that although the majority (93%) of library professionals are aware of the concept of OER, they are unable to guide the OER movement because of their parent institution (70%).There are no design policy guidelines and OER development.

Open Educational Resources :

The world of today is one of digitization transformation. The internet was primarily utilized by instructors and students to research new ideas and instructional strategies. Open educational resources, also known as OER, are used by teachers and students in their teaching, learning, and research. A vital component of open education is OER. Teachers, students, and educators can access digital materials freely from this site. Full courses, course modules, syllabi, homework, and a collection of digital resources from all over the world are a few examples of open educational resources (OER).In 2020,

Audio- visual resources of OER :

1. National Programme on technology enhanced learning (NPTEL)
2. Learning Object Repository Consortium for educational Communications:
3. E-GyanKosh
4. e-PG Pathshala
5. SAKSHAT
6. Vidyanidhi
7. NSDL

Indian OER repositories:

- SHODHGANGOTRI http://shodhgangotri.inflibnet.ac.in
- SHODHGANGA http://shodhganga.inflibnet.ac.in/
- E-SHODHSINDHU http://ess.inflibnet.ac.in

- ICSSR DATA SERVICE http://icssrdataservice.in
- INDCAT http://indcat.inflibnet.ac.in
- VIDWAN: EXPERT DATABASE http://vidwan.inflibnet.ac.in
- SWAYAMPRABHA https://www.swayamprabha.gov.in/
- e-PG Pathshala - INFLIBNET Centre https://epgp.inflibnet.ac.in
- Sakshat www.sakshat.ac.in

The following are the main international OER repositories: Google Classroom, Creative Commons, OER Commons, Wikipedia, Moodle, Google Scholar, which is a free source for scholarly articles.In 2008, Yuan, MacNeill, and Kraan

National Coordinators for MOOCs:

- AICTE (All India Council for Technical Education) for self-paced and international courses NPTEL (National Programme on Technology Enhanced Learning) for Engineering
- UGC (University Grants Commission) for nontechnical post-graduation education
- CEC (Consortium for Educational Communication) for under-graduate education
- NCERT (National Council of Educational Research and Training) for school education
- NIOS (National Institute of Open Schooling) for school education
- IGNOU (Indira Gandhi National Open University) for out-of-school students
- IIMB (Indian Institute of Management, Bangalore) for management studies
- NITTTR (National Institute of Technical Teachers Training and Research) for Teacher Training programme.(Upneja, 2020)

Massive Open Online Courses (SWAYAM) :

The Government of India's MHRD recently launched the SWAYAM project in India. The project's goal is to blindly combine offline and online learning. A MOOC platform has been launched. "Study Webs of Active Learning for Young Aspiring Minds" is what SWAYAM stands for. The project was distributed by SWAYAM based on education.

1. School Education: NIOS, NCERT.
2. Out of School Education: IGNOU, NITIR.
3. Under Graduate Education: NPTEL, AICTE, CEC, IIMB.
4. Post Graduate Education: NPTEL. AICTE, IIMB, UGC.

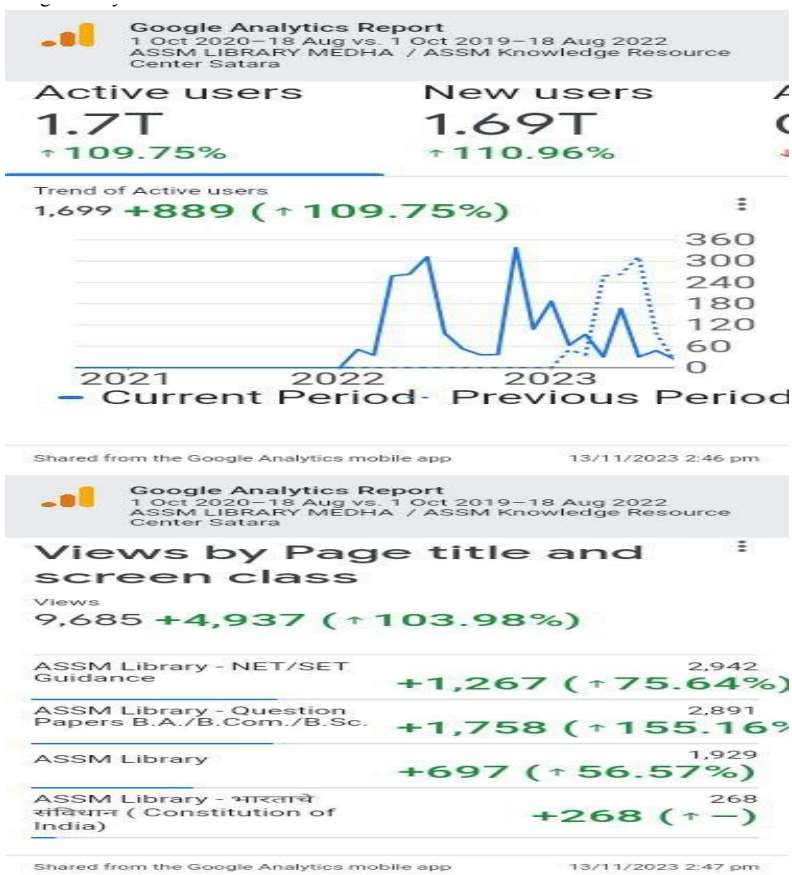
These are all online courses working in various education fields. Higher education institutions in India are the first to implement a choice-based credit system. MOOC offers a range of options for learning choice-based courses that are provided by various colleges and universities. Additionally, MOOCs allowed for endless learning for the duration of a user's life.(Das & Kayal, 2017)

Amdar Shashikant Shinde Mahavidyalaya Medha Library and KRC Website :

The example of open educational resources in the digital transformation era Assm College has provided an assm library and KRC NET/SET Guidance in Library and Information Science.

https://sites.google.com/site/assmlibrarymedha/netset-guidance?authuser=0

Google Analytics :





Conclusion:

There are many online courses accessible through the internet, but Open Educational Resources (OER) and Massive Open Online Courses, also known as MOOCs, play a significant part in online education. The OER facility is used by numerous learners, teachers, and researchers. OER is used in many different contexts, such as libraries and institutions of learning. The skills that ''digital librarians'' bring to this knowledge environment would help users make sense of an overwhelming number of digital collections and resources, provide access to a network of key contacts, identify cost-effective information retrieval strategies, and assist users in the publication and creation of new knowledge.

Website analysis of Amdar Shashikant Shinde College Library & KRC proves that maximum library and information science students are using open educational resources to Qualified NET SET exam and its usage is going to increase in future so library professionals should come for NET SET in Library Science. Open educational resources should be used.

References:

1. Bachalapur, M. M., & Hugar, J. G. (2021). Librarians awareness on Open Educational resources in India. *Library Philosophy and Practice(E Journal)* , 7-8.

2. Crozier, H. (2018). Promoting Open Access and Open Educational resources to faculty. *Serials Librarian 74(1-4)* , 145-150.

3. Dill, E., & Cullen, M. A. (2020). Introduction: Open Educational Resources and the Academic Library. *Library Trends 69(2)* , 335-342.

4. Isha, A. I., Ibrahim, M. A., Onojah, A. A., & Onojah, A. O. (2020). Undergraduates' Attitude towards the Utilization of Open Educational . *International Journal of Technology in Education and Science* , 227-234.

5. Kayal, S., & Das, B. (2017). E-learning system of Asia through open courseware (OCW) and educational resources (OER) for universal access to knowledge and information. *International Journal of Web-Based Learning and Teaching Technologies, 12(2)* , 43-54.

6. Rowell, & Janet, L. (2015). Students Perceptions: Teaching and Learning with Open Educational Resources. *Electronic Thesis and Dissertations* .

7. Upneja, S. (2020). Contribution of Library Professionals and Libraries in Open Educational Resources in Indian Scenario. *DESIDOC Journal of Library & Information Technology* , 97-103.

8. Yuan, L., MacNeill, S., & Kraan, W. (2008). Open Educational Resources - Opportunities and Challenges Hor Higher Education. *Educational Cybernetics:Reports* , 38-42.

9. https://sites.google.com/site/assmlibrarymedha/netset-guidance?authuser=0

10. https://analytics.google.com/analytics/web/?authuser=4#/p304374413/reports/intelligenthome

Transformation of College Libraries from traditional to Digital: A study on the impact of library user community

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ABSTRACT: Libraries are for the storage of knowledge and the sharing of resources with society. It helps to develop the workforce and local economy in society. Sustainability is a continuous process. Libraries play an important role in acting as a promoter of knowledge and building a sustainable environment. The present study examines the availability and usage of electronic resources in the college libraries of Assam. It also wants to know the digitized collections in their digital library. The study concluded that 52.23% of respondents are familiar with the term open educational resources. On the other hand, the remaining 47.77% are not familiar with the term open educational resources. Again, 46.37% of respondents used N-LIST, followed by 9.78% of respondents used DELNET. Similarly, 17.03% of respondents used NCERT e-Textbooks and DIKSHA. Moreover, 51.12% of respondents can access e-resources remotely. Again, the remaining 48.88% of respondents cannot access e-resources remotely. The government and organizations take initiatives to contribute more important syllabus-based e-resources on consortiums, and library users should be trained in advanced search strategies and the use of controlled vocabulary to make the search process easier for them.

The study helps to promote sustainable collective development in libraries; all libraries use electronic resources. It is the positive impact of environmental sustainability. It helps reduce paper and trees in our environment. Although we are using both print and electronic resources, it helps balance our environment..

Introduction

Libraries play an important role in sharing knowledge to build a sustainable environment. Libraries are taking initiatives to take the balancing of the environment. The National Forest Policy of India, 2021 reported that 24.62% of the geographical area is covered by trees and forest in our country India. To increase the percentage, we librarians promote electronic resources as well as print resources. Electronic resources reduce the cost of paper and reduce the trees for printing

the resources. E-resources have many advantages they can reduce papers, costs, multiple access, easy to access, and remote access through the internet. Some of the most used e-resources are e-books, e-journals, e-magazines, e-newspapers, e-thesis, e-dissertations, etc. The most important advantage of digital objects is easy to access. Digital objects can be posted easily in digital libraries, software, and websites allowing anyone to retrieve the documents from the internet. It reduces the physical space of the library. Now, there are many open educational resources on the internet. We can access open education resources freely such as NCERT e-Textbooks, e-Gyankosh, NDLI, Shodhganga, DIKSHA, etc. Now, the college libraries of Assam are subscribed to NLIST. NLIST provides 6000+ journals and 1, 99, 500+ e-books. E-resources are becoming popular day by day because they are more up-to-date and can be accessed from anywhere at any time across the world. It also saves the time of the reader. The usage of e-resources has exponentially enlargement in higher education last 10 years. An institutional repository is the intellectual output of an institution. It includes journals, magazines, reports published by teachers and students, research publications of teachers and students, question papers etc which are stored in electronic form.

Literature Review:

Katabalwa (2016) surveyed the postgraduate students at the University of Dares Salaam, to assess the use of electronic journal resources. The researcher concluded that all respondents are using electronic journal resources for various purposes, including working on assignments, research proposal writing, literature review, research report writing, current awareness, leisure, and extra exploration of ongoing scientific debates through peer-reviewed papers.

Kaur and Kathuria (2016) conducted a survey method in the Punjab Agricultural University Library and concluded that electronic resources have become an integral part of the information for various features such as easy download and fast searching capability. Electronic resources have eased the task of research, and respondents still prefer information in both print and electronic formats.

Navarrete, Mora, and Penafiel (2016) have conducted a case study and explored the feasibility of using OERs to supplement e-learning environments for higher education in computer science. Moreover, the research paper highlights the main barriers and opportunities derived from adopting OERs in e-learning environments.

Saha and Padhan (2019) describe the green library and its impact on the environment in the present time. The researcher discussed green libraries in

the USA and green initiatives. The paper also focuses on the importance of green libraries, the structure of green buildings, and the role of initiatives like IGBC, UNDP, and LEED.

Anuradha (2020) described the status of digital library initiatives in India. The study found that the physical condition of selected digitized documents is good, and funding for developing digital libraries is provided by the state or central government. Regular backup of original digital content, copyright issues, funding, and lack of security are the challenges of the digital library. Most users regularly access digital content. Digital materials are found to be relevant and easy to access and use.

Objectives of the study:

- To observe the availability of e-resources of Dibrugarh and Guwahati University affiliated colleges in Assam.
- To explore the awareness of e-resources among the students of selected colleges in Assam.
- To know the digital library collections of Dibrugarh and Guwahati University affiliated colleges in Assam.
- To identify the usage patterns of e-resources among the students of selected colleges in Assam.

Research Methodology:

The current study was based on a survey method and carried out in the affiliated colleges of Dibrugarh and Guwahati University which was established on or before 1960. For collecting the primary data of affiliated colleges, a self-administered questionnaire was circulated randomly to 20 students for each college.

S. N.	Name of the College	Established Year	Affilation University
1.	Madhab Choudhury College	1939	Gauhati University
2.	Biswanath College	1960	Gauhati University
3.	Abhayapuri College	1955	Guwahati University
4.	Mangaldoi College	1951	Gauhati University
5.	Bholanath College	1946	Gauhati University
6.	Bilasipara College	1960	Gauhati University

S. N.	Name of the College	Established Year	Affilation University
7.	Dibrugarh Haumanbax Surajmall Kanoi (DHSK) College	1945	Dibrugarh University
8.	Dibrugarh Hanumanbux Surajmal Kanoi (DHSK) Commerce College	1960	Dibrugarh University
9.	Goalpara College	1955	Gauhati University
10.	Debraj Roy College	1949	Dibrugarh University
11.	Lumding College	1959	Gauhati University
12.	Devicharan Barua Girls College	1955	Dibrugarh University
13.	Chandra Kamal Bezbaruah College	1959	Dibrugarh University
14.	Nanda Nath Saikia College	1959	Dibrugarh University
15.	B. Barooah College	1943	Gauhati University
16.	Handique Girls' College	1939	Gauhati University
17.	Pragjyotishpur College	1954	Gauhati University
18.	Anandaram Dhekial Phookan College	1959	Guwahati University
19.	Nalbari College	1945	Guwahati University
20.	Gargaon College	1959	Dibrugarh University
21.	Darrang College	1945	Gauhati University
22.	Tinsukia College	1956	Dibrugarh University

Data Analysis and Discussions:

Analysis of Data:

The surveyed data of the respondents is organized, evaluated, and tabulated by using statistical methods such as figures, tables, and percentages in the following sections:

Table 1: Percentage of Questionnaire Respondents

Questionnaire Respondents	Number of Respondent	Percentage
Respondents	358	81.36
Non-respondents	82	18.64
Total	440	100

Table 1 displays the information about questionnaires distributed to the user. It is observed from the table that, out of 440 respondents, 358 (81.36%) filled questionnaires were received from the respondents. Again, 82 numbers (18.64%) of respondents did not fill up the questionnaires.

Table 2: Gender-wise distribution of Respondents

Gender	Number of Respondents	Percentage
Male	194	54.19
Female	164	45.81
Total	358	100

Table 2 gives brief information on respondents' gender categories. The table describes that 194 (54.19%) of respondents are male. Again, 164 (45.81%) of the respondents are female.

Table 3: Age-wise distribution of Respondents

Age Group	Number of Respondents	Percentage
15-18	98	27.37
19-22	258	72.07
23-26	02	0.56
Total	358	100

Table 3 shows the user's age starting from 15 to 18 years age group. However, the highest number of respondents 258 (72.07%) fall under the 19-22 age group. Again, 98 (27.37%) fall under the15-18, remaining 02 (0.56%) fall under the 23-26 age group.

Table 4: Availability of e-resources in Library

Availability of e-resources collection	Number of Respondents	Percentage
Yes	216	60.34
No	142	39.66
Total	358	100

The survey findings as shown in Table 4, 60.34% of respondents found e-resources collections are available in their libraries. Again, the remaining 39.66% are not found in available e-resource collections in libraries.

Table 5: Availability of different Types of library e-resources

S.N.	Indicators	Yes (No. of Libraries)	No (No. of Libraries)	Percentage
1	NLIST Program in Library	22 (100)	0 (0)	22 (100)
2	Website	22 (100)	0 (0)	22 (100)
3	Available OER Links in Library Website	15 (68.18)	7 (31.82)	22 (100
4	NLIST Link	15 (68.18)	7 (31.82)	22 (100)
5	Digital Library Link	13 (59.10)	09 (40.90)	22 (100)

Table 5 shows that all college libraries (100%) have the NLIST Program and library have library website. Again 68.18 % are given links to the OER and NLIST program on their library website. On the other hand, 31.82 % are not given links to the OER and NLIST program on their library website. 59.10% of libraries have digital library links on their website, on the other hand, 40.90% of libraries do not have any digital library links on their websites.

Table 6: Digital Library Collection available on the Website

Sl. No.	Name of the College	Digital Library	Collections
1	Madhab Choudhury College	Yes	Collections not accessible
2	Biswanath College	No	0
3	Abhayapuri College	Yes	Collections not accessible
4	Mangaldoi College	No	0
5	Bholanath College	Yes	703

Sl. No.	Name of the College	Digital Library	Collections
6	Bilasipara College	Yes	Collections not accessible
7	Dibrugarh Haumanbax Surajmall Kanoi (DHSK) College	Yes	162
8	Dibrugarh Hanumanbux Surajmal Kanoi (DHSK) Commerce College	Yes	188
9	Goalpara College	Yes	1159
10	Debraj Roy College	Yes	44
11	Lumding College	No	0
12	Devicharan Barua Girls College	No	0
13	Chandra Kamal Bezbaruah College	No	0
14	Nanda Nath Saikia College	Yes	62
15	B. Barooah College	Yes	Collections not accessible
16	Handique Girls' College	No	0
17	Pragjyotishpur College	Yes	349
18	Anandaram Dhekial Phookan College	Yes	1895
19	Nalbari College	No	0
20	Gargaon College	Yes	837
21	Darrang College	No	0
22	Tinsukia College	No	0

Table 6 indicates that Anandaram Dhekial Phookan College has the highest 1895 digitized collections in the digital library. This is followed by Goalpara College, which has 1159, Gargaon College, which has 837, Bholanath College, which has 703, Pragjyotishpur College which has 349, D. H. S K Commerce College, which has 188, DHSK College, which has 162, N. N. Saikia College, which has 62, and DR College, which has 44 digitized library collections in the digital library.

Table 7: Accessing e-resources remotely in the Library

Remotely accessing e-resources	Number of Respondents	Percentage
Yes	183	51.12
No	175	48.88
Total	358	100

Table 7 indicates that 51.12% of respondents can access e-resources remotely. Again, the remaining 48.88% of respondents cannot access e-resources remotely.

Table 8: Familiarity with Open Educational Resources

Understanding and familiarity with the OER	Number of Respondents	Percentage
Yes	187	52.23
No	171	47.77
Total	358	100

Table 8 found that 52.23% of respondents are familiar with the term open educational resources. On the other hand, the remaining 47.77% are not familiar with the term open educational resources.

Table 9: Usage of Consortia by Respondents

Usage of Consortia	Number of Respondents	Percentage
Yes	161	44.97
No	197	55.03
Total	358	100

Table 9 depicts that, 55.03% of respondents do not use consortiums in libraries. Likewise, the remaining 44.97% of respondents use consortiums in libraries.

Table 10: Usage of OER by Respondents

S.N.	Types of OER	Number of Respondents	Percentage
1	NPTEL	23	5.66
2	IGNOU e- Gyankosh	35	8.64
3	e-PGpathshala	31	7.65
4	NCERT e-Textbooks	69	17.03
5	NDLI	24	5.92

S.N.	Types of OER	Number of Respondents	Percentage
6	DIKSHA	69	17.03
7	VIDWAN	24	5.92
8	SWAYAMPRABHA	25	6.17
9	NIOS	24	5.92
10	Not used	82	20.24
Total		405	100

Here, respondents are allowed to choose more than one option. Table 10 shows that the highest users 20.24% do not use Open Educational Resources. This is followed by 17.03% of respondents using NCERT e-Textbooks and DIKSHA, 8.64% of respondents using IGNOU e- Gyankosh, 7.65% of respondents using e-PGpathshala, 6.17% of respondents using SWAYAMPRABHA, 5.92% of respondents using NDLI, NIOS and VIDWAN respectively. And the remaining respondents (5.66%) used NPTEL.

Table 11: Usage of different consortia by Respondents

S.N.	Types of Consortia	Number of Respondents	Percentage
1	N-LIST	166	46.37
4	DELNET	35	9.78
6	Not used	157	43.85
Total		358	100

Here, respondents are allowed to choose more than one option. Table 11 displays that, 46.37% of respondents used N-LIST, followed by 9.78% of respondents used DELNET. On the other hand, the remaining 43.85 % of respondents had not yet used consortia.

Conclusion:

Librarians are directly related to our society by providing the required information resources to the user and helping to educate the citizens of the country to be aware of the use of environmental resources. In the area of collection development College libraries have shifted from print resources to electronic resources. Libraries have invested larger amounts of budget in procuring electronic resources. The study shows that 52.23% of respondents are familiar with the term open educational resources. On the other hand, the remaining 47.77% are not familiar with the term open educational resources. Again, 17.03% of respondents used NCERT e-Textbooks and DIKSHA Similarly, 46.37% of respondents used N-LIST, followed

by 9.78% of respondents used DELNET. On the other hand, the remaining 43.85 % of respondents had not yet used consortia. Moreover, 51.12% of respondents can access e-resources remotely. Again, the remaining 48.88% of respondents cannot access e-resources remotely. Likewise, 60.34% of respondents found e-resources collections available in their libraries. Again, the remaining 39.66% of users did not find available e-resource collections in libraries. The government and allied organizations should take the initiative to contribute more important syllabus-based e-resources on consortiums, and library users should be trained on advanced search strategies and the use of controlled vocabulary to make the search process easier for them. The government should provide more funds for subscriptions to more e-resources through consortia and college libraries to procure more e-resources for students and teachers benefits of higher educational institutes.

References:

1. Anuradha, R. (2020). *Developing digital collection challenges and implications Indian experiences* [Doctoral dissertation, Andhra University]. Retrieved from https://shodhganga.inflibnet.ac.in/handle/10603/367707.

2. Katabalwa A S, (2016). Use of Electronic Journal Resources by Postgraduate Students at the University of Dares Salaam. *Library Review*,65(6/7), 445 - 460. https://doi.org/10.1108/LR-11-2015-0108.

3. Kaur K and Kathuria K, (2016). Awareness and Use of E-Resources: A Case Study of Mohinder Singh Randhawa Punjab Agricultural University Library, Ludhiana. *DESIDOC Journal of Library & Information Technology*, 36 (6), 396-404. doi: http://dx.doi.org/10.14429/djlit.36.6.9460.

4. Navarrete, R., Mora, S. L., Penafiel, M. (2016). *Use of Open Educational Resources in E-learning for Higher Education.* Paper presented at the 3rd International Conference on e-Democracy & e Government (ICEDEG 2016). Retrieved from https://www.desarrolloweb.dlsi.ua.es/oer/use-open-educational-resources-e-learning-higher-education.

5. Saha, P. & Padhan, H. (2019). Green Libraries Effect to the Academic Institutions: A Special Study on US Based Libraries. *Library philosophy and practice*. Retrieved from https://www.questia.com/library/journal/1P4-2234442466/green-libraries-effect-to-the-academic-inastitutions.

6. Saikia, S. (2019) Awareness and Usage of Electronic Resources among Humanities and Social Sciences Research Scholars of Central Library, Tezpur University: A Survey. *JIM - Journal of Information Management, 6*, (2): 86-95. Retrieved from https://splpjim.org/wp-content/uploads/2020/03/3.-JIM-Vol.-62-2019-2.pdf.

Transforming Academic Library Services in Digital Age

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ABSTRACT: This article assesses the role of Information Technology in transforming academic library services. The digital transformation process includes people, processes, technology and vision. The Digital University continuously uses digital technology to create new sources of value for university communities and improve operational flexibility to achieve excellence in digital operations. Academic libraries are adept tasks such as digital creation, preservation, archiving and more because they have an early adopter mindset. Therefore, academic libraries play a crucial role in the digitization. In fact, libraries should act as hubs for digital transformation.

Introduction

In the general structure of libraries, which includes national, general and special libraries, academic libraries form a separate group. A college or university and its functioning largely depend on its library. Academic libraries play a key role in providing access to information. Librarians and the library management industry have witnessed the evolution of libraries from manuals to virtual and cloud libraries. The revolutions brought with them many changes in both work needs and professional activities. In the age of technology**,** libraries are evolving in three ways. First, conventional considerations are changing. This means that libraries today use a variety of software for everything from acquisition to distribution. The most important tool is to know these management programs. Second, libraries must adapt their approach to providing information services. Libraries must create digital databases necessary for the information needs of users. Librarians must develop database construction and data mining skills to

identify digital content relevant to users' needs. Third, the modern information society is a competitive and science-based society. Adapting to a rapidly changing world where librarians are expected to do a different job than before also presents obstacles for the library. With the wider use of information and communication technology**,** the information society is moving from the industrial age to the information age. Library professionals must adapt their practices and use of information and communication technology to keep pace with developments. The libraries revolutions changed different phases of libraries such as: temple libraries, manuscript libraries, paper and print libraries, micro-format libraries, electronic libraries, digital libraries, virtual libraries, online libraries and cloud libraries etc**.** The application of the technology that was used at the time is mainly to blame for this development. Because library management depends on the development and use of technology, librarians are constantly faced with new staff and financial difficulties. By assigning roles and preparing staff to remain in the field, librarians can effectively manage transitions. The impact of the changes can be seen mainly in the following areas: collection development, staff, library services, content management, finance, library organization and profession.

Academic Libraries:-

An academic library is a library that serves the learning and research needs of students, faculty, and staff. Resources for student work and class reading are necessary to support learning**.** The academic library of the information age is a learning experiment, where there are many information resources in all forms and their necessary infrastructure is available and important for research. Because no library can contain everything, academic libraries must choose which priority areas to focus on in collection development. These collections, often the basis of a special collection, may contain unique writings, works of art, and objects created or written by a single author or on a particular subject.

Digital Transformation of Libraries:-

The first attempts to digitize the library date back to Paul Otlet and Henri La Fontaine in 1895(1). He began to systematically classify all human information, but the development of the digital library followed the growth of the Internet. The main advantage of a digital library is that millions of people can simultaneously access its digital collection through the web. Since the mid-1990s, India and the creation of digital libraries have been seen as a preserver of artistic culture and heritage. India ratified UNESCO's Universal Declaration of Cultural Diversity,

overwhelmingly adopted by the organization and its General Conference at its 31st session on November 2, 2001,(7) to improve access to the many cultural resources available throughout the country. Early programs were based on an electronic map catalog known as OPAC (Online Public Access Catalog) in the 1980s. OPAC has increasingly replaced the traditional card catalog in academic, public, and special libraries. As a result, libraries were able to promote resource sharing and increase the availability of library resources outside the purview of traditional libraries.

Transformation in Libraries from Past to Present:-

The earliest written records were written on clay tablets in the form of cuneiform script. Some of these records were found in the temple halls of Sumer as far back as 2600 BC. The clay tablets came in a range of sizes and shapes and were about one inch thick. Wooden frames were filled with mud-like clay and leveled for writing, then allowed to dry until moist. After writing, the clay was dried in the sun, or baked in the kiln for a rougher finish. The tools used by librarians on a daily basis have changed significantly in recent years. Very few libraries are as they were just a few years ago, in addition to more traditional tools such as card catalogues or microfiche readers. Most libraries now have online public access catalogs (OPACs), public PCs (CD-ROM drives), scanners or public terminals with an Internet connection. Increasingly, libraries are creating home pages on the Internet to enable users to access a wide range of services without going into the library. Many libraries are switching from a traditional library to a digital library. Libraries now provide full-text materials, not just information (print and electronic). In addition to contemporary publications, many historical library collections are being digitized (Corbin and Coletti, 1995). Without compromising sensitive documents, these electronic records allow anyone, anywhere, any time to review information. Despite numerous digitization initiatives, printed content continues to outperform electronic media. There is still a significant amount of paper in our libraries and we hope that this will continue for some time. As electronic publishing continues to evolve alongside, rather than instead of, the print library, the print library will coexist with the digital library for the foreseeable future. The idea of a library has long since grown beyond an actual physical structure. Access to sources outside the library has always been part of our offering. Over the years, librarians have worked together in various capacities. Only a few instances of resource sharing include central cataloguing, union lists of journals, cooperative collection creation, and interlibrary loan. Collaboration and reciprocal services among libraries allow us to offer a considerably wider variety of resources to our patrons and meet their information needs more quickly, affordably, and effectively.

Transformation of libraries in Changing Environment:-

In the modern era, academic libraries have evolved to extend their reach beyond their physical boundaries. They now offer online platforms that provide open access to knowledge, utilizing advanced internet sharing tools, social networking, and communication technology. Academic library staff members should possess the ability to support diverse and global university student bodies, in addition to fulfilling their regular duties. In addition, it is imperative for library staff to remain cognizant and open-minded towards the requirements of foreign students utilizing the library. Their utmost duty is to ensure these students receive an equivalent level of service. Academic library staff is encountering fresh hurdles as the realm of international education undergoes rapid growth. These hurdles compel them to focus on developing their skills and constantly striving for improvement. The goal is to offer library services and programs that are both impactful and interactive, capable of adapting to various needs and cultural perspectives.

Systems like the National Student Survey (2) are increasingly being used to gather metrics of student satisfaction, which have a direct impact on university league tables and the quality of services provided. Libraries, alike many other departments within institutions, are required to adjust to this customer-centric approach and vie with each other for resources. The methods of providing libraries for distance-learning students, whether they are domestic or international, and their varied learning environments, need to undergo significant transformation from the traditional on-campus approaches used for online learning and teaching, including MOOCs. Efficient libraries must remain attentive to the crucial role they play in supporting academic institutions' learning and scholarly activities. Library services can now be co-produced by both the library employees and the communities they serve. This new approach replaces the outdated system of one-way service. The library's corporate website has undergone a transformation, embracing a more interactive and engaging online environment through the incorporation of modern Web 2.0 tools such as RSS feeds, social networking sites like Face book, audio and video podcasting, and blogging. In the past, the library's corporate website mainly consisted of fixed, informative content that offered directions and descriptions of the library's internal and external services.

Online Public Access Catalogue:-

The library card catalogue has proven to be an incredibly versatile and long-lasting technology throughout history. Most libraries made use of a bound catalogue or shelf list. Although the books were listed in the order they were found on the shelf,

this approach had one drawback. The development of the first contemporary card catalogue made for readers can be credited to Ezra Abbot at Harvard. In 1868, Charles Cutter, his associate, became the librarian at the Boston Athenaeum and introduced a groundbreaking new method. The Library of Congress classification scheme was ultimately founded upon this system.

The entire collection of resources and materials of a specific library can be found in an online database referred to as an online public access catalogue, or OPAC. It operates in a similar manner to a card catalogue and can be accessed through a computer or any other electronic device. Online public access catalogs (OPACs) have the potential to replace traditional card catalogs, simplifying resource retrieval for library patrons.

The database allows users to efficiently and comprehensively search for the information, resources, books, literature, and other materials they require electronically. One of the distinguishing characteristics of an online public access catalogue is its user-friendly nature and accessibility to all users. This means that the system can be accessed by anyone, irrespective of their age, social standing, or even their level of computer knowledge.

Artificial Intelligence and Technologies-

It is a very broad topic that spans many fields, including computer science, cognitive science, mathematics, philosophy, neurology, and linguistics. Until now, the goal of the artificial intelligence community has been to simulate intelligent behavior through computer programs. Systems that act like humans, think rationally, and think and behave like humans are all examples of artificial intelligence. As argued by Hintze (2016). Artificial intelligence has also been used in libraries in the form of chat bots that can help provide directions about the library website, notify staff and borrowers of a book's due date, direct users to useful library resources, or answer brief questions. The use of digital technology has fundamentally changed our world. Big Data, Block chain, Could Computing, Robotic Technology, Internet of Things and other advanced technologies are what build the digital environment of academic libraries.

Causes of Transformation:-

Traditional libraries are changing as a result of the use of ICT and other approaches in various library activities. Libraries plays roles may have remained the same, but the climate and management of digital content has changed. The main change

appears in the library publishers, greater participation in activities related to the creation of information products such as indexes, guides, advanced summaries and bibliographies, guides and syntheses of information content. With the use of digital technology, analysis**,** synthesis and compression processes are significantly expanded. Information systems evolve along with the digital environment, and various search techniques are sought in data warehouses. A profound change in information, management, organization and collection.

Libraries must be transformed or re-engineered mostly because of the following reasons

- ❖ Information overload and information explosion
- ❖ Increased research and development in all industries
- ❖ Different needs and requirements of readers
- ❖ budget constraints ICT applications
- ❖ In all fields Free online and digital
- ❖ Sources of information are readily available

Components of Transformation:-

The following trends are mainly responsible for the development of the library system:

- Computer and communication technology
- Barcode**,** RFID and smart card technology
- Website and Internet Technology
- Library automation
- **Networking** of libraries and information resources
- Social networks **(**blogs, Face book, Twitter, applications, Skype, Wikipedia), etc.

Requirements of Users from Transforming Libraries:-

Students, educators, scientists, researchers, managers, technical assistants, administrative staff, engineers, medical professionals and private individuals are the daily purchasers of academic libraries. Users searching for records are roughly aligned with research difficulty, providing new records using data already triggered. Library staff is well trained and provide people with more successful and efficient access to archives. Wi-Fi compatible Internet records must be available in the library 24 hours a day for the use of the college and teaching staff**.** ACM Digital

Library, ASCE Journals, ASTM Standards and Digital Library, EBSCO Databases, Elsevier Science Direct, Emeralds e Books, IEEE/IEE Electronic Library and McGraw-Hill Access Engineering are just a few examples of online journals that businesses subscribe to various publishers to familiarize themselves with articles written by researchers. In an age of globalization and competition, libraries must purchase online journal subscriptions. Inspect, MathSci net, Sci Finder Scholar, Scopus Databases and Web of Science are some bibliographic databases.

Role of Librarians in Digital Era-

The academic library functions discussed in the above discussion are managed by librarians. Therefore, academic librarians are expected to have a variety of technological skills to provide services to students. Information literacy is necessary because of this. When we talk about teaching information literacy in the digital age, we mean teaching skills that include computer skills. There are many resources available to students today. Their dependence on technology is increasing day by day. A school, college or university library is called an academic library. Many companies also have internal libraries. Researchers,teachers, students and working individuals. They need the latest information in their field. The library is a priority for users due to the high cost of books, time and space constraints, and availability of resources. Each institute has a large print collection, but due to collection and fragmentation, users cannot access the information. It is the responsibility of librarians to develop versatile methods for rapid resource retrieval in order to utilize resources as much as possible. Librarians act as a bridge between students and teachers in the classroom. They help users find books in stacks, guide users to use the library and OPAC for time saving and easy searching, and help students find the information they need.

Conclusion:-

The popularity of the Internet and related technologies has grown rapidly and created a whole new way for consumers to access better information services and resources. In the future, librarians can reposition themselves, think creatively, and adopt new technological capabilities to provide services and resources that best utilize their strengths in structuring and organizing materials. A digital or virtual library connects users to materials through technology and networks, with the goal of giving everyone access to these libraries. In general, there are transparent links between different digital libraries and information services. Digital libraries are a methodical way of collecting, organizing, storing and sharing information

in digital form. For the most part, they are an effective way of disseminating information throughout society.

References:-

1. Anuradha, P.(2018). Digital transformation of academic libraries: Opportunities and challenges. IP Indian Journal of Library Science and Information Technology, January-June, 2018;3(1):8-10 https://en.wikipedia.org/wiki/National_Student_Survey

2. Berube L (2011) *Do You Web 2.0?: Public Libraries and Social Networking*. Chandos Publishing: Oxford.

3. Branin, J., Groen, F., & Thorin, S. (2000). The Changing nature of collection management in research libraries. Library Resources and Technical Services , 44 (1), 23-32.

4. Creed-Dikeogu G and Clark C (2013) Are you MOOC-ing yet? A review for academic libraries. *Kansas Library Association College and University Libraries Section Proceedings*; **3** (1): 9–13.

5. Ngoaketsi, J., Salawu, Y.K. & Tella, A. (2021): Digital Environment in Academic Libraries: Leveraging on Advanced Information Communication Technologies for Better Service Delivery. Proceedings of the Accra Bespoke Multidisciplinary Innovations Conference. University of Ghana/Academic university college,Accra,Ghana. 179-194.

6. Mintu Halder (2021).Transforming Academic Libraries for the Changing Environment.*ZENITH International Journal of Multidisciplinary Research. 11(5),* 16-25.

7. Journal of Emerging Technologies and Innovative Research (JETIR) December 2022, Volume 9, Issue 12 www.jetir.org (ISSN-2349-5162)

Prolific Digital Transformation of Libraries for Dynamic Information Services Sustainability

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ABSTRACT: The rapid advancement of digital technologies has revolutionized the way information is accessed, shared, and preserved. Libraries, as custodians of knowledge, are at the forefront of this transformation. This paper examines the pivotal role of digital transformation in libraries, focusing on its impact on the sustainability of dynamic information services. By harnessing the power of digital tools, libraries can enhance accessibility, relevance, and longevity of information resources, ultimately contributing to the broader goals of education, research, and community development. This paper provides a comprehensive overview of the challenges and opportunities associated with digital transformation in libraries and offers practical strategies for ensuring the sustainability of dynamic information services in the digital age.

1. Introduction

In an era characterized by unprecedented technological advancement, libraries find themselves at a critical juncture in their longstanding mission to disseminate knowledge and serve as bastions of learning. The advent of digital technologies has ushered in a seismic shift, redefining the essence of libraries and the services they provide. This paper delves into the imperative for libraries to embark on a prolific digital transformation journey, reshaping their identity as dynamic information service providers in the digital age. It is imperative to recognize that this transformation is not merely an option; rather, it is an unequivocal need dictated by the evolving landscape of information access, consumption, and preservation.

The role of libraries as repositories of human knowledge has been a linchpin of civilization for centuries. Traditionally, they stood as sanctuaries of printed volumes, custodians of manuscripts, and havens for scholars and seekers alike. Yet, in recent decades, the relentless surge of digital technologies has upended the traditional paradigm, necessitating a profound reimagining of the library's purpose and potential. This transformation is not confined to mere digitization, but rather, it encompasses a holistic recalibration of libraries' fundamental ethos to align with the dynamic, interconnected digital ecosystem that defines the contemporary world.

1.1 Digital Transformation in Libraries: A Paradigm Shift

The heart of this transformation lies in the evolution from physical repositories to dynamic digital information hubs. This shift signifies a radical departure from the constraints of physical space and territorial limitations. Libraries, once tethered to the confines of bricks and mortar, now extend their reach across geographical boundaries, offering a wealth of knowledge to a global audience. Digital collections, with their inexhaustible capacity and accessibility, serve as a testament to the boundless potential of this transformation. Moreover, the integration of interactive and multimedia content elevates the library experience, enabling a depth of engagement that was previously unimaginable.

1.2 Challenges in Prolific Digital Transformation:

However, this transformation is not devoid of challenges. Technological infrastructure and resource allocation emerge as paramount concerns. Libraries grapple with budgetary constraints, necessitating strategic allocation of resources to maximize impact. Staffing and training pose another critical challenge, demanding a workforce equipped with the requisite skills to navigate the complexities of digital technologies. Additionally, the integration of legacy systems, which have long been the backbone of library operations, requires careful consideration to ensure a seamless transition.

Moreover, ethical considerations loom large on the path of transformation. Issues surrounding data security, privacy, and the responsible utilization of emerging technologies demand scrupulous attention. As libraries become increasingly reliant on digital platforms, safeguarding the integrity and confidentiality of sensitive information becomes an ethical imperative.

1.3 Strategies for Sustainable Dynamic Information Services:

In navigating these challenges, libraries must adopt strategic imperatives to ensure the sustainability of dynamic information services. Collaborative partnerships and consortia emerge as powerful tools for resource sharing and negotiation of licensing agreements. By leveraging the collective strengths of institutions, libraries can amplify their impact and expand their offerings. Embracing user-centric design principles empowers libraries to tailor services to the specific needs and preferences of their patrons, enhancing user satisfaction and engagement. An agile approach to management, characterized by iterative development and a feedback-driven ethos, equips libraries to adapt swiftly to the ever-evolving technological landscape.

2. The Evolution of Libraries in the Digital Age:

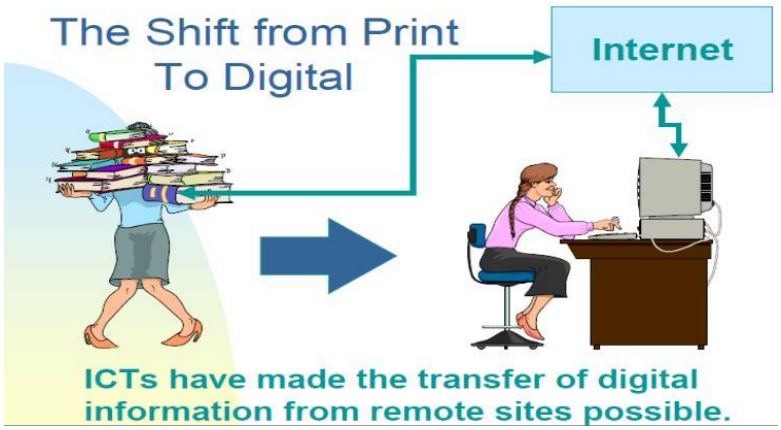
The digital transformation in libraries represents a profound shift in how libraries operate, serve their communities, and provide access to information and knowledge. It encompasses a wide range of technological advancements and changes in practices that have revolutionized the traditional role of libraries in society.

Key Aspects of Digital Transformation:

2.1. From Print to Digital Collections:

Digital Acquisition Strategies: Libraries have shifted from primarily acquiring physical books and materials to incorporating digital resources. This includes e-books, e-journals, online databases, and digital archives.

Cataloging and Metadata Management: Libraries have implemented advanced cataloging systems to effectively organize and retrieve digital materials. Metadata standards have become crucial in ensuring accurate and efficient search and discovery of digital content.



Source: https://www.lisedunetwork.com/impact-of-ict-in-library-and-society/

Figure 1: The shift from print to digital

2.2 Ubiquitous Access: Overcoming Geographical Boundaries:

(a) **Remote Access and Online Catalogs:** Digital libraries provide users with the ability to access resources from anywhere with an internet connection. Online catalogs and databases offer search and browsing functionalities, enabling users to find and borrow materials remotely.



Source: https://www.iitms.co.in/library-management-system/online-public-access-catalogue/

Figure 2: Online Public Access Catelogue

(b) **Virtual Libraries and Mobile Apps:** Many libraries now offer virtual library platforms and mobile applications, allowing patrons to borrow e-books, access digital resources, and engage with library services on their devices.

2.3. Interactive and Multimedia Content:

(a) **Diversification of Content Types:** Libraries have expanded their collections to include multimedia resources such as videos, audio recordings, interactive simulations, and virtual reality experiences.

(b) **Enhanced Learning and Engagement:** Multimedia content provides opportunities for more interactive and immersive learning experiences. It caters to different learning styles and can be particularly effective in subjects that benefit from visual or hands-on demonstrations.



Source: https://images.app.goo.gl/ycHM7TCqxTyvqtWY8

Figure 3: Interactive and Multimedia Content

2.4 Data-Driven Decision Making:

(a) **Analytics and Usage Data:** Digital libraries utilize analytics tools to track user behavior, measure resource usage, and gather valuable insights into patron preferences and needs. This data-driven approach informs collection development, resource allocation, and service improvement strategies.

2.5 Technological Integration and Innovation:

(a) **Adoption of Emerging Technologies:** Libraries have embraced technologies like artificial intelligence, machine learning, virtual reality, and augmented reality to enhance services and user experiences.

(b) **Digital Preservation and Archiving:** Libraries play a crucial role in preserving digital heritage, ensuring that valuable digital resources and cultural artifacts are archived and accessible for future generations.



Source: https://images.app.goo.gl/1jpGUkJC9pXUczxH8

Figure 4: Digital Preservation and Archiving

3. Enabling Technologies for Digital Transformation in Libraries

Libraries have evolved significantly in recent years, adapting to the digital age and leveraging cutting-edge technologies to enhance their services and offerings. The adoption of various enabling technologies has played a pivotal role in this transformation. Here, we will delve into the impact of Cloud Computing and Virtualization, Big Data and Analytics, Artificial Intelligence and Machine Learning, as well as Blockchain and Distributed Ledger Technology on the modernization of libraries.

3.1 . Cloud Computing and Virtualization:

Cloud computing involves the delivery of computing services over the internet, providing on-demand access to a shared pool of configurable computing resources

(e.g., servers, storage, databases) that can be rapidly provisioned and released with minimal management effort. This technology has revolutionized library operations in several ways:

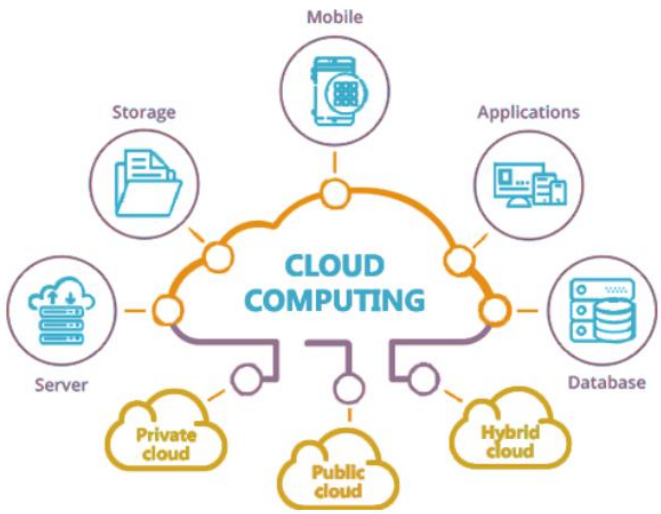
(a) **Scalability and Flexibility:** Libraries can scale their IT infrastructure up or down based on demand, reducing the need for significant upfront investments in hardware and software.

(b) **Cost-Efficiency:** Cloud computing reduces the total cost of ownership by eliminating the need for physical servers, reducing maintenance costs, and enabling pay-as-you-go pricing models.

(c) **Accessibility and Collaboration:** Cloud-based solutions allow library staff and patrons to access resources and services from anywhere with an internet connection, promoting collaboration and remote work capabilities.

(d) **Data Security and Redundancy:** Cloud providers often offer robust security measures and data redundancy, safeguarding against data loss and ensuring continuity of services.

(e) **Virtualization:** Virtualization allows multiple virtual machines to run on a single physical server, optimizing resource utilization and improving scalability.



Source: https://images.app.goo.gl/KsrnbLCA59qw94He6

Figure 5: Cloud Computing

3.2 Big Data and Analytics:

Libraries accumulate vast amounts of data, including circulation records, user behavior, resource utilization, and more. Big Data and Analytics technologies empower libraries to derive valuable insights from this data:

(a) **User Behavior Analysis**: Libraries can analyze user interactions with their digital resources to understand preferences, improve content curation, and enhance user experience.

(b) **Resource Utilization Optimization**: Data analytics can help libraries identify underutilized resources, enabling informed decisions about collection development and resource allocation.

(c) **Personalization**: By leveraging user data, libraries can offer personalized recommendations, tailored content, and targeted marketing campaigns to enhance user engagement.

(d) **Predictive Analytics**: Libraries can use predictive models to anticipate user needs, helping to streamline services and resource allocation.



Source: https://images.app.goo.gl/SMGeCfzk2GnaMRtD9

Figure 6: Big Data and Analytics

3.3 Artificial Intelligence and Machine Learning:

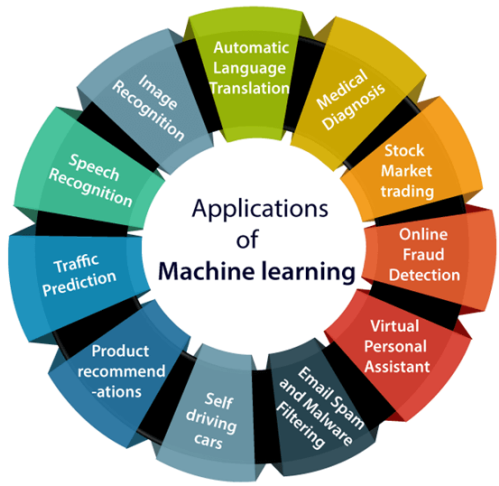
AI and Machine Learning technologies have transformed libraries by enabling automation, intelligent decision-making, and enhanced user experiences:

(a) **Natural Language Processing (NLP)**: NLP allows libraries to extract meaning from textual data, enabling functions like automated cataloging, sentiment analysis of user reviews, and chatbots for user assistance.

(b) **Recommendation Systems**: AI-driven recommendation engines suggest relevant resources based on user behavior, preferences, and historical data, improving discoverability.

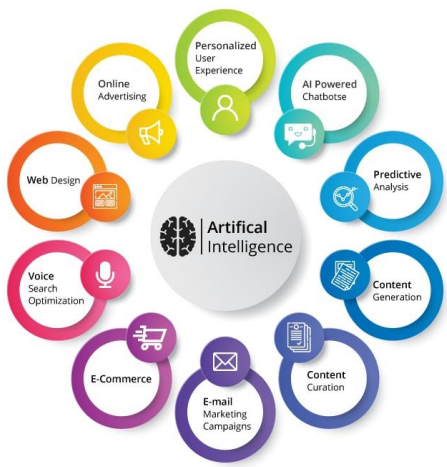
(c) **Automated Metadata Generation**: AI can assist in generating descriptive metadata for digital assets, enhancing discoverability and accessibility.

(d) **Cognitive Search**: AI-powered search engines can understand context and intent, delivering more accurate and relevant search results.



https://images.app.goo.gl/dp3u5YJCNF9KGGKT9

Figure 7: Application of Machine Learning



https://images.app.goo.gl/sqntcJ1m1cw4Rgs88

Figure 8: Application of Artificial Intelligence

3.4 Blockchain and Distributed Ledger Technology:

Blockchain and DLT offer secure and transparent ways to manage digital assets, transactions, and contracts within libraries:

(a) **Digital Rights Management (DRM)**: Blockchain can be used to manage copyright and licensing information for digital resources, ensuring compliance and tracking usage rights.

(b) **Provenance and Authenticity**: Libraries can use blockchain to establish the authenticity and origin of digital assets, crucial for preserving cultural heritage and rare materials.

(c) **Smart Contracts**: Smart contracts enable automated, self-executing agreements, streamlining processes like licensing, interlibrary loans, and access permissions.

4. Challenges in Prolific Digital Transformation:

4.1 Technological Infrastructure and Resource Allocation:

Digital transformation in libraries poses several challenges related to technological infrastructure and resource allocation. These challenges include:

(a) **Budgetary Constraints:**

One of the primary challenges in implementing a prolific digital transformation in libraries is the limited budgetary resources. Acquiring and maintaining advanced technology, software licenses, and digital content subscriptions can be costly. Moreover, libraries may need to allocate funds for staff training, cybersecurity measures, and ongoing maintenance and updates. Limited budgets can hinder the ability of libraries to invest in the latest technologies and keep up with evolving digital trends.

(b) **Staffing and Training:**

Introducing new digital technologies requires a workforce that is skilled and knowledgeable in their operation. Libraries may face difficulties in hiring or training existing staff to manage and operate complex digital systems. Training programs may be time-consuming and expensive, and librarians and support staff may need to adapt to rapidly changing technological environments. Additionally, recruiting specialized IT professionals who understand the unique needs of libraries can be a challenge, particularly for smaller institutions with limited hiring resources.

(c) **Legacy Systems and Integration:**

Many libraries still rely on legacy systems and software that may not be compatible with modern digital tools and platforms. Integrating these

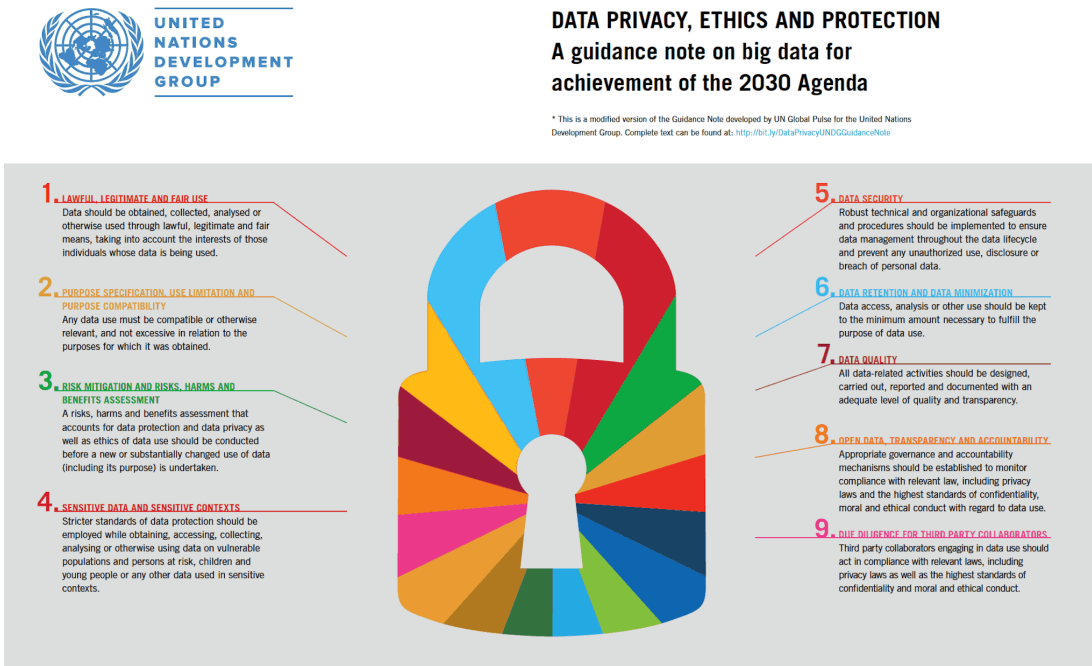
older systems with new technologies can be complex and time-consuming. It may require custom development or middleware solutions to bridge the gap between old and new systems. This can lead to additional costs and potential disruptions in library services during the transition period.

4.2 Data Security, Privacy, and Ethical Considerations:

Digital transformation also raises critical concerns regarding data security, privacy, and ethical considerations:

(a) **Intellectual Property Rights:**

Libraries must navigate the complex landscape of intellectual property rights when providing access to digital content. Licensing agreements, copyright restrictions, and fair use policies must be carefully managed to ensure compliance with legal and ethical standards. Libraries must also be vigilant in preventing unauthorized access and distribution of copyrighted materials.



Source: https://www.unglobalpulse.org/policy/privacy-and-data-protection-principles/

Figure 9: Data Security, Privacy and Ethical Considerations

(b) **Patron Privacy and Data Protection:**

As libraries increasingly rely on digital systems to collect and store patron information, safeguarding privacy becomes paramount. Libraries must implement robust data protection measures, including encryption, access controls, and secure storage practices. They must also establish clear policies for handling and disposing of sensitive patron data to comply with privacy regulations.

(c) **Ethical Use of Emerging Technologies:**

The adoption of emerging technologies, such as artificial intelligence and machine learning, in library services raises ethical concerns. Libraries must grapple with issues like bias in algorithms, transparency in decision-making processes, and ensuring that these technologies are used to enhance, rather than hinder, equitable access to information and services.

4.3 Accessibility and Inclusivity:

Ensuring that digital services are accessible and inclusive for all patrons is a fundamental challenge in the digital transformation of libraries:

(a) **Digital Divide and Accessibility Barriers:**

Not all patrons have equal access to digital resources. Factors like socio-economic status, geographic location, and physical abilities can create significant barriers to accessing digital content and services. Libraries must actively work to bridge the digital divide by providing resources and technologies that are accessible to all members of the community.

(b) **Multilingualism and Cultural Sensitivity:**

Libraries serve diverse communities with varying language preferences and cultural backgrounds. Ensuring that digital content is available in multiple languages and culturally sensitive is a challenge. Libraries must invest in translation services, multilingual interfaces, and curated collections that reflect the diversity of their user base.

(c) **Universal Design Principles:**

Designing digital interfaces and platforms that are user-friendly for individuals with disabilities is a critical consideration. Implementing universal design principles ensures that digital resources are accessible to patrons with visual, auditory, motor, and cognitive impairments. This may involve providing alternative formats, screen readers, captioning, and other accessibility features.



Source: https://www.dailybulletin.com/2022/09/23/pomona-library-to-receive-6-million-to-roof-other-upgrades/

Figure 10: Digital Accessibility and Inclusivity

5. Strategies for Sustainable Dynamic Information Services:

The digital transformation of libraries necessitates strategic approaches to ensure sustainable and dynamic information services. Key strategies include collaborative partnerships and consortia, user-centric design and personalization, and agile management with a focus on continuous innovation.

5.1 Collaborative Partnerships and Consortia:

(a) ***Collaborative Partnerships:*** Libraries are increasingly recognizing the importance of collaboration with external entities, such as other libraries, educational institutions, technology companies, and community organizations. By forming collaborative partnerships, libraries can pool resources, share expertise, and collectively address the challenges posed by the rapidly evolving digital landscape. Collaborative ventures can lead to cost savings, expanded access to diverse resources, and the development of innovative solutions.

(b) ***Consortia:*** Libraries can join consortia to amplify their impact. Consortia are alliances of libraries or institutions that work together to achieve common goals, such as negotiating better deals for electronic resources, sharing infrastructure, or coordinating collection development efforts. Participation in consortia enables libraries to leverage collective bargaining power, access a broader range of digital content, and benefit from shared technological infrastructure.

5.2 User-Centric Design and Personalization:

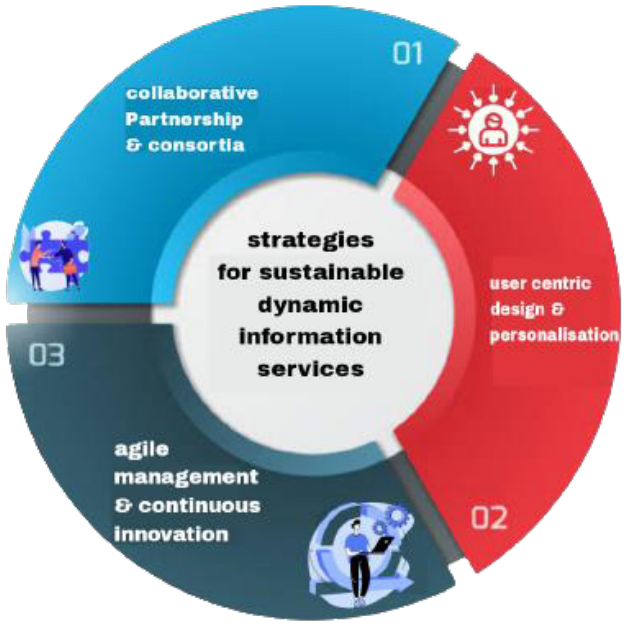
(a) ***User-Centric Design:*** The digital transformation of libraries necessitates a shift towards user-centric design principles. Understanding the needs, preferences, and behaviors of library users is crucial for developing digital interfaces, platforms, and services that are intuitive and user-friendly. User-centric design involves iterative testing, feedback loops, and a commitment to continuous improvement based on user experiences.

(b) ***Personalization:*** Personalization enhances the user experience by tailoring information and services to individual preferences. Libraries can leverage data analytics to understand user behavior, enabling the delivery of personalized content recommendations, targeted notifications, and custom interfaces. Personalization fosters engagement, improves information retrieval, and strengthens the library-user relationship in the digital realm.

5.3 Agile Management and Continuous Innovation:

(a) ***Agile Management:*** Libraries should adopt agile management methodologies to navigate the dynamic nature of digital transformation. Agile practices, such as Scrum or Kanban, emphasize iterative development, flexibility, and collaboration. This approach allows libraries to respond swiftly to changing user needs, technological advancements, and emerging trends. Agile management fosters a culture of adaptability and empowers library teams to deliver incremental improvements continuously.

(b) ***Continuous Innovation:*** Innovation is at the core of sustaining dynamic information services in the digital age. Libraries should foster a culture that encourages experimentation, creativity, and the exploration of new technologies. This may involve establishing innovation labs, dedicating resources to research and development, and creating mechanisms for staff to contribute innovative ideas. Continuous innovation ensures that libraries remain at the forefront of technological advancements and can proactively meet the evolving needs of their users.



Source: Image created by author

Figure 11: Strategies for Sustainable Dynamic Information Services

Conclusion

In conclusion, this paper underscores the pressing need for libraries to embrace prolific digital transformation as a means to ensure their sustained relevance and efficacy. By addressing challenges and adopting strategic imperatives, libraries can emerge as dynamic information service providers, meeting the evolving needs of a digitally connected society. This paper serves as a clarion call to action, urging libraries to embark on a path towards dynamic information services sustainability and reaffirm their pivotal role in shaping the knowledge landscape of the 21st century. The journey of transformation is not without its trials, but the destination promises a future where libraries stand as beacons of knowledge, accessible, adaptable, and indispensable to all.

The digital transformation in libraries has not only modernized the way libraries operate but has also expanded their reach and impact in the digital age. It has empowered libraries to adapt to changing user needs and technological advancements, reaffirming their relevance as vital information hubs in the 21st century.

The adoption of Cloud Computing and Virtualization, Big Data and Analytics, Artificial Intelligence and Machine Learning, as well as Blockchain and Distributed Ledger Technology has paved the way for a digital revolution in libraries. These technologies enhance efficiency, enable data-driven decision-making, and provide innovative solutions for preserving and disseminating knowledge in the digital era.

The challenges in achieving a prolific digital transformation in libraries are multifaceted and require careful planning, resource allocation, and a commitment to ethical and inclusive practices. Overcoming these challenges is essential to ensure that libraries continue to evolve as vital community hubs in the digital age.

The digital transformation of libraries requires a multifaceted approach to ensure sustainable and dynamic information services. Collaborative partnerships and consortia, user-centric design and personalization, and agile management with a focus on continuous innovation are key strategies that empower libraries to thrive in the ever-changing digital landscape. By embracing these strategies, libraries can enhance their relevance, accessibility, and impact in the digital age.

References:

1. Abram, S. (2019). Robotics in Libraries: Technology Trends That Aren't That Out-There Anymore. https://Lucidea.com.

2. Aiyebelehin, J. A., Ikenwe, I. J., & Okpetu, C. (2017). Survey of attitude towards ICTs and use of ICTs for service delivery by librarians in university libraries in Edo State. Journal of Applied Information Science and Technology, 10(2), 42-48. https://www.jaistonline.org/10vol2/5.pdf.

3. Anuradha, P. (2018). Digital technology of academic libraries: Opportunities and challenges. IP India Journal of Library Science and Information Technology. 3 (1), 8-10. https://doi.org/10.18231/2456-9623.2018.0002. Electronic copy available at: https://ssrn.com/abstract=4277978 79

4. Bansal, A., Arora, D., & Suri, A. (2018). Internet of things: Beginning of new era for libraries. Library Philosophy and Practice (e-journal). https://digitalcommons.unl.edu/libphilprac/2081/.

5. Chingath, V., & Rajendra, B. (2020). Advantage of block chain technology for the libraries. International Conference on Digital Transformation: A cognitive Learning Towards Artificial Intelligence. https://www.researchgate.net/publication/341725555_Advantage_Blockchain_Technology_for_the_Libraries.

6. Deja, M. Rak, D., & Bell, B. (2021). Digital transformation readiness: Perspectives on academia and library outcomes in information literacy. The Journal of Academic Librarianship. 47(5). https://doi.org/10.1016/j.acalib.2021.102403.

7. Dutt, M. (2015). Cloud computing and its application in libraries. International Journal of Librarianship and Administration, 6(1), 19-31.

8. Garoufallou, E., & Gartanou, P. (2021). Big data: opportunities and challenges in libraries, a systematic literature review. College and Research Libraries, 82(3). https://crl.acrl.org/index.php/crl/article/view/24918/32769.

9. Harada, T. (2019). Robotics and artificial intelligence in Japanese Libraries. International Federation of Library Association WLIC: Information Technology Satellite Meeting "Robots in libraries: challenge or opportunity?" 21-22 August 2019. Technical University of Applied Sciences Wildau, Berlin, Germany. http://library.ifla.org/id/eprint/2695/1/s08-2019-harada-en.pdf.

10. Hassan, N. (2021). Block chain technology and its application in libraries. https:// library.iitd.ac.in/arpit_2020-2021/Week%2016%20-%20Module%20 40%20 -%20PPT-%20Blockchain%20Technology%20and%20Its%20 Application%20 in%20Libraries.pdf. Electronic copy available at: https://ssrn.com/abstract=4277978 80

11. Idhalama, O. U., & Ikenwe, I. J. (2018). Relevance of the 21st century library in the actualization of sustainable development goals (SDGs): A case study. International Journal of Library Science, 16(3), 39-49.https://www.researchgate.net/publication/326044973_Relevance_of_The_21st_Century_Library_in_the_Actualization_of_Sustainable_Development_Goals_Sdgs_A_Case_Study.

12. Ikenwe, I. J., Adegbilero-Iwari, I., & Adegbilero-Iwari, Oluwaseun (2021). A survey of COVID-19 information dissemination behavior of library and information professionals in Nigeria. Library Philosophy and Practice (e-journal). 5506. https://digitalcommons.unl.edu/libphilprac/5506/.

13. Ikenwe, I. J., Adetona, O. C., & Ekpenisi, C. (2020). Perceived ease of use and extent of use of digital information resources by library and information science undergraduates in university of Benin. Journal of Applied Information Science and Technology, 13(1), 247- 259. https://www.jaistonline.org/13vol1/21.pdf. Electronic copy available at: https://ssrn.com/abstract=4277978 81

14. Ikenwe, I. J., & Udem, O. K. (2022). Innovative Digital Transformation for Dynamic Information Service Sustainability in University Libraries in Nigeria. Folia Toruniensia, 22, 67–86. https://doi.org/10.12775/FT.2022.004

15. Kamupunga, W., & Chunting, Y. (2019). Application of big data in libraries. International Journal of Computer Application, 178(16), 34-38. https://doi.org/10.5120/ ijca2019918955.

16. K., & Bianka, P. (2021). Digital transformation. Brainhub. www.brianhub. en/

library/digitaransformation. Library and Information Science Network. (2021). Information services. Library and Information Science Network. https://www.lisn.com.

17. Nag, A., & Nikam, K. (2016). Internet of things applications in academic libraries. International Journal of Information Technology and Libraries, 5(1), 1-7.https://www.ripublication.com/ijitls16/ijitlsv5n1_01.pdf.

18. Omame, I. M., & Alex-Nmecha, J. C. (2020). Artificial Intelligence in Libraries. In N. Osuigwe (Ed.), Managing and Adapting Library Information Services for Future Users (pp. 120-144). IGI Global. https://doi.org/10.4018/978-1-7998- 1116-9.ch008.

19. Patel, K. & Patel, S. (2016). Internet of things: definition, characteristics, architecture, enabling technologies application and future challenges. International Journal of Engineering Science and Computing, 6(5). https://doi.org/10.4010/2016.1482.

20. Princh. (2020). Internet of things technologies in libraries. Princh. www.princh.com/ iot.technologies/.

21. Pujar, S., & Satyanarayana, K. (2015). Internet of things and libraries. Annals of Library and Information Studies. 62, 186-190. https://doi.org/10.56042/alis.v62i3.9800. Sousa,

22. Sridevi, P. C., & Shanmugam, A. P. (2017). Artificial intelligence and its applications in libraries. In A. P. Shanmugam (ed.), E-Resources Management (pp.61-63). Department of Library, Thiruvalluvar University College of Arts &Science Villupuram.

23. Suman, A., & Singh, P. (2016). Cloud computing in libraries: An overview. International Journal of Digital Library Services, 6(1), 121-127. The Enterprisers Project. (2020). What is digital transformation? Your top questions answered. The Enterprisers Project. https://enterprisersproject.com/sites/ default/files/what_is_digital_transformation_2020.pdf.

Digitization of Manuscript as an approach towards sustainability: A study of College Libraries of Kamrup & Kamrup (M) District

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ABSTRACT: Purpose: As digitization is a measure for sustainability of manuscript collection, this study aims to identify whether the manuscript collection available in college libraries of Kamrup and Kamrup (M) are digitized or not.

Design and Methodology: For this study, the libraries of provincialised colleges situated in Kamrup and Kamrup (M) districts are surveyed using an online questionnaire. A purposive sampling method is used for selecting the sample. The collected relevant data are tabulated and analyzed accordingly.

Findings: Out of 47 only 9 college libraries have manuscript collection. It is found that the college libraries have a total of 128 manuscripts out of which 58 i.e. 45.31% are Sanchipat manuscript and 70 i.e. 54.69% are paper manuscript. Out of 9 college libraries 5 libraries have digitized their manuscripts and only 3 libraries have given access to the digitized manuscript through their digital library.

Value: Though the study is confined to a specific geographical area, it may reflect significance of digitization of manuscript for its sustainability. The paper may be a reference for the professionals who are engaged themselves in further study in this specific area.

KEYWORDS: Digitization, Digitized manuscript, Sustainability, College library, Kamrup, Kamrup (M)

1. Introduction:

Manuscript digitization is a strategy that guarantees sustainability in terms of access and preservation. Manuscripts, which have been converted from their original format to a digital one are more readily accessible and less likely to sustain

physical damage. In addition, it reduces actual storage space, routine preservation procedures, cautious handling, security protocols, etc. Normally, manuscripts are prone to deterioration due to various factors like exposure to light, humidity, and natural disasters. The digitization of manuscripts overcomes these issues to some extent.

Digitization makes manuscripts sustainable through its multiple backup facilities, easy accessibility and searchability. This active interaction with digital manuscripts encourages scholarly research and long-term intellectual development.

2. Literature review:

For sustainability, digitalization is one of the core issues, as mentioned by Dasgupta (2005). In a paper, "*Digitization, sustainability and access in the Indian context*", she wrote, "Sustainability is a board term which refers to many factors starting from technological issues of preserving digital data to social and economic questions for long term accessibility of information to the people ".

In another paper, it is explained how digitization is a means for cultural heritage preservation for long term sustainability. In a paper, "*The challenges of reconstructing cultural heritage: An international digital collaboration*", Heuberge, Leone and Evers (2015) explained "Adhering to best practices in both digitization and accessibility plays a vital role in sustainability for the long term."

Some academic libraries in India have taken initiative for preservating their manuscript through digitization. In the paper "*Digital Preservation of Rare Books & Manuscripts: A Case Study of Aligarh Muslim University*", Hasan, Azim and Bedar (2016) explored this area with a case study of Aligarh Muslim University's central library known as Maulana Azad Library. This study reveals how a particular library with a vast collection of 16000 manuscripts should start such digitization project in a very systematic and step by step manner.

In a recent study 'Integration of Sustainable Development by Digital Documentary Heritage Industry: A New Synthetic Model of Integration as Learning and Potential Research Direction', it is mentioned, "Documentary heritage represents a huge proportion of the world's cultural heritage. A large number of such resources have sustainable value and significance, and hence constitute a heritage, which should be preserved and protected for the present and generations to come. Manuscript can be categorised as one of valuable assets and historical documentary heritage." Hassan, Saman and Shaifuddin (2022) explained with supporting data how some of the greatest libraries of the world had been destroyed in war, flood and fire.

From this literature review, it is found that for ensuring sustainability, digitization is a significant kind of process followed by various institutions.

3. Statement of the Problem:

The statement of the problem of the study is entitled as 'Digitization of Manuscript as an approach towards sustainability: A study of College Libraries of Kamrup & Kamrup (M) District'. As digitization is treated as one of the measures for ensuring sustainability of manuscript, this study tries to find out the status of digitization of the manuscript collection of college libraries of Kamrup and Kamrup (M) district of Assam.

4. Objective of the study:

The primary objectives of this study are:

i) To reveal the availability of manuscript collections in college libraries of Kamrup and Kamrup (M) district of Assam.
ii) To know the status of digitization of manuscripts available in the college libraries of Kamrup and Kamrup (M) district of Assam.
iii) To suggest a model of digitization for sustainability of manuscripts available in the college library.

5. Scope and limitation:

This study is conducted through a survey of college libraries in Kamrup and Kamrup(M) districts of Assam and the principal objective is to assess the status of digitization of manuscript collection. Purposively it was surveyed those college libraries which have manuscript in their collection and the researchers are completely dependent on the data received from the respective college librarians. Due to limitation of time it was not possible to survey all the colleges in Assam. Besides, the paper tries to provide suggestions for sustainability of manuscripts through digitization.

6. Digitization of manuscript:

Digitization is a common process that ensures manuscripts' long-term viability. In order to preserve the manuscript as well as to make it available and accessible to a larger audience, transformation of manuscripts from its original format into

digital format has been given emphasis. It is noteworthy that first microfilming and then digitising gives a longer life span to both the original form of physical manuscripts and the content by facilitating to avoid multiple handling of the physical manuscripts by the users for their contents.

7. Digitization of Manuscript as an approach towards sustainability: some point

The following are some points that indicate how digitalization encourages sustainability of manuscript collection:

i) **Preservation and conservation:** Manuscripts in physical form are susceptible to deterioration, harm, and disappearance over time, particularly as a result of age, handling, and environmental variables. Generally, they are very fragile in nature. The text and the content of the manuscripts can be preserved for future generations by being digitalized. Additionally, digital copies ensure long-term preservation by removing the possibility of physical harm from handling, transit, or natural disasters.

ii) **Accessible and inclusive:** Digitization and online access makes manuscripts readily available worldwide. The digitized manuscript can be made online accessible for researchers, academics, and the general public to view and study from a distance. Literally, it overcomes all barriers of physical access to manuscript. Thus, it promotes inclusivity by allowing a wider audience to interact with and gain knowledge from this valuable knowledge treasure.

iii) **Promotes research:** Manuscripts in digital format and their access via digital libraries and online databases offer sophisticated tools, metadata, and search capabilities that make it easier to find out specific information or a particular manuscript from the trove of manuscripts. This helps researchers to improve their effectiveness and depth of their study by analysing and comparing manuscripts available in different institutions.

iv) **Minimize loss and damage:** As the digital copies of the manuscript serve as backup of the original one, as such it reduces the possibilities of misplaced or destroyed. Damages of manuscripts due to the threats such as fire, theft, or natural disasters are always possible. Besides, climate change is now a bigger threat for manuscript preservation. In such worst-case situation, having digital copies guarantees that the priceless content is saved and can be restored or recreated.

v) **Economical solution:** Preservation and conservation of manuscript in its original form is a very challenging task. Besides following various measures for preservation, it needs proper storage, security, and preservation methods in order to maintain the manuscripts in original form. Thus it requires recurring expenses. Digitalization of manuscript can lower these recurring expenses of an organization.

vi) **Multipurpose use:** Multipurpose use is an additional benefit of digitization of manuscript. Manuscripts in digital format can be put to use for different purposes other than reading. These can be used in multimedia presentations, interactive displays, exhibitions etc. Thus, this adaptability improves readers' interest and comprehension of the manuscript over a larger spectrum, including academics, students, and the general public.

8. Digitization of Manuscript as an approach towards sustainability: A study of College Libraries of Kamrup & Kamrup (M) District

As per the record of the Directorate of Higher Education, Govt. of Assam, there are 21 colleges in Kamrup(M) district and 26 colleges in Kamrup district (https://highereducation. assam.gov.in/sites/default/files/swf_utility_folder/departments/highere_medhassu_in_oid_3/do_u_want_2_know/337_stream_wise_colleges.pdf). A preliminary survey was conducted regarding the availability of manuscripts in the college libraries in these two districts through the data available on the colleges' website, IQAC SSR and telephonic discussions with the librarians of the respective colleges. From this preliminary survey, it was found that only two college libraries in Kamrup(M) district and seven college libraries in Kamrup district have manuscripts in their collections. Therefore, purposively the nine college libraries which have manuscripts in their collections have been surveyed through questionnaire designed in Google form and the number is only 19.15% of the total colleges in Kamrup and Kamrup(M) district. The table 1 depicts the status of manuscript collections in the college libraries of Kamrup and Kamrup(M) districts in Assam.

Table No. 1. College Library having Manuscript

Sl No	Area of Colleges	Number of College	Number of College having Manuscript	Percentage of College having Manuscript
1	Kamrup	26	7	14.89
2	Kamrup(M)	21	2	4.26
3	Total	47	9	19.15

Table No. 2. Surveyed College Library having Manuscript (Response Received 100%)

Sl No	Name of the College	Name of the Library	Year of Establishment
1	North Gauhati College	North Gauhati College Library	1962
2	Rangia Colege	Rangia College Library	1963
3	Jawaharlal Nehru College	Jawaharlal Nehru College Library	1964
4	LCB College	LCB College Library	1971
5	Pub Kamrup College	Pub Kamrup College Library	1972
6	Suren Das College	Suren das College Library	1979
7	Saraighat College	Saraighat College Library	1981
8	KC Das Commerce College	KC Das Commerce College Library	1983
9	Paschim Barigog Anchalik Mahavidyalaya	Paschim Barigog Anchalik Mahavidyalaya Library	1984

Table 2 shows the name of the colleges and their respective libraries which have manuscripts in their collection. The libraries are arranged in chronological order of the year of establishment.

Table No.3: Manuscripts Collection in College Libraries

Sl No	Name of Library	Type of Manuscript			No. of manuscript
		Sanchipat	Tulapat	Paper	
1	North Gauhati College Library	0	0	12	12
2	Rangia College Library	4	0	0	4
3	Jawaharlal Nehru College Library	4	0	3	7
4	LCB College Library	1	0	0	1
5	Pub Kamrup College Library	14	0	42	56
6	Suren das College Library	0	0	13	13
7	Saraighat College Library	1	0	0	1
8	KC Das Commerce College Library	5	0	0	5
9	Paschim Barigog Anchalik Mahavidyalaya Library	29	0	0	29
	Total	58 (45.31%)	0	70 (54.69%)	128

From the table 3, it is found that the college libraries have a total of 128 manuscripts out of which 58 i.e. 45.31% are Sanchipat manuscript and 70 i.e. 54.69% are paper manuscript. Pub Kamrup College Library has the highest number of manuscripts sharing 43.75% of the total out of which 25% are Sanchipat Manuscripts and 75% are Paper Manuscripts. LCB College Library and Saraighat College Library have the least number of manuscripts sharing only 0.78% each of the total and both the library has Sanchipat Manuscript. It is also observed that the college libraries have Sanchipat manuscript and Paper Manuscript but do not have any Tulapat manuscript. The shares of Sanchipat and Paper manuscripts are 45.31% and 54.69% respectively.

Table No. 4: Status of Digitization of Manuscript

Sl No	Name of Library	Digitized the Manuscript (Yes/No)	Digital Access of Manuscript (Yes/No)
1	North Gauhati College Library	No	No
2	Rangia College Library	No	No
3	Jawaharlal Nehru College Library	Yes	Yes
4	LCB College Library	Yes	Yes
5	Pub Kamrup College Library	Yes	No
6	Suren das College Library	Yes	Yes
7	Saraighat College Library	No	No
8	KC Das Commerce College Library	Yes	No
9	Paschim Barigog Anchalik Mahavidyalaya Library	No	No
	Total Count of Yes	5 (55.56%)	3 (33.33%)

From the table 4 it is found that 5 i.e. 55.56% libraries out of the 9 have digitized their manuscript collection; on the contrary, it means 44.44% libraries yet to take initiative regarding digitization of their manuscript collection. The librarian of Pub Kamrup College has also informed that they have completed the digitization process of ten (10) manuscripts and the digitization process is going on. It is also found that only 3 (33.33%) out of 9 libraries have given access to the digitized manuscript i.e. contents of the manuscripts.

It is to be mentioned that there are two other colleges in Kamrup Rural district that are Sonapur College and Dakshin Kamrup Girls' College, which have manuscript in their college and those are kept in their college museum but not in the library. Dakshin Kamrup Girls' College has 24 number of Sanchipat Manuscript and

Sonapur College has one Sanchipat manuscript. Both the college has not taken any initiative for digitization of the manuscripts.

9. Findings:

The following can be noted as findings of the study –

i) Only 19.15% colleges have manuscript collection in their library and manuscript collection is much higher in the college libraries situated in rural area than metro area.

ii) The total collection of manuscript is 128 only out of which 122 (95.31%) are in the libraries in Kamrup district and 6 (4.69%) are in Kamrup (M) district.

iii) The college libraries have two types of manuscripts that are Sanchipat manuscript and Paper manuscript. The shares of Sanchipat and Paper manuscripts are 45.31% and 54.69% respectively.

iv) The status of digitization of manuscripts is not encouraging one; only 55.56% libraries out of the 9 have digitized their manuscript collection. It indicates that 44.44% libraries yet to take initiative regarding digitization of their manuscript collection. Again, only 3 (33.33%) college libraries have given access to their digitized manuscripts through their digital library.

v) The library professionals in college libraries have faced challenges in generating of Metadata of manuscript which is a prime issue related to digitization of manuscript. It is well-known that metadata plays a vital role in organizing and providing contextual information about manuscripts. This helps in their searchability and accessibility. The challenges are-

   a) The script and language of age old manuscripts are very difficult to read, which needs specific skill.

   b) As such, the specific metadata elements including authorship, title, subject, date, etc are essential for a metadata, but in case of manuscripts available in the college libraries, these elements could not be indentified properly.

   c) Another challenge is incompleteness. Generally a manuscript is a collection of numbers of folios. Missing of some folios from a particular manuscript creates problem in generating metadata.

10. Digitization of manuscripts: an outline:

Digitization is a very necessary process for the sustainability of rare manuscripts. For the digitization process, the following points should be considered:

i) **Selection:** A crucial step in the digitization process is identifying the manuscript through a thorough evaluation. For selecting which manuscripts to digitize, factors like relevance, historical significance, physical condition, etc. should be taken into account.

ii) **Pre-digitization preparation:** Before digitization, every folio of a manuscript should be cleaned and repaired if required.

iii) **Scanning:** The manuscripts are to be scanned carefully using various scanners, like flatbed scanners and overhead scanners, however, from the sustainable preservation point of view of the manuscripts folio, overhead scanner is more suggestible. The quality of the scanned manuscript is to be ensured accordingly.

iv) **Assignment of Metadata:** The assignment of proper and detailed metadata to each and every scanned manuscript is another important issue. This facilitates easy search and access to the scanned manuscript.

v) **Storage:** The digital files should be stored in a secure and reliable storage system. To prevent the file from being permanently lost, multiple backups as well as a cloud storage facility are to be followed.

vi) **Accessibility:** Access to the digitized manuscripts can be provided through online repositories, digital libraries, and websites, which is a very common practice.

vii) **Regular Updates and Upgrades:** Since ICT is a very fast-changing area, periodic updates and upgrades are an essential step to ensure and maintain the accessibility and sustainability of digitized manuscripts.

9. Conclusion:

Digitization and giving access to the knowledge contents of the manuscripts available in college libraries is a challenging task which needs special skill and care. Though at individual level there have been difficulties for college librarians for digitization of manuscripts and generation of metadata, the college librarian may take help from the working model of National Mission for Manuscripts. It is to be noted that the National Mission for Manuscripts had played the role of torch bearer in India in this aspect. The National Mission for manuscripts is a Govt. of India project and Mission is treated as an apex body in India to look after our manuscript treasure in scientific way. This mission has been working for the indexing of the manuscripts in digital form. .

In conclusion, it can be stated that digitization not only helps manuscripts in their preservation but also for advancing sustainability through its increased

accessibility, research facilitation, potential damage mitigation, cost reduction, and innovative uses beyond its conventional use. We can preserve our priceless treasure trove of our cultural legacy and make it more sustainable and accessible for upcoming generations to enjoy and learn from by embracing digitization.

References and Bibliography

1. DASGUPTA, Kalpana. (2005). Digitization, sustainability and access in the Indian context. In*: Libraries_ A Voyage of discovery. World Library and Information Congress: 71th IFLA General Conference and Council. Oslo, Norway, August 14th - 18th 2005*. *http://www.ifla.org/IV/ifla71/ Programme.htm*

2. FEAR, Kathleen.(2010). User understanding of metadata in digital image collections: or, what exactly do you mean by coverage? *The American Archivist*, 73(Spring-Summer), 26-60.

3. HASAN, Nabi, AZIM, Mohmmad and BEDAR, Shayesta. (2016). Digital preservation of rare books & manuscripts: A case study of Aligarh Muslim University. *International Research: Journal of Library & Information Science,* 6 (4). Pp. 554-562.

4. HASSAN, Nor HasniChe, SAMAN, Wan Satirahbinti Wan Mohd and SHAIFUDDIN, Norshilabinti. (2022).Integration of sustainable development by digital documentary heritage industry: A new synthetic model of integration as learning and potential research direction. *Journal of Positive School Psychology*, 6(4), 2384-2401

5. HEUBERGER, Rachel, LEONE, Laura E. and EVERS, Renate. (2015). The challenges of reconstructing cultural heritage: An international digital collaboration. *IFLA Journal*, 41(3). Pp.223-229

6. MAZUMDAR, Nirmal Ranjan. (2009). Digital preservation of rare manuscripts in Assam. In: *E-Content management: challenges and strategies. Proceedings of 7th International CALIBER, 2009, Pondicherry University, Puducherry, February 25th-27th 2009*. (pp.14-19).Ahmedabad: INFLIBNET Center. 2009.

7. RANA, Dilip Kumar. (2006). Cataloguing of manuscripts. *Kriti Rakshana*, (April). pp. 2-7.

8. https://highereducation.assam.gov.in/sites/default/files/swf_utility_folder/departments/higheredu_medhassu_in_oid_3/do_u_want_2_know/337_stream_wise_colleges.pdf *(Retrieved on: November 2, 2023)*

Impact of Digital Transformation for Ensuring Sustainability in Library Services of Dr. D. Y. Patil, Vidyapeeth (Deemed University), Pune: A Case Study

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ABSTRACT: Digital transformation is a fast-growing trend that has caught the attention of Universities, Libraries, and academic higher educational institutes around the globe. Information Communication Technology has led to notable innovative digital transformation to sustain vigorous information services in contemporary academic libraries. Given these challenges, this paper advocates for a resilient digital transformation domain that draws from proven global best practices and expert recommendations. This study is an attempt to understand the impact of Digital Transformation for Ensuring Sustainability in library services of Dr. D Y Patil Vidyapeeth (Deemed University) Library at Pune. Data on the library users was collected through both printed and online questionnaires. About 350 questionnaires were distributed randomly to Students and faculty members, and the respondents returned 321 of them.

Index Terms- Digital Transformation, Usage Library services, Purpose, Digital Transformation Impact on Digital library services**.**

Introduction:

Information is processed, stored, and retrieved in digital format. New technologies are constantly emerging to define the acquisition and use of information. Digital media has two purposes: to make it easier for users to access information and to display people's skills. Information has become more accessible and cheaper than ever due to the Digital Transformation. Therefore, using digital information is an essential skill in 21st-century society. This research discusses and focuses on users and their opinions on the impact of digital Transformation on the use of library services, which Dr. D. Y. Patil, Vidyapeeth (Deemed University), Pune. This concept describes a service delivery model that supports new technological

changes. Libraries are the most affected area by digital Transformation because libraries operate in a digitally sensitive environment today. Users are also digital. ICT-enabled libraries offer dynamic and flexible services. Modern libraries have recognized the role of Digital Transformation in the services they provide to their users. As a result, libraries have integrated digital capabilities into their services.

Research Objectives:

- To determine digital services offered by the Dr. D. Y. Patil, Vidyapeeth (Deemed University) library at Pune
- To identify the usage of digital services by users of Dr. D. Y. Patil, Vidyapeeth (Deemed University) library.
- To determine the purpose of using library services in Digital Transformation.
- To determine the user's opinion about the impact of digital Transformation on the utilization of library services.

Purpose of the Study:

To find out the users' opinions about the impact of digital Transformation on the use of library services of Dr. D.Y. Patil Vidyapeeth (Deemed University), Pune, Maharashtra.

Concept of Digital Transformation and Digital Library

What is digital Transformation?

The concept of digital Transformation may be complex, consisting of two particular terms: advanced and altered. Computerized means the system that produces, stores, and prepares information by utilizing the values and 1. In progress, digital data is transmitted and put absent as strings of 0's and 1's, each of which is implied to be bits. These bits are amassed together as bytes to speak to data such as numbers, letters, pictures, or sounds. The term alter implies a thing or activity that changes its nature and capacities into another one of comparative esteem. In this setting, Progressed alter implies the act or handle of changing from an existing outline to a progressed shape".

Digital Library

A library could be a place where we keep books and other data sources to provide needed data administration to the client community. Giving data benefits is the main point of the library. In this setting, a Computerized Library may be a Library

that has digitized or electronic data sources supply required data administrations to the client community utilizing the Web, electronic gadgets, and digitized or electronic data assets.

Need for the Digital Transformation of Libraries

The library could be a put where we use books and other data sources to supply data services to the user community. Providing the right data to the proper user at the correct time is not very simple. It is a tedious task. Libraries should give such kinds of data administrations that can fulfilled their information needs and spare their time, which can draw them in towards libraries. Today, most libraries are attempting to give those sorts of administrations; subsequently, most of the libraries were robotized, utilizing the Web for communication and giving virtual services. These are the steps towards computerized change; after these steps, we can satisfy modern clients' desires. In the display situation, individuals like and are pulled in towards an advanced or electronic environment. They are not prepared to spend their valuable time and vitality to get what they require since progressed innovation, the Web, smartphones, and emerging applications have made them shrewd. So these shrewd individuals anticipate that what they require ought to be available promptly. They anticipate everything ought to be accessible effectively with minimum time, least fetched, and least interaction. As it was conceivable within the computerized environment, by understanding these sorts of dominos, attitudes, and desires of the individuals, most entrepreneurs created online administrations like Amazon, Flipkart, snap deal, Myntra, Ola, Uber, Redbus, Bounce, Etc. They achieved great victory with more benefits in their commerce only because they provided administration based on clients' desires. The libraries should also provide administrations based on user desires. It is as if it were conceivable through the correct utilization of rising technologies or ICT. So, libraries have to be changed into advanced libraries to provide successful data administration to the client community.

Literature Review

Pryor (2009)[1] did a study to examine libraries and the number of users responding to digital initiatives. In particular, the researchers studied changes in work dynamics and work tools. Their results showed that libraries suffer most in areas such as management, library operations, and technical requirements for library information access. **Singh (2018a)**[2] cited Singh (2018b) conducted a study to investigate the use of digital services in Indian libraries and found that the use of

these services. The results of the survey showed that 72.3% of the sample offered digital services. That is means that digital Transformation has a significant impact on service delivery.

Gulcin (2017)[3] studied Turkish libraries to determine how they use digital technology and found that libraries have changed the scope and nature of their digital technology-based service. **Gimpel and Röglinger (2015)**[4] conducted a study to determine the impact of digital Transformation. They found that digital Transformation has a significant impact on service delivery, service provider knowledge, leadership, thinking values, operations, and innovation. The most important thing to note from the above is that the libraries of the 21st century are different from the libraries of a few years ago. **Anuradha P.(2018)**[5]. Innovation has changed extra administrations. Scholarly libraries have broadly embraced perusing records as a successful means for making and altering online learning and educating fabric, making a difference by perusing assets of their courses. Scholastic library staff can promptly address desires and needs for overseeing and keeping up their perusing. That, without a doubt, moreover makes modern needs.

Current Scenario of Digital Transformation of Dr. D.Y. Patil Vidyapeeth (Deemed University) Library

In the rapidly changing educational environment triggered by technology, the purpose of the university library has been emphasized. In addition, digital technologies have completely changed the trends of university libraries, as well as the constantly changing information needs of users and the digital age, which have forced libraries to change their service model. Digital transformation work is constantly developing and ongoing in university libraries. Dr. D.Y. Patil Deemed University Library use and provide a number of digital Resource and services to their users, some of the digital services of Dr. D.Y. Patil Deemed University Library are discussed below.

Information and Communication Technologies (ICTs): Information and communication technology, such as the innovation introduced in university libraries, has improved information. ICT is increasingly used in university libraries for information acquisition, processing, management, storage, and distribution, as well as for other information services. Information and communication technology has transformed information management in university libraries, and it is concluded that librarians at Dr. D.Y. Patil Vidyapeeth (Deemed University), Pune, use computers, printers, and telephones for servicing.

Digital Services in Dr. D.Y. Patil Vidyapeeth (Deemed University) Library for Sustainability

Generally, university libraries are established as information centre's mainly to provide information services. In this regard, university libraries are threatened with extinction if they cannot transform into modern information services that meet the demands and expectations of users. Thus, the need for modern libraries and information services in universities is driven by the increased expectations and demands of users. Many digital library services provided by Dr. D.Y. Patil Vidyapeeth (Deemed University)are some of the services in this study.

- **Electronics Document Delivery Service:**
  The distribution of document services is very important for university libraries. It focuses on providing information documents to users on demand. Document service delivery is the process of finding the necessary documents and delivering them to users in the desired format. Modern libraries have a digital document service that offers the opportunity to use technology to transfer information documents anytime and anywhere. Dr. D.Y. Patil Vidyapeeth (Deemed University) Library provides eelectronic document delivery services to its users.
- **Web OPAC:**
  Web OPAC may be a present-day data innovation period. It is a web-enabled registry that permits clients to look at and access particular reports anytime. Can seek for any data or record over the Web with a Web association. Kumar (2021) opined that a web OPAC would make it simpler for "library individuals to get to the OPAC for the ease of borrowing rather than looking through a card catalogue. "Web-based or intranet library catalogues are OPACs. Clients can look at the OPAC site anytime, anywhere.
- **Inter Library Loan Facility (ILL) :**
  Interlibrary loan (ILL), interlining, delivery of documents, delivery of documents, or "interlibrary services" are all terms used to describe borrowing from libraries. With the help of inter-library lending, one library can borrow and reproduce information from another library. The library receives the request from the user, searches the libraries for the item, places the request, retrieves it, gives it to the user, and arranges for it to be returned. Fees may apply for long-distance loans. Lending libraries either provide or remove. Regional library networks manage inter-library lending and the exchange of resources. The PC VDX automates the procedures. Most trust ILL and World share management systems. With an inter-library loan, you

can read articles from other libraries. Certain journal or database licenses allow inter-library citation of journal articles. Ariel was developed by the Research Library Group (RLG) in the early 1990s to improve photocopying and original digital communication. Atlas Systems developed Odyssey in the early 2000s. Odyssey allows libraries to publish and report to their users. Articles are removed from the cloud-based article exchange of OCLC after several downloads and days.

- **Institutional Repositories** (IR)- Institutional data repositories store and share research results. Scholars and others need help accessing and trading university content. Researchers must help implement and develop IR initiatives to understand their benefits and motivations. The services distribute digital material created by universities. Peer- and peer-reviewed electronic academic journal articles and university monographs. Academic databases, administrative documents, course outlines, course materials, and conference materials are all stored in the institution's archives. The main goals of an institutional repository are to increase its global visibility, to archive research results in the open repository itself, and to preserve and preserve digital assets such as unpublished or easily lost literature as they work. Digital libraries are institutional archives. Institutional archives organize, store, and share digital library content. Self-archiving in the archives of research institutions increases visibility, usefulness, and efficiency. Institutional archives collect, organize, and disseminate information. Institutional archives share digital material developed by universities and communities. Institutional repositories allow universities to exchange digital resources. Digitize, store, and retrieve information. University research. Professional archives. Digital and digital content is stored in institutional archives.
- **E-Current Awareness Services**:

  A current awareness service alerts users to new electronic resources in the Resource Center. Fresh press releases are provided. Optional data transfer. The following services enable CAS service.

  Current Content: The Current Contents database makes it easy to find complete tables of contents, bibliographic information, and summaries of the latest issues of respected intellectual journals.

  CAS: CAS alerts readers to new events. Readers who want the latest information about their field need this service. CAS alerts professionals to new publications and library progress. Current Awareness Service informs users about their main interests and related fields. It helps people know about current advancements, especially in their field.

SDI sources of information on topics of interest: A library or other information agency provides selective dissemination of information (SDI) service that notifies users of new publications, report materials, or other sources of information on topics they specify.

Scope and Limitations:

Of the seven medically deemed universities in Maharashtra, Dr. D.Y. Patil Vidyapeeth (Deemed University) in Pune was selected for the study.

Research Methodology

The study intended to determine the current status of the utilization of digital services of Dr. D.Y. Patil Vidyapeeth, (Deemed University) at Pune. The author has prepared 350 structured questionnaires and distributed them to the library users, faculty, and students of medical deemed University, and 321 questionnaires were received from the library users.

Sampling and Questionnaire Design

Out of seven Medical Deemed Universities in Maharashtra, the study was conducted for one library. A formal questionnaire was prepared and distributed to library users of Dr. D.Y. Patil Vidyapeeth, Pune. The survey asked various questions about demographics, use of digital services, Purpose of Usage, and Impact of Digital Transformation on Library services. Out of the 350 questionnaires there, 321 questionnaires were returned. Answered by 92% of the respondents. Data were analyzed using Microsoft Excel.

Data Collection and Analysis

The analysis of data is presented in the following graphical and tables:

Table 1: Number of Respondents

Users	No. of Questionnaire distributed	No. of Responses received	Percentage (%)
Faculty Members	50	45	90%
Students	300	276	92%
	350	321	92%

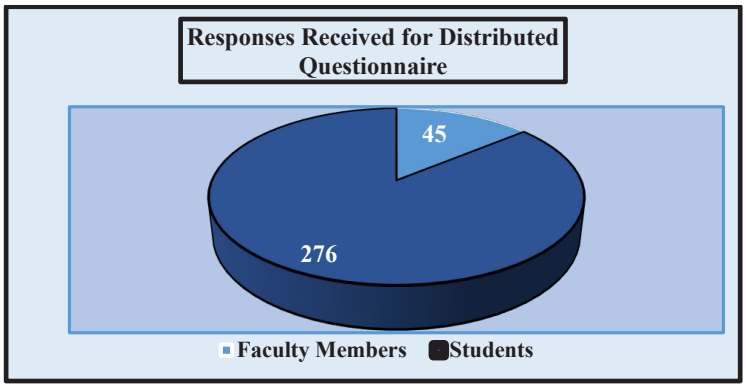


Figure No- 1: Responses Received for Distributed Questionnaire

Interpretation:

There are 350 structured questionnaires distributed to the Library Users Faculty (50) and Students (300) of the Dr. D.Y. Patil Vidyapeeth (Deemed University). 321 responses were received from the respondent. . 45 responses were received from faculty, and 276 responses were received from the students.

Usage of Digital Services

Table 2: Descriptive Statistics of Respondents' Usage of Digital Services

Digital Services	Overall Response	Percentage (%)
OPAC/ Web OPAC	325	93%
Current Awareness Service (CAS)	310	89%
Electronic Document Delivery Service	280	80%
Inter Library Loan Facility (ILL)	250	71%
Institutional repositories	290	83%

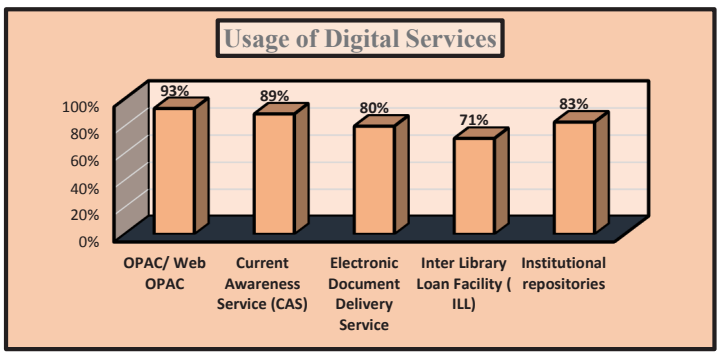


Figure No- 2: Usage of Digital Services

Interpretation:

Table 02 shows that the respondents used various digital information services. 93% of users used the OPAC/ Web OPAC services, 89% of users used the Current Awareness Service (CAS) services, 83% of users used the IR service, 80% of users used the Electronic Document Delivery Service, 71% users used the Inter Library Loan Facility (ILL).

Table 3: Descriptive Statistics of Respondents Purposes of using Digital Services

Purpose	Overall Purpose of Using Digital Services		Total	Percentage (%)
	Faculty	Students		
Learning	15	321	336	96
For searching the literature for research	45	250	295	84
For updated Subject Knowledge	47	170	217	62
To write research papers	48	209	257	74
For Career Development	15	190	205	59
For preparing assignments	0	275	275	79

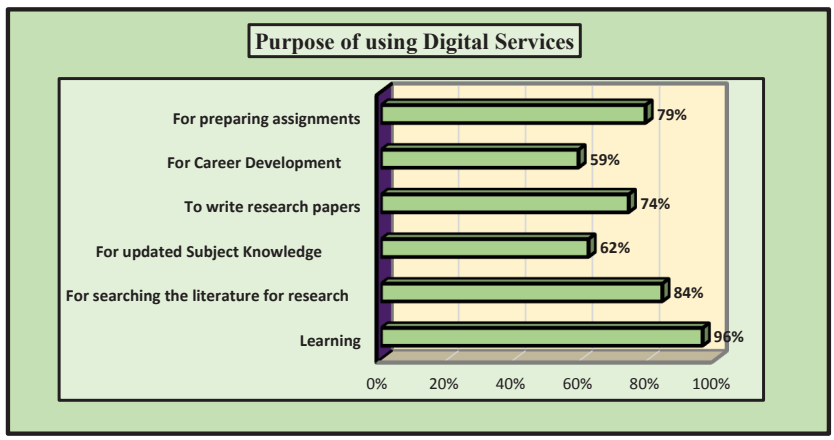


Figure No 3-Purpose of using Digital Services.

Interpretation:

The participants were prompted to state why they were using the online tools and services. The majority of respondents (96%) users have used digital services

for learning; (79%) have used digital services for the purpose of preparing assignments. 84% of respondents were used to search the literature for research, 74% of respondents were used to prepare research papers, 62% of respondents were used for updated subject knowledge, and 59% of respondents were used for career development.

Users Opinions about the Impact of Digital Transformation on Sustainability Using Digital Services

Table No. 4: Users Opinion about the Impact of Digital Transformation on Sustainability using Digital Services

Impact of Digital Transformation	Users	Response	Total	Percent
Search and Access information becomes easy.	Faculty	41	264	75%
	Student	223		
The time is saved.	Faculty	45	320	91%
	Student	275		
The current and up-to-date information is received.	Faculty	40	280	80%
	Student	240		
I am comfortable accessing information by using digital Transformation	Faculty	40	260	74%
	Student	220		
It can Improve the quality of Study or Research	Faculty	45	300	86%
	Student	255		

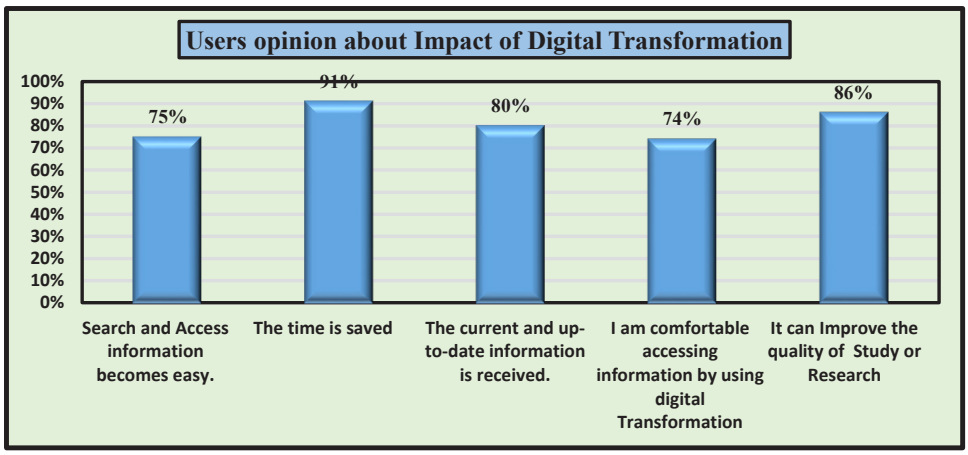


Figure No 4- Users' Opinion about the Impact of Digital Transformation.

Interpretation:

Table & figure no. 4 show that all 350 library users were asked for their opinions about the impact of Digital Transformation on using Digital services.

The coefficient of variance has been calculated for each Digital service out of all users: 91% of users gave their opinion for The time saved; 86% of users gave their opinion that It Can Improve the quality of the Study or Research; 80% of users gave their opinion for The current and up-to-date information is received. 75% of users gave their opinion that searching and accessing information becomes easy. 74% of users gave their opinion that I am comfortable accessing information by using digital Transformation.

Challenges Issues and solutions

Challenges Faced by Dr. D.Y. Patil Vidyapeeth (Deemed University) users while accessing library services in the appearance of Digital Transformation: the users face multiple problems and barriers.

1. Technological issues of outdated quality in terms of program and equipment and trouble in updating the same as a repeating need.
2. Non-availability of fetched useful unused innovative advancement.
3. Lack of numbers of Desktop/ PC's.
4. Non-availability of well-trained Staff with fundamental aptitudes to completely take part in the modern environment.
5. Lack of legitimate conservation arrangements to support digitization endeavors and Advanced libraries.

We need to keep in mind that the existence and use of modern and powerful IT tools are not enough. Organizations need sufficient ICT Equipment, Economic aspects, and Trained Staff. Sustainability is a broad term that refers to many factors, starting with the technical challenges of preserving digital data so that the information is available to users in the long term. All these factors influence the success or failure of digital initiatives and the creation of digital libraries. These issues need to be realistically addressed to ensure that the proposed programs on digital resources and digital libraries contribute to the common goal of the literate deemed universities of Maharashtra.

Recommendations:

The study suggests that libraries should monitor digital trends and adapt their services accordingly. Additionally, it recommends exploring similar libraries in

other colleges in Maharashtra for benchmarking purposes. University libraries should embrace digital transformation, and the administration should collaborate with them to ensure accessibility for elderly users. As technology evolves, university libraries should reevaluate their needs and improve information management. Finally, it is essential to invest in the continuous development of library staff to equip them with advanced skills.

Conclusion

The study focuses on users and discusses their views on the impact of digital Transformation on the use of library services of Dr. D.Y. Patil Vidyapeeth (Deemed University), Pune. Digital Transformation is currently changing many aspects of libraries. This study describes a service delivery model that supports new technological changes. Libraries are the sector most affected by digital Transformation. That is because libraries today operate in a digitally sensitive environment. ICT-enabled libraries offer dynamic and flexible services. Modern libraries have recognized the role of digital innovation in their services to their users. As a result, libraries have integrated digital capabilities into their services. Most users use library services in a digital environment, where users can conduct their studies or research. The coefficient of variation was calculated for each digital service for all users. 91% of users said it saves time. 86% of users said it could improve the quality of their research or studies. 80% of users receive new information and updates. 75% of users found it easier to find and access information. 74% of users prefer to access information through digital services.

References

1. Pryor, G. (2009). Skilling up to do data: Whose role, whose responsibility, whose career? *The International Journal of Digital Curation*, 4 (2), 34-47.

2. Singh, S. (2018). Digital Transformation of library services in the mobile world: The future trends. Retrieved from DigitalTransformationoflibraryservicesinMobileWorldinIndia_NLU.pdf http://eprints.relis.org/archive/00001930/01/sustainlrfinal.doc

3. Gulcin Kubat, (2017). The mobile future of university libraries and an analysis of the Turkish case. *Information and Learning Science*, 118 (¾).120-140

4. https://fim-rc.de/wp-content/uploads/2020/02/Fraunhofer-Studie_Digitale-

5. P. Anuradha(2018). Digital Transformation of academic libraries: Opportunities and challenges. *P Indian Journal of Library Science and Information Technology*, January- June, 2018; 3(1):8-10

6. https://www.researchgate.net/publication/358263424_Digital_Transformation_Need_for_the_Transformation_of_Libraries_into_Digital_Libraries

Sustainable Development of Libraries Through Digital Transformation: A Case Study Of IIT Kanpur Library

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ABSTRACT: In general sense sustainable development means the development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable Development is libraries perspective means continuous improvement in the growth and services of libraries. The present era is of ICT so for future oriented libraries Development it is necessary that digital transformation of libraries should be done. Digitized availability of things is also the users' demand. To follow the demand – supply chain, libraries are also moving towards providing digitized services to their users as per demand. We have included PK Kelkar Library of IIT Kanpur for the study to know what services are being provided under digital transformation.

KEYWORDS : Sustainable Development, ICT, Digital Transformation.

Introduction

Digital transformation is making a significant contribution to the sustainable development of libraries. For the Sustainable development of libraries, it is Necessary to adoption of useful technology to fulfill the users need as per demand on real time with round and clock availability. Present era is of ICT, that has changed drastically social scenario. In the era of digitization access use and sharing of information has also changed. Digital technology has revolutionized the production and distribution of knowledge. Digitization has significant values to fulfill SDG (Sustainable Development Goals). IFLA advocates for libraries to be recognized as essential partners for inclusive Sustainable Development, through their work to provide meaningful access to information for all. According to IFLA economically, socially and environmentally sustainable development depends on access to information. The then director of RRRLF, envisages digital and virtual libraries under the national mission on libraries, said, "We will ensure that All India content is provided in digital format". He further said Libraries continue to

remain relevant in our lives. The challenges are not only to have a large quantity of material bit also to make it available to people. Digital Transformation supports all three pillars of sustainability that is economical, social and environmental respectively. Digitization is moving libraries towards Paperless Society. Apart from this digital transformation is such a medium through which each and every section of society is easily accessing information. Library can be operated via digitally and virtually mode to disseminate information. It is also works in less budget comparatively manual collections.

Literature Review

- Jankari P Bhoir and J.Shivarama conducted a study on " Internet of Things for sustainable library development in the digital world." The study is around the significance of IOT applications to maintain library sustainable development as well as other social sectors.
- Prakasan P.M conducteda studyon "Sustainable Development initiatives in Libraries based on the COVID 19 experience: A future plan". The study focuses on the library activities for achieving the 17 Sustainable Development Goals in Post COVID era.

About PK Kelkar Library

PK Kelkar Library is the central library of IIT Kanpur. Since 1960 it has been serving organization. The first librarian was Shri M.K. Kelkar. Central Library renamed as the PK Kelkar Library in the name of first director of IIT Kanpur. The opening hrs. of library are working days of week as well as round and clock availability of examination days. Library has fully RFID implemented building. KOHA is using library management software. Regular users of the library are UG, PG students, Research Scholars and staff faculty.

To support digital transformation for sustainability, PK.Kelkar library providing following services to patrons.

- **E Databases: -** For the Sustainable development of library, it is necessary to implement ICT based applications in the library otherwise the utility of library may be destroyed. To promote the library sustainability PK. Kelkar Library is providing the facility of e databases to its users. Library is providing multiple databases facilities to users that are EBSCO, Sci Finder, Inspec, SCOPUS, Web of Science, MATH SCINET, PROQUEST.
- **E Books/Journals: -** Supporting sustainability through digital transformation library is providing e books and e journals to its users. In

present library have collection of more than 35633 e books and 16000 e journals that is freely accessible to the users.

- **Electronic Theses and dissertation: -** These are authentic source of sustainable research. Manual collection of objects leads to erosion in the longest way that is a hindrance element in the sustainable development of libraries. Keeping in mind the sustainable development of libraries PK. Kelkar Library is providing the facility of electronic theses and dissertation to its users and researchers. D Space software is using to maintain its Digital repository.
- **Library Networking: -** Library networking is a vital element for continuous development of libraries. It reduces the financial burden upon organization and helps users to interlink with online resources. Promoting Library networking, PK Kelkar Library has taken membership of e shodh Sindhu consortium. Users are benefited through multiple e content including books and journals by using it.
- **Open Access Tools: -** The library's activities should be flexible and user centric. It will help in the continuous improvement and development of Library. Moving towards it PK kelkar Library has been providing multiple open access tools and gateways to users. Users are also benefited by online reference tools like Mendely, Zotero, Pybliographer and BibDesk respectively.
- **AI Based services: - In present era various types of machines and tools are being designed based on artificial intelligence. Adoption of new technologies enhance sustainable development of libraries. In PK kelkar Library also, AI based technologies chatbots RFID for magnetic security, services are being delivered to patrons.**

Conclusion:

In conclusion it can be said that digital transformation is a vital process in view of sustainable development of libraries. Since today's society is information society, they demand real time information. ICT based applications have achieved amazing results by providing timely access to information to users that's the libraries are moving towards smart libraries. IIT Kanpur library is also fulfilling the objectives of digital transformation by ensuring accessibility of resources and services to the users. Databases, journals, research-oriented facilities related to various subjects are being provided to users that is a commendable step towards sustainable development of libraries.

References

1. P.M. Prakashit.(2021).Sustainable Development initiatives in libraries based on the COVID 19 experience: A future plan. *Library Philosophy and practice.*

2. https://www.researchgate.net/publication/348153027.

3. https://www.thehinducom/education/whyinstitutional-libraries-must-tramsform-into-digital-knowledge-ecosystem/article66890391.ece

4. https://www.thehindu.com/news/cities/delhi/transforming-the-library-in-in-digitalera/article5638064ece.

5. https://www.ifla.org/units/sustainable development/

6. https://www.enel.com/companystories/articles/2023/06/three-pillars-sustainability

7. https://pkklob.iitk.ac.in

Theme-2

Sustainable Collection Development

The Journey Towards Sustainability: A Study on E-Book Collection Development of Jadavpur University

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ABSTRACT: This research paper is the exploration of the e-Book collection development procedure on the basis of authors personal experience in the University and also a brief journal of his research investigation. eBooks are digital representation of printed materials those are available in PDF, HTML etc. These can be fully indexed, searchable and readable on any kind of e-Reader or PDA. Finally most important thing is that eBook chapters are retrieved through metadata. Jadavpur University is one of the leading educational institution of India. Electronic book collection of the Jadavpur University started during 2013. In this current investigation, a questionnaire based survey method was used. Relevant official documents were searched. Responsible higher officials were interviewed by the author for accurate primary data collection, This present study is limited to the E Book collection development of the University. The period 2014-2023 has been covered for collection of Data and the period 2017-2023 was focused for analysis. This study is carried out to explore its status and procedures of e-Book procurement. The Library subscribes around 3600 LNCS and LNP e-book series and 8907 e-Books. The Library has access to E-Book Central (formerly Ebrary) , which has over. 2 lakh e-Book titles. Analyzing the 8907 E-Books , it is found that 1816 books are from Central Library funds , 2458 books of Arts Faculty, 1068 from Science Faculty, 2916 E books from Faculty Engineering and Technology, 547 of ISLM and 102 e-books were added from the Salt Lake campus library funds. During 2017-18 e-books procurement AGR reached 103%. The AGR topped to 114% in 2020-2021 .During 2021-2022 and 2022-2023 the AGR of e-book procurement lowered by -22% and -33%. The AGR % of lecture notes picked in 2018 by 51.12%. For free flow of funds, positive initiative is highly required form government level . Care should be taken during the processing and procurement of E-Books. Trainings and workshops in regular interval are suggested to increase the flawless proficiency in e-book procurement.

KEYWORDS: E-Book; Collection Development; Sustainability; Jadavpur University

Introduction

Collection development and book selection is the systematic addition of items to the library stock. In other words Library collection development is the process of systematically building the collection of a particular library to meet the information needs of the library users (a service population) in a timely and economical manner using information resources locally held as well as resources from other organizations. According to the International Federation of Library Associations and Institutions (IFLA), acquisition and collection development focuses on methodological and topical themes pertaining to acquisition of print and other analogue library materials (by purchase, exchange, gift, legal deposit), and the licensing and purchase of electronic information resources. Collection development involves activities that need a librarian or information professional who is specialized in improving the library's collection. The process includes the selection of information materials that respond to the users or patrons need as well as de-selection of unwanted information materials, called *weeding*. It also involves the planning strategies for continuing acquisition, evaluation of new information materials and the existing collection in order to determine how well a particular library serves its users. A collection development policy is a statement of guidelines for library staff members to follow when selecting, acquiring, and building library collections.

The Information Communication Technology has resulted in a great amount of published documents in digital form, which is available globally without delay. Library and information professionals are thus facing a paradigm shift i.e. the transition from paper to electronic media as the dominant form of information storage and retrieval. Linked to this transition is the convergence of previously separate media, such as text, graphics and sound into multimedia resources. Since the time of Gutenberg a constant effort was going on to publish better and cheaper books. The result of which was advent of paper-back formats. But those are not at all cost effective, convenient, simpler and environment friendly.

'E-Books are digital representation of printed material which are available in PDF or HTML etc. These can be fully indexed, searchable through OPAC, Google, publisher platform etc. and readable on any kind of e-Reader or PDA. Finally most important thing is that eBook chapters are retrievable through metadata. Research in eBook began since 1971 when Project Gutenberg was introduced, the first digital library with public domain eBooks. Studies show that there is a growing demand for digital books from customers, especially for digital books from customers, especially from those who are engaged in knowledge intensive activities like education and research. Rapid increase in amount of electronically published information has led

to increased dependence of academia on web based information for their research needs'.(4) Most of the institutions and their libraries have dynamically modified the functions and modes of services. Multiplicity of the benefits associated with electronic information resources like flexibility in downloading/ storing, ease of use with saving of time enabling users to channelise their saved time for more useful works and accessibility without time and place constraints, and many more, have pushed back the long established print resources. Nowadays, users do not need to physically be in the library to have access to electronic resources. The electronic books are one of the vital knowledge sharing tolls in day to day research needs owing to their important role in influencing research outputs in many ways.

Literature Review:

Evans (1970) explain the philosophy of academic library collection development. The basic assumption is that the library is concerned with developing the most useful book collection for its patrons. The study also assumes that this is an active concern due in large measure to a budget that requires a judicious expenditure of funds.(1) Gopinath and Rao(1982) discusses the importance of collection development process in the library service. They highlight the variables having influence on the collection development. The analytic techniques helpful in the measurement of document usage are mentioned. The helpfulness of such studies for collection development is indicated.(2) Patel (2016) discusses the importance of collection development in libraries. Various factors have to be taken into consideration while developing a qualitative collection for the benefit of the users. These factors include policies, principles, techniques and procedures, problems associated with collection development and weeding out as well. It is equally important to evaluate the collections to assess its use and moreover the usefulness of collection development in electronic environment. (5) Kaur, and Gaur (2017) explain, collection development policy is undergoing a metaphoric transformation due to diversity of digital resources those are easily available through internet. This paper attempts to focus on collection development policy, internet-based collection and challenge in collection building in digital era. It also throws light on trends as well as needs of collection development in digital environment.(3)

Objectives:

Admitting the significance of electronic books collection, this study is carried out to explore its status with the following objectives:

- To know the status of the collection and its management
- To know the budget allocation.
- To know the acquisition expenditure on electronic document, and
- To know the overview of the growth rate of E Books.

Methodology:

Data for the study was collected using a questionnaire, observation, interview, schedules, and document review procedures. The author personally visited the Jadavpur University Central Library, where the procedure took place. In this current investigation , a questionnaire based survey method was used. Relevant official documents searched. Responsible higher officials were interviewed by the author for accurate primary data collection for his PhD research. Data collected through this survey is presented in tabular and graphical format.

Scope and Limitation of the study:

Jadavpur University is one of the leading educational institution of India. Rapid increase in amount of electronically published information has led to increased dependence of academia on web based information for their research needs. Electronic book collection of the Jadavpur University was started during 2013. Jadavpur University has a huge collection of documents , journals , dissertations , and e resources. This present study is limited to the eBook collection development of the University. The period 2014-2023 has been covered for data collection and 2017-2023 considered for analysis.

Jadavpur University Library:

The Jadavpur University Library System comprises the Central Library, Salt Lake Campus Library, Departmental Libraries and the Libraries attached with different Schools and Centres for higher studies; along with Centre for Digital Library and Documentation and Accessible Library for Persons with Disabilities. Most of the Departments in the main campus have their own Departmental Libraries. Reading and borrowing facilities in the appropriate manner are given in the Departmental Libraries to the faculty members and students, scholars of the Department. All the computers in the campus are connected through LAN and are IP address authenticated so that all e-resources can be accessed from all the computers. There is a separate two-storied library building on the Second Campus at Salt Lake. Over 14000 of users are facilitated by the library.

The total collection of Central Library along with the Departmental Libraries is about 6,92,905 (approx.) volumes of books, 7364 e-books in perpetual mode, 82,154 bound journals, 9107 (approx.) of hardcopy theses, 8631 dissertations and 6978 CDs of theses and dissertations 3000 standards & the number of others non-book materials like, Maps, Pamphlets, Reports, and microforms is around 37000 (aprox). In addition to that, Library of Salt Lake Campus of the J U, holdings is about 35,796 of books. The University uploaded around 13765 question paper , which is available at the library portals of the university. The total number of Print journals (including Newspapers and Magazines) subscribed by Central Library is 197, Online journals is 10578 and Print Online journals is 6 and Online databases is 29. The total number of Online journals subscribed by Salt Lake Campus Library is 14 and Database is 1. In addition to the subscribed journals, the University has access to 7041 Online journals from e-ShodhSindhu (INFLIBNET). The Library subscribes around 3600 LNCS and LNP e-book series and 8907 e-Books. The Library also subscribes to E-Book Central (formerly Ebrary) , which has over. 2 lakh titles.

Centre for Digital Library and Documentation (CDLD): The Centre for Digital Library and Documentation was established in November 2003 in the first floor of the new Annex Building of Central Library under the Potential for Excellence Program-I of UGC. The Digital Library has a Learning Resource Centre (LRC) with 60 Nos. of terminals, 4 Nos. of servers and one reading room for users. The digital resources are made available to the users through the Library Portal. The Digital Library Data Management Software D-space has been installed. All the facilities of Digital Library are available on the Library of the Universities salt lake campus . The users of the university can access e-resources from any computer connected to LAN, for from the CDLD, besides this, the faculty members , research scholars and post graduate students can access the e-resources remotely.

E-book procurement and growth:

Jadavpur University started their e-books procurement from 2014. During the 2014-2015 financial year the university started their e-book procurement journey by purchasding1017 e-books on perpetual basis, on this time the LNCS+LNP were about 950.

Table 1: E book purchased (perpetual) and growth rate

YEAR	Number of E Book Purchased	TOTAL	AGR%
2014-2015	1017	1017	0
2015-2016	0	1017	0
2016-2017	0	1017	0
2017-2018	2063	3080	103%
2018-2019	1730	4810	-16%
2019-2020	691	5501	-60%
2020-2021	1478	6979	114%
2021-2022	1154	8133	-22%
2022-2023	774	8907	-33%

Table1 shows the growth of the e-book procurement of the University, during 2017-2023. The growth started from 2017-18 period by 2063 e- books procurement and AGR reached 103%. Though 1730 and 691 no of ebooks were purchased by the university during 2018-2019 and 2019-2020 AGR% declined to -16% and downed to negative -60%. The AGR topped to 114% in 2020-2021 by adding 1478 documents. During 2021-2022 and 2022-2023 university procured 1154 and 774 e-books but the AGR lowered by -22% and -33%. The total number increased to 8907 at end of 2022-2023 FY.

Table 2: E book purchased (subscription) and growth rate

YEAR	LNCS+LNP	GR	AGR%
2017	1201		
2018	1815	614	51.12
2019	2451	636	35.01
2020	3049	598	24.39
2021	3600	551	18.07
2022	3600	0	0

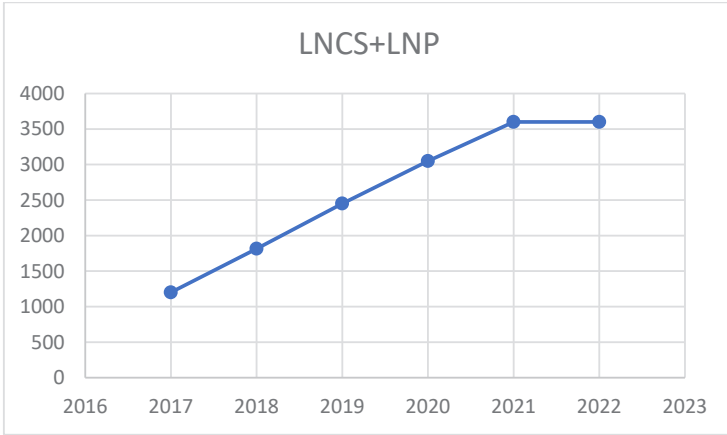


Figure 1 : Growth of Lecture Notes

Table 2 and Figure 1 analyzed the primary data of lecture notes series . for the period 2017-2022. Lecture notes on Computer Science(LNCS) and Lecture Notes on Physics (LNP) procured by the university under subscription mode. In 2017 1201lecture notes , 1815 in2018; 2451 in 2019 , 3049 in 2020 and 3600 in 2021 and 2022 respectively. In 2018 GR found 614, the GR found 636 in 20169, 598 in 2020 and 551 in 2021. The AGR % picked in 2018 by 51.12% and turned to 0 in 2022.

Table 3: Faculty wise E Book procurement (perpetual)

FACULTY / Department	**2014-2015**	**2015-2016**	**2016-2017**	**2017-2018**	**2018-2019**	**2019-2020**	**2020-2021**	**2021-2022**	**2022-2023**	**TOTAL**
ARTS	94	0	0	679	614	212	267	333	259	**2458**
SCIENCE	108	0	0	198	244	105	148	134	131	**1068**
ENGINEERING	736	0	0	100	736	290	439	329	286	**2916**
ISLM	0	0	0	9	130	82	82	148	96	**547**
CENTRAL LIBRARY	79	0	0	1077	6	2	491	159	2	**1816**
SALT LAKE	0	0	0	0	0	0	51	51	0	**102**
TOTAL	1017	0	0	2063	1730	691	1478	1154	774	8907
CT	1017	1017	**1017**	**3080**	**4810**	**5501**	**6979**	**8133**	**8907**	
GROWTH	**1017**	**0**	**0**	**1046**	**-333**	**-1039**	**787**	**-324**	**-380**	
AGR	**0**	**0**	**0**	**103%**	**-16%**	**-60%**	**114%**	**-22%**	**-33%**	

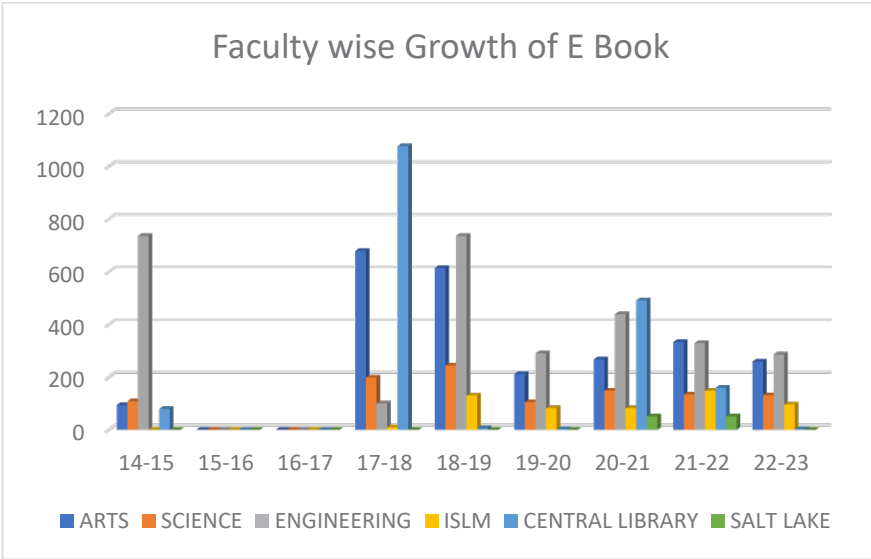


Figure 2: Faculty wise growth of e-Books

Table 1 Table 3 and Figure: 2 shows the clear picture of the growth of the perpetual e-book procurement by the Jadavpur University. The procurement of the e-book(perpetual) started from 2014-2015. During 2015-2016 and 2016-2017 no fund was allocated for the e-book and no book was purchased in those year. From 2017-2018 university purchased 2063 e- book and total number increased to 3080. Among 2063 e-book 1077 books procured from central library funds 679 of Arts faculty, 198 from Science faculty, 100 form Engineering faculty and 9 e-books procured from the funds of ISLM faculty. During this year the AGR reached to 103%. The AGR picked to 114% in 2020-2021. The AGR declined to -60% as lowest during 2019-2020. During the four consecutive period 2018-2019 to 2021-2022 total e-book added to the collection was 1730 ; 691; 1478 ; and1154. At the end of 2022-23 AGR was -33%, during this year 774 books included to the collection and the total number reached to 8907. Analyzing the 8907 E-Books , it is found that 1816 books are from Central Library funds , 2458 books of Arts Faculty, 1068 from Science Faculty, 2916 E books from Faculty Engineering and Technology, 547 of ISLM and 102 e-books were added from the Salt Lake campus library funds.

Besides the e-Books' and lecture notes, the university users can access over **2 Lacs** of e-Books from the **E Book Central** (formerly **Ebrary**).

Budget Allocation and Utilization :

There are both positive and negative growth found in the budgetary allocation

Table 4: Budget allocation and utilization of E Book (Perpetual)

YEAR	BUDGET (`)	Expenditure (₹)	Balance (₹)	AGR %
2017-18	19000000	17009940	1990060	
2018-19	15000000	17955683	-2955683	-21%
2019-20	10000000	7733920	2266080	-33%
2020-21	15000000	12376705	2623295	50%
2021-22	13750000	13430240	319760	-8%
2022-23	11900000	10437170	1462829	-13%

Table 4 analyses the financial budget and expenditure of the perpetual e-book of the University. During the period 2017-2023 (financial year) this study , collected and analyze the financial data to understand the growth of the perpetual e-book budget. In the year 2017-2018 the budget allocation was 1.9 crore , and 2019-2020 its declined to 1 crore as a result the Average Growth Rate(AGR) declined to -33%. In the very next financial year2020-2021 AGR increased by 50% , but the result again reduces to -8% and -13% in the next financial years. The expenditure to purchase the e-book increased in 2018-2019 and exceeded the budget limit and the expenditure managed from the balance of previous years balance. As funds not utilized in a year the remaining balance carry forwarded to the next FY to manage the positive or negative balance.

Table 5: Growth of Expenditure of LNCS+LNP(Subscription mode)

YEAR	Amount (₹)	AGR%
2017	1392306	
2018	1702293	22%
2019	1694744	-0.44%
2020	1753252	3%
2021	1994761	14%
2022	1994761	0%

Lecture Notes on physics(LNP) and Lecture Notes on Computer Science(LNCS) are procured by the university in subscription mode. The expenditure of the Lecture note series of LNP+LNCS managed from the fund of e-resources of JU. Table : 5

clearly explain and analyzed the expenditure of the lecture notes to find out the AGR of LNP+LNCS from 2017-2022. AGR of the expenditure increased by 22% in 2018 and declined by -0.44% in 2019 , it again managed its growth to 3% in 2020, 14% in 2021 and no growth found in 2022, as the expenditure remain same to the previous year so the AGR stands 0.

Conclusion:

The Jadavpur University has no written Collection Development / Book Selection Policy. Books (print and electronic) and Journals (print and electronic) are selected and procured on the basis of demands come from the various departments of the university. There is no evidence of receiving demand or involvement in book selection from all communities of users of the library. Sometimes the growth rate hampered due to the insufficiency of funds. Sometimes Procurement and uploading e-resources take much more time than expected. Delay in uploading and processing caused the loss of relevance of the specific items. Much more training and workshops are required to increase the proficiency in e-book procurement. Involvements of the representatives from all the communities in the department level may increase the usability, which can make the library more popular. Supply of manpower along with manpower resource development program have to be arranged on a regular interval is highly required. Care should be taken during the processing and procurement of E-Book to avoid the repetation. Positive initiative is highly required form both government (State and Central) level for free flow of funds .

References:

1. Evans,(G. Edward). (1970) Book selection and book collection usage in academic libraries. The Library Quarterly..40(3). 297-308

2. Gopinath (M.A) and Ravichandra Rao (I.K). (1982) .DRTC Annual Seminar(19) paper AA

3. Kaur (Rajinder), Gaur (Rupesh). (1982) Collection development in academic libraries with special reference to digital era. International Journal of Digital Library Services.. 7(2). 107-114.(www.ijodls.in)

4. Nicholas,D., Rowlands,I,Jamali,H.(2010) Etextbook use, information seeking behaviour and its impact: case study business and management in Journal of information science,36(2).263-80.

5. Patel (Sanjay). (2016.) Collection development in academic libraries.2016. International Journal of Library and Information Science 8 (7) 62-67 (http:// www.academicjournals.org/IJLIS)

6. Ranganathan (S R). (1989) Library Book Selection. Bangalore. SRELS .

Sustainable Collection Development Policy at the Central Library University of Burdwan: A Case study.

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ABSTRACT: Discusses the Sustainable Collection development policy of the Central Library, Univ of Burdwan. The methods which the University Library collect their collection such as Books, journals, periodical, E-Books and E-Journals. Introduction: Role of Library: Collection Development Process: Purpose of Collection development policy: Burdwan Univ. Library: Acquisition policy of the central library, Univ. of Burdwan; Conclusion: References.

Keywords: Sustainable, Central Library, University of Burdwan.

Introduction

The Central Library of the University of Burdwan is the heart of the University in relation to their Collection and Books and non-books material. A good University Library is understood their huge valuable collection of Books, journals or periodicals, theses, is the means Reports, as well as Good Reference collection which helps the students for their study purpose and to reach their aims of goal. Sustainable collection development is the means by which the library provides high quality information resources of print and non-print materials and provides access to electronic resources that will meet the needs of the students for their studies.

The development of need based collection required to serve the academic community of the University such as Post graduate students, Research scholars and the faculty of the University etc. and the rich collection of the materials serves academic community of the University.

Role of Library: The University Library Plays a vital role in promoting higher education serving as a hub of knowledge, research, and intellectual information. It is an essential component of academic institutions, the university library not only houses a vast collection of books, journals and digital resources but also

provides support and services to students, faculty and researchers. It is a space where individuals from diverse academic disciplines coverage, fostering a culture of learning collaboration and innovation. It gives the students in their quest for information to supporting faculty in their research endeavors; the university library serves as a catalyst for intellectual growth, critical thinking, and academic excellence

Role of University Library in Higher Education: Higher Education is a transformative journey that goes beyond classrooms and textbooks. It requires the access of knowledge, resources, and a supportive environment . In this context, university libraries play a vital role in promoting higher education. They serve as dynamic spaces that foster intellectual growth and offer invaluable support to students, faculty and researchers.

The role of University Library in promoting higher education is multifaceted and essential to the academic development and success of students, faculty and researchers.

Collection Development process: Library Collection development is the Process of Systematically building the collection of a particular library i.e. University and others to meet the information needs of the library users in a time and economical manner using information resources locally held as well as resources from other organizations

Collection development and management is a process accomplished through strategic planning, assessing needs, analyzing collections, establishing collection policies and procedures, budgeting, selecting and deselecting resources, and acquisitions, cooperating with other libraries and organizations, and evaluation.

Collection development policy: The Collection development policy sets goals or the collection that reflect the library's mission, the collection development policy provides information to the library's stakeholders about how the collection is chosen, and it explains who is responsible for making decisions about the collection

The Purpose of a Collection development Policy: The purpose of a collection development policy is to create a collection of library materials that supports the library's mission. All decisions about the kinds of material to be collected or accessed should be made with the mission statement in mind. For, if an elementary school library's mission is to support the curriculum, it will not be interesting collecting adult fiction. However if the library also has a mission to be resource for a teachers, it will collect some professional materials on elementary education. The collection development policy sets goals for the collection that reflect the library's mission.

The collection development policy provides information to the library's stakeholders about how the collection is chosen, and it explains and who is responsible for making decisions about the collection.

BURDWAN UNIVERSITY LIBRARY

The University of Burdwan was established under West Bengal Act XIX of 1959 as a teaching and affiliating University. It should functioning from 15th June 1960 with six post graduate teaching departments and thirty under-graduate colleges spread over five districts viz. Burdwan, Bankura, Birbhum (other than the areas served by the Visva Bharati University) Hooghly (excluding Serampore sub-division), Purulia and Midnapore (one Homeopathic College).

The National Assessment and Accreditation Council (NAAC), an Autonomous Body Constituted by University Grants Commission (UGC), Govt. of India, has recently awarded a 'Four Star' or its sustained a upgraded quality in Education, Academic Administration And Infrastructural facilities.

Facilities and Departments

Post Graduate Courses :

Faculty of Arts, Commerce, Law etc. & Science

1)Bengali 2) Business Administration 3) Commerce 4) English 5) Economics 6) Hindi 7) History 8) Law 9) Library & Information Science 10) Mass Communication; 11) MBA (Human Resource) 12) MBA (Tourism) 13) Philosophy; 14) Political Science; 15) Sociology; 16)MCA; 17) Physics; 18) Chemistry; 19) Mathematics; 20) Zoology; 21)Botany; 22) Statistics ; 23) Geography; 24) Biotechnology; 25) Env. Sc.; 26) Microbiology; 27) Geology; 28) Physiology; 11) M. Tech in Microwaves Are Running Under The Department of Physics

Faculty of Medicine

Four years Degree course of studies in M.B.B.S. and two years Post Graduate course(M.D.); Gynecology and Obstratics (D.G.O.) and Ophthalmology (DO) are offered at Burdwan Medical College.

Faculties of Engineering :

Other Course :

B.Ed (Sc), BLIS, LL.B., M.Phil., (Beng., Commerce, Eng., Econ., Hist., Phil., Pol. Sci., Sans., Environmental Sc., Zoology., P.G. Diploma in Population Studies, Certificate, Diploma & Adv. Diploma course in French, German, and Russian Language.

Other Facilities offered :

A well equipped University Science and Instrumentation Center (USIC) along with central Instrumental facilities (CIF) meets the technical needs of the post Graduate Science Departments including the researchers.

The Computer Centre of the University provides all shorts of computer facilities for the Students, Teachers, and Research Scholars.

Burdwan University Central Library :

The B.U. Central Library started along with the establishment of the university in 1960. the University Library situated at Golapbag provides facilities and services to its faculty, student staff, and other scholars members research scholars, students, officers and information users of the University as well as outside scholars.

Services offered :

Library Service of Readers (Circulation) Loan facility of documents (books) is available to all members but periodicals are not lent out to the members.

Reading Room :

The Reading Room of the Central Library remains open from 7.30 A.M. to 6 P.M. from Monday to Friday and 8 A.M. to 8 P.M. on working Saturday for the regular use of the students' teachers / scholars and others.

Periodical Section:

The Periodical Section is also kept open from 7.30 A.M. to 6 P.M. Students, Teacher & Scholars consult the current as well as back volume of journals for the academic purpose.

Reference section

This section has a rich collection of Encyclopedias, dictionaries, handbooks, yearbooks within the section. It has a display board where new books are displayed regularly.

Thesis section

This section thesis of Ph.D./D.SC./D.Lit. Degree awarded by the University are kept for reference and use research scholars, teachers and others.

Report section

Census reports, world development reports, Govt. publication, reports on education

are available here. Reprints of research papers published by the teachers, scholars are kept for the reference purpose. Students guide to different foreign Universities are available here. About 2000 readers used the facility of the section yearly.

Study centre

The text books on different subjects are kept in the section with a view to center the needs of the users providing them with post-Graduate / M.Phil / U.G.C. NET old question papers in the section. The candidates appearing in the National / State Level Examination are allowed to make use of the previous year model question paper s. reference guide books on NET / SLET examination are available here.

Archival cell

The present acquisition of the unit consist 2500 nos. of old and rare manuscripts in Sanskrit / Old Bengali Scrip, 8000 nos. of old and also rare books on various topics received from the Burdwan Raj Family library and Preserved for reference.

(a) Special collection
(b) Very old rare manuscripts
(c) Burdwan Maharaj Collection
(d) Sri Aurobindo Collection
(e) K. C. Chatterjee Collection
(f) Census Report
(g) Annual report of various Organization
(h) Thesis of Ph.D. / D.Sc. / D.Phil. degree awarded by this University
(i) Various reference collection such as Encyclopedias, Dictionary, Hand Books, Gazetteers, Almanac, Who's who etc.
(j) N. C. Chatterjee Collection on law.

INFORMATION AND COMMUNICATION TECHNOLOGY AT BU LIBRARY

Library computerization:

To promote and establish communication facilities to improve capability in information transfer and access that support to scholarship learning, research and academic pursuits through co-operation and involvement of agencies concerned INFLIBNET. (Ahmadabad) is an autonomous inter-University centre of the University Grants Commission sanctioned money for Automation of BU Library during the year 1977. The central library at present processes 20 computers and other peripherals, printers, U.P.S. etc. Computers are being used for houses keeping

jobs such as creation of book data bases of library holdings in machine readable from, rendering computerized library services such as online searching of full-text Journals, CD-ROM / DVD ROM (i.e., Biological Abstract) database search, websites through internet search etc. to the reading community of university as well as neighboring institutions.

Lists of Resources provided under UGC Info net

E-Journal : BURDWAN UNIVERSITY

Sl. No.	Name of the Publishers	Number of Journals	Website Address
1	American Chemical Society	31 Journals	http://www.pubs.acs.org
2	American Institute Of Physics	18 Journals	http://www.aip.org
3	American Physical Society	10 Journals	http://www.aps.org
4		29 Journals	http://www.orjournals.annualreviews.org
5	Black Well	489 Journals	http://blackwell_synergy.com
6	Cambridge University Press	189 Journals	http://cambridge.org
7	Emerald	28 Journals	http://eremeldsight.com
8	Encyclopedia Britannica	National site licensing	http://search.ib.com
9	Institute Of Physics	38 Journals	http://www.ibp.org.
10	Portland Press	4 Journals	http://www.portlandpress.com
11	Project Muse	222 Journals	http://muse.jhu.edu/journals
12	Royal Society Of Chemistry	23 Journals & 6 databases	http://www.springerli.mk.com
13	Springer And Kliwer	1217 Journals	http://www.springhler.com
14	Taylor & Francis	1105 Journals	http://journalsonline.tandf.co.uk
15	Eucid	18 Journals	http://projecteuclid.org
16	Oxford University Press	100 Journals	http://www.oup.co.uk

Other services (Xerox)

The reprographic unit is rendering services to the reading community with its

automatic plain paper copier. In addition, photo copying services are being provided by a commercial agency also to its users. Such commercial agency is rendering Xeroxing services as per University rules.

Human Resources Development (Staff Development) :

The University has arranged in-service training for the professional staff of the University library in the age of information and communication technology environment.

Besides the central Library there is also Departmental Science Library such as Botany, Zoology, Physics, Chemistry and Mathematics.

The Department Science Library of the Physics, Chemistry and Mathematics is highly rich collection of books and periodicals. All the books are stored in the Departmental science Library such as Physics, Chemistry and Mathematics. No books and Journals are kept in the Central. All the books and Journals are available in this departmental Science Library.

Acquisition Policy Of The University of Burdwan Central Library: The method of selecting specific titles or resources and acquiring through monetary transactions. Libraries May have designated acquisition budgets allocated for purchasing materials in different formats, such as books , journals, audiovisual materials, or electronic resources.

When a Budget amount comes to the Librarian for purchase of Books, journals or E-Books and E-journals etc. The Librarian calls for a library committee meeting for allocation funds or budgets in different departments. The Library Committee allocated budgets of the different Departments for purchase Books, Journals and also E-books and E-journals. The allocation of funds gives more in the Science Department in comparison to Arts and Social science Department. After complete the allocation of budget of each department. The Librarian sends a letter to the Head of the different department with the allocation of budget also with their list of books and journals for purchase of books and journals. When the list of books and journals comes from the Head of the Department subject-wise, the Librarian gives order for purchase of books as the GOC rules and university rule.

Conclusion

Sustainable Collection development policy is a continuing process for building

the good collection in a University. During the collection development process growing in a university, it should be noted and attention should be observed that avoid of duplication of books and journals when the order placed to the publisher or distributors. At the same time if the library has damaged books it should be weeded out from the library for the library's space more. F. W. Lancaster has already mentioned the paperless society in the library. Library resources should be purchased with the user satisfaction level.

References

1. Ahmad Tahir and M. P. Satija (2002). A plan for Resource sharing among Engineering College Libraries In Punjab Through networking periodicals as the thrust area . Herald of Library Science, 41(3-4), 188-194.

2. Babu, Suresh. (2015)Collection development for University Libraries in digital era : A practical study at Sreenidhi Institute of Science and Technology , Ghatkesar, Hyderabad, International Journal of digital Library Services , 5(1), pp152-56.

3. Harova, Tony. (2009). Challenges and possibilities for collection management in digital age. LRTS. 54(3). P123.

4. Mahapatra (1993). Collection development in libraries. Ess. & Ess. Publications. New Delhi, P201-210.

5. Parameswar M (!997). Collection development in University Libraries: Policy and Procedures DESIDOC Bulletin of Inf. Technology, Emeralds Publishing groups Limited, Emerald group limited, vol 17. No .2. P11-13.

6. Sharma, Shankar. Dayal. (1988). Key note address. New Delhi: World book fair,p2.

7. Dey, S.K. & Midda, A.M.- Burdwan University Library : a birds view,SouvenirXIII Reunion,2006, Department of Library & inf. science, University of Burdwan, 2006.

Sustainable Collection Development in University Libraries of Assam: Assessing the Issues in Combating Infobesity

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ABSTRACT: This paper tries to find out the concept of Sustainable Collection Development in terms of University Libraries - its linkages with information overload, research, and higher education. The paper seeks to analyze the concept of the collection development, its factors, its functions, collection development environment, and other different relatable aspects of the development of library collection. What are the roles of a librarian regarding the issues and challenges behind managing the information overload in the library has also been discussed in this paper. Mainly, this paper is aimed at surveying and understanding the emerging transformation in building the plan for sustainable collection development for web-based resources in the current academic libraries. This paper is an exploration into this specialized ground of library collection management as well as development. It focuses on the major steps, processes, and issues to be challenged in dealing with the incorporation of library materials into a university library collection.

Keywords: Combating, Infobesity, Embryonic, Vigorous, Obsolete

Introduction: Conceptualization

The library is considered the central ground of knowledge in an academic institution. The collection Development process is considered one of the embryonic tasks for any library and information center. It is a vigorous and continuous activity. In order to develop and maintain a properly balanced, use-oriented, and active collection, a well-planned and thought-out system has to be evolved by the library and information managers in having close alliances with the representatives of various user constituencies.

Collection development is a concept that has worldwide attention in recent decades. It is a dynamic and essential process in every library. Simply, Collection Development is a combined package of identification of the requirements, determining the selection policy, selection of documents, resource sharing, and proper budgeting.

The main elements of collection development are:

- Analysis of the user's needs
- Policies development
- Selection
- Acquisition
- Weeding
- Evaluation

Libraries have long been icons of sustainability. Vested with the duty of maintaining knowledge and information from one generation to the next, libraries have sought to support the rich variety of human experiences and understanding as a part of their mission. Given their substantial history as institutions, libraries have also come to embrace the library economy as a necessary tenet of operation. These traditions within the library make it ideally suited to embrace a newer, increasingly urgent call for sustainability.

Review of Literature:

Leonard, B. G. (1994) in the article "**Collection Management in Australian Academic Libraries**" discusses various activities of collection management in Australian academic libraries. This article also researches about the current changes in the higher education system and its impact on universities and libraries.

Nisonger, T. E. (1997) in the article, "**Electronic journal collection management issues**" initiates and synthesizes basic issues of library collection management regarding e-journals and the process of its selection, making budgets, policymaking, collection evaluation, and preservation/archiving.

Seetharama, S. (1997) in the paper "**Collection Development/Management in an Information Technology-based Environment: Current Initiatives and Issues**" recognizes the influences of information technology on collection development and collection management. This paper also examined the changing role of libraries and librarians in the operation of managing and developing the traditional collection as well as electronic resources in the most efficient way.

Glenn, S. (2008) in the article "**Collection Management in Electronic Journals in Academic Libraries: notes on Embracing Change in an unstable environment**" provides a viewpoint based on the study that research libraries are increasingly evolving services like publication hosting and dissemination, production or digitization of back volumes of information.

Joy, G. (1982) in the article, "**Collection Development for Academic Libraries in a Changing Environment**" clarifies that when resources are insufficient to meet all the demands, then priorities should be established. During the last decade, shortage of funds is one of the most common factors in almost all academic libraries which resulted in a decrease of good quality collection. This article defines some factors through which the library staff can cope with the changing environment of the library in the current situation.

Das, D. & Saikia, J. (2013) in the article "**Collection development of E-resources in Academic Libraries**" emphasize the use of digital technology to use the collected information for further research and overall developments of the users. This article points out the role of librarians regarding the accessibility of e-resources to the user and to make a balance of available budget between print and e-resources.

Hazarika, L. and Borah, C.K. (2013) in the paper "**Collection Development in IT Environment and Computerization of College Libraries in the District of Dhemaji and Lakhimpur**" displayed the current status of college libraries. This paper aims to point out the present situation of the availability of e-resources and the problems faced in automation.

Rath, P. & Rath, M. (2014) in the research paper, "**Collection Development in Libraries: Challenges and Solutions for Library Professionals**", talk about the importance of collection development in libraries. This paper explores that there are various factors that are taken into consideration for developing a quality collection for the benefit of the users. These factors include policies and guidelines, techniques and procedures, problems associated with collection/development, and weeding. Authors suggest that library staff have to take maximum care to develop the valuable library collection increasingly.

Aims and Objectives:

The main aims and objectives of this paper are shown below

- To explore about the availability of collection development policy in the university libraries of Assam.
- To study the library collection, collection development, different aspects of the collection management, and maintenance in the University Libraries of Assam.

Methodology:

The method used in this paper is survey method using questionnaire tool.

Analysis:

Development is the action of improving by expanding, enlarging, or refining. Thus we can say that Collections Development involves processes like selection, acquisition, arrangement in a systematic way, development, storage, and preservation of collections in a constructive way. In intellectual utilization, the process of replacing intelligence requirements with collection requirements by establishing priorities and coordinating with appropriate collection is called Sustainable Collection Development.

At present in a University Library, standard collection and information sources must be maintained effectively. Among the three important operations of a library namely collection, storage, and dissemination of resources, the term collection occupies the most vital position. Collection Development is considered the most remarkable area of librarianship. It is the spine of all library services and important for librarians to improve the library collection progressively. The highest level of collection management which is the planning of the activities and selection is the second level of hierarchy.

University libraries have a huge collection of resources and managing them according to user satisfaction is also very important. That means organization, management, and development of collection are must for satisfying the user's requirements in all types of libraries. If the collection of a library is up to the mark, users will automatically be satisfied. In the college library, the library committee should give utmost importance to the textbooks of the students that are relevant to the academic curriculum, research papers, and journal articles along with other reference materials in both print and electronic format.

It is a great challenge for librarians to understand library goals, and user's needs as well as to cope with today's aggressive condition regarding the vulnerable information of e-resources.

The idea of sustainable development of library collection does not seem to be new to the librarians as most of them often using it as a synonym for the terms "selection" and "acquisition". Collection development is one of the most significant areas in librarianship. It is the backbone of facilities provided by the libraries to evolve the library collections.

Knowledge is strength and libraries are the pool of the strength demonstrated in books and other reading materials. Libraries are the sanctuary of learning, the doors of which are open to each and everybody. The main activities of a library are to collect, store, and disseminate the knowledge/ information as per the users' requirements. Among these three main tasks, the collection of knowledge occupies the most important place. If the collection of the library is efficient, ideal, and could satisfy the needs of the user, then it would assimilate the image of the library. The regulation of the library service is controlled by the quantity and quality of its collection. Library collections are estimated not only in terms of numbers but also in terms of their value and utility.

In the all over the world, Collection development in the library is a worldwide process. Overload of information both in conventional and nonconventional documents in the 21st century is a common trend where it is not possible to manage libraries efficiently without the appropriate process of their collection. A library is the temple of knowledge, the door of which is open to every person to fulfill all the needs of the users; which results in the development of its collection. Thus, the fifth law of library science i.e. "Library is a growing organism" directly relates to the concept of collection development. A library grows in its size, materials, documents, building, staff, expenditure, and other resources from time to time. According to the fifth law of Library science, a library should select its resources as per the needs of its users so that it can meet them properly and develop its collection year after year.

The collection development process is a document drawn up by a particular library to provide guidelines whereby the collection is developed and managed to meet the requirements of that particular user community. This operation also helps in weeding and evaluating the collections. It circumscribes several functions related to the management of the library collection.

The following format may be included in a university library collection although this list is not exhaustive and new formats are continually appearing;

(a) Books, both hard and soft covers
(b) Pamphlets
(c) Newspapers and periodicals including cutting files
(d) Digital information through the Internet
(e) Online databases
(f) CD-ROM databases
(g) Software programs

(h) Microforms
(i) Tapes and Compact discs (CDs)
(j) Digital versatile discs (DVDs)
(k) Videocassettes
(l) Laser discs
(m) Large print materials
(n) Audiobooks
(o) Electronic books and Posters

Factors of Collection Development:

"In order to facilitate the transformation of their collections from analog to hybrid, academic librarians need to develop a concept of collection that will inform practice rather than be dictated by it" (Casserly, 2002, p. 582).

Generally, user needs and financial involvement are the main factors responsible for the collection of reading materials in college libraries. With the change in syllabus, the librarian along with the library staff must take the utmost care and management of their library collection as per requirement.

Financial condition occupies a vital role in the management of the library collections. It is not possible to access all the activities of a university library without financial assistance. The size of the collection is determined by many factors, including space, financial resources and proximity to other libraries, regional role of the collections, and access to e-resources, assessment of user's needs, and acquisition and policy of stock exchanges with other libraries.

The main factors of Collection Development of the university libraries are as follows:

(a) **User's based Resources:** "We find that 'collection of printed publications' affects 'user satisfaction' most profoundly" (Martensen & Gronholdt, 2003, p.140). User needs are the first and most important function of sustainable collection development. Development of the collection helps the library staff to satisfy the needs of the user's community. The resources of a college library should be curriculum-based for the students. Thus. The Collection Development process attempts to engage users in building consortia collections. It also trains users to use the individual resources available in the university library.
(b) **Sources of Funds:** In the university library, major sources of funds come from the UGC grants, state government's grants, and fees of the students.

(c) **Adequate Space:** For proper management of the collection, there should be adequate space in a library. The flow of new books leads to space necessity in an academic library, The Systematic arrangement of different sections of a library demands sufficient space.

(d) **Selection of Medium:** Selection of medium means title for procurement comes in what language form as well as in what format is one of the factors for collection development. The main criterion for the selection of language for a university library is its users. Users' preference for language selection of library resources is also helpful for the growth of collections.

(e) **Acquisition Policy:** Acquisition policy includes titles for procurement, a list of purchasing documents, provision of duplicate checking in the library, book selection policy followed by the library, and what type of acquisition is adopted by the library. Under the acquisition policy, the library can acquire the collections in the following mode:

  (a) **Gift:** A library can acquire material by gift.

  (b) **Exchange:** If any particular material demanded by any user is not available for purchase, then certain materials may have to be obtained by the exchange.

  (c) **Membership:** Occasionally a library or its parent body becomes a member of society or organization whereby it might be possible to get certain materials free of charge or by paying a nominal cost.

  (d) **Purchase:** Any documents could be purchased if they cannot be brought by the mode of gift or exchange or by the way of membership.

Functions of Sustainable Collection Development:

The following are the main functions of the collection development process laid down in a university library;

(a) **Planning of Collection:** The first and foremost function of any academic library is to prepare a plan for collection. There are four main steps required for this purpose which include:

  (i) Selection of materials

  (ii) Prepare a list of titles

  (iii) Planning a library budget

  (iv) Selection vendor

(b) **Selection Policies:** Selection policies are essential for collection development for the selection of current as well as retrospective materials. These policies are generated to guide for selecting any material. Some

principles are there for the selection of books from libraries. These are as follows :

(i) **L. R. Mc Colvin's Principles (1925):** According to this principle, books have no meaning until they are serviceable by demand. Here emphasis is given to the demand of the user.

(ii) **Drury's Principle (1930):** It states that the right book at the right reader at the right time. The selector should be aware of the requirements and needs of readers. The informational, educational, and recreational needs of the users are fulfilled through this principle.

(iii) **Melvil Dewey's Principle:** According to Dewey, the best reading materials should be selected for the purpose of maximum users at a nominal cost. The economic condition has been noticed for purchasing the document.

(iv) **Ranganathan's Principle (1952):** Ranganathan's Principle is based on the first three laws of library and information science. On the basis of these three laws, documents are selected in the libraries.

(c) **Selection Format:** The format of the resources should be selected in such a way that every user should be able to use the library services. In university libraries, there are various types of formats for printed and non-printed materials. Users' satisfaction has been taken care utmost care in any academic libraries which are performed through the management and development of collection.

(d) **Weeding and Storage:** The necessity for reviewing library collections to make space available for new acquisitions was recognized very early. Weeding is an essential process that libraries continuously execute. Conditions of weeding policy include the usability of an article, its physical status, its format, and space. With the weeding policy, the library staff removes useless library resources, and for this users benefit from searching the relevant resources. The selection of resources for weeding purposes is as follows:

(i) Poor substantial condition
(ii) Outdated Information
(iii) Resources those are misleading or factually inaccurate
(iv) Obsolete or impractical formats
(v) Resources that have a newer edition

(e) **Collection Evaluation:** Collection evaluation is a part of collection development related to the assessment of the collection and it is an ongoing

process. Collection evaluation can be viewed in two senses- macro sense, where the focus is on the entire collection, and micro sense, which is the evaluation of a specific document or journal. There are three fundamental dimensions in collection evaluation- ownership; availability and acceptability. In university libraries, the size and variety of its collections were the main measures of excellence of a library. Evaluation of the collection is most often considered a function of collection development and should be related to the planning, selection, and planning of the collection.

Collection development Environment:

There are two types of collection development environments in a college library. These are;

(a) **Traditional Environment:** The traditional environment of collection development allows space for few material and easier access to the collection or to improve the services of the users.

1. Reading
2. Ordering, Billing
3. Writing
4. Catalogue in Card form
5. Document Delivery
6. Interlibrary loan
7. Literature search
8. Resource sharing
9. Classification
10. Cataloguing
11. Indexing system

(b) **Electronic Environment:** The electronic environment of collection management offers help on difficult issues like planning changes in library structure, establishment of new model form collection development, fulfilling the needs of scholars, etc. The electronic environment consists;

1. Browsing/Surfing
2. E-Commerce
3. Web Publishing
4. OPAC
5. Attachments, E- e-prints
6. Consortia

7. CD-ROM and the Internet Search
8. Networking
9. Subject directories, subject gateways
10. Metadata
11. Search Strategies

Role of Librarian in Collection Development Process:

A. To follow the rapidly changing needs of the user.
B. To collect and analyze library data pertaining to the collection and its users.
C. Different types of selection tools should be applied by the librarian to procure library collections.
D. The librarian should be communicating with their information resource provider. The provider may be a vendor or publisher.
E. The librarian should provide relevant and concise product of information.
F. The librarian should coordinate and promote trials of electronic resources.
G. The librarian should regularly communicate with faculty and departments on library resources

Data Interpretation:

- **Budgeting for Library Collection**

Budgeting is an important as well as crucial activity for library collection of university library. Without preparing the budget for library, no activities of library system can be accessed efficiently. Budgeting is a systematic and organized activity. Thus, consciousness is the most important factor to process this activity in a most effective way.

Budgeting for library collection of university libraries includes the sources of income which is much required for the library budget, the factors that affect the library budget, methods applied for preparing library budget.

Table 1: Yearly budget of different library resources of the University Libraries

Resources	1 Lakh to 30 Lakhs (approx)	Less than 30 Lakhs (approx)	Less than 30 Lakhs (approx)
Books	4 Libraries	-	3 Libraries
Journals	5 Libraries	-	2 Libraries
Others	5 Libraries	-	2 Libraries

Table 1 identifies the yearly budget of the university library prepared for various library documents/resources. Here an approximate data serves the purpose.

Among seven (7) most reputed universities of Assam, the analysis about the yearly budget of the respective library collection has been conducted. The above table implies that the budget of library collection for some libraries ranges from one (1) Lakh to thirty (30) Lakh and for some libraries it is more than thirty (30) Lakh.

Depending on Table 1, the following diagram has been prepared:

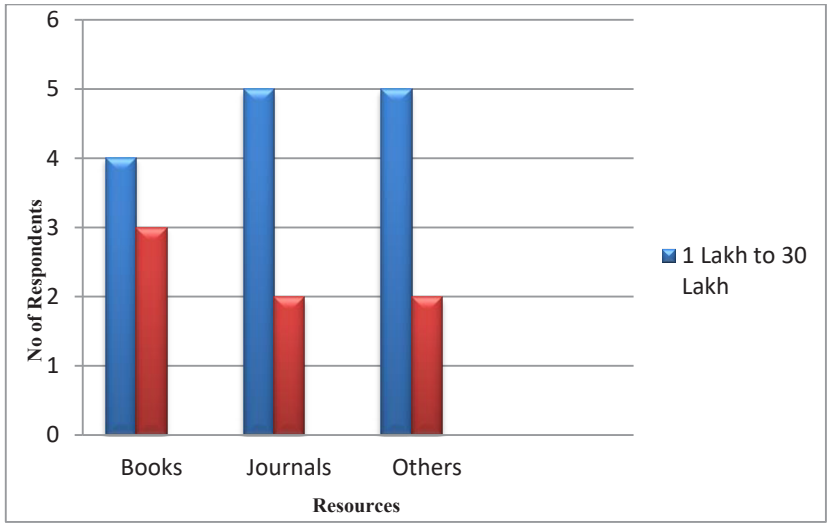


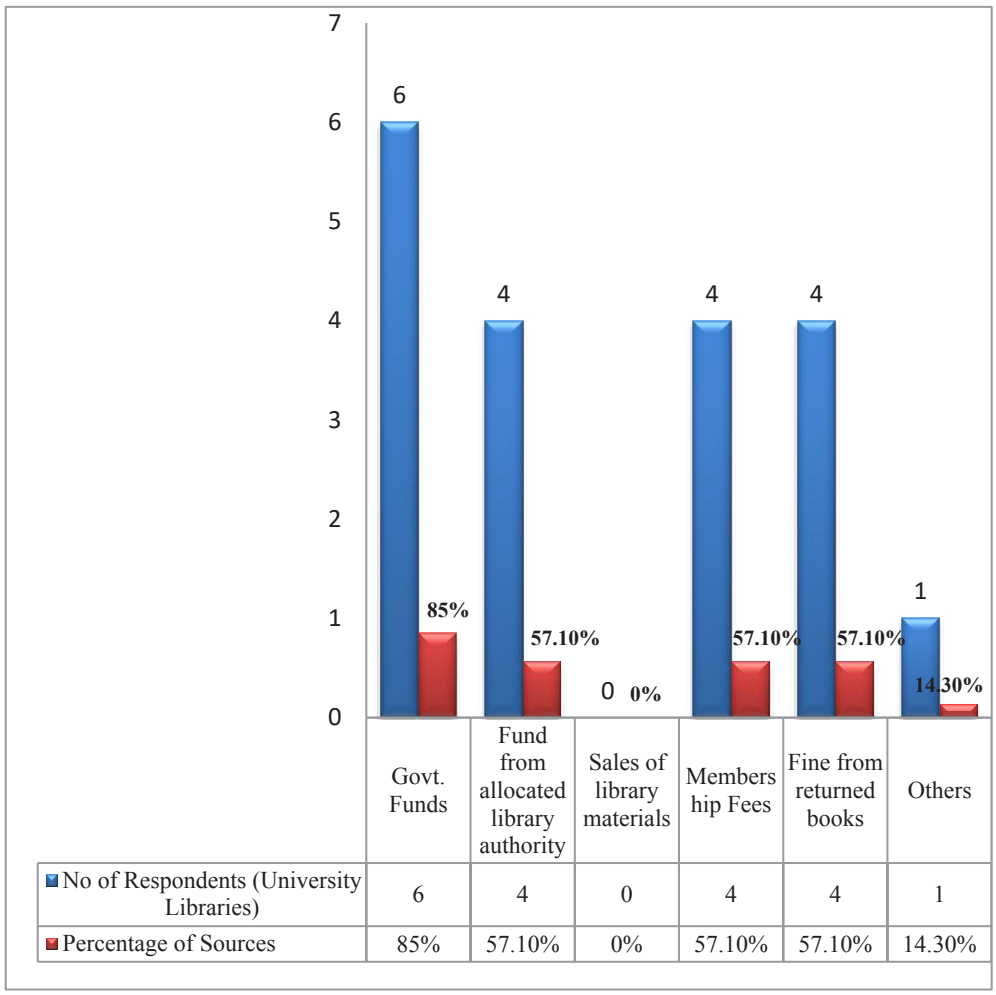
Fig 1: Yearly budget (approx) of different library resources of the Libraries

The analysis in Fig 1 is presented in a graphical form to clear the picture of the status of the yearly budget of different university libraries for their library collection. In this analysis, the resources of a library are divided into three categories. Here respondents indicate the University libraries. This analysis shows that out of seven (7) university libraries, four (4) libraries' yearly library budget for books ranges from one (1) Lakh to thirty (30) Lakh and the rest are ranges more than thirty (30) Lakh. Similarly for journals and others, out of seven (7) university libraries, four (5) libraries' yearly library budget for ranges from one (1) Lakh to thirty (30) Lakh and the rest are ranges more than thirty (30) Lakh. It has been clear that, university libraries always focus on preparing their budget more than 30 Lakh for the acquisition of library resources and to carry out all the activities effectively.

- **Sources of Library Budget:**

In the Fig 2diagram, the analysis is prepared on the basis of those university libraries taken for the study. Basically the above diagram shows the sources of

income for the library budget in percentage wise also. It is clear from the diagram that the source of income for six (6) university libraries (85%) is Funds allocated by Government. It may State Govt. or Central Govt. Apart from Govt. funds, the sources of income for library budget for four (4) universities (57.10%) are funds allocated by the library authority, membership fees and fine from returned books also. One (1) library (14.3%) has other options to get any path for income for the library budget. It is clear from the analysis that, most of the libraries depend on the Government Funds as sources of income for preparing their library budget. Also, the data table has been providing along with the diagram for the better understanding in the following.



	Govt. Funds	Fund from allocated library authority	Sales of library materials	Membership Fees	Fine from returned books	Others
No of Respondents (University Libraries)	6	4	0	4	4	1
Percentage of Sources	85%	57.10%	0%	57.10%	57.10%	14.30%

Fig 2: Sources of Income for the Library Budget in Percentage

Method Applied for preparing library budget in Percentage:

The following diagram in Fig 3 represents the percentage of method that has been applied by the university libraries in the preparation of library budget. This analysis clearly indicates that out of seven (7) libraries taken for the study, three (3) libraries (43%) apply Lump – sump method, two (2) libraries (29%) apply Line by line item method, one (1) library (14.3%) apply Planning programming and another one (1) library (14.3%) apply Zero – based budget method. The other methods – Performance, Programme and Formula Budget are not applied by any libraries out these seven university libraries. This analysis shows that Lump – sump method is applied for preparing the library budget by the maximum number of libraries among those seven libraries.

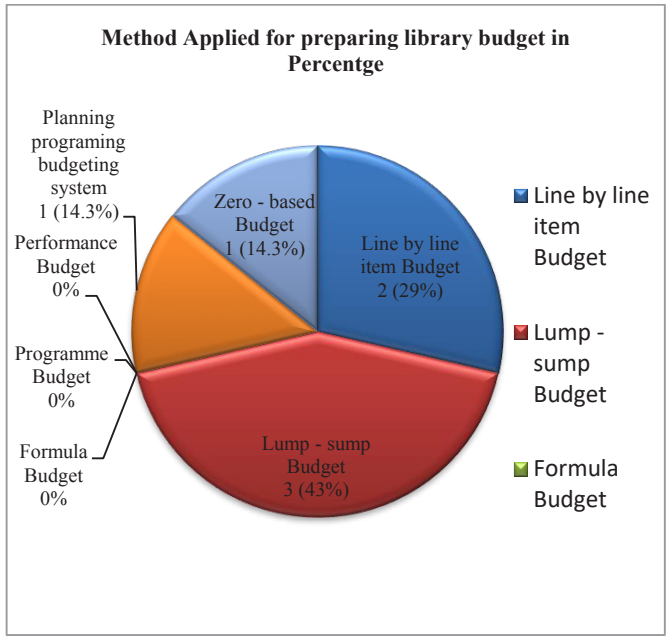


Fig 3: Method Applied for preparing library budget

- **Collection Development Policy:**

The Collection Development Policy of a library is prepared to support all the housekeeping activities- selection, acquisition, maintenance and retention of materials by establishing roles, responsibilities and a process for addressing Library users concerns. It is must require to control budgetary system of a library. A Collection development Policy is statement (basically in written) of one library's intensions for building its collection. It provides the strength and weakness of the collection and also provides guidelines for the staff.

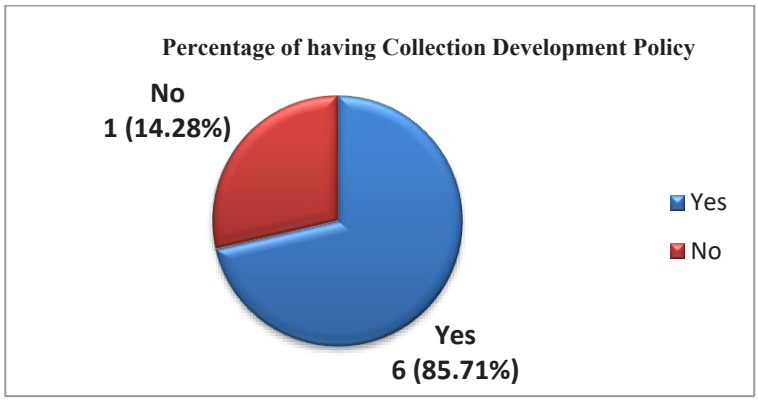


Fig 4: Percentage of having Collection Development Policy

The Fig 4 shows a clear picture about the status of having collection development policy by the seven (7) university libraries which are undertaken foe the study. It is clear from the above analysis that out of seven (7) libraries, six (6) libraries (85.71%) have their collection development policy whereas only one (1) library (14.28%) do not have their collection development policy. The KKHSOU library don not have their collection development policy for the library.

- **Selection of document based on Collection Development Policy in Percentage:**

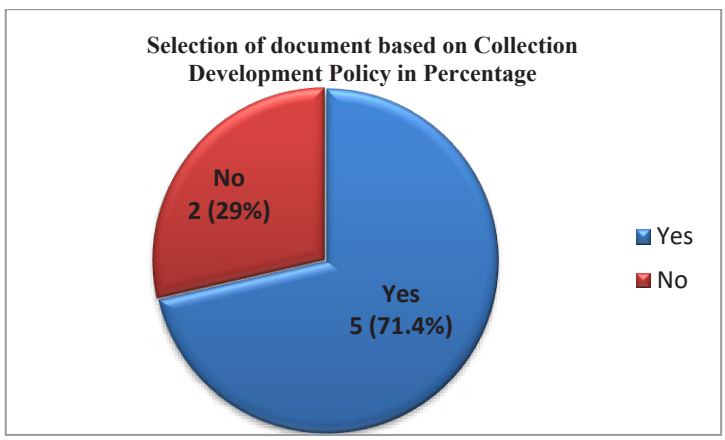


Fig 5: Selection of document based on Collection Development Policy

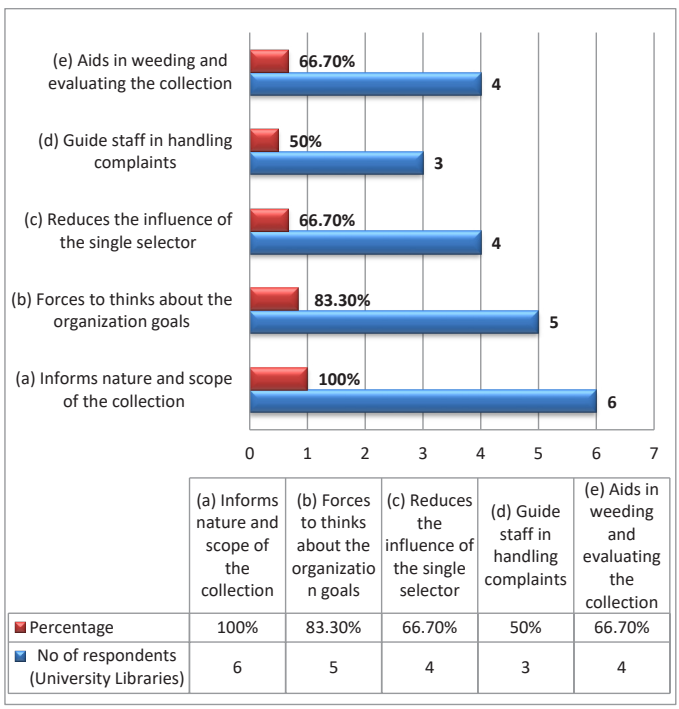
The diagram in Fig 5 indicates whether the process of selection of library document follow the Collection Development Policy or not. The analysis shows that in maximum number of libraries, i.e. five (5) libraries (71.4%) out of six (6) libraries; selection of document is done based on the collection development policy and rest

of the libraries do not follow the collection development policy for selection of the library document.

- **Issues in Collection Development Policy:**

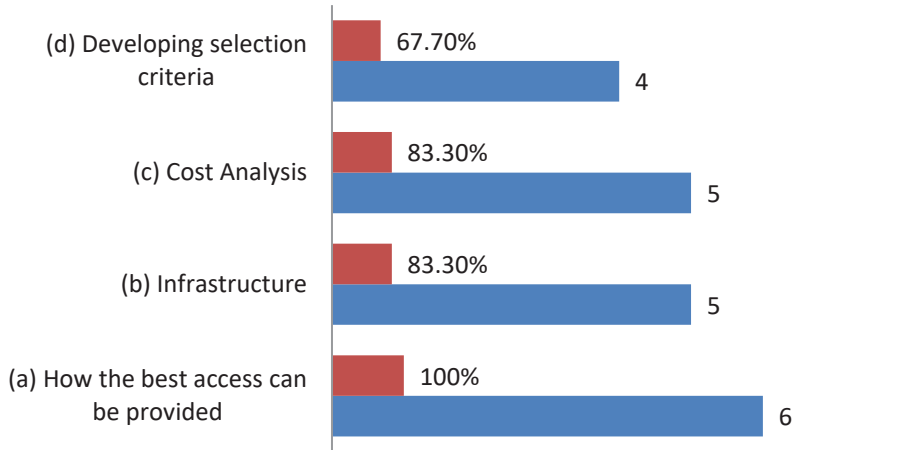
The graphical representation in Fig 6 shows the issues that the collection development policy contains. Issues are categorized into five different categories. As it is mentioned earlier that six (6) university libraries have collection development policy out of seven (7) university libraries, thus the above analysis is done on the basis of six (6) university libraries. From the above diagram, it is clear that all the six (6) libraries (100%) contains Informs nature and scope of the collection as an issue in their collection development

policy which is the highest percentage of this analysis. The lowest percentage of this analysis is 50% which indicates the point - Guide staff in handling complaints. This issue is contained by only three (3) libraries in their collection development policy. Likewise, the point – Forces to thinks about the organized is considered as issue containing in the policy by five (5) libraries and its percentage is 83.3%. The other two categories - Reduces the influence of the single selector and Aids in weeding & evaluating the collection are considered by four (4) libraries as an issue contains in the policy and its percentage is 66.7%.



	(a) Informs nature and scope of the collection	(b) Forces to thinks about the organization goals	(c) Reduces the influence of the single selector	(d) Guide staff in handling complaints	(e) Aids in weeding and evaluating the collection
Percentage	100%	83.30%	66.70%	50%	66.70%
No of respondents (University Libraries)	6	5	4	3	4

Fig 6: Issues that contains the Collection Development Policy in Percentage



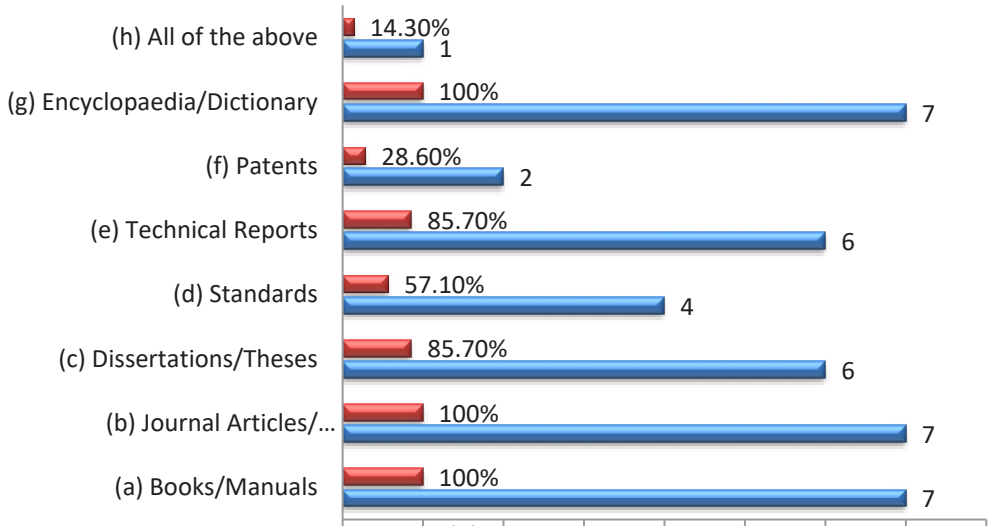
	(a) How the best access can be provided	(b) Infrastructure	(c) Cost Analysis	(d) Developing selection criteria
Percentage	100%	83.30%	83.30%	67.70%
No of Respondents (University Libraries)	6	5	5	4

Fig 7: Issues involved in the policy for developing E- Resources in Percentage

The analysis in Fig 7 indicates how the university libraries develop their collection development policy for evolving the E – Resources. All the libraries are very much concerned with how to provide the best facility to access the e-resources. Also, five (5) libraries (83.3%) are concerned with the infrastructure, cost analysis factors. Among the six (6) libraries, four (4) libraries (67.7%) are focus on developing the selection criteria so that the users get the best services in accessing e- resources.

Library Collection, Collection Management, Maintenance and Development:

In any library, all the collections should be maintained in a systematic and most efficient way to serve the users' satisfaction. In case of a University Library, the library has a huge collection and all the functions for maintaining and developing the collection should be done constructively by following instructions guided in the collection development policy of that particular university library.

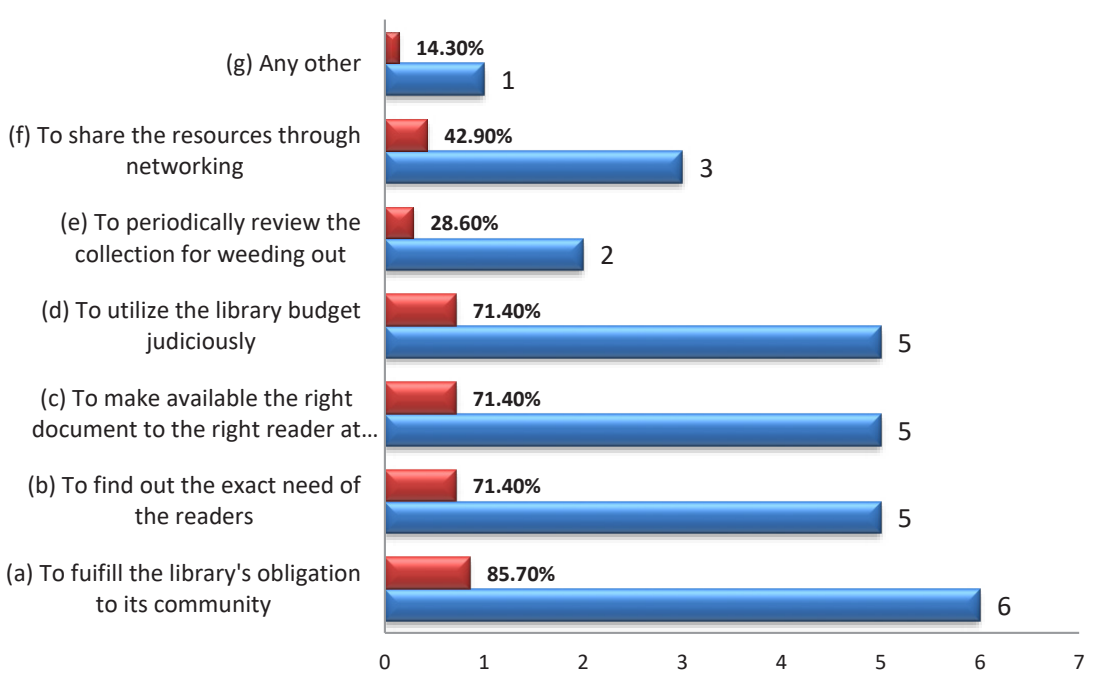


	(a) Books/ Manuals	(b) Journal Articles / Conference Communications	(c) Dissertations/ Theses	(d) Standards	(e) Technical Reports	(f) Patents	(g) Encyclopaedia/ Dictionary	(h) All of the above
Percentage	100%	100%	85.70%	57.10%	85.70%	28.60%	100%	14.30%
No of Respondents (university Libraries)	7	7	6	4	6	2	7	1

Fig 8: Different Library Collection in Percentage

Fig 8 shows the types of library collections that the seven (7) libraries of the most glorious universities of Assam have. As it is most obvious that Books, Manuals, Journals, Encyclopedias, Dictionaries are the common and the necessary resources for a university library, so all the seven (7) libraries that means 100% have these types of collections in their libraries. Other than out of seven (7) libraries, four (4) libraries (57.10%) have Dissertations and Theses and six (6) libraries (85.70%) have Technical reports in their collections along with other resources. Only two (2) libraries (28.60%) have patents in their collections and one (1) library (14.30%) have all these above discussed resources in the library collection. Here, the whole number indicates the how many university libraries respond for that particular category. The data table s also attached with the diagram for better understanding.

- **Main purpose of Collection development Policy:**



	(a) To fuifill the library's obligation to its community	(b) To find out the exact need of the readers	(c) To make available the right document to the right reader at the right time	(d) To utilize the library budget judiciously	(e) To periodically review the collection for weeding out	(f) To share the resources through networking	(g) Any other
Percentage	85.70%	71.40%	71.40%	71.40%	28.60%	42.90%	14.30%
No of Respondents (universityl ibraries)	6	5	5	5	2	3	1

Fig 9: Main Purposes of Collection Development in the Library

Fig 9 represents a graphical interpretation about the main purposes for the development of the library collection. From the above analysis, it seems that most of the libraries have their main purpose to achieve the well development of the collection is to fulfill the obligation to its community which get the highest percentage 85.70%. The lowest percentage of this analysis is 14.30%.

- **Difficulties in managing the Library Collection in Percentage**

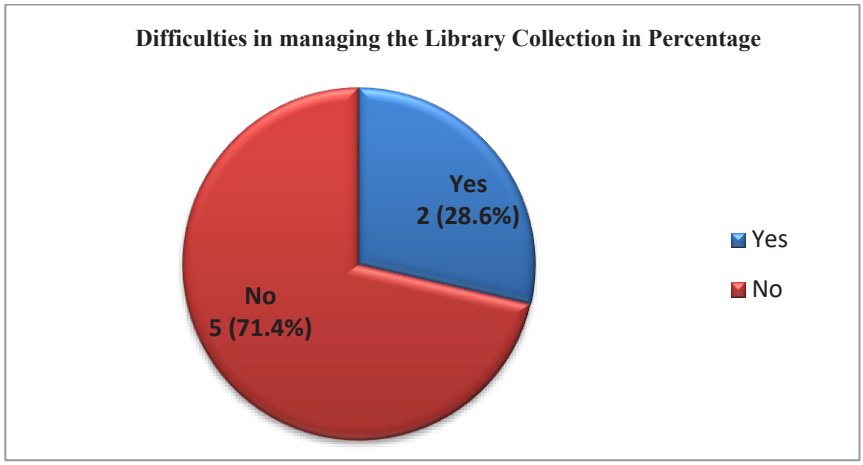


Fig 10: Difficulties in managing the Library Collection in Percentage

The graphical representation in the Fig 10 signifies the difficulties face by the seven (7) university libraries in managing the library collection. Out of seven (7) libraries, five (5) libraries (71.4%) do not face any difficulties in managing the library collection whereas two (2) libraries (28.6%) face difficulties in managing the collection of that respective library.

Conclusion:

The field of collection development is changing rapidly. A library is essential not only for the development of its collection but also for the improvement of the services and facilities as per the changing needs of library users in a rapidly changing information age. A library should continue taking their feedback to discover the effectiveness of the resources and services offered. The collection development environment, collection building, and library space are the important aspects of sustainable collection development.

References:

1. Abbott, J.A.M. (2020). A Foundation for Change: Using Challenges and Opportunities as Building Blocks for Collection Management, Collection Management. 45(2), 110-123.
2. Agee, J. (2005). Collection Evaluation: A foundation for collection development. Collection Building. 24(3), 92-95.

3. Behera, J. & Singh, S. (2011). Problems and challenges of Collection Management of Indian Libraries in Digital Era an Assessment. Journal of Arts, Science and Commerce. 2(1), 133-142.

4. Bhusan, A. (2007). Collection Management in Libraries. New Delhi: Cyber Tech Publications, 318.

5. Casserly, M.F. & Hegg, J.L. (1993). A study of collection development training and evaluation in academic libraries. Library Acquisitions: Practice & Theory. 17(3), 249-262. https://doi.org/10.1016/0364-6408(93)90069-I

6. Courtney, N & Jenkins, F.W. (1998). Reorganizing collection development and acquisitions in a medium-sized academic library. Library Acquisitions: Practice & Theory. 22(3), 287-293. https://doi.org/10.1016/S0364-6408(98)00083-0

7. Crawford, L.S. (2020). Implementing a just-in-time collection management model in an academic library. The Journal of Academic Librarianship. 46(2). https://doi.org/10.1016/j.acalib.2019.102101

8. Cubberly, C.W. (1987). Organization for collection development in academic libraries. https://doi.org/10.1016/0364-6408(87)90004-4

9. Danielson, R. (2012). A dual approach to assessing collection development and acquisitions for academic libraries. Library collections, acquisition, and technical services. 39(3-2), 84-96. https://doi.org/10.1016/j.lcats.2012.09.002

10. Das, D. & Saikia, J. (2013). Collection development of E-Resources in Academic libraries. Collection Development in IT environment in the College Libraries of Assam. 25-31.

11. Filson, C.K. (2018). Comparative study of collection management practices of academic libraries. Library Management. 39(1), 66-77. https://doi.org/10.1108/LM-12-2016-0096

Fostering Sustainable Development in the University Libraries of Assam through Web-Based Resources and Services: An Evaluative Study

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Abstract: This study aims to present an evaluative picture of web-based resources and services offered by the university libraries of Assam with the concept of promoting sustainable development. Twelve university libraries of Assam were selected based on the information content available on their website to achieve the same through website survey method and observation method for the primary data collection. The study reveals that all the selected university libraries have dedicated library websites with well-structured and provide information on their latest web 2.0 tools. 75% of library websites have information or links to institutional repositories, referral services, online document delivery services, and online renewal and reservation facilities. The provision of Web-OPAC facilities has been offered by 83.33% of libraries. CIT, Kokrajhar; Tezpur University, and Assam University have reflected the highest Web 2.0 features. 83.33% of libraries provide their information about plagiarism checks. 66.67% of libraries provide remote access facilities through e-content. Initiatives through INFLIBNET center like e-ShodhSindhu, ShodhShudhi, N-LIST Programme, and ShodhGanga plays a prominent role in promoting sustainable development. Moreover, it is also suggested that the newly established university libraries should adopt sustainable development goals at the very initiation process to meet future objectives.

Introduction

Sustainable development is a holistic approach to growth and progress that seeks to meet the needs of the present without compromising the ability of future generations to meet their own needs (The Brundtland Commission (1987). It involves balancing economic, social, and environmental considerations to ensure that development is not only viable in the short term but also environmentally responsible and socially inclusive in the long run. The terrible effects of climate change have become clear in recent years. Sustainability has truly become a global phenomenon, driven by concern about climate change. As a result, environmental awareness and sustainability have moved to the forefront of

library debate. Sustainability is commonly defined as encompassing the economy, the environment, and equality. Sustainable development should thus consider economic considerations (saving resources), but it should also be environmentally conscious.

Sustainable development in libraries involves a wide range of activities, such as developing and disseminating sustainable development information resources. Educating users about sustainable practices such as energy conservation, waste reduction, and environmentally friendly product choices; fostering collaboration among community members such as government agencies, businesses, and non-profit organizations on sustainable development initiatives; and promoting sustainable practices within the library through energy conservation, waste reduction, and the purchase of recycled materials. Several actions can be applied in the day-to-day operations of a library to reduce human impact on nature and promote sustainable development. Such actions must become part of the daily life of any librarian, functioning as a starting point for environmental awareness and generating behavioral changes throughout the community.

(SDGs)-2030 Sustainability' nowadays is one of the leading global issues popularly known as Agenda for Sustainable Development Goals (SDGs)-2030. They have set major 17 goals for sustainability. United Nations, as well as IFLA, considered that to achieve all the goals the library might have taken the major role. However, among all 17 goals, 'Goal 4' is directly related to the library. This goal states that 'ensure inclusive and equitable quality education and promote lifelong learning opportunities for all' [United Nations Resolutions adopted by the General Assembly on 25 September 2015 available at https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E].

Background of the Study

Higher educational institutions (HEIs) play a critical role in promoting sustainable development, and their libraries. Libraries can contribute to sustainable development in several key ways:

- **Providing access to information and resources:** Libraries curate and maintain vast collections of information resources related to sustainability, including books, journals, articles, databases, and multimedia materials. They provide students, faculty, and researchers with access to these resources, enabling them to stay up-to-date on the latest research, trends, and best practices in sustainable development.

Promoting education and awareness: Libraries offer a variety of educational

programs and activities to promote sustainability awareness among the HEI community. These may include workshops, seminars, speaker series, film screenings, and exhibits. Libraries also collaborate with faculty to integrate sustainability concepts into the curriculum.

- **Supporting research and innovation:** Libraries provide essential support for research on sustainability by providing access to research databases, specialized equipment, and research grants. They also offer workshops and training on research methods and data management.
- **Fostering collaboration and partnerships:** Libraries act as conveners and facilitators, bringing together stakeholders from different sectors, such as government, industry, non-profits, and community organizations, to collaborate on sustainability initiatives. They also promote partnerships between HEIs and communities to address local sustainability challenges.
- **Modeling sustainable practices:** Libraries themselves can adopt sustainable practices in their operations, such as reducing energy consumption, minimizing waste, and purchasing environmentally friendly products. By doing so, they set an example for the HEI community and demonstrate the feasibility of sustainable practices

Library services have now moved out of the four walls of the library to a virtual environment and electronic resources are accessible ubiquitously around the clock (Boachie, 2018). The web has changed the concept of a physical visit to the library for scholarly purposes with virtual access to library resources and services. An ideal and feasible way of promoting and maintaining environmental sustainability is the use of web-based sources and services or the use of a digital environment for the provision of information sources and services. Therefore, the present study "**Fostering Sustainable Development in the University Libraries of Assam through Web-Based Resources and Services: An Evaluative Study" carried out to** address the deficiencies in the criteria for the analysis of the web contents, to analyze the web contents of libraries in a border context, analyze the strength and weakness in providing web-based sources and services o user community and contribution towards sustainable development.

Review of Related Literature

A study conducted by **Jain (2016)** evaluated the status of the University Libraries of Mumbai which reveals that libraries do not have independent websites. Information about the library was available under the sub-heading of Infrastructure/ Academic/ Facilities/Campus area on the main site. Another

study by, **Ramesh and Maranna (2018)** highlighted the status of the library websites of central universities of South India. They have evaluated the domain name of the host website, general information about the library, collection details, information on e-resources, Link search, and retrieval interfaces, and innovative services adopted are the major elements considered to evaluate the websites. Similarly, **Hugar (2019)** in his study stated that ICT-led developments have created new opportunities and challenges for libraries in the creation, promotion, dissemination, and storage of information. **Bharati & Madhusudhan (2019**) analyzed the quantitative and qualitative contents of the JNU and BHU Library websites the features of general information; multimedia, library services; about the library; library resources; currency, accuracy, and relevance; Web 2.0, Library 2.0; user interface; search features, informative feedback, structure features, organization, link and periodical maintenance features, etc. On the other hand, **Haridasan and Firdaus (2021),** found that the majority of the libraries were offering traditional library services such as referral services, and library catalogs in a web-based environment more extensively compared to innovative and modern present. It is suggested that libraries should make efforts to provide social media services extensively as the current generation is the predominant user of social media; hence it is evident on the libraries' part to make efforts to reach out to a wide population of their library users-day services like library application (App), Instant Messaging (IM), and virtual library tours. Whereas, **Devi and Verma (2018)** found that on a majority of the Indian Institutes of Technology (IIT) websites library link was hidden under other broad headings such as facilities, quick links, etc. The study observed that it becomes confusing for the users if the library link is hidden under other broad headings rather than being provided directly on the parent institution's home page. **Kumar and Yadav (2020)** depicted a picture for formulating a policy for university library portals, regarding the minimum contents that should be mandatorily made available through the library portals to the users.

Objectives of the Study

The following are the objectives set to carry out the present study:

- To examine the current status of e-resources, services, library-related information, and other facilities
- To examine the reference services provided by the university libraries through the web.

- To examine the application of Web 2.0 tools
- To examine the use of web-based research tools
- To examine the contribution of university libraries to sustainable development

Methodology of the Study

This study is completely based on website survey method and observation method for the collection of primary data, which includes the following-

- The data was separately gathered from the University library's web pages.
- The investigation started with a review of the available literature. The library websites of the Universities were reviewed thoroughly with their contents, services, facilities, etc.
- The comparative study was made among the library websites under study.

Scope and Limitation of the Study

The study is confined to the different university library websites of Assam. At present, there are 30 Universities in Assam.

(*Source: https://www.ugc.gov.in/centraluniversity.aspx?type=1*), i.e. 2 Central Universities, 1 Deemed University, 18 State Universities, and 9 Private Universities in Assam. The list of Universities is as follows-

Table No. 1: Name of the Universities

Sl. No.	Name of the University	Year of Establishment	Type
1.	Assam Agriculture University	1969	State
2.	Assam Don Bosco University	2008	Private
3.	Assam Down Town University	2010	Private
4.	Assam Rajiv Gandhi University of Cooperative Management	2010	State
5.	Assam Science and Technology University	2010	State
6.	Assam Skill University	2021	State
7.	Assam University	1994	Central
8.	Assam Women's University	2013	State
9.	Auniati University	2023	Private

Sl. No.	Name of the University	Year of Establishment	Type
10.	Bhattadev University	2019	State
11.	Birangana Sati Sadhani Rajyik Vishwavidyalaya	2021	State
12.	Bodoland University	2009	State
13.	Central Institute of Technology (CIT), Kokrajhar	2018	Deemed
14.	Cotton University	1901/2017	State
15.	Dibrugarh University	1965	State
16.	Gauhati University	1948	State
17.	Girijananda Choudhury University	2022	Private
18.	Kaziranga University	2012	Private
19.	Krishanu Adhyatmik Vishvavidyalaya	2017	Private
20.	Krishna Kanta Handique State Open University	2006	State
21.	Kumar Bhaskar Varma Sanskrit and Ancient Studies University	2011	State
22.	Madhabdev University	2018	State
23.	Mahapurusha Srimanta Sankaradeva Viswavidyalaya	2013	Private
24.	National Law University and Judicial Academy, Assam (NLUJAA)	2009	State
25.	Pragjyotishpur University	2022	Private
26.	Rabindranath Tagore University	1985/2019	State
27.	Royal Global University	2013	Private
28.	Sri Sri Aniruddhadev Sports University	2020	State
29.	Srimanta Sankaradeva University of Health Sciences	2009	State
30.	Tezpur University	1994	Central

For the present study, we have considered only Twelve (12) Universities of Assam out of which 8 are State Universities, 2 Central Universities, 1 Deemed University, and 1 Private University. The rest of the Universities are not taken into account for the study as some of them are newly established with no dedicated library web page and lack poor maintenance and updates in the library webpages/websites.

The following are the selected twelve universities taken under study in detail are listed below:

Table No. 2 General Information about the Selected University Library Websites

Sl. No.	Name of the University	Abbreviation	Name of the Library	University Library URL
1.	Assam Agriculture University	AAU	The Rev. B M Pugh library	http://www.aau.ac.in/academics/library
2.	Assam Don Bosco University	ADBU	ADBU Library	https://www.dbuniversity.ac.in/Library.php
3.	Assam University	AU	Rabindra (Central Library)	http://www.aus.ac.in/library/
4.	Bhattadev University	BHU	Central Library	http://bhattadevuniversity-opac.koha.co.in/
5.	Bodoland University	BU	Central Library	http://bulibrary.in/
6.	Central Institute of Technology	CITK	Central Library	http://centrallibrary.cit.ac.in/
7.	Cotton University	CU	Dr. Surya Kumar Bhuyan Library	https://cottonuniversity.ac.in/library/
8.	Dibrugarh University	DU	Lakshminath Bezbaroa Central Library	https://dibru.ac.in/portals/lnblibrary/about_library.htm
9.	Gauhati University	GU	Krishna Kanta Handique Library	https://gauhati.ac.in/academic/library/kk-handiqui-library
10.	Krishna Kanta Handique State Open University	KKHSOU	Central Library	https://kkhsou.ac.in/web/library/index.html
11	National Law University and Judicial Academy, Assam	NLUJAA	NLUJAA Library	http://librarynlujaa.blogspot.com/
12	Tezpur University	TU	Central Library	http://www.tezu.ernet.in/Library/

Data Analysis and Interpretation

The data analysis part was completed from 8th November to 25th November 2023. We have adopted the checked marked method, viz, tick mark "✓" for Yes (1) and cross sign "✗" for Not (0) to each feature accessible on the library website in the present study.

Virtual or Web-Based Library Services: Virtual library services have revolutionized the way we access and utilize information. It provides a gateway to a vast repository of digital resources, including electronic books, journals, databases, multimedia collections, and much more. Unlike traditional libraries, which are confined to physical spaces, web-based library services are accessible from anywhere in the world with an Internet connection. Virtual library services offer a plethora of benefits, making them an indispensable tool for students, researchers, and anyone seeking to expand their knowledge with access to information 24/7. Web-based library services offer a variety of user-friendly features, such as Library App, OPAC, online tutorials, chat support, and personalized recommendations. As technology continues to evolve, virtual library services are poised to play an even more prominent role in our lives, providing us with a wealth of information at our fingertips.

Table No. 3: Virtual or Web-Based Library Services

Name of the Library	Types of Web-Based Library Services						
	Web OPAC	Information Repository (IR)	Referral Service	Remote Access	News & Events	Online DDS	Online Renewal or Reservation of Books
Rev. B M Pugh Library, AAU	✓	✓	✓	×	✓	✓	×
Assam Don Bosco University Library	×	×	×	×	✓	×	×
Rabindra Library, Assam University	✓	✓	✓	✓	✓	✓	✓
Central Library, Bhattadev University	✓	×	×	×	✓	×	×
Central Library, Bodoland University	×	×	✓	×	✓	×	×
Central Library, CIT Kokrajhar	✓	✓	✓	✓	✓	✓	✓
Surya Kumar Bhuyan Library, Cotton University	✓	✓	✓	✓	✓	✓	✓

Name of the Library	Types of Web-Based Library Services						
	Web OPAC	Information Repository (IR)	Referral Service	Remote Access	News & Events	Online DDS	Online Renewal or Reservation of Books
LaksminathBezbaroa Library, Dibrugarh University	✓	✓	✓	✓	✓	✓	✓
K K Handique Library, Gauhati University	✓	✓	×	✓	✓	✓	✓
Central Library, KKHSOU	✓	✓	✓	×	✓	✓	✓
NILUJAA Library	✓	✓	✓	✓	✓	✓	✓
Central Library, Tezpur University	✓	✓	✓	✓	✓	✓	✓
Total	10	9	9	7	12	9	9
%	83.33%	75%	75%	58.33%	100%	75%	75%

From the above table it can be seen that among the selected university library websites, 100% of the library websites have news and event information about the parent library, while 83.33% of libraries have web-OPAC facilities and 75% of library websites have the information or link to institutional repositories, referral services, Online document delivery services and online renewal and reservation facilities. Referral services are offered by libraries to assist patrons with their information needs by indicating them toward helpful resources outside of the library. 58.33% of libraries implemented remote access facilities to access the e-content of the library from any place.

Virtual or Web-Based Reference Services: A virtual or web-based reference service is a library reference service that is conducted online, and the reference transaction is a computer-mediated communication. It is the remote, computer-mediated delivery of reference information by library professionals to users who cannot or do not wish to communicate face-to-face. The term "reference" in this context refers to the task of assisting library users in finding information, answering questions, and otherwise meeting their information needs. Virtual reference service is typically an extension of a library's existing reference service program. Virtual reference services are typically provided through a variety of channels, such as email, chat, video conferencing, instant messaging, and so on.

Table No. 4: Virtual or Web-Based Reference Services

Name of the Library	Virtual or Web-Based Reference Services						
	E-mail	Contact Number	FAQ	Ask Librarian	Instant Message/ Chat	Bulletin Board	Video Conference
Rev. B M Pugh Library, AAU	✓	✓	×	×	×	✓	×
Assam Don Bosco University Library	✓	✓	✓	✓	×	✓	×
Rabindra Library, Assam University	✓	✓	✓	✓	×	✓	✓
Central Library, Bhattadev University	✓	✓	✓	✓	×	✓	×
Central Library, Bodoland University	✓	✓	✓	✓	×	✓	×
Central Library, CIT Kokrajhar	✓	✓	✓	✓	✓	✓	✓
Surya Kumar Bhuyan Library, Cotton University	✓	✓	✓	✓	×	✓	×
Laksminath Bezbaroa Library, Dibrugarh University	✓	✓	✓	✓	×	✓	×
K K Handique Library, Gauhati University	✓	✓	✓	✓	×	✓	×
Central Library, KKHSOU	✓	✓	✓	✓	×	✓	✓
NILUJAA Library	✓	✓	✓	✓	✓	✓	✓
Central Library, Tezpur University	✓	✓	✓	✓	✓	✓	✓
Total	12	12	✓	✓	3	11	5
%	100%	100%	58.33%	50%	25%	91.67%	41.67%

Web forms of communication will save paper waste and promote sustainable development. From the above table, it is shown that most of the libraries have implemented various tools for Web-Based Reference Services. Almost all the libraries have dedicated email IDs and contact phone numbers for quick services.

Again 91.67% of libraries used bulletin board services.58.33% and 50% of libraries have the provision of FAQ facilities and Ask librarian facilities through which a user can quarry about his/her required information and can provide any suggestion for better services. Some other services like instant messaging/ chat facilities and video conferencing are also provided by the libraries. It is also to inform you that the COVID-19 pandemic situation has boosted the use of digital reference services by users.

Table No. 5: Research Tools and Services

Name of the Library	Research Tools and Services					
	Searchable Database & Journal	Remote Login	Federated Search/ Discovery Search	Plagiarism Check (Academic Writing Tools)	Reference Management Tools	Tutorials and Guides
Rev. B M Pugh Library, AAU	✓	✓	×	×	×	×
Assam Don Bosco University Library	Yes	No	×	✓	×	×
Rabindra Library, Assam University	✓	✓	✓	✓	✓	✓
Central Library, Bhattadev University	✓	×	×	×	×	×
Central Library, Bodoland University	✓	✓	✓	✓	×	×
Central Library, CIT Kokrajhar	✓	✓	✓	✓	×	×

Name of the Library	Research Tools and Services					
	Searchable Database & Journal	Remote Login	Federated Search/ Discovery Search	Plagiarism Check (Academic Writing Tools)	Reference Management Tools	Tutorials and Guides
Surya Kumar Bhuyan Library, Cotton University	✓	×	✓	×	✓	✓
Laksminath Bezbaroa Library, Dibrugarh University	✓	✓	✓	✓	×	✓
K K Handique Library, Gauhati University	✓	✓	✓	✓	×	✓
Central Library, KKHSOU	✓	×	×	✓	×	✓
NILUJAA Library	✓	✓	×	×	×	✓
Central Library, Tezpur University	✓	✓	✓	✓	✓	✓
Total	12	8	7	10	2	9
%	100%	66.67%	58.33%	83.33%	19.67%	75%

The use of various research tools and services may help to promote sustainable development by reducing pollution and resource and energy consumption. As the center of research, academic libraries have a responsibility to support researchers with expertise and educate them about new developments in widely used research instruments and services. In this study, it is found that all the University Libraries have searchable databases either through E-ShodhSindhu or subscribed databases. 83.33% of libraries provide their information about plagiarism checks.

66.67% of libraries use remote access facilities through which researchers can access their e-content from anywhere. It is also found that 58.33% of libraries use Federated search/Discovery Search application, which helps the researchers to find all available e-resources from a single platform. Only 19.67% of libraries provide the service of reference management tools/ citation management (End Note, Mendeley, etc.)

Table No.6: Application of Web 2.0 Services

Name of the Library	Application of Web 2.0 Services						
	Facebook	Twitter	YouTube	LinkedIn	RSS Feed	Wiki	Blog
Rev. B M Pugh Library, AAU	×	×	×	×	×	×	×
Assam Don Bosco University Library	✓	✓	✓	×	×	✓	✓
Rabindra Library, Assam University	✓	✓	✓	✓	✓	✓	✓
Central Library, Bhattadev University	×	×	×	×	×	×	×
Central Library, Bodoland University	Yes	×	×	×	×	×	×
Central Library, CIT Kokrajhar	✓	✓	✓	✓	✓	✓	✓
Surya Kumar Bhuyan Library, Cotton University	✓	✓	✓	✓	×	×	×
Laksminath Bezbaroa Library, Dibrugarh University	✓	✓	✓	✓	×	×	×
K K Handique Library, Gauhati University	✓	✓	✓	✓	✓	×	×
Central Library, KKHSOU	Yes	×	✓	✓	×	✓	×
NILUJAA Library	✓	✓	✓	✓	×	✓	✓
Central Library, Tezpur University	✓	✓	✓	×	✓	✓	✓
Total	10	7	9	7	4	6	3
%	83.33%	58.33%	75%	58.33%	33.33	50	25%

The above table shows the use of various Web 2.0 applications and the presence of social networking accounts on various social media platforms. it was found that all the University libraries have their account on Facebook and 75% of libraries have accounts on YouTube. It is also seen that 25% of libraries use blogging services. The research revealed that university libraries typically utilized their web 2.0 platforms to advertise and inform users about upcoming events, including workshops and conferences, as well as to keep them updated on the newest additions to their collections.

Table No. 7: Web-Based Resources

Name of the Library	Web-Based resources					
	Links to E-Journals	Links to E-Books	Links to Online Database	Links to ETD	E- Reports	External E-sources link
Rev. B M Pugh Library, AAU	✓	✓	✓	✓	✓	✓
Assam Don Bosco University Library	✓	✓	✓	✓	✓	✓
Rabindra Library, Assam University	✓	✓	✓	✓	✓	✓
Central Library, Bhattadev University	✓	✓	✓	×	×	✓
Central Library, Bodoland University	✓	✓	✓	✓	×	✓
Central Library, CIT Kokrajhar	✓	✓	✓	✓	×	✓
Surya Kumar Bhuyan Library, Cotton University	✓	✓	✓	✓	✓	✓

Name of the Library	Web-Based resources					
	Links to E-Journals	Links to E-Books	Links to Online Database	Links to ETD	E- Reports	External E-sources link
Laksminath Bezbaroa Library, Dibrugarh University	✓	✓	✓	✓	✓	✓
K K Handique Library, Gauhati University	✓	✓	✓	✓	✓	✓
Central Library, KKHSOU	✓	✓	✓	✓	✓	✓
NILUJAA Library	✓	✓	✓	✓	✓	✓
Central Library, Tezpur University	✓	✓	✓	✓	✓	✓
Total	12	12	12	11	9	12
%	100%	100%	100%	91.67%	75	100

Information and communication technology (ICT) has provided an opportunity to use web-based resources. The using of web-based resources will promote sustainable development by less usage of paper, less cutting of trees, and reduction of carbon footprint. The above table reveals that most of the University libraries encourage to use of web resources through their University website. All the University libraries provide links to subscribe e-books, e-journals, and e-databases and also provide links to other e-resources. 91.67% of libraries have provided links to access electronic theses and dissertations.

Findings of the Study

Objective 1: To examine the current status of e-resources, services, library-related information, and other facilities:

From the above studies it is found that among the selected University libraries of

Assam, all the library websites are web-structured and provide the information of their latest news and events organized by the libraries. 75% of library websites have information or links to institutional repositories, referral services, Online document delivery services, and online renewal and reservation facilities. Libraries use referral services to cater to the information needs of the users by directing them to useful sources other than those provided by the libraries. The provision of Web-OPAC facilities has been offered by 83.33% of libraries.

Objective 2: To examine the reference services provided by the university libraries through web.

With the passage of time and the introduction of the Internet and information and communications technology (ICT), methods of providing reference services to library patrons have evolved and changed dramatically. Virtual reference service is one of them which is used extensively in the library. From the above study, it is found that the most popular service provided by libraries for contacting library staff is Email and contact number, as the majority (100%) of libraries provided the email address and contact phone number of library staff for responding to users' queries. Services like FAQ, Ask a Librarian, and live chat are also provided for the user community for quick response.

Objective 3: To examine the application of web 2.0 tools.

The web has provided the scholarly community with invaluable tools for significantly increasing research activity and productivity. The study reveals that different Web 2.0 features in the university library websites in Assam were provided. CIT, Kokrajhar, Tezpur University, and Assam University have provided the highest Web2.0 feature search in their library websites namely blog, wiki, RSS feed, and SNS.

Objective 4: To examine the use of web-based research tools:

Libraries play a critical role in supporting researchers' scholarly and research endeavors by developing skills and practices that will enhance their efficiency and productivity. The libraries' need to identify and provide current and relevant research tools and services is quite obvious to address researchers' research needs and increase research productivity. In this study, it is found that all the University Libraries have searchable databases either through E-ShodhSindhu or subscribed databases. 83.33% of libraries provide their information about plagiarism checks. 66.67% of libraries use remote access facilities through which researchers can access their e-content from anywhere and any place.

Objective 5: To examine the contribution of University libraries to sustainable development.

University libraries play an important role in promoting sustainable development by providing access to online information, fostering knowledge creation, and promoting best practices in library services. Their collections, services, and programs have the potential to significantly contribute to the achievement of the United Nations Sustainable Development Goals (SDGs). University libraries provide equitable access to e-books, e-journals, e-databases, and multimedia materials. Various govt. initiative through INFLIBNET centers like e-Shodh-Sindhu, Shodh-Shudhi, N-LIST Programme, and ShodhGanga plays a greater role in promoting sustainable development. University libraries also enhance knowledge creation by providing researchers with access to research materials, facilitating collaboration, and disseminating research findings. The study also shows that the University libraries of Assam make significant contributions to fulfilling the SDGs as recommended by the United Nations like Quality Education, Gender Equality, and Partnerships for the Goals.

Suggestion and Conclusion

The application of Web 2.0 and its related features in library services has made a revolutionary change in the entire perspective of information service and dissemination among users through the creation of a dedicated library web page or website. Based on the selected universities undertaken for the study, it reveals that a library web page fosters the motive of promoting sustainability and feasibility movement in the long run process where retrieving information is becoming one of the major issues. Since post-COVID-19, the accessibility of library e-resources has touched significant growth among the user community which ultimately meets the goal of a sustainable future by meeting the objectives of the UN and IFLA to promote the concept of digital literacy and achieve a life-long learning process. In this regard, the results highlighted that the selected university libraries of Assam are also promoting the objectives of sustainable development goals through web-based library sources and services, digital reference services, and web-based research tools. Moreover, it is also suggested that the newly established university libraries should adopt sustainable development goals at the very initiation process to meet future objectives.

References

1. Vasishta, S. 2013. Dissemination of electronic journals: A content analysis of the library websites of technical university libraries in North India. *The Electronic Library*, 31(3), pp.278-289.

2. Haridasan, S. and Firdaus, S., 2021. Application of Web-Based Sources and Services for Sustainable Development in University Libraries. *Library Philosophy and Practice*, pp.1-16.

3. Kumar, V. and Yadav, S.B., 2020. How Efficient are University Library Portals of NIRF-Ranked Indian Universities? An Evaluative Study. DESIDOC *Journal of Library & Information Technology,* 40(1),351-358.

4. Verma, M.K. and Devi, K., 2016. Web Content and Design Trends of Indian Institutes of Management (IIMs) Libraries Website: An Analysis. DESIDOC Journal of Library & Information Technology, 36(4), 220-227. *Library Philosophy and Practice.*

5. Bharati, S.K. and Madhusudhan Margam, D., 2019. Content evaluation of Jawaharlal Nehru University and Banaras Hindu University Library Websites in India. *Library Philosophy and Practice.* https://digitalcommons.unl.edu/libphilprac/2290/

6. Kuri, Ramesh and O, Maranna Content Analysis of Central University Library Websites of South India., 2018. In National Conference on Next Generation Libraries, Tumakuru, 7th March 2018. [Conference paper]

7. Jain, V., 2016. Evaluation of Content Analysis of University Library Websites in Mumbai Region. In International research conference, Mumbai. [Conference paper]

8. Haridasan DS, Firdaus DS. Web-Based Sources and Services for Sustainable Development in Academic Libraries: A Longitudinal Approach. *Library Philosophy and Practice.* 6764. https://digitalcommons.unl.edu/libphilprac/6764

9. Haridasan, S., & Uwesh, M. 2014. Content analysis of the central university library websites in India: a study. *Journal of information management*, *1*(2), 59-71.

10. Manjunatha, K. S. 2016. Content Analysis of special library websites: An Analytical study. *International Journal of Next Generation Library and Technologies*, *2*(2), 1-9.

11. Savitha, K. S. 2016. Content analysis of deemed university library websites of Karnataka state: A study. *International Journal of Digital Library Services*, *6*(1), 87-93.

12. Verma, M. K., & Brahma, K. 2017. Websites of Central Universities in North East India: A Webometric Analysis. *DESIDOC Journal of Library & Information Technology*, *37*(3).

13. Gautam, V. K. 2017. Content Analysis of Websites of Central University Libraries in Delhi, India: A Study. *International Journal of Information Movement*, *2*(4), 82-89.

14. Das, S., & Das, S. 2018. Web content analysis of IISER library web sites in India: A comparative study, *International Journal of Information Management,* 2(IX), 41-47

15. Devi, K., &Verma, M. K. 2018. Content analysis based evaluation of library websites: a case study. *Annals of Library and Information Studies,* Vol. 65, December 2018, pp. 239-251

16. Bharati, S. K., & M. M. 2019.Content Evaluation of Jawaharlal Nehru University and Banaras Hindu University Library Websites in India. *Library Philosophy and Practice (e-journal),* 1-23.

17. Assam Agriculture University (2023) *The University library*. Available at: http://www.aau.ac.in/academics/library (Accessed: 17 November 2023).

18. Assam Don Bosco University (2023) *Library.* Available at: https://www.dbuniversity.ac.in/Library.php (Accessed: 17 November 2023).

19. Assam University (2023) Rabindra Library. Available at: http://www.aus.ac.in/library/ (Accessed: 17 November 2023)

20. Bhattadev University (2023) Central Library. Available at: http://bhattadevuniversity- opac.koha.co.in/ (Accessed: 17 November 2023)

21. Bodoland University (2023) Padma Shri Madaram Brahma Central Library. Available at: http://bulibrary.in/ (Accessed: 17 November 2023).

22. Central Institute of Technology, Kokrajhar (2023) Central Library. Available at: http://centrallibrary.cit.ac.in/ (Accessed: 15 November 2023).

23. Cotton University (2023) Dr Suryya Kumar Bhuyan Library. Available at: https://cottonuniversity.ac.in/library/ (Accessed: 17 November 2023).

24. Dibrugarh University (2023) About Library. Available at: https://dibru.ac.in/portals/lnblibrary/about_library.html (Accessed: 17 November 2023).

25. Gauhati University (2023) K K Handiqui Library. Available at: https://gauhati.ac.in/academic/library/kk-handiqui-library (Accessed: 17 November 2023).

26. Krishna KantaHandique State Open University (2023) Available at: https://kkhsou.ac.in/web/library/index.html (Accessed: 17 November 2023).

27. National Law University and Judicial Academy, Assam (2023) Available at: http://librarynlujaa.blogspot.com/ (Accessed: 17 November 2023).

28. Tezpur University (2023) Available at: http://www.tezu.ernet.in/Library/ (Accessed: 17 November 2023).

Contribution of RRRLF to the Advancement of Public Libraries in Maharashtra : A Study

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Abstract: The paper discuss the role of RRRLF in Public library of Maharashtra. The Public Libraries have to play a crucial role in modern society in meeting many of its social needs like information communication, education, recreation and socio-cultural development. Library is a place where the collection of information resources in print or in other forms that is organized and made accessible for reading or study is kept. The purpose of the paper is to discuss about the function, promotion and Achievement of Raja Ram Mohan Rai Library and Public library of Maharashtra.

Introduction

Library is the store- house of knowledge for posterior use. Human knowledge can be recorded and preserved in different media. Some years back, documents written or printed in paper were considered as the best medium. But with the development of science and technology today electronic multimedia have been widely used for preservation of knowledge in the libraries of any kind whether it may be public, academic or special library. Since the beginning of civilization human beings have been putting emphasis on storing of information in different ways. However it must be admitted that libraries in ancient times were not like those of the present days. Libraries are dynamic and grow along with human civilization. The urge of social, economic, intellectual and cultural improvement necessitates the development of different kinds of libraries.

Definition of Library

International Organization for Standardization has defined library as "irrespective of the title, any organized collection of printed books and periodicals or of any other graphic or audio-visual materials, and the services of a staff to provide and facilitate the use of such materials as are required to meet the informational, research, educational or recreational needs of its users".

"A public library (also called circulating library) is a library which is accessible by the public and is generally funded from public sources (such as tax money) and may be operated by the civil servants. Taxing bodies for public libraries may be at any level from local to national central government level. The public library is an excellent model of government at its best. A locally controlled public good, it serves every individual freely, in as much or as little depth as he or she wants."

Changing role of Public Libraries in Maharashtra:-

- Information and knowledge are commonly recognized as strategic resources in the countries around the world.
- Radical technological, social and economic transformations have provided not only faster access to information and knowledge, but also created new dependencies and complex social practices among people, organizations and even entire nations.
- It is important to create knowledge infrastructure so as to facilitate equitable access to information.
- Citizens should be enabled to know when and what information is needed; where and how to obtain that information.
- Public library is the only institution which provides access to knowledge, information and works of imagination through a range of resources and services without any discrimination.

Public Library In Maharashtra :-

Directorate of the libraries was set up in the state of Maharashtra on 2nd May 1968. Under the directorate upto 31st March 2013 One State Central Library, 6 Divisional Libraries, 35 District Libraries and One Reference Library and 6 Offices of Asstt. Director of Libraries & Head Quarter of Directorate thus 50 offices are established. The Director of Libraries is the Head of the Department and he has been entrusted with certain functions under Superintendence, direction and control of the State Government. He is assisted by the Divisional/Asstt. Directors working at the Divisional Head Quarters. These 6 Asstt. Directors are responsible for supervision, inspection and technical guidance for the recognized public libraries. They have been allotted with the staff viz. Inspectors and Sr. Clerks.

The Director is assisted by one Dy. Director and one Asstt. Director at head office. Dy. Director looks after establishment so also, the work of Book Selection Committee and preparation of bibliographies. He is expected to give technical guidance to

the Divisional Libraries. The State Central Library, established at Mumbai and the Divisional Libraries established at Pune and Nagpur, are under the control of Class I Officers.

Functions of DOL :-

Directorate of Libraries comes under administrative control of Higher and Technical Education Department, Govt. of Maharashtra. As per provisions in The Maharashtra Public Libraries, Act 1967.

Sr. No.	Office				Nos.
A	Head Quarter of Directorate				1
1	State Central Library				1
2	Govt. Divisional Libraries				6
3	Dr. Babasheb Ambedkar Memorial Reference Library				1
4	Govt. District Libraries				35
5	Assistant Director Offices				6
	Total Offices				50
B	**Public Libraries (As on 31.03.2013)**				
	Grade	**District**	**Taluka**	**Other**	
1	A	35	133	164	332
2	B	-	114	2032	2146
3	C	-	29	4195	4224
4	D	-	-	5955	5955
	Total	**35**	**276**	**12346**	**12657**
C	**Grampanchayat Libraries**				**201**
	Total Libraries				**12858**
D	**Research Institutions**				**35**

The following functions are carried out by Directorate of Libraries for the development of Public Libraries movement in the State.

1. To recognize The Public Library and provide Ad-hoc and Maintenance grants.
2. To prepare schemes for the development of Public library movement.
3. To create network of libraries and library services from state central library to divisional, district, Taluka and village level.

4. To prepare and publish a classified Index of Books published in Marathi language every year.
5. Preserving and promoting collection of rare books and manuscripts.
6. Encourage the development of government and public Libraries.
7. Properly using Funds of The State Public Library grant.
8. Providing financial assistance received under the Scheme of Raja Ram Mohan Roy Library Foundation for Public Libraries.
9. The State Government may recommend names of members to the Library Council.
10. Organizing of The State Library Council
11. To guide Workers for establishment of Public Library
12. To develop reading culture and Library movement in society State Government gives following Awards annually-
    - Dr. Babasaheb Ambedkar Excellent urban-rural Library each category of award
    - Dr. S. R. Ranganathan Granthamitra Excellent field worker and worker award

Raja Ram Mohan Roy Library Foundation:-

In 1972 was a significant year in the history of the library movement in India. Silver Jubilee celebration of the independence of his country from British administration in 1972. Sudden he›s reading habits among the masses to emphasize that an international year of the proclamation of the book promotion «all books». Not only that, it was a good occasion of the Bicentennial of the birth anniversary of Indian social reformer, who stressed the need for the development of modern education in the nation. This year in August the king Ram Mohan Roy Library (RRRLF) was in May 1972 (; 1997; 1 RRRLF) . The public library service and support system and is the nodal agency of the Government of India to promote the country›s public library movement. King Ram Mohan Roy Library Foundation is sponsored by the Department of Culture to establish an autonomous institution and the Government of India. But the West Bengal Societies Registration Act, 1961, is registered under. Has its headquarters in Kolkata. Northern Regional Office at New Delhi; In view of the large programs, the Foundation has opened regional offices Foundation under grant presented by the impact of the implementation of the monitoring Assistant East Regional Office and regional authorities, such as

the Southern Regional Office at Calcutta , Mumbai, Chennai and Western regional office.

Main Objectives of RRRLF:-

- to enunciate a national library policy and to help build up a national library system;
- to provide financial and technical assistance to libraries;
- to provide financial assistance to organizations, regional or national engaged in the promotion of library development;
- to promote research on library development;
- to advise the Government on all matters pertaining to the library development in the country;
- to propagate the adoption of library legislation in the country.
- Monitoring and developing public library services in the country.

Functional Procedure of RRRLF :-

For effective implementation of the Matching and Non-Matching Schemes and also to draw development Plans a State Library Committee (SLC) is constituted in each State.SLC Draws the annual implementation plan for library services keeping in view the Budget allocated by the State Government, requirements and thrust area. RRRLF collaborates with Directorate of Library Services in each State. to develop the Public System & Services through implementation of the schemes.

- RRRLF has adopted certain schemes of Matching and Non-Matching assistance.
- State/U.T. has to participate in the Matching programmes of the RRRLF by contributing matching share on a pre-determined basis.
- 50:50, for the states having developed library system
- 60:40 (40% is the state share and 60% is the central share) for the states having moderately developed Library System
- 90:10 for north eastern states (90% is the central share and 10 % is the state share).

Financial Assistance under Matching schemes are provided out of the total fund created with the State Contribution and the corresponding Central Share.

In case of Non-Matching schemes assistances are provided from the Central

Government Plan fund only.

Achievements of RRRLF :-

- RRRLF has assisted more than 34000 public libraries in India.
- State Central Libraries, District Libraries, Divisional Libraries, Sub-divisional/Taluka/Tehsil/Town and Rural Libraries,
- Nehru Yuva Kendras/Jawahar Bal Bhavan
- Libraries run by voluntary organizations (NGOs),
- Libraries run by Rural Extension Centres of Visva-Bharati, Shantiniketan, Various professional Ogrnanisations and Library Science Departments of Universities.
- Books to about 16,500 libraries,
- Furniture and Equipment to about 5000 libraries,
- About 125 libraries for construction or renovation of library building,
- About 500 libraries for modernization,
- About 160 Training programme, seminars are organized with the assistance of RRRLF,
- About 60 Children corners are established,
- About 10 libraries are provided assistance for creation of facilities for specially abled groups,

Promotional Activities :-

- Preparation of National Policy on Library and Information System.
- Guidelines on Public Library System & Services and Model Public Library Act.
- Report on Loss of Books in Library for the Government of India.
- Raja Rammohun Roy Memorial Lecture by a scholar of eminence.
- RRRLF interacts with national and international professional associations like IFLA, ILA, IASLIC and different state level library associations.
- RRRLF had also started conferring awards in the following fields :
- Award to best State Central Library and Award to best District Libraries (two district libraries in each of the five zones),
- Best article award.

- RRRLF confers the prestigious RRRLF fellowship to selected eminent professionals to honor their outstanding contribution in the field of public library services.
- RRRLF has assisted in Digitization of rare documents of Rabindra Bhavan, Visva-Bharati.

Conclusion :-

- The Foundation has been able to achieve its objective of encouraging the functioning of libraries outside the metropolitan areas with optimum utilisation of the limited resources made available by the Central and State Governments.
- Considerable more work, constantly expanding, has to be done so that all who want access to reading resources can make use of a library services.
- The nature of the tasks ahead is such that greater involvement of state governments and voluntary agencies is inevitable.
- To play their role more efficiently most of the state governments have already taken steps to, and we hope that other states will establish functional state library directorates and state library committees.
- Their endeavor will be to make most effective use of public funds for propagating the vision of "***Knowledge for all at their doorsteps***".

References :-

1. **Anki Reddy, D.C.,** (1998)**.** *Management and organization of public libraries*. Vol.1. New Delhi: Cosmo Publication.

2. **Barman, R.K.**, (2007). Origin and development of rural libraries in India with reference to Assam: an observation. In: *Proceedings of the National Seminar on Rural Libraries in the North East India Problems and Prospects*, Guwahati, March 28-29, 2007, Central Reference Library: Kolkata.

3. **Cottaschonberg, M.,**(2005). Drivers and directions of academic library development. [Online] Available at: www.google.com [Accessed 1 February 2008].

4. **Cyriac, J., Deshmukh, G.R. and Rajalakshmi, D.**,(2002). Digitization of libraries in modern era. ***ILA Bulletin***, 38 (3), pp 68-73.

5. https://dol.maharashtra.gov.in/Content.aspx?ID=102&PID=129

6. **Soumen Sarkar**, Role of Raja Rammohun Roy Library Foundation and National Mission on Libraries in promoting public library system & service in India (PPT)

7. **Haider, S.J.,** Public libraries and development planning in Pakistan: a review of past efforts and future needs**.** ***Asian Libraries***, 8 (10), pp 371-379.

8. **Hossain, S.,** (1981). Library Development Schemes for Bangladesh. ***ILA Bulletin***, 17 (3-4), pp 209-212.

9. IGNOU, (1999). *Library and society: development of libraries and their role in society.* BLIS-01, Block 1. New Delhi: IGNOU.

10. **Kaula, P.N.,** (2007). The need, structure and Development of Rural Libraries. In: *Proceedings of National Seminar on Legislation based*

    Rural Library Service in India, Imphal, September 9-11, 2007, RAS North East Chapter: Imphal.

11. **Khanna, J.K.,** (1987). *Library and Society*. Kurukshetra: Research Publication.

12. **Krishan Kumar,** (1987). *Library Organization*. New Delhi: Vikas Publishing House.

Building up Library collection in University libraries of Assam with reference to K K Handique Library, GU: A Critical Analysis

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ABSTRACT: Collection is most important content of library or information centre. Due to technological development, information can be accessed by larger number of users in electronic format, and these changes force to think the library Professionals to take important steps and designed for collection development policy for library.

This paper highlighted the collection Development policy of university library of Assam. The study was made among five different university of Assam. Finding shows that libraries are try to increase their collections keeping in view of both faculty and users demand. This paper basically emphasizes about the development of library collection and status of university library and tried to give some suggestions on the basis of findings.

1. Introduction

Collection development (CD) consider to be the most important and fundamental aspect of the library or an information centre. Collection development is a process of building up and improving the collection of a library, User need, Collection development policy (CDP), Book selection, Weeding policy, storage and preservation of collection are the important area of collection development.

Collection development for better service to the user is the most important and primary objective of any library. A university library may have to deal with specific current and upto date information in a variety of forms including unconventional forms like technical reports, conference papers and proceedings, instruction manuals, data handbook, data sheets, newspapers, slides, photographs, records etc. The main purpose of the Collection Development Policy (CDP) is to establish guidelines for the pre planned development of collection of materials to meet the educational needs of student, research scholars and faculty members of the university.

Collection Development and Selection of Materials should be done according to some important standards and established selection and procedure. Collection development and management has gained importance in modern information society in the context of university library environment.

Due to technological development, information can be accessed by a larger number of users in electronic and digital format. These overall changes have forced information professionals to think over issue related to collection development to design strategic based policies to satisfy the user's needs.

2. Library Collection Development

Library collection Development (LCD) refers to the systematic process of acquiring, organizing and maintaining library materials for a library's information centre's collection. It involves selecting and obtaining library materials such as books, journals, audio-visuals materials and electronic resources that meet the needs of library users.

The following are the few steps that involves process of collection development-

(a) **Needs Assessments:** It involves analyzing the needs of information and determine the types of materials that should be included in the collection.

(b) **Selection:** Library professionals use various methods to choose materials for the collection. The selection process involves evaluating the quality, relevance and appropriateness of materials for the users.

(c) **Acquisition:** Once the materials are selected, library acquires them through different processes, such as through purchases, exchange or interlibrary loan etc. Some of the important factor that is to be consider are budget constraints, availability and licensing agreements for electronic resources.

(d) **Cataloguing and Classification:** After acquiring of materials, the library professionals assign call numbers, subject headings and other metadata to organize the items in the library's catalog or database. This ensures efficient retrieval of library materials.

(e) **Weeding and deselection**: Over time, the some library materials become outdated, damaged or less relevant to user's requirements. Weeding involves removing such items from the collection of the library.

3. Collection Development Procedure

A University library may have to deal with specific, current and up to date information in a variety of forms like unconventional form or conventional form. The objective of the university library is to provide information resources and facilitate information access in support to scholarly activity, curriculum

development and to promote research activities.

To find out the resources and services available and the practices of ICT application in university. I have visited four Universities such as Tezpur University (TU,) Dibrugarh University (DU), , Assam Agricultural University (AAU) and Kaziranga University(KU).

3.1 Collection Development Policy

Table-1 Collection Development Policy

University	Written Collection Development Policy	Regularly Implemented	Revised and Updated	Include the Electronic Resources
TU	Yes	NA	Yes	Yes
GU	Yes	Yes	Yes	Yes
AAU	Yes	Yes	Yes	Yes
DU	Yes	Yes	Yes	Yes
KU	No	NA	NA	NA

Table-1 Stated that 80% University have their collection development policy they are TU, GU, AAU, DU, other for example KU don't have their written collection development policy. All the libraries which having written collection development policy are regularly implemented by the library authority of the University.

3.2 Document Selection

Table-2 Library Resources Selection

University	User who play major role in the document selection				Resources Selection tools
TU	Faculty	Library Committee			Publisher Catalogue
GU	Faculty	Library Committee t			Publisher Catalogue
AAU	Faculty				Publisher Catalogue, Book Quotations etc.
DU	Faculty	Student	Library Staff	VC & Library Committee	Publisher Catalogue, Book Quotations etc.
KU	Faculty		Library Staff		Publisher Catalogue, Book Quotations etc.

Table no 2 stated that regarding the document selection, faculty play major role in all libraries they are TU, GU, AAU, DU, KU.

3.3 Collection of Resources

Table-3 Total Library Collection up to 2022-23

Collection	TU	GU	AAU	DU	KU
Print Books	1,16,643	2,78,107+	1,88,327	2,25,672	15,458+
E Books	1,255	1500+	3801	1439	
Print Journals in current list of subscriptions	52	350+	60	143	
E Journal in current list of subscriptions	9,309+	12000+	3856	8000+	49000
Total Collection	1,45,907+	291957+			

3.4 Subscribing E-Resources

Table-4 E-Resource Subscription

University	Mode of subscription		From whom the university subscribe	
TU	Independently	Consortia	From Publisher	
GU	Independently	Consortia	From Publisher	
DU	Independently	Consortia	From Publisher	
AAU	Independently	Consortia		From Vendor
KU	Independently			From Vendor

From table-4 stated that the university libraries of GU, DU, AAU, are subscribing e-resources both independently and through consortia. Assam University library is subscribing e-resources by consortia. The libraries subscribing e-resources vendor are AAU and KU.

3.5 Findings

(a) It is seen that G.U. Library is the oldest one library highest number of books and reading materials.

(b) It is evident that library user is highest in Gauhati University Library. Basically users are belongs to higher education like faculty member, Research Scholar, PG student and staff of the University.

(c) It is stated that regarding the document selection, faculty plays the major

role in all university.

(d) It is seen that 60% University libraries subscribing e-resources both independently and through consortia.

(e) Manual classification procedure is adopted by 85% of University libraries of Assam.

(f) University libraries adopting accession register method is 75% for stock verification. Most of the libraries verify that stock in one or two years, some of the libraries verify their stock in three or four years.

4. University Library and ICT

The concept of digital library services has evolved after the implementation of ICT in the university library. The implementation of ICT in the libraries has demanded new forms of library services to get user satisfaction. University libraries are now greatly influenced by the impact of ICT. UGC liberally contributes the grants to the University and other affiliated college to install the ICT facilitate and create a digital environment. INFLIBNET is actively involved in the automation and digitization of university libraries. The instruction given by the INFLIBNET by its various activities like funding, training, orientation, workshop made by University libraries equipped with all the ICT tools for providing better service to students, research scholar and faculty members of University.

5. Collection Development Policy (CDP)

This policy covers guidelines for collection development in the University Libraries.

CDP include following principles-

- Objective of collection Development
- Responsibilities
- Collection analysis
- Electronic collection life cycle
- Criteria for journals and databases
- Open access materials
- Infrastructure system and software
- Standard assessment tools
- Licensing
- Collection maintenance

- Policy revision

5.1 Digital library Collection Policy

Digital libraries play vital role in providing access to a wide range of digital resources. A collection policy outlines the guiding principles, objectives and strategies for acquiring, organizing and processing digital content.

- **Definition and purpose of collection policies**: One fundamentals aspect of collection policies is defining the scope and purpose of a digital library's collection.
- **Intellectual property Licensing:** The Digital environment presents unique challenges in terms of intellectual property right and library licensing agreements.
- **Metadata and organization:** Effective organization and metadata standards are critical for enhancing discoverability and access to digital collection.
- **Preservation and sustainability:** Preserving digital content for long term access is a central concern for digital libraries.

6. Sustainable Development Challenges in Libraries

The sustainable development in librarianship is relatively new in new research field.

Sustainable development recognizes consistent growth that meets contemporary and future generation.

There are three interrelated dimensions to sustainable development: Social, Environment (Ecological), and financial.

Over the last two decades, the significance of SD in libraries has broad in its scope.

Generally all types of libraries need to be socially, environmentally and economically sustainable to be available for future.

All around the world, libraries and library association such International Federation of Library Association (IFLA) and America Library Association (ALA) are furthering, supporting and integrating sustainability in their practice.

Sustainable Development (SD) in the LIS, research is gaining significant momentum as going green movement in libraries.

Sustainable development has received attention in LIS research and continues for

exploring effective strategies for the environment friendly libraries SD has multi dimensions challenges in libraries.

7. Suggestions

(a) In a University Library, the faculty and students are the main focus and keeping in view of their needs, the library collections are to be development.

(b) Books Selection Policy should be a common endeavor of the faculty members, librarian and students which would be made aware of the problem.

(c) Library must study community and determine the needs of the community. So also the goal and objective of the institution before finalizing the drafting of collection development.

(d) In assessing and analyzing the past use of collection enables the librarian to predict future use, a prediction may be deciding factor in the formulation of collection development.

(e) A Collection Development Policy (CDP) must be formulated very carefully with utmost caution and wisdom as it is concerned with delicate issues.

(f) Collection Development Policy (CDP) must be reviewed at regular intervals in accordance with the changes in teaching methodology, alteration in curriculum, changing budgetary situations and new research programme.

(g) The professionals and library authority should be accepting the challenges with the latest development of IT application in libraries and therefore they should try to adopt every last knowledge on the development of ICT.

(h) To improve and develop a library collection adequate financial support is needed. The library should procure new and up to date research materials for which financial support is essential.

8. Conclusion

Collection Development Management and services in library is the main driving factor to developed and maintain the library in perfect condition for the library users.

Collection Development is a planned, continuous and cost effective acquisition of relevant materials to meet the needs of users and objective of the library. Effective collection development and management policies and procedure should be

adopted by the university libraries to satisfy users needs in terms of availability, accessibility and use of materials.

It is essential that collection should be well organized to assist users in their search for information. Digital and electronic collection should be given enough proportionate, so that user could access them easily,

The Library Professional staff should be fully equipped with ICT knowledge and well concerned with recent trends and development to serve the information seeker which will directly help in the overall development of the library. Collection development procedure in the digital age are very essential for libraries and information centres to effectively manage and provide access to digital collection.

As the University library is the important part of a university, the user expects more from it, so the library professionals should be very dedicated towards their duties and responsibilities. They should be fully equipped with ICT knowledge and well concerned with recent trends and development of parental university as well as indirect development of society.

References

1. Jan, Sumaira and Geniae, Shabir Ahmed. "Trends in collection & collection development practices in University libraries with particular reference to India and other developing countries: A review of literature"(2019). Library Philosophy and Practice(e-Journal).2510. http://digitalcommon.unl.edu/libphilprac/2510.
2. Khalid, Ayesha, Malik, Ghulam, Farid, Mahmood, Khalid. "Sustainable development-Challenges in libraries: A Systematic literature review (2000-2020)"| The Journal of Academic Librarianship. Vol-47, issues 3, May 2021.
3. Rahman, Mukutor, Choudhury, Tahera, Akhtar, Barooah, PK, "Management of Collection in University libraries of Assam in ICT environment: A Study " Library philosophy and practice (e-journal) .
4. Aradhara, Ramjyoti "Building up library collection in Colleges of Assam with reference to Lakhimpur and Dhemaji District: A critical analysis".
5. Mawia, F Chanchin "Collection management & services of Rajiv Gandhi University and Tripura University Libraries & North East India : A comparative study (2021)". Library Philosophy and practice (E-Journal by Mawia) Digital Common University of Nebraska

6. Kapadi, Rajaram Vaman and Palil Daya T. "Collection development policies in digital age" AEGAEUM Jounal V11(8) 36-43,August 2023.

7. Khan, Ghalib and Bhatti, Rubina ..(2021) "Collection Development and Management in the University of Pakistan" Library philosophy and practice (e-journal. 5276 http://digitalcommons.unl.edu/libpjhilprac/5276

Library Collection: Sustainable Development with Challenges

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Abstract: Sustainable development is a critical global concern, addressing economic, social, and environmental challenges. Libraries play a pivotal role in supporting sustainable development by providing access to information, knowledge, and resources. This research article explores the concept of sustainable development in the context of library collections, highlighting the challenges and opportunities faced by libraries in their mission to contribute to a sustainable future. By identifying and addressing these issues, libraries can better serve their communities and advance the goals of sustainable development.

Keywords: Collection, sustainable development, library collection, collection development policy, selection, weeding evaluation, librarian

1. Introduction:

Sustainable development is a multifaceted concept that aims to balance economic growth, social equity, and environmental stewardship. Libraries have a crucial role in supporting this endeavor by collecting, preserving and disseminating information and resources related to sustainability. However, in their efforts to contribute to sustainable development, libraries face various challenges that require careful consideration and innovative solutions. This article delves into the complexities of managing library collections in the pursuit of sustainable development.

2. Sustainable Development and Libraries:

Libraries are not just repositories of books but serve as dynamic centers for learning, research, and community engagement. They are uniquely positioned to advance the United Nations Sustainable Development Goals (SDGs), including ending poverty, ensuring quality education, and protecting the environment. Library collections are a key component of this mission, providing the knowledge necessary to address these global challenge

3. Definition:

Library Collection: A library collection refers to the total body of materials, resources, and items that a library has acquired and organized for the use and benefit of its patrons. These materials can encompass a wide range of formats and subjects, including books, periodicals, newspapers, e-books, audiovisual materials, manuscripts, maps, government documents, digital resources, and more. The collection is carefully curated and managed to provide a diverse and relevant selection of materials to meet the educational, informational, and recreational needs of the library's users.

A library collection can be further categorized into various sub-collections or sections, such as the reference collection, circulating collection, special collections, and digital collections, each serving specific purposes within the library's mission and goals. Libraries continuously develop and maintain their collections through processes like acquisition, cataloguing, weeding, and preservation to ensure that their resources remain current and accessible to the community they serve.

4. Objectives:

(a) To study of collection development system adopted by the libraries
(b) To study collection development policy implemented by the libraries
(c) To study, how to do work of the libraries with scope of the collection development system

5. Scope of the study:

The scope of the research is related to the following

1. Library collection development system:-
   Book selection, preservation, evaluation and weeding.

2. Collection development process, Sustainable development, Challenges, Best practices and role of the librarian

6 Fundamentals of Library Collection Management:

Library collection management is a core function of libraries, encompassing the systematic development, maintenance, and assessment of library collections to meet the needs of their users. This practice is essential for libraries to provide valuable resources and support the academic, research, and informational requirements of their communities. Here are the fundamental concepts and principles of library collection management:

6.1 Selection:

- Purposeful Decision-Making: Selection involves making informed decisions about what materials to acquire and include in the library's collection. The choices should align with the library's mission, goals, and the needs and interests of its users.
- User-Centered: Collections should be user-centered, meaning that they should cater to the diverse interests and requirements of the library's patrons, including students, faculty, researchers, and the general public.

6.2 Acquisition:

Methods of Acquisition: Libraries acquire materials through various methods, including purchases, donations, interlibrary loans, and subscriptions. The choice of acquisition method depends on the library's budget and collection development policy.

6.3 Budgeting and Finance:

Allocation of Resources: Managing a budget is critical for acquiring and maintaining collections. Libraries need to allocate funds efficiently to meet both immediate needs and long-term goals.

6.4 Collection Development Policy:

Guiding Document: A collection development policy is a foundational document that outlines the library's collection development goals, selection criteria, and procedures. It helps maintain consistency and transparency in decision-making.

6.5 Weeding:

Continuous Evaluation: Weeding, or the systematic removal of materials from the collection, ensures that the collection remains current, relevant, and space-efficient. weeding involves removing materials from the collection permanently.

6.6 Curation and Organization:

- Cataloguing and Classification: Materials in the collection need to be catalogued and classified for easy retrieval. Metadata and classification systems, like the Dewey Decimal Classification or Library of Congress Classification, are commonly used.
- Physical and Digital Management: In the modern era, libraries manage both physical and digital collections. Electronic resource management and digital repositories are essential.

6.7 Assessment and Evaluation:

- User Feedback: User feedback and assessments help libraries gauge the effectiveness and relevance of their collections. Surveys, usage statistics, and focus groups are commonly used evaluation tools.
- Collection Analysis: Collection analysis involves evaluating the age, condition, usage, and overlap of materials in the collection. It informs decisions about weeding, acquisition, and resource allocation.

6.8 Collection Diversity:

- Balanced Collection: Libraries should strive to maintain a balanced collection that represents diverse voices, perspectives, and formats. This includes ensuring the inclusion of materials from different cultures, disciplines, and genres.
- Inclusivity: Promoting inclusivity and diversity in collections fosters an equitable and accessible library environment.

6.9 Digital Transformation:

Digital Resources: The advent of digital technologies has led to the inclusion of e-books, online databases, and other digital resources in library collections. Managing digital resources effectively is a critical aspect of collection management.

6.10 Legal and Ethical Considerations:

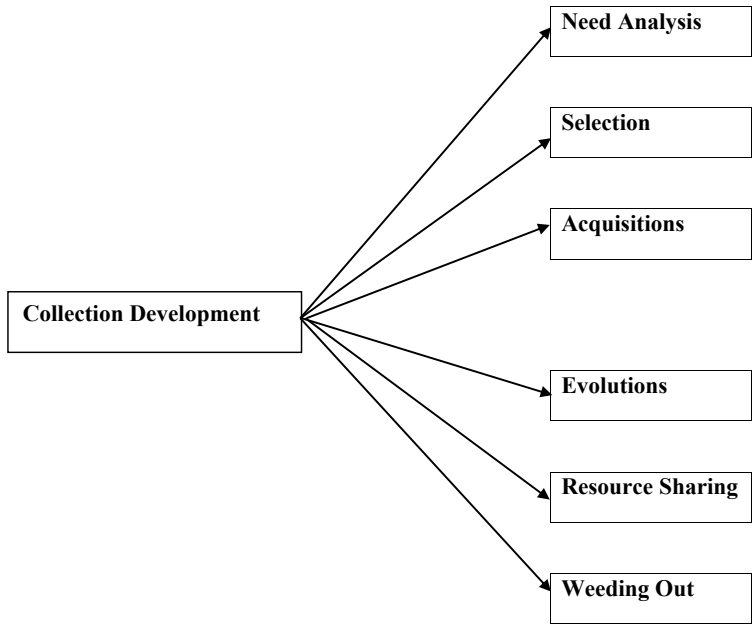
- Copyright and Licensing: Libraries must navigate copyright and licensing regulations when acquiring, lending, and digitizing materials. Compliance with intellectual property laws is essential.
- Privacy and Confidentiality: Libraries also have a responsibility to safeguard the privacy and confidentiality of their users' information and borrowing records.

6.11 Collaboration and Networking:

Resource Sharing: Libraries often collaborate through consortia, interlibrary loans, and partnerships to share resources and expand the scope of their collections.

Steps Involved in Collection Development

It is process of building a collection for meeting the information need of the users. The process comprises that as per following diagram



Effective library collection management requires a deep understanding of these fundamentals, adaptability to evolving technologies and information landscapes, and a commitment to serving the needs of the library's user community. It is an ongoing process that ensures the library remains a valuable resource in an ever-changing world.

7. Collection Development in College Libraries: Strategies and Best Practices:

Collection development is a critical function of college libraries, as it directly impacts the quality of education and research support provided to students and faculty. This research article explores the essential aspects of collection development in college libraries, including the selection, acquisition, organization, and maintenance of resources. It also discusses the challenges and best practices in building and managing a relevant and effective collection for the academic community.

College libraries play a pivotal role in facilitating learning, teaching, and research within an academic institution. Collection development is the process by which libraries systematically build, maintain, and improve their collections to meet the evolving needs of their user community. Effective collection development strategies are essential for supporting the institution's educational and research goals.

7.1 The Role of Collection Development in College Libraries

Collection development serves several crucial functions in college libraries:

a. **Supporting Curriculum:** College libraries must align their collections with the institution's academic programs and support the curriculum by providing resources that meet the educational objectives of various disciplines.
b. **Research Support:** Academic libraries are expected to offer research materials and databases that help faculty and students engage in high-quality scholarly research.
c. **Information Literacy:** Libraries contribute to information literacy by providing diverse resources and teaching users how to find, evaluate, and use information effectively.
d. **Intellectual Freedom:** Libraries uphold the principles of intellectual freedom by offering a wide range of perspectives, even on controversial or sensitive subjects.

7.2 Collection Development Process

The collection development process in college libraries typically includes the following stages:

a. **Needs Assessment:** Understanding the educational and research needs of the user community is crucial. Feedback from faculty and students,

curriculum analysis, and assessment of existing collections inform this stage.

b. **Selection and Acquisition**: Librarians, in collaboration with faculty, select resources that align with the curriculum and research interests. These resources can include books, journals, databases, multimedia materials, and more. Acquisition methods, such as purchases, subscriptions, or interlibrary loans, are determined.

c. **Cataloguing and Organization:** Acquired materials are catalogued and organized to ensure ease of access. Consistent cataloguing practices and efficient shelving or digital organization systems are essential.

d. **Weeding:** Periodic review of the collection helps identify outdated or irrelevant materials for removal. This process ensures that the collection remains current and relevant.

e. **Preservation:** Steps are taken to preserve and maintain the physical and digital materials within the collection to extend their lifespan.

8 Importance of Library Collection for sustainable development:

Library collection development plays a vital role in promoting and advancing sustainable development in various ways. Here are some of the key reasons why library collection development is important for sustainable development:

8.1 Access to Knowledge and Information:

Libraries are essential repositories of knowledge, information, and resources on various aspects of sustainable development. They provide access to a wide range of materials, including books, journals, reports, and digital resources, allowing individuals to research and learn about sustainable development issues.

8.2 Support for Education:

Libraries in educational institutions are a cornerstone of the learning process. By curating collections that align with the curriculum and educational goals, they provide students with the necessary materials to understand, explore, and address sustainability challenges.

8.3 Research and Innovation:

Libraries support research by providing access to scholarly materials, data, and resources related to sustainable development. Researchers, faculty, and students rely on library collections to advance their work, whether it's in fields like environmental science, renewable energy, or social sustainability.

8. Dissemination of Best Practices:

Libraries collect and distribute case studies, best practices, and reports on sustainable development projects and initiatives. These resources help individuals and organizations learn from successful models and avoid common pitfalls, fostering progress in sustainability.

8.5 Awareness and Advocacy:

Library collections often include materials that raise awareness about sustainability issues and advocate for positive change. Books, documentaries, and reports on climate change, social equity, and environmental conservation can inspire and mobilize communities to take action.

8.6 Supporting Policy Development:

Libraries can offer resources that assist policymakers and government officials in making informed decisions about sustainable development. Access to relevant research, policy papers, and international agreements is crucial for developing effective policies.

8.7 Cultural Preservation:

Libraries also play a role in preserving indigenous knowledge and cultural heritage, which is essential for sustainable development. These collections contribute to maintaining cultural diversity and promoting sustainable practices that are deeply rooted in local traditions.

8.8 Promoting Lifelong Learning:

Libraries are spaces for lifelong learning, where individuals of all ages can access materials that enhance their understanding of sustainability. Whether it's a child's book on recycling or a senior's guide to organic gardening, libraries cater to diverse learning needs.

8.9 Equal Access:

Public and academic libraries serve as a democratic resource where people from various backgrounds can access information, regardless of their socio-economic status. This equal access to information is crucial for fostering inclusive and sustainable development.

8.10 Networking and Collaboration:

Libraries often serve as hubs for collaboration, connecting individuals and organizations working on sustainable development initiatives. By facilitating

networking and partnerships, libraries can enhance the collective efforts to address sustainability challenges.

Library collection development is essential for sustainable development because it provides access to information, supports education and research, disseminates best practices, raises awareness, and advocates for change. By offering a diverse range of materials and resources, libraries play a pivotal role in empowering individuals and communities to work towards a more sustainable and equitable future.

9 Role of Librarian in Collection development:

The role of a librarian in collection development is critical for ensuring that a library's collection meets the needs and interests of its patrons. Collection development involves the systematic and strategic process of acquiring, evaluating, organizing, and maintaining materials, including books, journals, digital resources, and other information assets, to support the library's mission and the information needs of its users. The librarian's role in this process includes:

9.1 Needs Assessment:

Identifying and understanding the information needs and preferences of the library's users, which can vary depending on the community the library serves.

9.2 Collection Analysis:

Evaluating the existing collection to determine its strengths, weaknesses, and gaps in subject areas, formats, and age of materials. This analysis may involve weeding outdated or irrelevant materials.

9.3 Selection:

Choosing materials to be added to the collection, which can include books, e-books, journals, databases, multimedia, and other resources. Selection decisions should align with the library's collection development policy, budget constraints, and user needs.

9.4 Budget Management:

Managing the collection budget, which involves allocating funds for acquisition, subscription renewals, and other collection-related expenses. Librarians need to make cost-effective decisions and prioritize acquisitions accordingly.

9.5 Vendor Relations:

Establishing relationships with publishers, booksellers, and other vendors to negotiate terms, discounts, and access to materials. Librarians may also attend book fairs and conferences to discover new titles and resources.

9.6 Collection Maintenance:

Regularly assessing and maintaining the collection to ensure it remains up-to-date and relevant. This includes monitoring the condition of materials, replacing damaged items, and updating electronic resources.

9.7 Weeding:

Removing outdated, damaged, or little-used materials from the collection, freeing up space and resources for new acquisitions.

9.8 Preservation and Conservation:

Implementing preservation and conservation strategies to extend the life of physical materials, such as books, manuscripts, and archival items.

9. Collection Policies:

Developing and updating collection development policies that outline the library's goals, selection criteria, and procedures for acquisition and de-selection.

9.10 Collaboration:

Collaborating with other librarians, library staff, and stakeholders to gather input and ensure that the collection reflects the diverse needs of the community.

9.1 Promotion and User Education:

Promoting the collection to users and providing guidance on how to access and use the materials effectively. This may involve creating resource guides, hosting workshops, and offering research assistance.

9.12 Evaluation and Assessment:

Continuously evaluating the collection's performance in meeting user needs and making adjustments based on user feedback and usage data.

Overall, the librarian's role in collection development is multifaceted and requires a deep understanding of the library's mission, the information needs of its users,

and the resources available to build a well-rounded and responsive collection. It's an ongoing process that aims to maintain a dynamic and relevant library collection in an ever-changing information landscape.

10. Challenges in Building Sustainable Library Collections:

a. **Digital Divide:** One of the significant challenges libraries face is addressing the digital divide. Access to digital resources is a critical component of sustainable development, but many communities lack adequate internet access or technology. Libraries must ensure equitable access to digital resources to bridge this gap.
b. **Funding and Budget Constraints:** Libraries often have limited budgets, making it challenging to acquire and maintain collections of sustainable development materials. Balancing the acquisition of new materials with the maintenance of existing resources can be a difficult task.
c. **Evolving Information Landscape:** The rapid pace of change in the information landscape presents challenges in keeping collections up-to-date. Libraries must adapt to new formats, technologies, and emerging topics in sustainable development.
d. **Space and Storage Issues:** Physical libraries face space limitations, making it difficult to house extensive collections. Deciding which materials to prioritize can be a challenging task.
e. **Copyright and Licensing:** Copyright restrictions can limit the distribution and use of certain resources, hindering efforts to share information and knowledge related to sustainable development.

11. Strategies for Overcoming Challenges:

a. **Collaborative Partnerships:** Libraries can partner with local governments, non-profit organizations, and other community stakeholders to secure additional funding and resources for sustainable development collections.
b. **Digital Inclusion Initiatives:** To address the digital divide, libraries can implement digital inclusion programs, providing internet access and technology to underserved communities.
c. **Collection Development Policies:** Clear and flexible collection development policies can help libraries prioritize resources that align with their sustainable development goals.

d. **Preservation and Digitization:** Libraries can adopt preservation and digitization strategies to maximize the longevity and accessibility of their physical collections.
e. **Open Access and Licensing Advocacy:** Libraries can advocate for open access and open licensing initiatives to reduce copyright restrictions and increase access to sustainable development materials.

Conclusion

Libraries are invaluable allies in the pursuit of sustainable development, as they provide the knowledge and resources needed to address global challenges. While they face numerous obstacles, libraries can overcome these challenges through innovative strategies, partnerships, and a commitment to their communities' sustainable development goals. By addressing these issues head-on, libraries can continue to play a vital role in building a more sustainable and equitable future for all.

References:

1. Aggarwal, B. S. (2005): Collection Development and Collection Management. Jaipur: ABD Publication.
2. Bhushan, A. (2007): Collection Management in Libraries. New Delhi: Cyber Tech Pub.
3. Gorman, G. E. and Howes, B. R. (1999): Collection Development for Libraries. London: Bowker Saur.
4. Hyde, James H. (2003): Library Collection Management. New Delhi: Dominant Pub. & Distributers.
5. Patel, Sanjay (2016): Collection Development in Academic Libraries. International Journal of Library and Information Science. 8(7).
6. Evans, Robert W. (1985): Collection management policy statement: the documentation process. Collective Management 7(1).
7. Kumar, K., Hussain, A. & Singh, N. (2008). A survey of collection development practices in Technical Institutes in Ghaziabad,Utter Pradesh, India. Library Philosophy and Practice.
8. Madu, E. C. & Adeniran, T. E. (2005). Information technology: Uses and preservation of resources in libraries and information centres. Ibadan: Evi Coleman publications.

Theme-3

Community Engagement for Sustainability

Libraries and Librarians as Social Entrepreneurs for Holistic Sustainable Development: A Review of Exemplified Holistic Initiatives

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ABSTRACT: Entrepreneurs possess the inherent potential to address various social and environmental challenges. The purpose of the study is to highlight libraries and libraries as social entrepreneurs actively involved in sustainable development initiatives. Librarians with motivation, passion, environmentally conscious and great commitment towards their patrons and institutions can exhibit strong entrepreneurial leadership by demonstrating sustainability in their actions and initiatives. The study used descriptive approach to explore all the qualities and roles a library and librarian should play for overall holistic sustainable development. Furthermore, a few initiatives of sustainable developments in Libraries across the world are highlighted as examples in this study.

1. Introduction

The concept of 'sustainable development' or 'sustainability' originated with the World Commission on Environment and Development, which defined it as the kind of the development that meets the present without compromising the ability of future generations to meet their own needs (UN, 1987). The three core elements of sustainable development are economic growth, social inclusion and environmental protection. The balance among these core elements and the sensible use of appropriate technology are vital for sustainable development. The concept of sustainable development has gained significant recognition to address socioeconomic global challenges including elimination of poverty, economic growth, innovation and investment in education and climate change (Seelos & Mair, 2005). Sustainable development has always been connected to entrepreneurship. Entrepreneurs hold the potential to serve as a solution to numerous social and environmental challenges. Entrepreneurship can be considered as a catalyst in fostering the transition to sustainable communities (Hart & Milstein, 1999; Wheeler et al., 2005; Brown, 2006; Brugmann & Prahalad, 2007).

2. Entrepreneurship and social entrepreneurs

Entrepreneurship in libraries is much like business entrepreneurship, with both led by a desire to address needs and create opportunities. The initiators in both fields take risks, are highly motivated, and seek self-sustaining initiatives. While commercial entrepreneurs aim for profitability, entrepreneurial librarians focus on fulfilling their institutions' mission and serving its patrons. Business entrepreneurs use their personal savings, loans etc., while librarians rely on institutional support, grants or donations. Unlike entrepreneurs who own their companies, librarians' projects become part of their libraries, and the financial risks lies with the institution rather than the individual (Crowe et al., 2019). Entrepreneurial librarians can play a prominent role in contributing to sustainable solutions. Librarians with motivation, passion, environmentally conscious and great commitment towards their patrons and institutions can exhibit strong entrepreneurial leadership by demonstrating sustainability in their actions and initiatives (Less et al., 2012). Alvord, Brown & Letts (2004) defined social entrepreneurs creates innovative solutions to immediate social problems and mobilizes the ideas, capacities, resources, and social arrangements required for sustainable social transformations. Social entrepreneurship could provide innovative and sustainable solutions to social issues and improve the welfare provision (Leadbeater, 1996; Nyssens, 2006)

3. Methodology

The present study adopts a descriptive study approach with primary motive of exploring available literature on holistic sustainable development initiatives in Libraries. The central focus is on elucidating the role of librarians as social entrepreneurs engaged in sustainable development initiatives and educating community. The study consulted relevant literature published in journal articles, conference proceedings and official reports. Besides, secondary sources of information like books, websites and blogs were consulted to gather wide variety of perspectives.

4. Objectives

The primary objective of the study is to highlight the role of libraries and librarians a s social entrepreneurs for sustainable development. Further, explore a few exemplified initiatives of holistic sustainable development in Libraries across the world.

5. Libraries and Librarians as catalyst of Change

The American LIS researcher David Lankes in his influential book on librarianship argued that "librarians are agents for radical positive change who choose to make a difference" (Lankes 2016). In Lankes' vision of librarianship, to make a positive change is equivalent to improving society. Globally, libraries and librarians are recognized as vital change agents and are encouraged to take action in the current interest in sustainability and sustainable development, including the UN sustainable Development Goals (SDGs). Libraries and Librarians need to work proactively and innovatively towards change to achieve sustainable development. Through the strategy "Global Vision", IFLA calls on libraries and librarians to act and "initiate the change that is urgently needed facing global challenges like climate change, poverty, hunger, gender equality etc." (Hauke, 2018).

Qualities of a Librarian as social entrepreneur for Sustainable development initiatives (Less et al., 2012**;** Usman et al., 2020; Mamza & Waba, 2021):

- **Innovative Thinking**: The ability to think creatively and find novel solutions to address social and environmental challenges.
- **Adaptability**: Being open to change and able to adapt strategies to evolving community needs and global trends.
- **Community Engagement**: Building strong relationships within the community, understanding its needs, and involving community members in the development process.
- **Collaborative**: Working collaboratively with diverse stakeholders, including government agencies, non-profits, and businesses, to maximize impact.
- **Resourcefulness**: Effectively utilizing limited resources and finding innovative ways to secure funding for sustainable initiatives.
- **Passion for Social Impact**: A genuine commitment to making a positive difference in the community and a passion for social and environmental causes.
- **Leadership Skills**: Inspiring and leading teams toward a shared vision of sustainable development.
- **Tech Savvy**: Embracing technology to enhance library services and outreach, ensuring relevance in the digital age.
- **Environmental Consciousness**: Integrating eco-friendly practices and promoting environmental sustainability in library operations and initiatives.

- **Continuous Learning**: Keeping abreast of current trends, best practices, and emerging technologies relevant to sustainable development.

6. Librarians as sustainable literacy educators

The Sustainable development Goals (SDGs) emphasizes the importance of public access of information as a target under Goal 16.10. Public access to information enables everyone to obtain relevant and timely information. Communities that have access to timely, relevant and accurate information will eradicate poverty and inequality. These would help communities to make better decisions and enhance their lives by improving agriculture, ensuring quality education, health, culture, research and innovation (IFLA, 2016). Librarians are natural educators, researchers, educators, information sharers and awareness-builders. Entrepreneurial librarians, possessed by their commitments to bring change through outreach and extension activities, educate patrons with sustainability themes (Less et al., 2012). Achieving Sustainable development goal requires more than simply providing public access to information. In present scenario, Librarians and libraries must be more proactive and engaged. The new challenge is to integrate sustainability literacy skills, encompassing thinking, problem solving, decision making and action taking with a socio-economic structure (Carter & Schmidt, 2013). Sustainability literacy "means having the knowledge and skills to advocate for resilient social, economic and environmental systems" – also called the "Triple Bottom Line (Shaffer, 2017, 2018). Maria Anna Jankowska in her book "*Focus on Education for Sustainability: Toolkit for Academic Libraries*" asserts the commitment of libraries and libraries to promote sustainability education. It highlights a fresh role for academic libraries by incorporating sustainability into areas such as information literacy, collection development, scholarly publishing, communication, services, actions and the education of future leaders (Jankowska, 2014).

7. Librarians as sustainable green library initiators

A green library minimizes environmental impact through careful site selection, natural construction materials, and resource conservation (Reitz, 2017). Similarly, a sustainable library, aligned with the balance of environmental, economic, and social aspects of sustainable development, addresses issues such as infrastructure, economic considerations, and social well-being, including access to knowledge and technology, employee salaries, and working conditions (Noon 2008; Aldrich et al. 2013). Entrepreneur librarians who are passionate about sustainability envision their ideal library to be environmentally sustainable buildings. They

aspire to curate sustainable information resources, conserve resources and become more energy efficient. Librarians can adapt a sustainable library setup by replacing artificial lights with daylight to be more energy efficient. Additionally, utilizing green power and renewable energy sources can save both money and energy. Opting for eco-friendly materials like wood, linoleum, bamboo, and cork in library construction is effective and environmentally friendly. Ensuring proper ventilation in every library room for fresh air and sunlight, coupled with a green roof covered in plants, contributes to a sustainable and green library (Less et al, 2912; Gaffar, 2021).

8. Sustainable Inclusivity and Accessibility in Libraries

Libraries play a crucial role in advancing Sustainable Development Goal (SDG) 5, which strives to "achieve gender equality and empower all women and girls" (United Nations, 2019). In support of SDG 5, libraries can function as inclusive spaces that provide access to information, educational resources, and skills development opportunities, fostering a more gender-equitable society. Libraries contribute to bridging the gender gap by offering a diverse range of materials that promote awareness and understanding of gender issues. Through curated collections, informative programs, and educational workshops, libraries serve as platforms for initiating conversations around gender equality, challenging stereotypes, and inspiring positive societal shifts (Olayemi & Olayemi, 2019). Additionally, libraries can act as community hubs, hosting events and forums that amplify the voices of women and girls, encouraging their active participation in decision-making processes. Furthermore, libraries serve as safe spaces that support diversity and inclusivity, creating environments where women and girls feel supported and encouraged to explore their interests and talents (Hilliard, 2018).

Accessibility in libraries means ensuring that individuals with disabilities can easily use buildings, spaces, and services without major adjustments to their routines. By embracing the social model of disability and universal design, libraries aim to create inclusive environments. Sustainable accessibility benefits patrons and enhances community outreach, fostering cultural adaptability and encouraging innovative problem-solving (Pionke, 2016).

9. Cultural Preservation Sustainability in libraries

Culture is increasingly recognized as equally vital to social, economic, and environmental aspects in sustainability. The United Nations emphasized cultural

inclusion in post-2015 sustainability goals (IFACCA, 2013). Once seen as part of social sustainability, culture is now often considered a distinct and crucial 'fourth pillar' alongside social, economic, and environmental concerns (Hawkes, 2001). Despite this, libraries struggle for acknowledgment of cultural sustainability within their policies. Preserving cultural heritage is vital to sustaining culture, an opportunity for libraries and museums to showcase their true value. Currently, their efforts are often considered secondary to social, economic, and environmental contributions (Barthel-Bouchier, 2013; Soini and Birkeland, 2014). Culture is fundamental for societal sustainability, influencing shared values and beliefs for social cohesion. Libraries, inherently invested in cultural sustainability, need policies recognizing their intrinsic cultural value (Sundholm, 2013). Integrating cultural sustainability into Library policies alongside social, economic, and environmental concerns, libraries can highlight their distinctive societal contributions and ensure a secure future (Loach et al., 2017).

10. Library Fundraising and Partnerships for sustainability

Libraries engage in fundraising activities to secure resources for new initiatives and infrastructure improvements. Financial constraints often hinder the implementation of modern technologies in libraries despite awareness among professionals. Libraries are undergoing substantial change due to technology, paralleled by significant shifts in funding processes (Kernochan, 2016). Amidst this transformation, the role of libraries in promoting sustainable development has become evident. The National Council for Science and the Environment (NCSE) outlined this evolving role, emphasizing collaborative partnerships, heightened community awareness, and directing library organizations to support sustainability during the 2002 United Nations World Summit on Sustainable Development (Michael, 2010). Libraries regularly team up to save costs, share resources, and tackle projects together. They collaborate locally and globally, from supporting business research to aiding disadvantaged groups. Common partnerships involve working with faculty on information literacy and teaming up with municipal agencies for event and service promotion (Marcum, 2008). Adopting sustainable practices in library operations is crucial for long-term success and eco-friendly environments.

11. Exemplified initiatives of Holistic Sustainable Development

The study highlights the winners of 2023 Green Library award and green project award presented by IFLA (International Federation of Library Associations) and

its section ENSULIB (Environment, Sustainability for Libraries) for best holistic initiatives of sustainable development in Libraries from across the world.

The first category of the award is the Green Library award. A Green Library is one that comprehensively meets green and sustainable requirements, encompassing new buildings, renovations, and innovative service concepts. Success in this category involves library-wide commitment to environmental and sustainable practices, reducing carbon footprint, and providing green resources and services. Completed within the last 12 months, the library showcases measurable results, emphasizing the pervasiveness of environmental efforts and social engagement, regardless of size or budget.

The second category of the award is the Green Library project award. A Green Library Project is a focused and sustainable initiative within limited scope, time, and budget, addressing specific areas of library operations to advance environmental goals, at least locally. Success in this category requires completion within the last 12 months or ongoing progress, with visible or measurable results. The project's budget size is not a decisive factor; emphasis is on the environmental impact achieved, such as a children's environmental education or a campus library's zero waste project. Special recognition may be given to projects with significant impact despite minimal resources.

12. The IFLA Green Library Award aims to:

(i) Recognize outstanding green libraries and projects showcasing a strong commitment to environmental sustainability.

(ii) Raise awareness about libraries' social responsibility and leadership in environmental education.

(iii) Support the global green library movement, focusing on sustainable buildings, services, activities, programming, resources, collections, and projects.

(iv) Advocate for the conservation of resources and energy.

(v) Promote the development of green library initiatives at local, regional, and global levels.

(vi) Encourage all types of libraries to actively share their green activities with an international audience.

Table 1: Holistic sustainable initiatives in Libraries

Best Green Library Awards 2023				
Rank	**Library**	**Country**	**Sustainable Development initiatives**	**Library Web Address**
1	Biblioteca EPM	Colombia	The library has embedded sustainability into its core strategy, addressing every aspect of environmental sustainability. It has achieved a significant social impact by raising awareness and actively promoting environmental sustainability initiatives. The library's comprehensive approach encompasses various aspects of sustainability, showcasing a commitment to making a positive difference in the community and beyond	https://www.grupo-epm.com/site/bibliotecaepm/
2	"Illyés Gyula" Library of Tolna County	Hungary	The library actively engaged with the community and formed partnerships with local, national, and international organizations. Notably, the Hungarian submission demonstrated a strong determination to make a real impact through its initiatives.	https://www.igyuk.hu/
3	Vietnamese-German University Library	Vietnam	The library unveiled a distinctive building closely tied to the campus, featuring an energy-efficient design. It's worth highlighting the effectiveness of assembling a specialized team dedicated to implementing strategic programs that promote sustainability	https://library.vgu.edu.vn/

Best Green Library Projects 2023				
1	West Vancouver Memorial Library	Canada	The library excels in prioritizing community and diversity, actively reporting the number of participants in their events. The entry stands out for its innovation, with reviewers recognizing its distinctive approach of blending fiction and climate programs in a fresh and unique manner. It sets itself apart as a remarkably different and exceptional project compared to others	https:// westvanlibrary. ca/
2	Biblioteca Civica Villa Valle	Italy	The library not only implemented a seed library but also demonstrated its enduring impact with noticeable long-term effects. Additionally, the library exhibited commendable community engagement practices, further contributing to its comprehensive and sustained positive influence	https://www. comune. valdagno. vi.it/eventi/ biblioteca-civica-villa-valle
3	Seoul Metropolitan Library	South Korea	The library showcased a remarkable range of initiatives, impressively spanning various facets of sustainability. Notably, they employed innovative and creative methods to actively engage both citizens and the broader community they serve.	www/html/en/ main.jsp

Source: https://www.ifla.org/g/environment-sustainability-and-libraries/ifla-green-library-award/

13. Conclusion

The role of libraries and librarians as social entrepreneurs is crucial for sustainable development. Libraries and librarians are recognized as vital change agents and

are encouraged to take action aligning with the current interest in sustainability and sustainable development, including the UN Sustainable Development Goals (SDGs). Entrepreneurship within libraries shares common attributes with business entrepreneurship, yet its focus transcends profitability to fulfill the institution's mission and serve patrons effectively. As social entrepreneurs, librarians exhibit qualities such as innovative thinking, adaptability, and a passion for social impact, enabling them to lead sustainable initiatives that address urgent societal and environmental challenges. Entrepreneurship and sustainable development are powerful forces that, when combined, can transform libraries into dynamic hubs for positive societal change. Entrepreneurship libraries are involved in finding innovative solutions, promoting sustainable literacy and green library initiatives, building strong relationships within their communities, engaging in cultural preservation and collaborating with stakeholders for holistic sustainable development.

References:

1. Aldrich, R. S., Susan, B., Louise S., and Jeffrey, A. S., (2013). Sustainable thinking. Passageway to better buildings, budgets and beyond. In Hauke, P., Latimer, K., & Werner, K.U. (Eds.), *In The green library: the challenge of environmental sustainability* (15−37). De Gruyter Saur, Berlin

2. Alvord, S. H., Brown, L. D., & Letts, C. W. (2004). Social Entrepreneurship and Societal Transformation: An Exploratory Study. *The Journal of Applied Behavioral Science*, *40*(3), 260–282. https://doi.org/10.1177/0021886304266847

3. Barthel-Bouchier, D. (2015). *Cultural heritage*. Routledge Handbooks Online. https://doi.org/10.4324/9780203762844.ch19

4. Brown, L. R. (2006). *Plan B 2.0: Rescuing a Planet under Stress and a Civilization in Trouble.* W. W. Norton, New York. Accessed on November 14th, 2023, from https://www.earth-policy.org/books/pb2

5. Brugmann, J. & Prahalad, C. (2007). *Cocreating business's new social compac*t. Harvard Business Review, 85(2): 80–90. Accessed on 12th November 2023, from https://hbr.org/2007/02/cocreating-businesss-new-social-compact

6. Carter, T., & Schmidt, G. (2013). Transforming Students Through Two Literacies: The Integration of Sustainability Literacy into Information Literacy Classes. *Georgia International Conference on Information Literacy*. https://digitalcommons.georgiasouthern.edu/gaintlit/2013/2013/5

7. Crowe, K., Crumpton, M. A., Gwynn, D., Harper, J., Lock, M. B., & Scanlon, M. G. (2019). The Status of Entrepreneurship in Libraries: Content Analysis and Assessment from the Conference for Entrepreneurial Librarians. In J. A. Crum & S. S. Hines (Eds.), *Advances in Library Administration and Organization* (Vol. 40, pp. 115–132). Emerald Publishing Limited. https://doi.org/10.1108/S0732-067120190000040007

8. Fedorowicz-Kruszewska, M. (2019). Sustainable libraries: Fashion or necessity? *JLIS*, *1*. https://doi.org/10.4403/jlis.it-12500

9. Gaffar, S., N, S., & Kumar, S. (2021). The Green Library Initiative in Indian perspective: A Study. *Library Philosophy and Practice (e-Journal)*. Accessed on 7th November 2023, from https://digitalcommons.unl.edu/libphilprac/6189.

The Needs of Sustainable Community Services: An Analysis with Bir Chandra State Central Library, Agartala

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ABSTRTACT: The conducted study aimed to understand how the Birchandra State Central Library offers diverse community information services to its user community. This paper delves into the common function of public libraries as essential community information distributors, often recognized as public institutions. Public libraries play a crucial role by furnishing necessary information to address people's everyday challenges. Additionally, this research underscores the significant role of Birchandra State Central Library in sustainable development, providing a spectrum of services. The paper elaborates on community information service (CIS) as a systematically organized process involving the preservation and dissemination of a wide range of information within a community. The findings reveal that the Birchandra State Central Library significantly contributes to community information services, forming an integral part of its user community's circle for overall development.

1.Introduction

A Public Library stands as a repository of diverse information, functioning as the central hub for community knowledge dissemination. It ensures equitable access to a broad spectrum of information and data, catering to the varied needs

of users. The inclusivity of services is essential, encompassing content suitable for all age groups and incorporating both traditional materials and contemporary technologies across different media. The role of public libraries was delineated by the ILA in 1987, specifying responsibilities such as serving as independent training centers for community activities. Public libraries play a pivotal role in fostering community engagement, welcoming all members to participate in various programs. Initially established by the public, these libraries later received government funding for expansion and other requirements. The systematic development of India's public library system ensued after the establishment of the Raja Rammohan Roy Library Foundation (RRRLF) in 1972. The enactment of library legislation in several states further facilitated well-planned library services, benefiting both those states and the entire nation. This evolution underscores the vital role of public libraries as dynamic sources of knowledge and community development.

Community Information Service (CIS) is defined as information that addresses problems and assists individuals in making optimal decisions when needed. A committee established by the Library Association in 1980 characterized CIS as services aiding people and groups in resolving everyday issues and engaging in the democratic process. These services specifically target individuals with limited access to other support forms and address critical concerns related to homes, jobs, and rights. Community information, essential for daily living, encompasses these services (Das, 2018). Effectively utilizing information resources is integral to the seamless functioning of a community development system, offering support across all aspects of community life. Public libraries, by providing informational support, play a crucial role in raising awareness and motivating communities to actively participate in their own development. To effectively serve their communities, public libraries must assess how, with the available resources, they can contribute. Community involvement is paramount for the development of a locality, with public libraries serving as vital connection points between information and society. These libraries offer diverse services that contribute to societal growth, and in turn, communities actively contribute to shaping the library's future. This reciprocal relationship underscores the significance of public libraries as dynamic agents fostering community development and knowledge dissemination (Sarkar, 2019).

A community is any group of people who empathetically settle down to share a common life in a certain area, regardless of the size of the area or state boundaries. There is no limit to the shapes, social configurations, population sizes, and compositions of communities (Chatterjee,1970). The relationships

that serve as the foundation of communal life, along with the members' shared interests and perspectives, are what hold the community together as a cohesive whole(Cobigo,2016). A widely accepted definition of community is a collection of individuals with varying traits who are connected through social connections, have similar viewpoints, and work together in specific settings or locations (MacQueen,200).

Community information services, integral to public libraries, aim to grant patrons access to local information, and in the Sundarban region, public libraries play a crucial role by offering diverse and updated services to the community (Sarkar, 2019). In today's digital era, public libraries are indispensable for fostering information literacy and community education, with their primary goal being to provide optimal services for the community's well-being (Chatterjee, 2020). Aptly termed the "Arsenal of Democracy," public libraries contribute significantly to community development in the Sundarban region (Hazarika, 2020). Public libraries, strategically positioned within communities and equipped with resources for human development, are considered ideal partners in community development initiatives. Their influence extends beyond the realm of knowledge dissemination, impacting social and economic development as a driving force for progress (Chidozle, 2022). Community information serves as a problem-solving tool, aiding individuals in making informed decisions when needed. Often referred to as "survival information," it encompasses knowledge essential for day-to-day community survival. Despite the vital role of information, public libraries remain crucial for providing free access to a broad user base, ensuring that valuable knowledge is accessible to all members of the community (Joselin, 2015). The multifaceted contributions of public libraries underscore their pivotal role in community well-being and development.

2. Birchandra State Central Library

The Birchandra State Central Library, formerly known as the public library of Tripura, has a rich history dating back to its establishment in 1896 during the Maharaja's Period. Originally named Bir Chandra Library, it was dedicated by King Maharaja Radhakishore Manikya in honor of his late father, Maharaja Bir Chandra Manikya. Functioning as a social institution and information center, Birchandra State Central Library houses a comprehensive collection of reading and information materials in Bengali, English, Hindi, and various regional languages such as Kokborok, Manipuri, Chakma, and more. On June 27, 2013, Birchandra State Central Library expanded its services by inaugurating the digital library of Tripura, a project executed in collaboration with CDAC under the Digital Library

of India scheme by the Government of India. This initiative, equipped with four computer machines, facilitates users and scholars in accessing information. The library aims to extend this digital scope to other public libraries in the future. Additionally, Birchandra State Central Library stands out by providing cybercafé services, further contributing to the accessibility and utilization of information in the modern era (Bhattacharjee, 2019).

Table-1 Name of library services and facilities of Birchandra State Central Library

Sl. No	Services/ Facilities
1	Lending service
2	General reading facilities
3	Career guidance service
4	Reference service
5	Free news paper reading service
6	Senior citizen section
7	Wi-Fi facility
8	Cyber café service
9	Reprography service
10	Children corner section
11	Women's section
12	Journal or Periodical section
13	Ramaprasad Govesanagar (for Researcher)
14	Braille section

Table-1 shows that, Birchandra State Central Library which services or facilities library provided for their users or community peoples and library play most important role in sustainable development in community which is reduced the problems of people who faced daily life, which are listed below:

Lending service: Lending service also known as circulation service. The main function of lending service is to issue and return the books to the library users and Government Departments. The service time 7.30 a.m. to 8.30. a.m. for central library and 12.30p.m for others libraries. Only those books are lent out which is printed books.

General Reading Room Facility: The reading room are daily open at 8a.m to 8p.m except Monday. Users without library card do not entrance their room and do not take their own books.

Career Guidance Service: This service is most important for unemployment peoples and students. The service time 7.30a.m to 8.30p.m. This section holds various types of books like competitive exam books, entrance exam books, general knowledge books etc. Many students in our society belong in below poverty line who cannot afford this types of books but in this way library provide this service which is more helpful to the students for their study.

Reference Service: This service is to get quick information of a specific subject. The library staffs always help their users for quickly collected their information. The service time 8.a.m to 8.30 p.m.

Free News Paper Reading Service: This service is most important for community peoples. This service totally free for all peoples including students, old peoples etc. the service time 7.30a.m to 8.30p.m.

Wi-Fi Facility: Birchandra State Central Library provides this facility only for Bonafide members or users with computer basic knowledge. For this facility they also show computer operating card and, in this way, they also deposited 300rs as security amount, which is refundable. In our community there are many people belongs below poverty level who can not cost available money to buy a computer. In these regard Birchandra State Central Library play most important role in sustainable development, which reduced poverty in community and give better life.

Senior Citizen Service: This section was established in 2011. This section holds senior persons related books . This section also systematically arrange their documents and they easily find their information from the rack as per their needs. This section also available various daily news paper.

Cyber Café Service: Only Birchandra state central library provide this service. The service time 12.30p.m to7.00pm. This section was established in 2011, 14th September. The users, research scholar daily come and collected their information at a time.

Reprography Service: Reprography service hour of Birchandra State central Library 12.00 p.m to 7.00 pm. Nominal cost of per A4 size page of Birchandra State Central Library is 1rs.

Children Corner Section: This section is most important for children's. This section holds various story books with English, Bengali, Hindi and Kokborok, toys, video games, computer game . About 12,243 nos books and 650 children members of Birchandra State Central Library. In our society, most of the families belong poverty line who cannot fulfil their children demands but the library provide this service to the children for increase their interest and reading habits etc.

Braille Section: Currently, there are three Braille libraries in Tripura, namely Birchandra State Central Library, Nazrul Granthagar, and Unakati District Library. Birchandra State Central Library inaugurated this section on May 3, 2012. The service is provided free of charge, operating from 10:00 a.m. to 5:30 p.m. Presently, Birchandra State Central Library has 48 members, and it offers the Jaws software to facilitate computer operation for users. To effectively support residents, public libraries must adapt their offerings to align with the needs and strengths of local communities. This necessitates thorough research and analysis to tailor services for maximum community impact.

3. Sustainable Community Service Provided by Bir Chandra State Central Library

Sustainable community service by public libraries addresses vital needs, fostering social, economic, and environmental well-being. Libraries play a pivotal role in providing equitable access to information, promoting literacy, and supporting educational initiatives. They serve as hubs for community development, offering resources for skill-building, job seeking, and civic engagement. Sustainable community service involves adapting to evolving needs, embracing technology, and ensuring inclusivity. By offering diverse programs and collaborating with local organizations, public libraries contribute to a resilient and interconnected community. Their commitment to environmental stewardship, social equity, and lifelong learning reflects a dedication to fostering sustainability in all facets of community life. Bir Chandra State Central Library also provide various kind of Community Information Services which are given below**:**

3.1 Education:

Bir Chandra State Central Library is provide various information about education and they give to the people proper way to choose decision. Library take good initiative to developed sustainability which is reduced lack of literacy level in our community. These are:

(a) **Career Guidance:** Naturally, having the right education is crucial to landing the best job in your field. Naturally, the prerequisites or stepping stones for selecting one's own ideal career are the credentials needed to succeed in it. Top jobs are available to those with the necessary credentials, and choice would be abundant. Career counselling can help students choose the classes that are right for them. Bir Chandra State Central Library Give this service to the students and unemployed peoples of the community.

This service is a ground breaking opportunity and it show the way to take the right path to their career. This leads them to choose the proper decision to grow their career.

(b) **Competitive Examination:** Competitive exam are the first stepping stone for those who are seeking for government jobs. This kind of exam shows the ability and knowledge of the candidates from different field. Bir Chandra State central Library is providing the materials, weekly classes and proper books to those candidates who are preparing for the competitive exam. They also give the individual attention to the candidate not only that they also make sure the availability of the books which is helpful the candidates to wants for their preparation.

(c) **Job Notification and Guidance:** Bir Bircharndra Library is giving this service for past 4 month, Head librarian Dilip Kumar Das, Ramkrishna Bhattacharjee and Samir Das has taken this initiation to provide this community service and more then hundreds are taking this service. They have invited various TCS Officers, TPS officers, SP, SDM, Ex- Principal, Professors and other renowned people. They Provided the classes and guidance to the candidates. Among the students some of the candidates already have cleared various exams and joined in their jobs. Library provide Group discussion which is helpful the candidates can share their thoughts and Knowledge, prepare for different interviews which is reduced unemployment and increase income level in our community.

3.2. Health:

Library provide health related information to the people. Library organized different health awareness programme to the people for their good helth like AIDS/HIV. In corona period specially library provide various precautions and advised to alert the people how to maintain their health of this virus. Library is provide various nutritious food which are needed for their day to day life. In community most of the people don't consume healthy food and children need more nutritious food for their growth and development. Library have taken good initiation to provide proper chart and healthy food list for the community. On the other hand library provide information to the people to apply different health insurance and health cards for their health benefits.

3.3 Women Right:

Library provide information about various women'srights**.** In community most of the women don't know about reserved laws for them. Library have taken good initiations like different educational programme, to discuss various laws for their

development and protection, to organize various skill development training. Child marriage and its related issues are also discussed via different awareness programmes.

3.4 Self Employment:

Library provides information to the people how they can depended own. Library provide information about different vocational courses to the people become self depended. In these way library organized various workshop, training courses etc.

3.5 Help Desk:

Library help desk is a way of providing quick information to the people for their needs. Library provide this service to the users in a two way i.e. longtime and short time information.

4. Discussion and Conclusion :-

Libraries, often perceived as bastions of knowledge preservation, transcend traditional roles to actively contribute to community development. Birchandra State Central Library exemplifies this shift, marking a departure from mere book lending to becoming a vital hub for diverse community services. Embracing sustainability, the library pioneers various initiatives, recognizing the interconnectedness of social, economic, and environmental aspects in community well-being. The library's commitment to sustainability is evident in its multifaceted approach. It extends beyond conventional services, reaching into realms like education, health, self-employment, women's empowerment, and vocational training. Initiatives such as user orientation programs, discussions with experts, and health awareness campaigns underscore the library's proactive engagement with community needs. Health-related programs not only address immediate concerns but also foster long-term sustainability. The provision of nutritious food charts reflects a holistic approach to community well-being, emphasizing preventive healthcare. Moreover, the library serves as a catalyst for women's empowerment, conducting skill development workshops and raising awareness about legal rights, thus contributing to the cessation of child marriages through targeted awareness campaigns.

In promoting economic sustainability, the library plays a pivotal role in disseminating information about vocational courses, empowering individuals with skills that enhance self-confidence and reduce economic challenges and unemployment. This aligns with the library's broader objective of achieving

sustainable development within the community. Public libraries, such as Birchandra State Central Library, function as social institutions, bridging gaps and actively addressing community needs. They have evolved into dynamic hubs for community information services, extending their outreach beyond students to encompass individuals of all backgrounds without discrimination. The library's proactive stance involves organizing user orientation programs and awareness campaigns to better understand and address community needs. Community information services are pivotal in enhancing knowledge, decision-making capacity, and self-confidence within a community. By providing a vast array of information on education, health, self-employment, and career guidance, public libraries serve as channels for effective communication. The library's role as a repository of historical and cultural knowledge further enriches community life. While Birchandra State Central Library has made commendable strides in offering community information services, this study highlights opportunities for expansion. Recommendations include incorporating additional services such as information on agriculture, horticulture, animal husbandry, and financial assistance. By broadening the scope, the library can further contribute to the comprehensive development of the community, addressing a more extensive array of needs and fostering sustainability in all aspects of community life.

In conclusion, public libraries like Birchandra State Central Library are indispensable catalysts for sustainable community development. They transcend traditional roles, actively engaging with diverse community needs, and contribute to social, economic, and environmental sustainability. The ongoing commitment to expand services ensures that libraries remain dynamic agents of positive change, fostering a resilient and empowered community for the future.

References

1. Agustín-Lacruz, C., & Saurin-Parra, J. (2020). Library Services to Diverse Communities in Europe: The Case of the Roma Community in Spain. The International Journal of Information, Diversity, & Inclusion, 4(3/4), 20–35. https://www.jstor.org/stable/48645283

2. Akhter, Md. Yeosuf; Deb, Prasenjit; and Biswas, Jahar, "Role of Public Libraries with special reference to Women Empowerment through Kanyashree Prakalpa in West Bengal of India" (2021). Library Philosophy and Practice (e-journal). 6099. https://digitalcommons.unl.edu/libphilprac/6099 .

3. Chatterjee, P., & Koleski, R. A. (1970). The concepts of community and community organization: A review. Social Work, 15(3), 82–92. https://doi.org/10.1093/

sw/15.3.82

4. Chatterjee, S.; Samanta, M. and Dey, S. (2020). Role of Public Libraries in Providing Community Information Services Available at SSRN: https://ssrn.com/abstract=3535051 or http://dx.doi.org/10.2139/ssrn.3535051

5. Chidozle, O. (2022). The roles of Public Library in Community Development in the 21stCentury. https://www.researchgate.net/publication/365489157

6. Cobigo, V., Martin, L., &Mcheimech, R. (2016). Understanding community. Canadian Journal of Disability Studies, 5(4), 181. https://doi.org/10.15353/cjds.v5i4.318

7. Hazarika, Sanjoy Kumar (2020). Public Library as Community Information service provider: a study in North East India. Library Philosophy and Practice (e-journal). https://digitalcommons.unl.edu/libphilprac/3843

8. Joselin, J. Jaba., & Panneerselvam, P. (2015). Community Information Services in public libraries – a solution toinformation poverty. https://www.researchgate.net/publication/280244522

9. MacQueen KM, McLellan E, Metzger DS, Kegeles S, Strauss RP, Scotti R, Blanchard L, Trotter RT 2nd. What is community? An evidence-based definition for participatory public health. Am J Public Health. 2001 Dec;91(12):1929-38. doi: 10.2105/ajph.91.12.1929. PMID: 11726368; PMCID: PMC1446907.

10. Ndungu, J. and Otike, J., Community Information Services in Public Libraries: A Case Study of KNLS Nairobi County (June 2, 2018). Available at SSRN: https://ssrn.com/abstract=3189375 or http://dx.doi.org/10.2139/ssrn.3189375

11. Rakshikar, Nidhi. (2012). Career Guidance services in academic libraries: A study of college libraries in Mumbai. Entire Research. 4. 107-112.

12. Sarkar, A. (2019). Public Libraries and Community Information Services: An Experience in Blocks of Sundarban Region, South 24 Parganas. Journal of Information and Knowledge, 56(1), 32–35. https://doi.org/10.17821/srels/2019/v56i1/131264

Community Engagement for Sustainability by the College Libraries of Assam

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ABSTRACT: An attempt has been made in this article to explore the possibilities whereby community engagement in the academic libraries of Assam maintains sustainability. In this study, the scope of self-sustainability in the college libraries of Assam was thoroughly discussed. The study is based on primary data. The questionnaire approach was employed to gather data. Descriptive statistics served as an analysis of the data using frequency and percentage tables to analyze to test the relationship between variables. The study identified libraries can play a major role in achieving sustainability through their extension services with community engagement. An attempt has also been made to identify those areas, which can help; libraries start a new journey on their own to survive and thrive. Following an investigation of the state of college libraries in Assam, it is observed that college libraries fall short when it comes to aligning their operations with sustainable development goals. According to the study, college libraries should align their programs, services, and resources with sustainable development goals. Conclusively, this study gives room for further study in the near future to develop a work plan and procedure for the library structure as well as library services for community engagement to sustainability.

Keywords: College Libraries; Sustainable Development Goals; Community engagement; Assam, Sustainable Libraries.

Introduction:

Sustainability development is a very popular global issue in the 21st century. Sustainability is the capacity to sustain or continue a process over an extended period of time. In order for natural or physical resources to last for a long time, it aims to stop their depletion(Mollenkamp, 2023). In simple words, sustainability means the ability to maintain something at a certain level or standard.

The scarcity of natural resources, pollution, global warming, etc., made the international communities think about sustainability. The United Nations Brundtland Commission sought to bring nations together in the pursuit of sustainable development. The United Nations adopted 17 major goals for sustainability in 2015, and the 2023 SDG Summit ushered in a new era of rapid advancement towards sustainable development goals by providing high-level political direction for transformative and expedited actions leading up to 2030 (United Nations, 2023). UN and IFLA believed that the library could have played a significant role in achieving all 17 goals. But out of the entire set of 17, "Goal 4" directly affects the library (Hatua, 2020). 'Goal 4' states that it 'guarantees high-quality instruction and encourages chances for lifelong learning for everyone'.

Sustainability was identified by the American Library Association as one of the profession's core values, and the term "sustainability" was defined using the "triple bottom line" conceptual framework. Libraries must adopt economically viable, socially just, and environmentally sound practices in order to be a sustainable institution (ALA, 2022).

To attain sustainability or the SDGs, all of us have to act as a world citizens and deliver our role for a sustainable world. In this paper, it is intended to portray how college libraries can play an important role in sustainability through community engagement. The self-sustainability of the libraries is also emphasized in the paper.

Literature review:

Review of literature systematically investigates current literature on the research area. The review of the literature gives background information about how far knowledge has unfolded in the area of research under study and identifies the gaps in it.

Mathews (2013) provided an introduction to green issues and sustainability in academic libraries through renovations that integrate these concerns into the architecture, interior design, infrastructure, and services offered. Missingham(2021) assesses quality education, gender and equity, industry, innovation and infrastructure, and sustainable cities and communities to reveal a contribution beyond their institution's walls. This gives an impression of library assessment and information on the advancement of the UN sustainable development goals. Academic libraries will be crucial to achieving the goals of sustainable development by the year 2030 (Mashroofa, 2022; Obeng & Dadzie, 2020; Chukwu, Emezie & Abanum, 2022). In order to support their societies in the

long run, library professionals must recommit to their values and support a culture of sustainability through ongoing evaluation(Tribelhorn, 2023). Jankowska & Marcum (2010) created a framework for long-term plans for college libraries. (Joel, 2021) looks at the relationship that exists between the adequacy of resources, services, and maintenance of library policies that can sustain academic libraries in the Olusegun Oke Library. The choice of location, the conservation of energy and water, the materials used in construction, the architectural characteristics of library buildings, including their physical layout and interior design, as well as the hygienic conditions both inside and outside the building, etc. play an important role in constructing a sustainable library (Mollick & Mondal, 2020; Naskar, Tudu, & Pathak, 2020; Hatua, 2020).

Sustainable energy practices are connected to sustainable library conservation and preservation techniques used in academic libraries (Rachman & Ratnasari, 2022). (Jana, 2020) demonstrates how the use of electronic information resources will rise in semantic web-enabled digital libraries, improving sustainable libraries in the process. Libraries must designate staff members with specific duties in the area of sustainability as the demands of patrons researching sustainability rise. (Charney, 2014).

(Bangani & Dube, 2023) established that the mission and strategic plans of academic libraries clearly include community engagement, but it is not underfunded or poorly assessed.

(Embree & Gilman, 2020) discuss how their library is part of a campus sustainability hub that can serve as a model and a source of inspiration for libraries of all sizes worldwide as they strive to achieve sustainability. Many publications highlighted the community engagement of libraries and its effectiveness and their practical models in different educational, social, cultural, and economic causes (Khattab, Lendo, & Demiragic, 2019; Qayyum, Afzal, & Mahony, 2020; Jankowska, Smith, & Buehler, 2010).

The reviewed literature indicated a growing interest of the researchers on the topic of community engagement of libraries and sustainability. Area-specific study, especially in the Indian context, is not found during the review process. Awareness of the librarians or library professionals on SDGs is also not examined in the reviewed articles. A roadmap for community engagement in the college libraries to maintain sustainability is not discussed in the available literature. In the context of Assam, how an academic library can become sustainable is not explored. With particular reference to the college libraries in Assam, this study aims to close these gaps and advance the discussion of the topic of academic libraries' roles in sustainable development and community engagement.

Objectives:

The objectives of the study are-

I. To discuss the need and scope of libraries in community engagement for sustainability.
II. To suggest a roadmap for community engagement in the college libraries of Assam to achieve sustainability.
III. To explore the scope for self-sustainability in the college libraries of Assam.

Data and methodology:

The study is based on primary data. A descriptive methodology is applied to the study. A questionnaire is distributed among the college libraries of Assam. Documents on SDGs are reviewed and based on the response of the college librarians, a roadmap for community engagement is prescribed to achieve sustainability. Scopes for self-sustainability are also explored in this study.

Analysis and discussion:

The process of collaborating with community members to address various issues for the community's betterment is known as community engagement (ALA, 2018). Libraries should welcome their neighbours to discuss and resolve important issues of the society for the betterment of society. Sustainability is a major global issue that humans should properly address with the mindset of thinking globally and acting globally (Fairbotham, 2021). Libraries provide ideal learning spaces for the communities and also can play an important role in creating sustainable communities (Cockfield & Mehra, 2023).

To maintain sustainability, every section of society needs to be aware and careful towards a sustainable world or society. As a core component of the social infrastructure, it is possible for libraries to be associated with every section of the community, and it can play an important role in meeting the UN's 17 sustainable development goals through community engagement (Fairbotham, 2021). The total area of Assam is 78,438 square km with 336 provincialized degree colleges (Government of Assam, 2021a; 2021b).

Libraries have a direct impact on the students and can influence their communities and societies. Table 1 shows the ranges of active users in the libraries that are surveyed in this study.

Table 1: College libraries and their active users

Number of college libraries	Range of active users
14	Within 1000
10	10001-2000
10	2000-4000

This study conducted a survey in 32 colleges and found that on average, the colleges cover a large area as a higher education institute in their locality i.e. colleges are connected with a huge crowd and as the heart of the institute, the libraries of the colleges can play an important role in it.

Table 2 shows up to what range of radius(in km) the surveyed colleges are the only higher educational institutes in their area.

Table 2: Colleges and their range

Number of colleges	Range in radios(km)
8	Within 1km
5	1-2 km
8	2-5 km
7	5-10 km
4	More than 10 km.

Libraries can promote and create awareness of sustainability through library extension activities. Deka & Das (2023) discussed the importance of library extension activities and also described how libraries can influence community/ connect community. From Figure 1 it is seen that 96.7% of the librarians are aware of sustainable development goals.

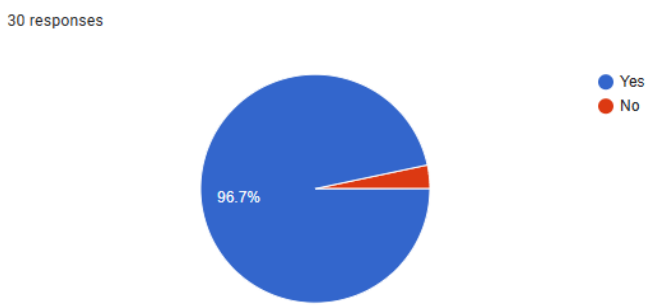


Figure 1: Awareness of librarians about sustainable development goals

Libraries can take the initiative to conduct the following kinds of library extension activities to community engagement-

1. Awareness camp
2. Book display on sustainable development
3. Involve the active users to create awareness
4. Competition like poster making, slogan writing, etc.
5. Publish a book/journal/ article/ blog, etc.
6. Train the students and community members to practice sustainable activities.

The NDLI-Club provides a venue for holding learning-focused events both offline and online, involving numerous other institutes in addition to local ones, using contents of NDLI (and others as well) and experts to deliver talks or conduct sessions. NDLI can be used as a platform for community engagement. The programs that are organized through the NDLI platform are time and cost-effective. From Figure 2, it is seen that 61.3% of the colleges have NDLI club membership, whereas 38.7% don't.

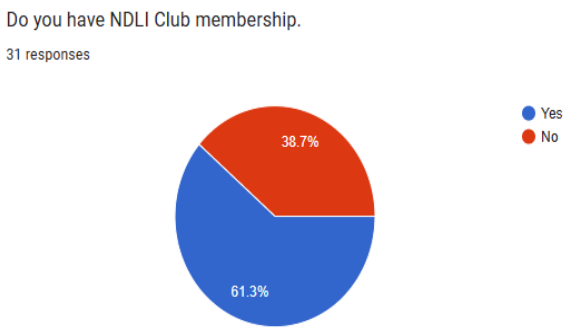


Figure 2: Available NDLI club membership

The college libraries of Assam can enhance their contribution to sustainability through community engagement by taking the initiative to alert people towards this noble cause with the NDLI platform.

Colleges under study have adopted villages which are the primary places to deliver their social responsibility. The college libraries can guide the local school libraries, village libraries, etc of the adopted villages to develop collections for sustainability development, conduct awareness programs among the villagers, etc.

The libraries of college libraries can take the initiative to publish books, periodicals, etc. on sustainability activities regularly to aware people. They can also conduct competitions like poster making, slogan writing, etc. among the students and

users on sustainable development. These kinds of initiatives are very impactful on the users to generate interest and awareness on a certain topic.

Father of the nation India, Mahatma Gandhi believed that people are the mirror of this world. One need not wait to see what others do ((Ranseth, 2015). There is a famous quote that if you want to change the world, start with yourself. As discussed earlier, the college libraries of Assam have a significant impact on the nearby communities of their institute. So, if the libraries practice sustainable activities it will be an example and encourage people to do so. Also, it will help the libraries to attain self-sustainability. From Figure 3, it is clearly seen that only 37.5% of the college libraries are practising sustainable activity regularly in their libraries, whereas 96.7% of the librarians are aware of SDGs.

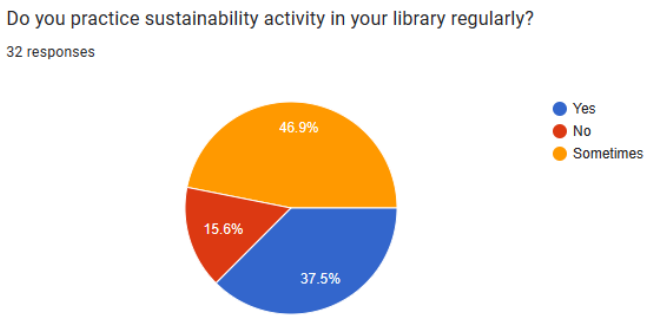


Figure 3: Practice of sustainable activity in the colleges

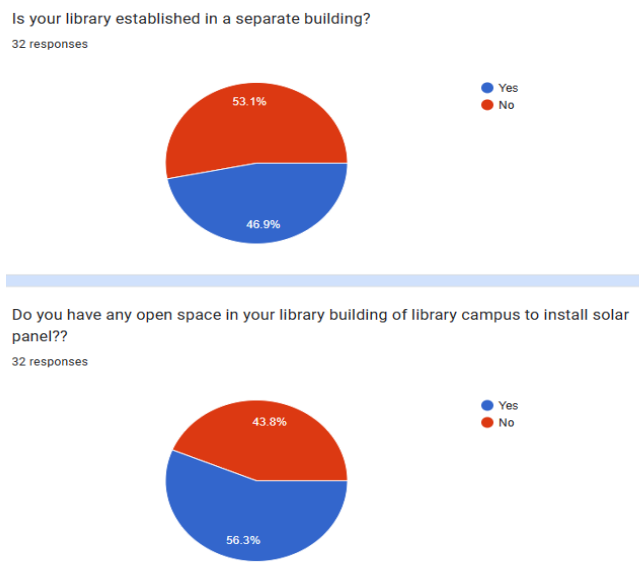


Figure 4: Scopes to take the green initiative

75% of the libraries that were surveyed during the study are totally dependent on electricity as a source of power. In our survey, it is also seen that the libraries that are established in separate buildings have enough space to install solar panels (Figure 4), and 90.6% of the total respondents want to install solar panels in their libraries. This is only one way among many; this finding in the survey portrays the scope for alternate renewable energy that can be used in the college libraries of Assam.

The green initiative is a popular strategy for sustainable activity. Along with the environmental factors, economic and social factors are associated with the libraries. Sustainability also means maintaining best practices at a certain level and standard. After the global pandemic, libraries are facing a lot of challenges due to fund cuts and reduced sponsorship and making tangible progress against the SDGs (Fairbotham, 2021). Boruah(2022) identified that the lack of enough permanent professional staff is a major problem in the college libraries of Assam.

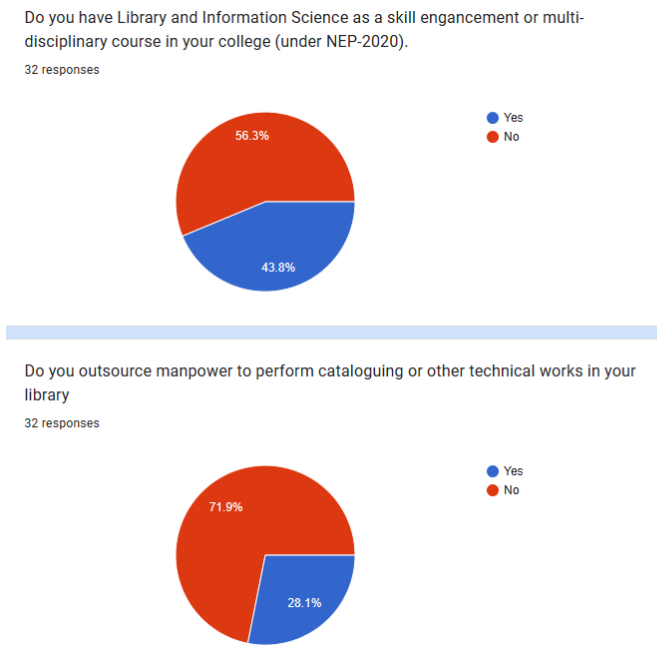


Figure 5: Sustainable economic effort can be attempted for the technical works

Our study reveals that 43.8% of the colleges under study are offering Library and Information Science as a multi-disciplinary/skill enhancement/interdisciplinary course under NEP 2020 and 28.1% of them are outsourcing human resources for technical work (Figure 5). In most of the colleges librarian is the teacher in charge of the course. Hence, the librarian can engage their students who are skilled in technical works and offer them internship certificates for a specific period of time. This will

help the students in their academics as well as help the library to overcome its funding constraints and also reduce the cost of human outsourcing. Thus economic sustainability can be achieved by the libraries through community engagement.

All the libraries that are surveyed are using the Integrated Library Management System(ILMS). In the ILMS software, there are many facilities like in-out registers that can be maintained digitally, library cards that can be integrated with the college I-card, Barcode and spine level that can be printed in bulk in regular A4 size papers, online acquisition process, etc. So by the proper use of ILMS software, it is possible for the libraries to minimize the use of papers, reduce the cost, and also be well connected with the user community. Because ILMS is socially just, economically viable, and environmentally sound, it can be viewed as a tool for sustainability.

For example:

To buy 10000 spine labels, libraries usually spend 6000 to 7000 rupees but if libraries make those labels in A4 size paper by using ILMS software, the whole process of spine labeling will reduce to 1500 rupees only. This process also minimizes paper waste than that of traditional spine labels. In Figure 6, images of traditional spine labels and ILMS-generated spine labels are shown.

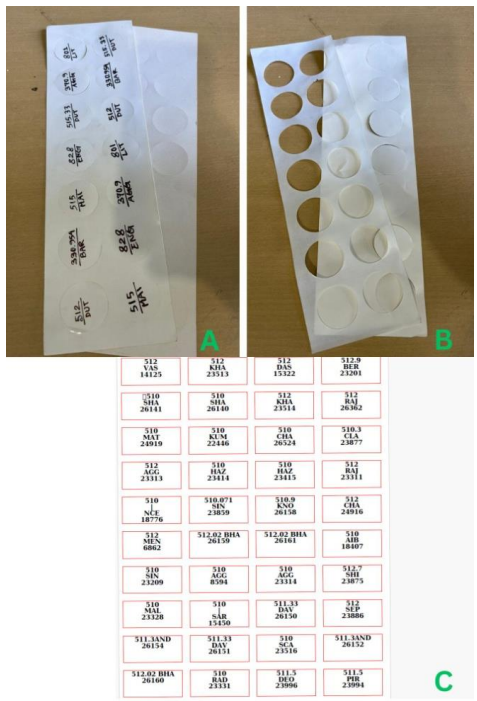


Figure 6: Traditional spine label vs ILMS generated spine label

In Figure 6, portion A and B shows what traditional spine labels look like and the remaining waste after the spine labels are used. Portion C shows how 40 -50 spine labels can be generated in a normal A4 size paper with the help of ILMS.

Findings:

1. Reports declared libraries can play a major role in achieving sustainability in the global scenario. In this study, it is seen that the college libraries of Assam can be considered as an influential social establishment by considering the number of active users. Additionally, the colleges are spreading the light of knowledge covering people from large areas and as the heart of the HEIs, libraries are playing a vital role in it. 96.7% of the librarians are aware of SDGs. Thus libraries can create awareness and generate interest in sustainable development or sustainability, and training programs can be organized by the libraries through its extension services. Adopted villages or areas of the parent institute can be considered as the epicentre of community engagement by the libraries. Sustainability is not a goal, but it is a practice to be maintained. Establishing self-sustainable libraries will be ideal for the society that can inspire a large portion of the community to be sustainable.
2. The suggested plan of action for the college libraries of Assam to engage the community for sustainability is-
   (a) Strengthen and advocate library extension services.
   (b) Compulsory NDLI club membership so that libraries can be connected with the community through a dynamic and authentic public platform.
   (c) Awareness, orientation, and training program for sustainability among the active users, potential users, and local community of the library at regular intervals i.e. at least twice a year in both offline and online mode.
   (d) Advocate the use of online resources and digital libraries that will help to reduce the use of paper directly and energy, fuel, etc. indirectly.
   (e) Collection development and book display on sustainable development in the libraries as well as in the adopted libraries at least twice a year.
   (f) Competitions like poster making, slogan writing, etc. should be organized on special occasions that will encourage the students to think in line.
   (g) Publish articles/blogs etc. through library platforms on sustainable development.

(h) Encourage communities to practice sustainable activities by establishing self-sustainable libraries.

3. To achieve self-sustainability-

(a) The college libraries should be established in well-planned buildings where they can generate revenue through the different services and facilities that can be offered to the community without hampering the main objectives of an academic library. Some examples of such kinds of services are offering reprographic service to all people, a special library reading section for the general public on a subscription basis, a conference room exclusively for academic purposes that can be rented on a daily basis, a separate computer section for online exams, etc.

(b) Alternate sources of power like solar panels, etc. can be installed in the libraries to minimize the use of non-renewable energy as well as to reduce cost.

(c) Proper use of ILMS and other digital platforms to maintain sustainability.

(d) Utilize the opportunity created by the NEP-2020, make skilled students in library activity, and engage them in internship programs. That will help the students as well as the library to minimize outsourcing costs.

Conclusion

As the centre of any academic institution, the academic library is essential to the development of civilization through education, research, and volunteer work. Libraries are frequently and easily accessible establishments that provide important resources for different types of users of different communities. Based on the survey, it is evident that library professionals are enthusiastic about the UN SDGs. Several programs for library extensions and other services of academic libraries contribute to the communities, helping them to align with the sustainable development goals. Academic libraries possess the potential to deliver sustainable development goals with the help of community engagement. Still, it seems lacking in mapping sustainable development goals as a foundation for better strategizing. Academic libraries should embrace sustainability by first learning what it is and then taking into account all of its implications when putting it into practice. Academic libraries ought to develop into self-sufficient hubs that serve as sources of inspiration and direction for libraries of all stripes as they strive toward the same objective. Community engagement also helps academic libraries to attain self-sustainability. There is future scope for research to develop a time-bound and compulsory work plan and protocol for the library structure as well as library services for community engagement to sustainability.

References:

1. ALA(2018). *What is community engagement?* Tools, Publications & Resources. http://www.ala.org/tools/librariestransform/libraries-transforming-communities/engagement

2. ALA. (2022). *Sustainability in Libraries:A Call to Action.* American Library Association.

3. Bangani, Siviwe, & Dube, Luyanda. (2023). Institutional Commitment to Community Engagement in South African Academic Libraries. The Journal of Academic Librarianship, 49, 1-9. https://doi.org/10.1016/j.acalib.2023.102679

4. Boruah, B. B. (2022). Challenges and possibilities in the academic libraries of assam in promoting positive climate and culture in the educational institutes in the current scenario. *IP Indian Journal of Library Science and Information Technology*, *7*(2), 96–100. https://doi.org/10.18231/j.ijlsit.2022.017

5. Charney, Medeleine. (2014). Academic Librarians and the Sustainability Curriculum: Building Alliances to Support a Paradigm Shift. *Collaborative Librarianship*, *6*(1), 20-35. https://digitalcommons.du.edu/collaborativelibrarianship/vol6/iss1/3?utm_source=digitalcommons.du.edu%2Fcollaborativelibrarianship%2Fvol6%2Fiss1%2F3&utm_medium=PDF&utm_campaign=PDFCoverPages

6. Chukwu Rev Sr. Dr., Scholastica A.J., Emerzie Dr., Nkeiru A., Njoku Dr., Ifeoma S., & Abanum, Rosemary. (2022). Towards Effective Community Participation in Sustainable development Goals in Nigeria: The Academic Library Perspective. *Library Philosophy and Practice*, 1-17. https://digitalcommons.unl.edu/libphilprac/7239/

7. Cockfield, K. W., & Mehra, B. (2023). How Public Libraries Build Sustainable Communities in the 21st Century. *Advances in librarianship*. https://doi.org/10.1108/s0065-2830202353

8. Deka, B., & Das, J. (2023). Extension services provided by the public libraries of Lower Assam: a descriptive study. In *Empowering libraries, connecting communities: Innovation, collaboration and entrepreneurship*. Global alliance publishers.

9. Embree, Jennifer K., & Gilman, Neyda V. (2020). The Library as a Campus Sustainability Hub: A Case Study in Increasing Community Engagement & Collaboration in Sustainability through Academic Libraries. *International Journal of Librarianship*, *5*(2), 26-44. https://doi.org/10.23974/ijol.2020.vol5.2.172

10. Fairbotham, J. (2021). Public libraries play a crucial role in sustainable

development. *Pressreader*. https://blog.pressreader.com/libraries-institutions/public-libraries-play-crucial-role-sustainable-development

11. Government of Assam. (2021a). *Assam at a glance*. Assam State Portal. https://assam.gov.in/about-us/393#:~:text=Assam%20covers%20an%20area%20of%2078%2C438%20km2%20(30%2C285%20sq%20miles).

12. Government of Assam. (2021b). *List of provincialized colleges*. Higher Education. https://rusa.assam.gov.in/sites/default/files/swf_utility_folder/departments/rusa_medhassu_in_oid_7/menu/document/latest_list_of_all_provincialised_colleges.pdf

13. Hatua, D. S. (2020). Changing mode of library functions for it's sustainability. *Sustainable library , 26* (1), 11-14.

14. Jana, Dr. Sibsankar. (2020). *Sustainable Library*. Department of Library & Information Science Jadavpur University.

Assessment of Attitude and Information Literacy Competencies towards e-Learning among the Veterinary Students of Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar

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ABSTRACT: The present study was carried out to assess the attitude and information literacy competencies among the veterinary students of Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar. The data was collected with the help of self structured questionnaire from 131 under graduate (B.V.Sc.) veterinary students. The study found that 35.12 percent of the respondents have good information literacy and competencies towards the use of ICT applications, whereas, 26.72 percent respondents rated as they have very good skills. Around half of the respondents know about the e-learning benefits, while 43.51 percent of the respondents know properly about the concept of e-learning and its use in their academic and learning activities. The findings also revealed that 58.78 percent of the respondents found e-learning gives opportunities to learn new knowledge in their concerned field and in general, whereas, e-learning was useful and enjoyable for 55.72 percent of the respondents. On the basis of findings, the study suggested that proper initiatives must be taken by the library or University authorities to uplift the attitude and skills of veterinary students towards the enhancement of information literacy and e-learning.

Keywords: ICT, E-Learning, Information literacy competencies, Veterinary students, LUVAS, Hisar.

1. Introduction

Information is a powerful tool for progress of any country or individual human being. Earlier, the information is available and provided in manual form but gradually, when technology has impacted every field of knowledge, the form and way of information is totally been changed. Today, information rich peoples or organizations have flourishes in every way as information is the only tool, which serves and gives strength as compare to those who have not. So it is presumed that one should be information literate so that he/she can understand, evaluate, use and communicate in a useful way. Today, information is being generated in enormous quantity as well as in many formats; hence, to access the right information in right way from the heap of the information by the right user is the mandate of information literacy. In this technological era, where every type of information

is supposed to be available and accessible through Internet, every person of the human society must be information literate so that progress or success can be achieved in effective manner.

It is practically observed that there is an educational imbalance between the updated technology and the information existing to all kind of users. Most of the information resources or documents are available and accessible in digital form due to digital era. The users of all kind should be digitally literate in this technological era. Similarly, the veterinary students also must know how to access, retrieve, store, use, and share the information among others. For veterinary students, information literacy competency towards e-learning would facilitate independent learning and also develops critical thinking skills among them.

An ability, which makes an individual able to identify, efficient and effective use of print and digital information resources in order to meet his/her objectives is known as information literacy. Even, with the high information literacy level, one can develop critical thinking skills, which excellence in their academic, personal, and professional endeavours. Information literacy skills can also develop decision making skills. So, likewise every students or professionals, it becomes necessary for veterinary students as well in this digital era to develop strong information literacy skills towards e-learning to achieve excellence in their academic and professional career. In another way, we can elaborate that, to access the Information and Communication Technology (ICT) and digital contents, to know how to navigate the vast online information landscape and to know how to find, evaluate, process, and use information in efficient way are some of the crucial skills, which must be have in an information literate.

In view of the facts discussed above, the present study was therefore, planned to assess the attitude and information literacy competencies towards e-Learning among the veterinary students of Lala Lajpat Rai University of Veterinary and Animal Sciences (LUVAS), Hisar.

2. Literature review

Li *et al.* (2023) conducted a study to analysis the "impact of information literacy, self-directed learning skills, and academic emotions on high school students' online learning engagement and observed that students' information literacy, self-directed learning skills, and positive academic emotions positively predicted their online learning engagement, and moreover the positive impact of self-directed learning skills on students' online learning engagement was significantly and largely enhanced through the mediation effects of positive academic emotions,

while to enhance adolescent students' online learning engagement, it is important for school administrators, teachers, and parents to improve students' information literacy, self-directed learning skills, and positive academic emotions". On the other hand, Hemamalini and Umesh (2020) conducted "a study to know the information literacy competencies among the undergraduate students of Mysore City and explored that the majority of the students can differentiate between the primary, secondary and tertiary sources of information, while, the study also found that the major problem in locating the information in the library was lack of knowledge about the information retrieval and the difficulty in locating the sources in the library". A study was conducted by Hemavathi and Chandrashekara (2019) to "assess the information literacy competency among students of Kittur Rani Chennamma College of Horticulture, Arabhavi (Belagavi), Karnataka and found that majority (93.18 percent) of the respondents use simple keywords for searching required information, while 64.77 percent of the respondents feel the need of training for use of electronic resources effectively in their academic and research work".

Adeniran and Onuoha (2018) conducted a study to explore the influence of information literacy skills on postgraduate students' use of electronic resources in private university libraries in South-West, Nigeria and it was found by the researchers that people's ability to discover the need for information as well as search skills predict their level of electronic resources use in the academic environment, while the researchers experienced that the teaching of information literacy skills to postgraduate students should be promoted to ensure high level of usage of the resources. To know the information literacy competencies of veterinary students and their attitude towards e-learning at Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana (Punjab), Elnoor *et al.* (2017) conducted a study and revealed that majority of PG students (67.5%) belonged to high knowledge level category whereas majority of UG students (68.3%; $P<0.01$) possessed low knowledge towards information literacy competencies, whereas, a high percentage of veterinary students lacked the necessary knowledge and skills to identify main concept and significance of words (46.6%), to opt appropriate search strategy (77.9%), to select required document types (36.0%), to utilize efficient search tools (59.6%) and to evaluate and use of results (40.4%). Similarly, Shweta Kumari K. and Mallaiah (2017) conducted a study to know digital information literacy skills among faculty members of engineering colleges in Mangalore, Karnataka and found that using digital resources for preparing course material for teaching was the main purpose for 72 percent respondents, while majority of the respondents rated as excellent for accessibility, accuracy, authority and usefulness of web resources.

A lot of studies have been conducted in the different parts of India and around the globe to assess of attitude and information literacy competencies towards e-learning among the veterinary students. However, no such type of study was conducted in the Haryana state of India. Therefore, a study was planned to fill this gap and to which provides an insight into the assessment of attitude and information literacy competencies towards e-learning among the veterinary students of Lala Lajpat Rai University of Veterinary and Animal Sciences (LUVAS), Hisar.

3. LUVAS, Hisar

"An independent University of Veterinary and Animal Sciences has been established w.e.f. 01.12.2010 in pursuance of the Haryana Act No. 7 of 2010 notified on 7th April, 2010. The new University has been named in the cherished memory of Lala Lajpat Rai, a great patriot, the foremost freedom fighter, an ardent social reformer and a versatile writer. Lala Lajpat Rai, popularly known as "Punjab Kesri", did his early legal practice at Hisar and also served as a Member and Secretary of the Hisar Municipality. The College of Veterinary Sciences and the College of Animal Sciences, earlier the constituent colleges of CCS Haryana Agricultural University, Hisar has now been incorporated in this newly established University. The college of Animal Sciences is merged into College of Veterinary Sciences. The College has a glorious history of more than 60 years, since it was shifted to Hisar from Lahore (Pakistan)" (LUVAS, 2023).

4. Nehru Library- A brief sketch

"Though the library was establishment in 1948 with the establishment of College of Veterinary Sciences, in the year 1975 it was named after Jawaharlal Nehru, the first Prime Minister of India. The Nehru Library is common to use for the users of both of the Universities, *i.e.*, CCS HAU, Hisar and LUVAS, Hisar situated in the same campus. The covered area of the building is 9076 m^2 with a capacity to accommodate more than 3.5 lacs books and bound journals. The library possesses a rich collection of more than 3.8 lacs books, bound journals and other reading material to meet the informational requirements of students, teachers, research scholars, extension specialists and other staff of the Chaudhary Charan Singh Haryana Agricultural University (CCSHAU) as well as Lala Lajpat Rai University of Veterinary and Animal Sciences (LUVAS) located at Hisar and sub-campuses. The library is also maintaining its collections at College of Home Science, Hisar, College of Agriculture, Kaul, College of Agriculture, Bawal, Campus School, 19 Krishi Vigyan Kendras and 7 Regional Research Stations. The library is successfully exploiting

the power of information and communication technologies in various activities for retrieval and dissemination of information" (Nehru Library, 2023).

5. Objectives

- To assess the information literacy competencies among the veterinary students of LUVAS, Hisar towards the use of ICT applications
- To know the purpose of library visit
- To examine the information literacy and competencies towards e-learning concept among the veterinary students
- To find out the information literacy and competencies towards concept identification of information literacy and e-learning
- To know the information literacy and competencies towards search strategy
- To explore the information literacy and competencies towards sources of information
- To assess the information literacy and competencies towards search tools
- To examine the information literacy and competencies towards ethical use of information
- To know the information literacy and competencies about the use of e-learning tools
- To explore the overall opinion of veterinary student's attitude about using e-learning tools

6. Scope and limitation of the study

This study focused on assessment of attitude and information literacy competencies towards e-learning among the veterinary students of Lala Lajpat Rai University of Veterinary and Animal Sciences (LUVAS), Hisar. Data collection of this study is limited to undergraduate students (B.V.Sc.) students of Lala Lajpat Rai University of Veterinary and Animal Sciences (LUVAS), Hisar, who visited the library frequently for their academic and research pursuits.

7. Research methodology

The present study was based on survey method and conducted in the premises of Nehru Library to get the opinion of veterinary students about their awareness, attitude, and information literacy competencies towards e-learning. About 150

undergraduate (B.V.Sc.) students were approached randomly with the stratified random sampling. For data collection, a questionnaire was developed on the basis of objectives as well as literature reviewed. The survey was conducted in the months of May-June 2023 and out of 150 veterinary students, 131 positively responded, which form the response @ 87.33%. The collected data than put into tabular form and conclusions are drawn accordingly.

8. Data analysis and interpretation

The data have been presented, compared and analysed in the following tables:

Table 1: Distribution of respondents by gender

Sr. No.	Gender	Respondents	Percentage
1.	Male	76	58.01
2.	Female	55	41.99
Total		131	100

The Table 1 shows the data about the participants by their gender and revealed that out of total 131 respondents, 58.01 percent were the male respondents and rest of the respondents, *i.e.*, 41.99 percent were the females who took participation in the survey study positively.

Table 2: Frequency of library visits

Sr. No.	Frequency	Respondents	Percentage
1.	Daily	21	16.04
2.	Twice a week	25	19.09
3.	Weekly	38	29.00
4.	Fortnightly	32	24.42
5.	Monthly	15	11.45
Total		131	100

The Data presented in the Table 2 highlights the frequency of library visit among the veterinary students. It was found during the study that out of total 131 respondents, 29 percent of the respondents preferred to visit the library on weekly basis, while 24.42 percent of the respondents visited the library once in a fortnight. On the other hand, 19.09 percent of the respondents visited the library twice a week, whereas, 16.04 percent of the respondents preferred to visit the library daily, followed by once in a month (11.45 percent).

Table 3: Purpose of library visits

Sr. No.	Purpose*	Respondents (n= 131)	Percentage
1.	To issue/return of books	87	66.41
2.	To read newspapers and magazines	24	18.32
3.	To consult journals	93	70.99
4.	To prepare class assignments	48	36.64
5.	For general reading	39	29.77
6.	To access electronic resources	108	82.44
7.	To photocopy or other research related work	62	47.33

**Multiple answers were permitted*

The presented data in the Table 3 depicted the purpose of library visits of veterinary students and the study explored that 82.44 percent of the respondents visited to the library to access electronic information resources for their academic and research activities, while 70.99 percent of the respondents visited the library to consult various journals related to their concerned field of study. On the other hand, 66.41 percent of the respondents visited the library to issue/return of books, whereas, 47.33 percent of the respondents visited the library for the purpose 'to photocopy or other research related work', followed by 'to prepare class assignments' (36.64 percent), 'for general reading' (29.77 percent), and 'to read newspaper and magazines' (18.32 percent) respectively.

Table 4: Information literacy and competencies towards the use of ICT applications

Sr. No.	Competencies towards use of ICT applications	Respondents	Percentage
1.	Excellent	23	17.55
2.	Very good	35	26.72
3.	Good	46	35.12
4.	Average	27	20.61
5.	Poor	00	00
Total		131	100

The information literacy and competencies among the veterinary students towards the use of ICT applications is reflected by the data given in above Table 4. It was found during the study that 35.12 percent of the respondents rated as

good information literacy and competencies towards the use of ICT applications, whereas, 26.72 percent respondents rated as it very good, followed by average (20.61 percent) and excellent (17.55 percent) respectively. The analysis shows that one third of the respondents under the study having satisfactory information literacy and competencies towards the use of ICT applications in their personal, academic and research assignments.

Table 5: Information literacy and competencies towards e-learning concept

Sr. No.	Competencies towards e-learning concept*	Respondents (n= 131)	Percentage
1.	Known properly about the e-learning	57	43.51
2.	Known about the e-learning tools	50	38.17
3.	Known about the e-learning benefits	63	48.10
4.	Known about the limitations of e-learning	39	29.77
5.	Known about how information sharing on e-learning platform	48	36.64

**Multiple answers were permitted*

The data reflected in the Table 5 highlights the information literacy and competencies towards e-learning concept among the veterinary students towards e-learning concept. The study found that 48.10 percent of the respondents know about the e-learning benefits, while 43.51 percent of the respondents know properly about the e-learning concept. On the other hand, 38.17 percent respondents know about the e-learning tools and its use, followed by 'known about how information sharing on e-learning platform' (36.64 percent), and 'known about the limitations of e-learning' (29.77 percent) respectively. The analysis shows that in this digital era, it is supposed that everyone should have at least a little bit knowledge about the e-learning concept, hence, veterinary students have good knowledge about the e-learning.

Table 6: Information literacy and competencies towards concept identification

Sr. No.	Concept identification	Respondents	Percentage
1.	Identifying the main concepts in a topic by using key words	73	55.73
2.	Differentiating between significant and non-significant terms	58	44.27
Total		131	100

The data pertaining to information literacy and competencies towards concept identification is reflected in the Table 6 and it was found during the study that more than half of the respondents (55.73 percent) capable in identifying the main concepts in a topic by using key words, whereas, 44.27 percent of the respondents able to differentiating between significant and non-significant terms. The analysis shows that veterinary students under study have satisfactory information literacy and competencies towards the concept identification and also have analysis capabilities.

Table 7: Information literacy and competencies towards search strategy

Sr. No.	Competencies towards search strategy	Respondents	Percentage
1.	"Using a thesaurus to get the preferred vocabulary for a particular database or source of information"	62	47.33
2.	Using Boolean operators 'AND', 'OR', 'NOT'	46	35.11
3.	Using other search technology bases strategy technique	23	17.56
Total		131	100

The Table 7 shows the information literacy and competencies towards search strategy among the veterinary students under study. The study explored that 47.33 percent of the respondents "using a thesaurus to get the preferred vocabulary for a particular database or source of information", while 35.11 percent of the respondents using Boolean operators 'AND', 'OR', 'NOT'. On the other side, 17.56 percent of the respondents using other search technology bases strategy techniques while searching or accessing information resources or contents.

Table 8: Information literacy and competencies towards sources of information

Sr. No.	Competencies towards sources of information	Respondents	Percentage
1.	Good knowledge about the sources of information	46	35.11
2.	"Knowing when to refer to book, journal, newspaper, peer reviewed article, database, *etc.* in academic and research work"	56	42.75
3.	Knowing about the authenticity of information and information resources	29	22.14
Total		**131**	**100**

The information literacy and competencies among veterinary students under study towards sources of information is presented by the data as reflected in the

Table 8. The study explored that 42.75 percent of the respondents "know when to refer to book, journal, newspaper, peer reviewed article, database, *etc*. in an academic and research work". On the other hand, 35.11 percent of the respondents having good knowledge about the sources of information, whereas, 22.14 percent of the respondents having knowledge about the authenticity of information and information resources.

Table 9: Information literacy and competencies towards search tools

Sr. No.	Competencies towards search tools	Respondents	Percentage
1.	Knowing how to use library catalogue effectively	34	25.96
2.	Knowing how to use search engine (Google, Yahoo, *etc.*)	54	41.22
3.	"Knowing how to search in many search engines simultaneously for getting more results and time saving"	15	11.45
4.	Knowing how to federated search (single window search)	28	21.37
Total		131	100

The data presented in the Table 9 highlights the information literacy and competencies towards search tools among veterinary students of LUVAS, Hisar. It was found during the study that 41.22 percent of the respondents properly know how to use search engines such as Google and Yahoo for their required information, while 25.96 percent of the respondents know about how to use library catalogue effectively, followed by "knowing how to federated search (single window search)" (21.37 percent) and 'knowing how to search in many search engines' (11.45 percent) respectively.

Table 10: Information literacy and competencies towards ethical use of information

Sr. No.	Competencies towards ethical use of information	Respondents	Percentage
1.	Knowing how to cite a research work properly	33	25.19
2.	Knowing about the concept of plagiarism and how to avoid plagiarism	47	35.88
3.	Knowing about the ethical use of information	29	22.14
4.	Knowing about the popular citation styles of referencing	22	16.79
Total		**131**	**100**

With reference to information literacy and competencies towards ethical use of information, the data presented in the Table 10 reflects that 35.88 percent of the respondents know about the concept of plagiarism and how to avoid plagiarism, whereas, 25.19 percent of the respondents know how to cite a research work properly, followed by 22.14 percent of the respondents know the ethical use of information and 16.79 percent of the respondents know the popular citation styles of referencing.

Table 11: Information literacy and competencies about the use of e-learning tools

Sr. No.	Competencies towards the use of e-learning tools*	Respondents	Percentage
1.	E-mail	131	100
2.	Video conferencing	90	68.70
3.	Search engines	95	72.52
4.	YouTube	131	100
5.	Recorded audio/video lectures	131	100
6.	e-Databases	78	59.54
7.	e-Journals/books consortiums	89	67.94
8.	Mobile apps such as Zoom, Microsoft Teams, WebEx, *etc.*	38	29.00

**Multiple answers were permitted*

The table 11 shows the information literacy and competencies about the use of e-learning tools among the veterinary students of LUVAS, Hisar. The study found that all the respondents have enough knowledge about the use of e-mail, YouTube, recorded audio/video lectures. Another side, 72.52 percent of the respondents have enough competencies towards the use of search engines, while 67.94 percent of the respondents have good competencies about the use of e-journals/books consortiums. Veterinary students have good knowledge about Video conferencing and its use, followed by e-databases (59.54 percent) and mobile apps such as Zoom, Microsoft Teams, WebEx, *etc*. (29.00 percent) respectively.

Table 12: Overall opinion of veterinary student's attitude about using e-learning tools

Sr. No.	Attitude about using e-learning tools*	Respondents (n=131)	Percentage
1.	e-learning is useful and enjoyable	73	55.72
2.	e-learning gives opportunities to learn new knowledge	77	58.78

Sr. No.	Attitude about using e-learning tools*	Respondents (n=131)	Percentage
3.	e-learning enhances learning experience	56	42.75
4.	e-learning is quiet convenient way of learning	22	16.80

**Multiple answers were permitted*

The presented data in the Table 12 shows overall opinion of veterinary student's attitude about using e-learning tools and the present study explored that 58.78 percent of the respondents found e-learning gives opportunities to learn new knowledge, whereas, e-learning is useful and enjoyable for 55.72 percent of the respondents. On the other hand, 42.75 percent of the respondents opined that e-learning enhances learning experience, while 16.80 percent of the respondents were in the opinion that e-learning is quiet convenient way of learning.

9. Summary of findings and discussion

Based on the results, some of the major findings may be summarises as given below:

- About 82.44 percent of the respondents visited the library to access electronic information resources for academic and research activities, whereas, around 71 percent of the respondents visited the library to consult various journals related to their concerned field of study.
- About 35.12 percent of the respondents rated as good information literacy and competencies towards the use of ICT applications, whereas, 26.72 percent respondents rated as it very good.
- 48.10 percent of the respondents know about the e-learning benefits, while 43.51 percent of the respondents know properly about the concept of e-learning.
- More than half of the respondents (55.73 percent) were capable in identifying the main concepts in a topic by using key words, whereas, 44.27 percent of the respondents were able to differentiating between significant and non-significant terms.
- About 47.33 percent of the respondents using a thesaurus to get the preferred vocabulary for a particular database or source of information, while 35.11 percent of the respondents using Boolean operators 'AND', 'OR', 'NOT'.
- 42.75 percent of the respondents know when to refer to book, journal, newspaper, peer reviewed article, database, *etc*. in an academic and research work.

- About 41.22 percent of the respondents properly know how to use search engines such as Google and Yahoo for their required information, while 25.96 percent of the respondents know how to use library catalogue effectively.
- 35.88 percent of the respondents know the concept of plagiarism and how to avoid plagiarism, whereas, 25.19 percent of the respondents know how to cite a research work properly.
- All the respondents have enough knowledge about the use of e-mail, YouTube, recorded audio/video lectures.
- About one third of the respondents (72.52 percent) have enough competencies towards the use of search engines, while 67.94 percent of the respondents have good competencies about the use of e-journals/ books consortiums.
- 58.78 percent of the respondents found e-learning gives opportunities to learn new knowledge, whereas, e-learning is useful and enjoyable for 55.72 percent of the respondents.

10. Conclusion and suggestions

In this digital era, it is supposed that everyone should be information literate; however, in the case of present study on veterinary students of Lala Lajpat Rai University of Veterinary and Animal Sciences (LUVAS), Hisar, there is a need to enhance some skills related to use of ICT and information as only 35.12 percent of the respondents rated as they have good information literacy. Similarly, nearly half of the respondents (48.10 percent) know about the concept of e-learning and its benefits. The study also found that only 35.88 percent of the respondents know the concept of plagiarism and aware how to avoid plagiarism and even among the respondents, only 25.19 percent know how to cite a research work properly. The study concluded that there are some areas where veterinary students have less competencies about the concept of e-learning and information literacy, hence, the study suggested that proper initiatives must be taken by the library or University authorities to lift the attitude and skills of veterinary students towards the enhancement of information literacy and e-learning. For this, information literacy and e-learning skills programs must be started on frequent basis by the library concerned or University authorities.

References

1. Adeniran, P.O., & Onuoha, U.D. (2018). Influence of information literacy skills on postgraduate students' use of electronic resources in private university libraries in South-West, Nigeria. *Communications and Network*, 10, 164-179. https://doi.org/10.4236/cn.2018.104014

2. CCSHAU, Hisar (2023). https://hau.ac.in/

3. Elnoor, O.S. *et al.* (2017). Information literacy competencies of veterinary students and their attitude towards e-learning. *Haryana Veterinarian*, 56(1), 41-46.

4. Hemamalini, H.C., & Umesh, Shobha (2020). Information literacy competencies among Undergraduate students of Mysore City. *Library Philosophy and Practice (e-journal)*, 3875. https://digitalcommons.unl.edu/libphilprac/3875

5. Hemavathi, K.N., & Chandrashekara, M. (2019). Information literacy competency among students of Kittur Rani Chennamma College of Horticulture, Arabhavi (Belagavi), Karnataka: A study. *Indian Journal of Information Sources and Services*, 9(2), 53-57.

6. Li, Huan *et al.* (2023). Impact of information literacy, self-directed learning skills, and academic emotions on high school students' online learning engagement: A structural equation modelling analysis. *Education and Information Technologies*. https://doi.org/10.1007/s10639-023-11760-2

7. LUVAS (2023). https://luvas.edu.in/

8. Nehru Library, CCS HAU, Hisar. (2023). https://hau.ac.in/college/nehru-library

9. Shwetha Kumari, K., & Mallaiah, T.Y. (2017). Digital information literacy skills among faculty members of engineering colleges in Mangalore, Karnataka: A study. International Journal of Digital Library Services, 7(1), Jan-Mar, 28-37.

Impact of Social Networking Sites on Academic Libraries

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ABSTRACT: Social networking is a social structure that lets the user interact and work collaboratively with other users, including the ability to browse, search, invite friends to connect and interact with web world. Social media becomes an integral part of life; Social media is now main stream. Many businesses, cultural organizations and other institutions are leveraging social media to achieve their strategic goals, how are libraries considering social media as part of their core communication and engagement strategies? How are libraries preparing their staff to communicate and engage professionally using social media through the inclusion of social media in library strategic plans? In short, how are libraries future-planning for the inclusion of formal social media roles in their institutions? It's time to start answering these questions and to put forward the case for formal recognition of social media duties and the creation of specialist social media librarian roles. This paper will highlight current practice in social media strategy, communication and engagement.

Introduction

This paper examines how Libraries can leverage on social networking and Social Media skills to provide dynamic library services in the face of decreasing economic problems in India. The unique technological advancement of the 21st century, no doubt has impacted on library services globally and in India in particular. The Social Media publicity has gradually creep into the library profession with social sites such as Facebook, MySpace, Flicker, YouTube, Library Thing; it has become evident that our services will need to change to meet the growing needs of our end users. Social software in the web 2.0 world not only enhances the practical usability in the library but also helps the moving back librarians add value to their profession, given the value or potential of librarian being questioned in the information landscape.

1 What is social networking?

The term "Social Networking" refers to a range of web-enabled or IT enabled software programs that allow users to interact and work collaboratively with other users. It includes ability to browse, search, invite friends to connect and interact, share film reviews, comments, blog entries, favorites, discussions, events, videos, ratings, music, classified ads, tag and classified information and more.

Social networking is a composition of individuals or organization, which are attached with one or more individuals such as friend, neighborhood, small communities etc. In the professional field, especially in the workplace, university and colleges, it is most fashionable online networking site among the individuals.

Social network is a broad term used to denote the blogs, user created videos and wikis. A social networking is an online service, platform or site that focuses on building and reflecting of social network or social relations among people who share interests and activities.

1.1 Academic Libraries

The advent of information technology has resulted in significantly reducing the size of libraries. These small modern academic libraries have rich potential for serving information needs. It has become possible to the digitize information contained in book formats. The digital and electronic information is based on digitized data, which has gradually replaced paper-based records. Digital information system in comparison to text based information system is getting more and more popular in these days. Internet has become an unavoidable requirement for every educational institutions and libraries.

2. Social networking sites and Media

A social networking site is an online portal, or web service, which induce to building a social relations among group of individuals. It connects the feelings, emotions, sharing information, and other activities of real life situation among peoples. The service of the social network site consists of a representation of each people, their social links, and a range of additional services. There are many social networking sites are available, Facebook, Orkut, Twitter, My space, LinkedIn etc are mostly used among them.



Source : www.socialnetworkinglibraries.com

3. Uses of Social Networking sites by the Libraries

Libraries and other business organizations are using social networking platform to interact and reach out to their patrons or clients. It has also become a level playing ground for academics and students to interact on issues pertaining to course work. Students also use this platform to share information amongst themselves on any subject and topic.

The Social Networking sites are mostly used to:



Source: www.socialmedialibraries.com

1. Marketing of library product and services.
2. Marketing specific adult programs and services.
3. Marketing specific children's and youth services programs.
4. To modernize the library image and e-reputation.
5. To reach a new audience of potential users.
6. To push library news and press release.
7. To provide quick updates to users.
8. To build discussion groups and collaborative work.
9. To spread news and service alerts.
10. Announce programmes of the library.
11. Give students the opportunity to ask questions pertaining to the use of the library.
12. Teach basic search tools.
13. Paste new books on the wall to inform the Library Community.
14. Send brief updates to patrons.
15. Ask a Librarian.

4. Use of Social networking sites For library and information science professionals.

1. The primary function of any library is to acquire, store and disseminate the information, in the same way social networking sites explores the information variously.
2. Social networking sites help students or research scholar to develop practical research skills that they need in a world where knowledge construction and dissemination make increasing use of online information network.
3. Social networking sites works as a tool to mobilize library services among younger generation of LIS Professionals.
4. Similarly as to get aware of the users about new arrivals library have make notices, in the same way Social networking sites also shows new information in the form of notification.
5. The faculty of Library and Information Science may get share information with their students on Social networking sites that will help to embark their wide knowledge to the student's community outside the classroom.
6. web 2.0 can work as a tool for interaction among the students and teachers.

7. The popularity of social networking sites is increasing among the educated people especially adult youth in college and universities and by LIS Professionals.



Source: www.socialmedia.com

5. How works Social Media in Library

Facebook- Most popular now because it is user- friendly, with many applications like JSTOR search, World Cat, and much more. Librarians can interact with users to know their information need. Libraries try to link some of these specialized library applications to Facebook.

MySpace: In Academic institutions libraries have taken advantage of this site to post, calendar, custom catalog search tools, and blog features to improve their presence.

Blogs: librarians can periodically post messages; share information on a particular subject or issue, and allow users to contribute to content. They can write articles, news on topical issues and expect an instant reaction from their users. A blog, or weblog, is an online journal or web site on which articles are posted and displayed in chronological order. Library can use this site for subject resources, book reviews, and library news and discussion groups. E.g. http://www.blogger.com

Wikis: Wiki technology provides an area for effortless collaboration and knowledge sharing among a community of users without any programming knowledge. Features: add a new page, edit page, search, comments, files and attachments, revision comparison. Is a free online encyclopedia that gives a background knowledge and definition of concepts. It offers a platform for users to access, edit and contribute to content. This is a collaborative web page for developing web content.

LinkedIn: Librarians can get patrons connected with specialists in their particular field of interest via LinkedIn. Librarians can use this platform to render specialized services such as Strategic Dissemination of Information (SDI).

Twitter: Is the micro blogging application used to keep staff and patrons updated on daily activities, like frequently updated collections. Users can utilize this platform to type in short messages or status update. Users can send Instant Messages (IM) on complaints or ask questions on a particular issue and get a feedback on the spot using twitter.

YouTube: Enable users to share, rate, comment, watch & gather around video content free of charge and technical expertise, In institutions in India, events such as important highlights of inaugural lectures, conferences and workshops are disseminated via the YouTube.



Source: www.educationalandsocialmedia.com

Flickr: Librarians can use this tool to share and distribute new images of library collections. Cover page of new arrivals of both books and journals can be disseminated to users via Flickr.

Library Thing: A tool that enriches the library OPAC. Once an account is created, a list of books with ISBNs is sent to Library Thing which sends back a piece of code which is pasted into the footer of the Library OPAC.

6. Impact of ICT on Libraries

With the developments and application of ICT, whole scenario of libraries has changed. There is shift from traditional libraries to hybrid libraries. We see emergence of libraries with different nomenclatures operating in the universe of knowledge. These libraries are automated libraries, electronic libraries, digital libraries or virtual libraries. In the web environment there has emerged the concept of Library 3.0. All these libraries are using different information technology applications for performing activities ranging from acquisition of materials to the dissemination of information.

7. Conclusion

Use of social networking for professional development and professional networking purposes. This is particularly true for the library and information industry which is already embracing web 2.0 technologies across many of its core activities. A suitable plan and strong evaluation needs to be look while pioneering social networks in library. User required to aware and sufficient training should be imparted to staffs to accomplish the task of planning social software in library. Last but not the least large encouragement and user empowerment on technologies used in web 2.0 should given the prime priority so that thinking on implementing social networking in library may be possible.

References

1. Abram, S. (2017). Web 3.0 - Huh?! Library 3.0, Librarian 3.0. *Information Outlook, 9*(12), 44.

2. Ayiah, E M, (2019), Social Networking: a tool to use for effective service delivery to clients by African Libraries, p 1-4.

3. Chauhan, M, (2016) Use of Social Media in Libraries, ibrarian's Day 2013 on 10th August, 2013 at EDII, Gandhinagar.

4. Chu, S. K.-W., & Du, H. S. (2012). Social networking tools for academic libraries. *Journal of Librarianship and Information Science*, *13*(1), 69-85.

5. Hupp, Jessica.(2018) Useful Social Networking Tools for librarians. College degree. 2017.8(6), 67.http://www.collegedegree.com/library/financial-aid.htm. [Accessed on 13 May 2023]

6. http://en.wikipedia.org/wiki/Library 3.0

Community Radio and Library Sustainability: A Symbiotic Relationship

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ABSTRACT: The symbiotic relationship between Community Radio Stations (CRS) and libraries can play a very important role to foster knowledge dissemination, community engagement, and sustainable development. This article explores the dynamic relationship between these two institutions and its impact in information access, cultural preservation and community empowerment. Qualitative approach through content analysis is taken as the methodology for this study. Community Radio and libraries differ in their mediums but their common features underline their common goal of enhancing knowledge sharing and amplifying community development. This study highlights the role played by libraries and CRS to reinforce each other's sustainability and on the ways in which their collaborative effort acts to foster robust ecosystem of knowledge and community development.

Keywords: Community Radio Stations (CRS), Libraries, symbiotic relationship, sustainability, information dissemination, community engagement, cultural preservation.

Introduction:

Community Radio and libraries both are the vital institutions for information acquisition and dissemination. In the ever evolving world of knowledge the symbiotic relationship between Community Radio Stations and libraries become essential for the sustainability of both the institutes. Libraries are the centers of knowledge and resources and Community Radio Stations can act as the dynamic platform to give voice to the voiceless. By fostering collaboration these two institutions can create a powerful synergy to strengthen their individual goals and also enhance the community development and empowerment. This study tried to explore the symbiotic nature of the relationship between the Community

Radio Stations and libraries and how their collaboration can contribute to the sustainability of both the institutions. It also discusses some obstacles in the path of collaboration and provides suggestions to overcome the issues.

Common features of Community Radio and libraries:

Both Community Radio Stations (CRS) and libraries are the important entities to preserve and disseminate information. Community Radios are the platforms to give voice to the voiceless. They are the third kind of media which is made for the community, by the community, and of the community. Whereas libraries are the epitome of knowledge. They contain same motto of developing community and empowering individuals of the community. The common features of these two institutes are:

- **Information sharing:** Both platforms aim to disseminate information. Community Radio achieves this by broadcasting news, interviews, sharing stories and libraries provide information through books, journals, multimedia and educational programs.
- **Education and lifelong learning:** Libraries and Community Radio contribute to education by providing resources and program which support the lifelong learning of the individuals. While libraries provide a wide range of educational materials, Community Radio can host educational discussions and programs.
- **Focusing community:** These two institutions serve the need of the communities. They provide resources and programs according to the requirement of the communities.
- **Community participation:** Both of these institutions encourage community participation which can promote a sense of belonging.

Objectives:

- To explore the common features of Community Radio and Libraries.
- To understand the symbiotic nature of relationship between Community Radio and Libraries and how that relation can bring sustainability for both.
- To identify the obstacles in the path of the collaboration between Community Radio Stations and libraries.

Significance of the study:

With the advancement of technologies, the whole scenario of information acquisition and dissemination is changed. To cope up with this continuous

evolving knowledge world collaborative effort of both libraries and Community Radio Stations is needed to fulfil the community requirements. This study will focus on the collaborative nature of libraries and Community Radio Stations. It also presents issues that stand in the way of this collaboration and provides suggestions to overcome those. This article can contribute to the existing knowledge and also can be helpful for the policy makers. It also has the capacity to spread awareness about the collective strength of libraries and Community Radio Stations.

Synergetic relationship between Community Radio and Libraries:

- **Promoting access to information:** Community Radio Stations are the platforms for disseminating information to diverse audiences, including those who have no direct access to the libraries. Community Radio Stations can contribute to promote literacy and can quench the thirst for intellectual curiosity within the community by broadcasting educational contents, literary discussions, book reviews. These programs can encourage the individuals to seek out libraries as essential resources for learning and reinforcing the role of libraries as the center for knowledge acquisition and dissemination.
- **Enhancing community engagement and participation:** Libraries and Community Radio Stations, when working together can enhance the community engagement and participation. By promoting library – hosted events, awareness programs, book club, educational workshops Community Radio Stations can generate interest and participation within the community and it strengthens the role of libraries as active hubs for social and intellectual engagement.
- **Amplifying local voices:** The collaborative relationship of libraries and Community Radio Stations has the strength to amplify local voices. Interviews with authors, local leaders, and local scholars can showcase the knowledge and richness of the community and also encourage community members to explore the resources of the local libraries.
- **Fostering collaboration and innovation:** Collaboration between these two institutions can encourage innovative ideas within the community. These innovations are able to bring sustainability for both these institutions and also the development of the community.
- **Cultivating a sustainable partnership:** Community Radio Stations and libraries can form a partnership to promote sustainable development and community engagement. Libraries can promote literacy campaigns, environmental initiatives, and health awareness programs through

Community Radio stations to address local issues. This collective effort can foster a culture of social responsibility ensuring the sustainability of both the institutions.

- **Preserving cultural heritage:** By presenting folklores, music, traditional stories Community Radio plays a pivotal role to preserve the culture and heritage of the communities. Libraries also play a significant role to preserve community culture and heritage by storing various traditional documents, music and other cultural resources. Both the institutes can ensure the preservation of community culture and heritage.

Review of literatures:

The papers collectively suggest that there is a symbiotic relationship between community radio and libraries. Henne (1941) highlights the shift in librarians' perception of radio from a competitive agency to a medium for cooperation and communication. Fraser (2002) emphasizes the role of community radio in facilitating public dialogue and social change within a community. Gaynor (2012) discusses how community radio serves as a vital element in community development by enabling community debate, fostering a sense of place, and promoting progressive social change. Madamombe (2005) explores the importance of community radio to voice the communities across Africa. Forde et.al. (2003) shows the result of two years study on Australian Community Radio sector. They also analyse the skill, career profiles of the people working in community radio. Overall, these papers suggest that community radio and libraries can work together to enhance community engagement, dialogue, and development.

Methodology:

The qualitative approach by using content analysis technique is adopted for this study. An extent amount of literature is explored to get the finding for the study. The search was conducted through the various online academic databases, news papers, videos and is limited to the English language sources only.

The hindrances for collaboration between Libraries and Community Radio Stations (CRS):

Community Radio Stations and libraries are the two powerful organizations of the society for information acquisition and dissemination. But unfortunately the collaborative status of these two institutions is very poor in India or rather we would

say that there is no collaboration at all. Some of the Community Radio Stations in India are having their own libraries but they don't have much collaboration with the local libraries. The reasons that can hinder this path of collaboration are:

- **Ignorance:** Ignorance about the Community Radio Stations is a major reason to not have any collaboration. The concept of CRS is still new to the people. Many of the libraries are not aware of the functions of CRS and that may come in the way to reach to all the individuals of the community.
- **Insufficient number of Community Radio Stations and libraries:** Another issue is the insufficient number of Community Radio Stations in India. India is the most populated country in the world but we have only 478 CRS. Community Radio Stations are still not able to reach towards the every corner of the Indian society. This may cause the lack of awareness about the CRS among the people. Not only CRS but there is also the scarcity of enough number of libraries in different localities.
- **Lack of interest:** Lack of interest of the library staffs and as well as the members of Community Radio Stations becomes an issue.
- **Funds:** Funding is become a great issue for setting up Community Radio Stations and also libraries.

Findings and Discussion:

The world of information is evolving everyday. The world is moving towards digitization. With this continuous evolving information landscape, a sustainable partnership between libraries and Community Radio Stations is much needed. Their collective strength can create a robust ecosystem to promote access to information, smooth dissemination of information, amplify local voices, enhance community engagement and participation, and foster innovation. The obstacles in the way of collaboration in India can be overcome by spreading awareness about the need of Community Radio Stations and libraries in the society. They both can be the platforms to promote each other. The government and non-government organizations also can take the initiative to establish Community Radio Stations and as well as local libraries and they also can provide financial assistance to those institutions. Not only government and non-government organizations but the different communities can play important role to set up Community Radio Stations and libraries to fulfil their own need of information. With the strategic collaboration both the Community Radio Stations and libraries can become the pillar of knowledge, enhance empowerment and community development and also can foster more information-engaged society.

References:

1. Henne, F. (1941). Library-Radio Relationships. *The Library Quarterly, 11*, 448 - 496. https://doi.org/10.1086/615064

2. Hopkins, K. (2022). The Cultural Work of Community Radio. *Journal of Radio & Audio Media, 29*, 491 - 493.

3. Fraser, C., & Restrepo-Estrada, S. (2002). Community Radio for Change and Development. *Development, 45*, 69-73.

4. Forde, S., Meadows, M.E., & Foxwell-Norton, K. (2003). Community radio and local culture: an Australian case study. *Communications, 28*, 231-252. https://doi.org/10.1515/COMM.2003.015

5. Madamombe, I. (2005). Community radio: A voice for the poor. *Africa Renewal, 19*, 4-5. https://doi.org/10.18356/614eab52-en

Relational analysis of library blogs of top universities of the world: A systematic study

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ABSTRACT: This study employs the relational analysis method to examine the status of library blogs top 20 universities worldwide and explores the various content types, resources and services that are made available to the users in those blogs. The top 20 universities were identified using the 'Times Higher Education' ranking for 2022 and their library websites were checked for the availability of blog services. The library blogs were then subjected to a relational qualitative content analysis method based on some parametric indicators and the library blogs of those top universities were ranked. The study found that all top 20 universities have library blogs, with textual blogs being the most common. The University of Cambridge and Imperial College London scored the highest number of points in ranking, process while California Institute of Technology, Peking University, and University College London scored the lowest. These findings are relevant for librarians and information scientists to better understand the phenomenon of the LIS blogosphere.

1. Introduction:

Relational analysis is a method of qualitative content analysis that uses various parametric scales to evaluate contents of various mass media like newspapers, websites etc on a binary scale. Content analysis is a research tool used to determine the presence of certain words, concepts, themes, phrases, and sentences within texts and quantify their presence objectively. It helps researchers understand the purposes, messages, and effects of communication contents, and helps them make inferences about the producers and audience of the texts they analyse. Historically,

content analysis was used to study paper-based documents like books, journals, or newspapers. However, with the increasing diversity of digital content on the World Wide Web, researchers are increasingly using content analysis to study web content. Libraries has made an opportunity out of the world wide boom in the nineties and started delivering services over it. Now the websites form's a larger portion of the library services for better user engagements. Blogging is a lib 2.0 services and are used by libraries as for providing current awareness services. Blogs, or weblogs has become away of communication where people can share freely-shared content, creating a community of bloggers and their audience. Blogs are organized in reverse chronological order, with new content appearing first. Library blogs, maintained by library associations, allow for discussions and timely delivery of updates. Despite the challenges of unstructured blog content, established methodology, and specialized software tools, content analysis of blogs can be an interesting area of study.

2. Review of literature

The issue of exploring the blogsphere movement for use in libraires had began with the start of lib2.0 services (Harinarayana & Raju, 2010). Since then it has been a issue of discussion among LIS communities across the world for its practical implementation for service delivery (Boateng & Liu, 2014). There has been studies that identifies various services that can be delivered via Library portals and Library blogs (Mahmood & Richardson, 2011; Yi, 2014). Those studies helped to establish the importance of library blogs across institutions.

Content analysis of LIS blogs is an emerging area of research that further identifies and compares blogs so that better return on investment on those can be achieved. Even though the idea of content analysis dates back to 17th century (Groth, 1948), with growth of other mass media platforms like radio, television, news papers, the practice of content analysis has expanded to a concrete research method (Krippendorff, 2013). Content analysis is now an interdisciplinary area of research having multiple use cases (Hsieh & Shannon, 2005; Kracauer, 1952). As websites, blogs forms a very distinctive entity of todays mass media, therefore, content analysis is now extensively used in analyzing websites of various domains. Hung (2018) conducted a study on sustainability and unsustainability in daily media content using qualitative content analysis. The study was limited to BuzzFeed and Daily Mail's Snapchat Discovery channels. The study concluded three sustainability and unsustainability characteristics in daily media content. The findings could inform future media education and improve media literacy. Murray (2018) conducted a study which utilizes a content analysis of Sports Illustrated

covers from 1954-2016 to evaluate the amount and type of coverage permitted to female athletes through this source of print media. The covers were critiqued for both quantity and quality as it relates to the coverage afforded to female athletes and how it differs from the coverage of male athletes. The results from this study provided a foundation for those who wish to further explore and raise awareness on the issue of underrepresentation and misrepresentation of female athletes in sports media. Yu (2004), studied weight loss companies' website appeals using a quantitative content analysis of 100 websites (50 U.S. and 50 Korean). The study found that health and nutrition were the main visual and verbal appeals used by both countries, despite significant differences in appeals across the two countries. Other features like interactivity and product sales were also analyzed.

As content analysis of websites helps in better understanding of web content management, there are studies for analysis library portals. Gadhavi(2017) analyzed library websites of eight national-important institutes in Gujarat, focusing on library information, collection, services, online resources, and technology use. The findings revealed that the websites were easy to access, clear, informative, and user-friendly, with a focus on technology and social networking sites. Gala (2013) examined the LIS blogosphere to understand its coverage of library and information science subjects. The analysis involved analyzing blog posts, comments, responses, and links over six months. Results showed that bloggers focus on specific subjects, providing focused and current information. Blogs chronologically arranged record subject trends over their lifespan. Emerging technologies and multiple subject areas were found to be prevalent in the LIS blogosphere. Yumnam & Singh (2021) study examined the content of nine library websites in central universities of North East India using a checklist. The data was analyzed for general information, selection, facilities, services, best practices, and web 2.0 software. The data was collected from June to October 2021, helping website developers and administrators understand the current state of these websites and provide more informative, authentic, user-friendly, and dynamic information.

3. Objectives of the Study

The study has been designed to address the following objectives:

i. To study the current status of library blogs of top 20 universities in the world.
ii. To explore the different types of contents available in university library blogs using a predefined content base.

iii. To rank the library blogs based on the various services available on them.

4. Methodology of the study

Relational analysis of contents involves evaluation of a media platform for presence of specific contents. Relational studies may help to make some standardized content available within library blogs helping the users and making the services more interactive. Shukla & Tripathi (2010) has elaborated a very distinctive way of doing an exploratory relational content analysis of library websites on a binary scale on some specific parameters. The current study was undertaken to do a relational analysis of the library blogs of top 20 universities of the world. The top 20 universities in the world were identified based on the ranking in 'Times Higher Education' for the year 2022. University library websites were given a visit to check for the presence of the parameters as identified for qualitative content analysis by Shukla & Tripathi (2010). Each blog was given a visit, and the presence of the identified parameters were recorded using a binary scale in MS-Excel. This data was later analysed based on the said objectives of the study and a parametric ranking of the libraries are made.

5. Data analysis and Interpretation

5.1 Detailes of the studied universities:

Table 1 presents the name of the top 20 universities listed based on the ranking of Times Higher Education 2022. . University of Oxford was ranked at the top in the year 2022. Out of the top 20 universities, 12 universities from US featured in the list, while 4 universities were from United Kingdom. From Asian continent, three universities from China featured in the list. All the libraries of these top 20 universities has an active library blog linked to the main library website well maintained by the library staff.

5.2 Availability of Blog Contents in Multiple Formats

In order make the blogs attractive and informative, various formats like textual, audio's, videos are used to represent the content. It enhances the blogs aesthatic, look and feel and increases the user engagement. Texual blogs are common type of blog in all the unversities while none of the university has audio blogs. Video blogs are found in four universities viz California Institute of Technology, University of Cambridge, The University of Chicago and Tsinghua University. Fig 1 presents the detailed findings.

Table 1: Details of university

SL. NO	UNIVERSITY NAME	COUNTRY	WEBSITE URL'S	RANK
1	University of Oxford (UO)	United Kingdom	https://www.ox.ac.uk/	1
2	California Institute of Technology (CIT)	United States	https://www.caltech.edu/	2
3	Harvard university(HU)	United States	https://www.harvard.edu/	2
4	Stanford University(SU)	United States	https://www.stanford.edu/	4
5	University of Cambridge (UC)	United Kingdom	https://www.cam.ac.uk/	5
6	Massachusetts Institute of Technology(MIT)	United States	https://www.mit.edu/	5
7	Princeton University (PTU)	United States	https://www.princeton.edu/	7
8	University of California , Berkeley(UCB)	United States	https://www.berkeley.edu/	8
9	Yale University(YU)	United States	https://www.yale.edu/	9
10	The University of Chicago (TUC)	United States	https://www.uchicago.edu/	10
11	Columbia University (CLU)	United States	https://www.columbia.edu/	11
12	Imperial College London (ICL)	United Kingdom	https://www.imperial.ac.uk/	12
13	Johns Hopkins University (JHU)	United States	https://www.jhu.edu	13
14	University of Pennsylvania (UP)	United States	https://www.upenn.edu/	13
15	ETH Zurich(EZ)	Switzerland	https://ethz.ch/	15
16	Peking University (PU)	China	https://english.pku.edu.cn/	16
17	Tsinghua University(TU)	China	https://www.tsinghua.edu.cn/en/	16
18	University of Toronto(UT)	China	https://www.utoronto.ca/	18
19	University College London (UCL)	United Kingdom	https://www.ucl.ac.uk/	18
20	University of California, Los Angeles (UCLA)	United States	https://www.universityofcalifornia.edu	20

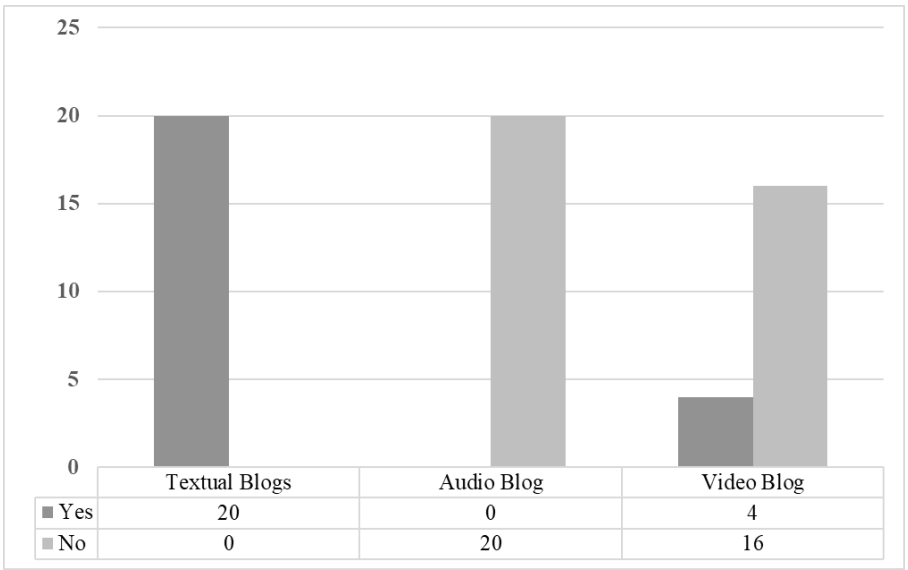


Fig 1: Content format of the studied blogs

5.3 Categorization of Various Contents in Blogs

Arrangement of blog contents in various category helps the user to find the blogs in easiest possible time. Content categorization is done in form of tabs or tags. For this particular study, arrangement of contents in three categories viz research guide, social activity, professional development have been looked for. In general, not all the blogs had content categorization. Fig 2 represents that out of 20 universities, 12 had categorization of blogs and 8 university had no such categorization.

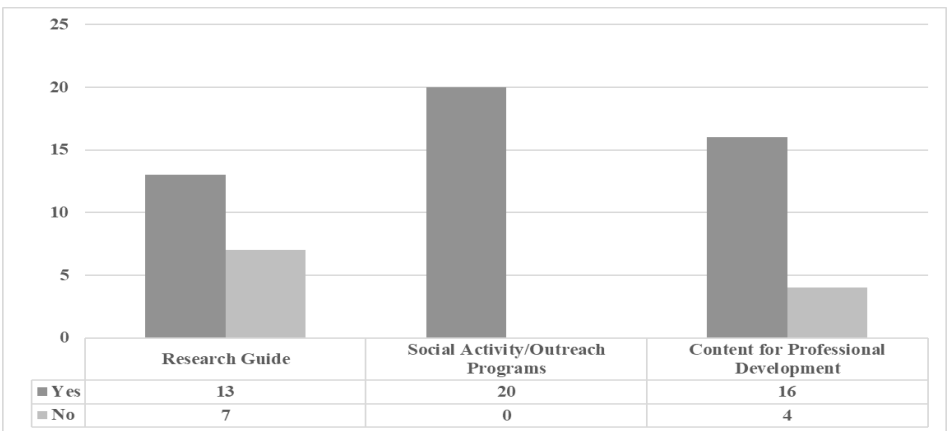


Fig 2: Content categorization within the library blogs

5.4 Library Service through Blogs

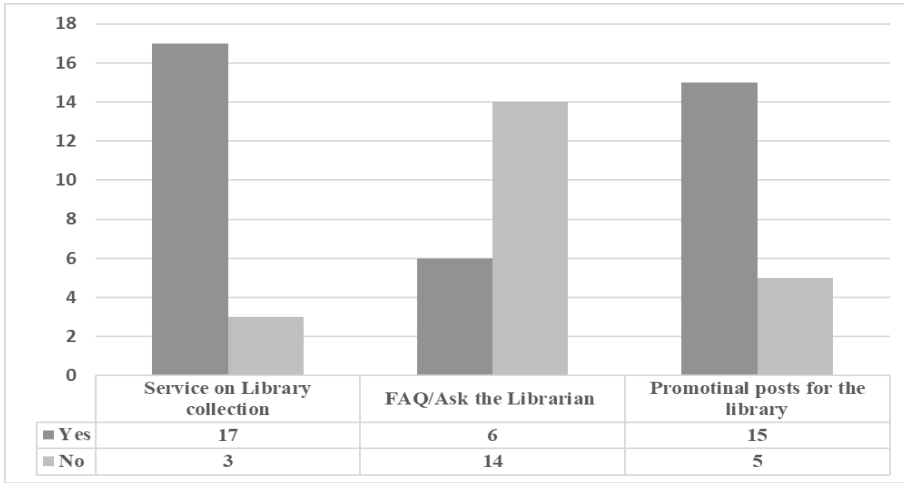


Fig 3: Blog for as a tool for providing library services

In order to raise knowledge and encourage usage of library services, promotion of those services is a crucial activity. Blogs can be a very useful tool for libraries to employ in their efforts to advertise their services to its patrons. Writing about the library's collection can benefit its patrons. Users and librarians can both use blogs to address issues relating to the library and

to offer answers to questions that have been posted. The availability of blogs regarding some specified library services is shown in fig 3. Except the library blogs of Massachusetts Institute of Technology, University of Toronto and University of California Los Angeles all other universities had blogs about their library collection and services. Only 6 universities had library blogs about FAQ or ask the librarian and 15 universities had promotional library blogs.

5.5 Management of Blogs

Existence of a blog is only successful when blogs are properly managed. Management includes frequent updating of contents. A proper archival of blog posts helps the users as well as library mangers to access older contents. More over arrangement of contents within the blog itself is needs to follow a certain order. In the current study the blog management feature was checked on three crucial issues viz. frequency of content updating, the archival feature of old blog post and arrangement of contents in a chronological order. Fig 4 displays blog managements according to the chosen criteria. All other universities continue to regularly publish blogs, with the exception of Peking University and University College London. Out of 20 universities 15 universities have archived contents

available in their blogs and all the universities included in the study arranged their blogs in chronological order.

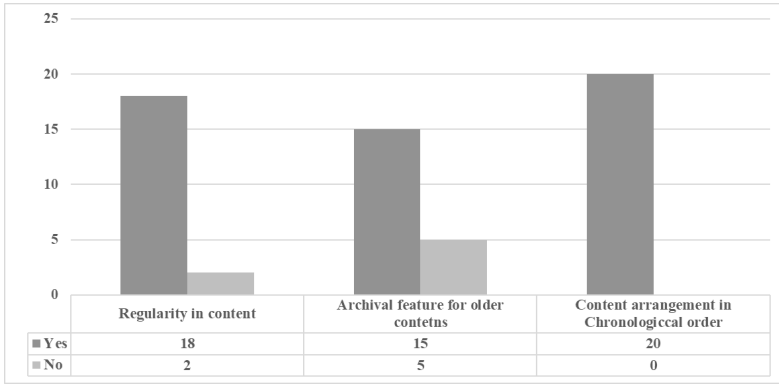


Fig 4: Management of blogs 0f top university libraries of the world

5.6 Blog Interactivity

Blogs are a means of communication between bloggers and their readers; bloggers post their contents, and readers comment and rate it. Blogs written by scientists discuss the most recent advancements in their fields. Scholars and researchers can communicate via blogs, and questions about the blog's contents can be answered through comments or blog reviews. Blogs occasionally have links to additional resources. The findings regarding the accessibility of a particular interactive feature in blogs are shown in Fig 5. Only 40 per cent of universities offered commenting, 75 per cent of blogs had links, and 60 per cent had live RSS feeds.

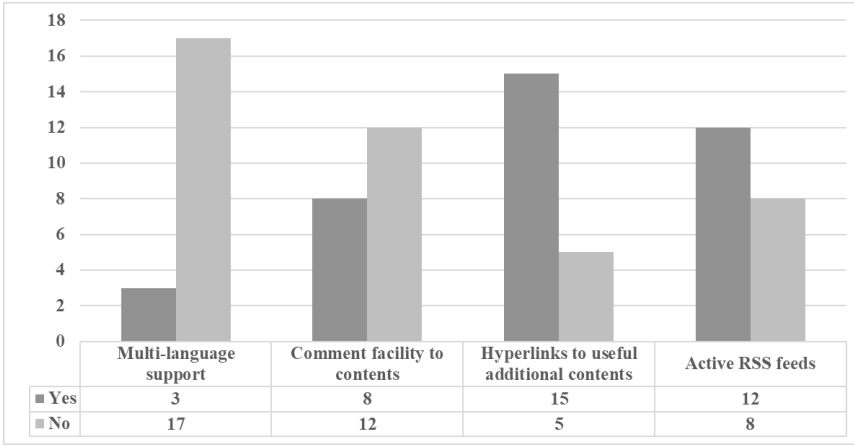


Fig 5: Presence of Interactive features within the blogs

5.7 Blogs with presence of Assistive Technology

The library blogs of the universities should have some technical facilities so that differently abled persons can also use the blogs. The table 2 presents the findings about the availability fo assistive technologies within the blogs for the access of differently abled persons.

Table 2: Blogs with assistive technology

UNIVERSITY NAME	ASSISTIVE TECHNOLOGY	
	YES	NO
University of Oxford	0	1
California Institute of Technology	0	1
Harvard university	0	1
Stanford University	0	1
University of Cambridge	0	1
Massachusetts Institute of Technology	0	1
Princeton University	0	1
University of California , Berkeley	0	1
Yale University	0	1
The University of Chicago	0	1
Columbia University	0	1
Imperial College London	0	1
Johns Hopkins University	0	1
University of Pennsylvania	0	1
ETH Zurich	0	1
Peking University	0	1
Tsinghua University	1	0
University of Toronto	0	1
University College London	0	1
University of California, Los Angeles	0	1
Total	**1**	19

5.8 Ranking of the Library Blogs

Analysis of the library blogs and collecting the data led to the evaluation of the blogs based on the parameters as presented at table 3. Details of the evaluation

and the score for the presence of the parameters from table 3 is presented at Table 4. The library blogs of top twenty universities in the world have been ranked according to the points scored by the blogs based on the 19 parameters. Fig 6 presents the ranking of the blogs of the universities and the points obtained by them. Library blogs of University of Cambridge and Imperial College London have scored highest point among all other university library blogs included in the study

Table 3: Parameters and significance

Parameters	Significance
P1	Does the main university/library website contain link to blogs?
P2	Does the university library contain textual blog?
P3	Does the university library contain blog has audio material?
P4	Does the university library contain video blog?
P5	Does the blogs on the website divided in categories? e.g.: science, social science, blogs by staff and interns etc.
P6	Does the blogs of the university library contain research guide?
P7	Does the university library contain blogs related to social or community activity?
P8	Does the university library contain blogs related to professional development?
P9	Are the university library blogs supportive to multiple languages?
P10	Does the university library contain blogs about their own library or about their collection/ services?
P11	Does the university library contains blogs about frequently asked question / ask the librarian?
P12	Does the university library contain any promotional blogs?
P13	Does the university library has blogs which are published frequently?
P14	Does blog posts are archived?
P15	Are the blogs are arranged in chronological order?
P16	Does the university library blogs support comments or reviews?
P17	Does the blogs contain any hyperlinks to further readings?
P18	Does the university blogs have the facility of RSS feed?
P19	Does the university library blogs are supportive to assistive technology?

Table 4 : Score obtained by universities in the relational analysis

		UO	CIT	HU	SU	UC	MIT	PTU	UCB	YU	TUC	CLU	ICL	JHU	UP	EZ	PU	TU	UT	UCL	UCLA
PARAMETERS	P1	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0
	P2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	P3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	P4	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0
	P5	1	0	1	1	1	0	1	1	1	1	1	1	0	0	0	0	0	0	1	1
	P6	1	0	0	1	0	1	1	0	1	1	1	1	1	1	1	0	1	1	0	0
	P7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	P8	1	0	1	1	1	0	1	0	1	1	1	1	1	1	1	0	1	1	1	1
	P9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0
	P10	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	0
	P11	0	0	0	0	0	1	0	0	1	0	0	1	1	0	0	0	1	0	0	0
	P12	1	1	0	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	0	1
	P13	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
	P14	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	0	0	0	1
	P15	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	P16	1	0	1	0	1	1	0	0	0	0	1	1	0	0	1	0	0	0	0	0
	P17	1	1	0	1	1	1	1	0	0	1	1	1	1	1	1	0	0	1	1	1
	P18	1	0	0	0	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	0
	P19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
TOTAL POINTS		13	8	9	11	14	11	10	9	10	12	13	14	12	11	13	8	12	8	8	9

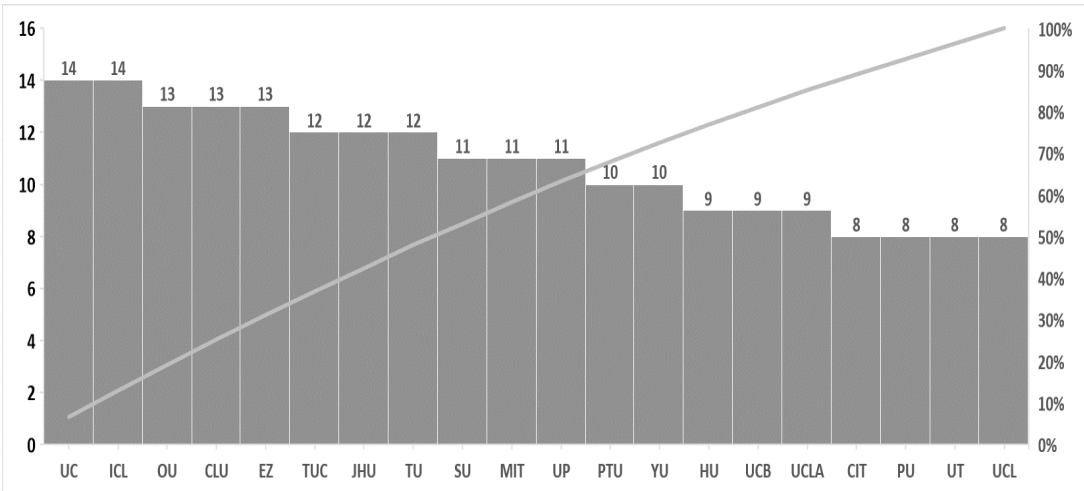


Fig 6: Rank of the universities based on score of relational analysis of library blogs

5.9 Conclusion:

The current study sought to explore the library blogs in top twenty universities in the world. The findings of the study reveals that the library blogs of the top universities of the world are at least maintaining the basic standard services required for their patrons. Even though the study ranks the library blogs on some parameters, but it doesn't mean that the library blog ranked in the tail requires the basic quality. So, studied libraries needs to give attention to promote their blogs and make proper section for the blogs in their website. The findings can be an example for other university libraries to follow and develop their blogs on the line and delve into the phenomenon of LIS blogosphere. Furthermore, the findings shed light on the importance of library blogs as they deal with variety of information such as professional information, information about collection of library, information about latest development & announcement etc., and provides a great opportunity to make use of and derive benefit from the information assigned in the blogs.

References:

1. Bar-Ilan, J. (2000). The Web as an information source on informetrics? A content analysis. *Journal of the American Society for Information Science*, *51*(5), 432–443.

2. Boateng, F and Liu, Y Q(2014). Web 2.0 applications' usage and trends in top US academic libraries. *Library Hi Tech*, *32*(1), Pp 120-138.

3. Clyde, L. A. (2004). Weblogs – are you serious? *The Electronic Library*, *22*(5), 390–392.

4. Gadhavi, G. G. (2017). *Content analysis of library websites of institute of national importance: A critical analysis*. *6*(8), 8. https://doi.org/DOI:10.15680/IJIRSET.2017.0608280

5. Gala, B. (2013). Library and information science blogs: A content analysis. *INFLIBNET*. https://shodhganga.inflibnet.ac.in:8443/jspui/handle/10603/38109

6. Groth, O (1948), Die Geschichte der deutschen Zeitungswissenschaft, Probleme und

7. Methoden. Munich: Konrad Weinmayer

8. Harinarayana, N S and Raju, N V (2010). Web 2.0 features in university library web sites. *The Electronic Library, 28*(1), 69-88.

9. Hsieh, H.F. ,& Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15*(9), 1277-1288.

10. Hung, J.P. (2018). *An exploration of sustainability and unsustainability on daily media content and its implications for media education: A qualitative content analysis of Snapchat* [University of Tampere]. https://trepo.tuni.fi/handle/10024/104872

11. Kracaur, S. (1952). The Challenge of Qualitative Content Analysis. *The Public Opinion Quarterly, 16*(4), 631-642.

12. Krippendorff, K. (2013). *Content analysis: An introduction to its methodology* (3rd ed.). California, CA: Sage Publications.

13. Mahmood, K & Richardson, J V (2011). Adoption of Web 2.0 in US academic libraries: a survey of ARL library websites. *Program: electronic library and information systems*, *45*(4), 365-375.

14. Murray, H. (2018). *Rationales for first nations run schools in Ontario: a content analysis* [Master's thesis, Ryerson University]. https://digitalcommons.liberty.edu/masters/518/

Community Engagement in Private Library for Maintenance of Sustainability: A Case Study

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ABSTRACT: Community engagement is an effective way for maintenance of social balance as well as social integrity in today's changing socio-environment. By keeping this view, this paper has tried to study community involvement in private library namely Bhogram-Gunaibala Smriti Puthibharal and Samuhik Bhavan, Ramdia as well as the role of the private library in the society. The data for the work has been collected both from primary and secondary sources and analysed accordingly. From the study, it is found that though there is a lack of finical budget, this library has been trying always to maintain a close relationship with its local community by conducting different programmes, celebrating every national and local importance days from its inception. Free education concept is also followed by this private library as it is not levying ant membership fees for any members of it and the library has been running its services purely on the basis of faith. This paper has discussed about the collection, funding sources and different steps of library for the community engagement. Moreover, this paper also highlights the various sustainable measures taken by this private library to cope up with the changing library environment.

Keywords: Community engagement, private library, sustainability, inception.

Introduction:

Today's society is an informative as well as collaborative society. Nowadays, it is believed that access to information is one of the most fundamental rights, necessary for both social and personal advancement as well as for citizens to take part in efficient government. The success of a cultured society is based on the fact that people are always willing to share their creative thoughts and ideas with one another.

Objectives of the study :

The main objectives of the study are -

(i) to discuss about the community engagement in the private library.
(ii) to explore different measures to maintain the sustainability of the library.

Methodology :

The study is mainly based on primary survey using direct personal interview method. This has been supplemented by observation of working of the libraries, discussion and interview with the librarian, review of literature, etc. Literature search has been done through secondary sources such as journals, books, proceedings and other relevant publications. The information provided by the librarians of the surveyed libraries have been processed and analysed accordingly. The collected data have been represented by using tables to befit the analysis.

Concept of Community Engagement :

Community engagement is a term which is used to explain such type of environment. Basically, it is a concept based on democratic principle who gives an opportunity to every citizen to take parts any social issue that impacts their community.

Despite the lack of a generally agreed-upon definition of Community Engagement, Rogers and Robinson's (2004, p.1) definition was used for the purposes of this study "Community engagement encompasses a variety of approaches whereby public service bodies empower citizens to consider and express their views on how their particular needs are best met. These may range from encouraging people to have a say on setting the priorities for community safety […] to sharing decision-making with them in relation to defined services."

The phrase "community engagement" is fairly wide and has diverse meanings in different circumstances. It's common to use phrases like "engagement," "involvement," "participation," etc. interchangeably to refer to a range of engagement styles.

One of the fundamental requirements of today's society is community engagement for the following reasons:

1. Engagement in society fosters and sustains cohesive communities
2. Assuring access and community empowerment through community engagement
3. Local governments can encourage sustainable decision-making through community engagement.
4. Social transformation is propelled by community engagement.
5. Involving the community is essential to advancing democracies.

Community engagement can be broadly classified into two categories:

(a) In-person community engagement i.e., face to face community engagement.

(b) Digital-first community engagement which prioritizes in digital platforms.

The library is another dynamic social engine. This institution actively involved its community in many ways to instill optimism in the next generation. Every activity has a different impact on society, whether it is the library staff exchanging ideas about successful projects or organizing partnerships, outreach programs, and community events. While different types of libraries have different definitions of community engagement, most agree that it involves connecting, interacting, and communicating. The success of a library and the enrichment of the community depend on community engagement. Bringing people together to give accurate information, necessary resources, and a sense of belonging is known as community engagement.

Concept of Sustainability :

A set of 17 interconnected goals known as the Sustainable Development Goals, or Global Goals, were adopted by all United Nations Member States in 2015 with the intention of providing a "shared blueprint for peace and prosperity for people and the planet, now and into the future". According to the United Nations, sustainable development is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". The Sustainable Development Goals, according to the United Nations, balance the three facets of sustainable development - economic, social, and environmental. They are also integrated and indivisible.

Sustainable development is necessary to meet our developmental need as well as ensuring that future generation will also be able to do so. Charis Park has defined the concept of sustainable development as, meeting the needs of present without compromising the ability of future generation to meet their needs. In other words, sustainable development requires us to find a way to live our lives and make our economies prosper while conserving the planet and eradicating inequalities. Thus it means present generation can fulfill its needs without harming the capacity and potential of future generation for satisfaction of their needs and wants.

Private Library :

A private library is one that is maintained by private ownership and is typically intended for the use of a small group of people, or perhaps just one person. Private libraries can have collections that are far more comprehensive in a particular area of interest than public libraries can, and they frequently reflect the interests of the

owners. Prior to the nineteenth century, the majority of libraries were private or semi-private establishments. The earliest libraries were typically only accessible to nobles, aristocracy, scholars, or priests and belonged to kings, temples, and other individuals and institutions. In the past, private libraries belonged to kings or rulers and had restricted access. They were used as record depositories as well as archives. One private library whose records are still in existence is the Library of Ashurbanipal.

The printing press's development made it feasible for citizens to have private libraries because it allowed people to build their own personal collections. Some people's private libraries could serve as the foundation for a museum. In certain situations, a private library's foundation is laid by the owner's will or upon their passing. For instance, in August 1814, during the War of 1812, Thomas Jefferson offered the country his personal collection of books after the British set fire to Washington, D.C. and the Library of Congress. It was arranged roughly into three categories, Memory (History), Reason (Philosophy), and Imagination (Fine Arts), and it comprised more than 9,000 volumes. Congress approved his offer in January 1815 and appropriated $23,950 for his 6,487 books. This laid the groundwork for the establishment of the U.S. Library of Congress, an amazing national library. In honor of Jefferson, the federal legislative information website maintained by the Library of Congress is now called THOMAS.

Some important features of the private libraries are:

1. Private library owners possess exclusive authority, power, and proprietary ownership over the knowledge within their establishments.
2. Historically, private libraries also functioned as archives, preserving records of royal families, family trees, medical histories, military histories, and other personal belongings to the king or other ruler.
3. Private funding sources support private libraries.
4. The needs, preferences, and interests of the owner are reflected in the private libraries.
5. The collections of private library typically have a focused, in-depth, and well-developed emphasis on a particular subject.
6. Unpublished materials like the owner's notes, letters, images, writings, and other records can also be found in private libraries. Moreover one's own original works, letters, diaries, pictures, blogs, and other private materials are included in private libraries.
7. Professional librarians and staff might not exist in a private library.

The term "private library" is now used to refer to any person's personal collection, regardless of size.

Relation among community engagement, sustainability and private library :

Through effective community engagement, private libraries play a significant role in sustaining the library system in this digital age. Community engagement is an effective tool for maintaining sustainability in private library systems. The entire three concepts are interrelated to each other. The study conducted by Sung, Hepworth, and Ragsdell titled "Community engagement in public libraries" covered eleven crucial components of community engagement, including sustainability. The eleven essential elements of community engagement are shown in fig.1.



Source : Sung, Hepworth& Ragsdell, 2011

Fig. 1: Essential element of community engagement

Once more, Pandey discusses a different perspective on community participation for sustainability in his research paper "Engagement with the Community and Sustainable Development," citing the UNDP report 2009 as follows:

"The focus on community participation is largely based on the recognition of the knowledge pool embedded in the community and the need to capitalize on this knowledge and, thereby, develop locally sustainable models (UNDP 2009)".

The above elements of community engagement for sustainability are the bridge which relates all the three concepts. Private library librarian should have also act in accordance with the all eleven elements of community engagement.

Bhogram-Goneaibala Smirti Puthibharal Aru Samuhik Bhavan: A Case Study

Ramdia is a Mouza in Kamrup district in the state of Assam situated on the north bank of river Brahmaputra. It is consisted of 10 villages, namely- 1) Majarkuri 2) Ujankuri 3) Shastar 4) Bongaltola 5) Gendhelitari 6) Hahdia 7) Satalbori 8) Saru Bonkara 9) Bor Bonkara and 10) Nodia. It is 30 km from the city Guwahati, near Hajo town. People are mainly engaged with Farming, local businesses, and government service. The Ramdia is also fortunate as it give a good number of educationists to the state. The private library in this area, "Bhogram- Goneaibala Smirti Puthibharal Aru Samuhik Bhavan," is taken as the research paper's case study.

The Bhogram-Goneaibala Smirti Puthibharal Aru Samuhik Bhavan was officially opened on May 8, 2016, by Ramdia-based high school teacher Rajat Chandra Bharali. In 2008, he established the Bhogram-Goneaibala Smirti Puthibharal library at his home after being inspired by the renowned Assamese poet Nabakanta Barua. During his graduation from B. Barua College, he was fortunate enough to visit Nabakanta Barua's home, where he discovered an extensive collection of the renowned poet's books and found inspiration. Dayal Krishna Bora, a distinguished Vasinav Pandit, was another individual who encouraged Bharali to start the library. Bharali began gathering books during his graduation year from various sources, but he had to move his collection to his own home in Ramdia when some of the books were damaged by insects. Following the completion of his Bachelor of Science degree, he began working as an assistant teacher at Kaliram High School in Ramdia. He continued to amass books from various sources and named the library "Bhogram-Goneaibala Smirti Puthibharal" in honor of his parents. A growing number of patrons at the library led Bharali to move the library to a new location so that he could provide his readers with the option of additional reading

space. After talking with a member of his family, Bharali made the decision to move his library to a location on freshly purchased land using his own money. Three lakh rupees had been approved by the local MLA for the construction of the library's new building. When there wasn't enough money to finish the building, Bharali himself had taken out a loan from microfinance. Renamed as "Bhogram-Goneaibala Smirti Puthibharal Aru Samuhik Bhavan," the recently built library was formally opened on March 13, 2022, in the presence of several renowned Assamese citizens. With one office room, one conference hall, one stack room, and one reading room, the library's total land area is1 katha 5 lecha.

Collections :

As of 2018, the library's collection of books and journals numbered 2000; however, it has since doubled. The library currently has 4,000 books and journals in its collection. The library has a collection of over 600 books and articles about the Hajo region. A good selection of children's books, novels, historical fiction, and holly books are available at the library. Assamese, English, Sanskrit, and Bengali are the languages in which the collections are available. There are overall 5010 books in the library's collection (Table-1). The library has over 500 memoirs, or collected books. The library also provides two regional news publications, Danik Assam and Pragjyotish besides some other journals and magazines (Table2).

Table 1 : Collection of Documents

Type of the Document	No. of Collection
Biography	1600
Children Books	2000
Books on Poetry	160
Article	240
Books on History	150
Religious Book	100
Grammar	80
Collections	80
Novel	400
Story Book	120
Literature Book	80

Table 2 : Name of the journals and magazine procured by the library

Name of the Journal	Explanation of the item
Prantik	An Assamese fortnightly journal
Gariyoshi	An Assamese monthly Journal
Satsari	An Assamese monthly Journal
Safura	An Assamese monthly Children Magazine

Source of fund :

Donations are the primary source of collections; surprisingly, there hasn't been a trend toward book donations up until 2016. On the day of the library's opening, Lawyer Book Stall became the first donor when it gave 50 books to the establishment. The library has continued to acquire books using its own funds, recognizing the value and demand from users. Birthdays of locals are another significant source of collection material in the library. The family members contribute by giving a sizable number of books to the library while the community celebrates their birthday.

Target Group of user :

The local community, children, research scholars, and growing students are the library's target group of users. The library's opening hours are flexible and based on patron demand. The library is typically open in the evenings. There are no restrictions with regard to holidays.

Library Services :

The only method of circulation service for the books is faith, and they are only available for 15 days without the need for a library card. There are no fines for library users, and they are allowed to keep the books for ten months as long as they need them for research. The library also has a feedback facility. The average number of users in the library is 10. Currently, the library offers the service on demand via digital media as well. Distance readers can use WhatsApp, phone, or email to access the necessary document or information.

Administration of the library :

Before 2016, a Trust was established by the library to oversee its managerial and administrative operations. All housekeeping operations, including the payment of the electricity bill, have been handled by the library using funds from its own library fund. However, the trust hasn't been registered yet.

Community Engagement of the Study Library :

1. ***Conducting Extension Activities:*** By organising different seminars, competition and workshops the library always tries to engage its local community with the library environment**.** The Library has conducted 3 Days recitation workshop in 9th July to 11th July, 2023 where 39 students were participate and the timing was from 10 am to 2 pm.
2. ***Publication:*** Publication of annual journal 'Bordoisila' is another step of community involvement in the library. The annual magazine "Bordoisila" launched its second edition in 2023, demonstrating the community's active support of the library.
3. ***Book Exhibition Programme:*** On August 12, 2023, a book exhibition program was held in honor of Tilak Mazumdar, a well-known Vaisanisim researcher, who was born on this day.
4. ***Celebration of National and Regional importance Day:*** In addition to a tree-planting event and a "Jyoti Sangeet" competition, August 12, 2023, was designated as Librarian's Day. The local community fully participates in the library's celebration of various national and regional holidays.
5. ***Book Donation Camp:*** Another event held at Ramdia Adarsha Prathamik Vidyalaya was a book donation camp. Additionally, local students received books as a donation during the COVID-19 pandemic.
6. ***Organising different events at Library Conference Hall:*** Various organizations have requested permission to hold different programs in the library. Additionally, a locally established literature club called "Sabdik" held its inaugural meeting and a separate "Kavi Sanmilan" in the library's conference hall. In addition, the Kamrup District Educational Trust, "Gyanam," in Assam, ran a number of other programs that greatly involved the local community.

Community engagement and sustainability of the study Private library:

Future plans are being considered by the Bhogram-Goneaibala Smirti Puthibharal Aru Samuhik Bhavan to adapt to the evolving library landscape. The study library will adhere to the following methods in order to preserve sustainability.

1. ***Digitations:*** The library intends to become completely digital in the future. As per Mr. Bharali, one of the fundamental requirements for the current library system's sustainability is the administrator of the study library digitisations.
2. ***Scientifically arrangement:*** Additionally, the library is working to maintain its collection in a scientific manner, and the administrator is willing to accept any assistance from the nearby educational institution's librarian in this regard.
3. ***Art Gallery:*** This private library also plans to open an art gallery where the community members will be able to show off their artistic creations. The government has guaranteed that the idea of an art gallery will improve the atmosphere of the current private library and provide patrons of the nearby library with something new to look forward to.
4. ***Increase the measures to reading habit:*** In light of this, the library has planned various workshops, seminars, awareness campaigns, and social engagement events in the hopes that these kinds of gatherings will boost the general trend of reading among the populace.
5. ***Levy of Library fees:*** The library under study plans to implement library fees in order to provide robust financial support. The only way to raise the funds that will support the library's expansion in all directions is directly.
6. ***Organising a book fair:*** The library also intends to host a book fair in the future so that the residents of the Ramdia area can experience various reading habits. The administrator maintains that this is one of the most effective ways to get society's attention.

Recommendations:

Like other library branches, private libraries are significant divisions of the larger library system that serve the community. Even though the study library has been successful in fostering a pleasant reading atmosphere in the Ramdia neighborhood, it still needs to take additional steps to ensure its sustainability in the ever-changing world of libraries. The recommendations that follow are based on the study:

1. The introduction of library fees would help the library to generate funds.
2. The library should prioritize expanding its selection of children's literature.
3. In order to maintain the library properly, the reader should be charged for a library card.
4. Compile a list of research scholars who have been awarded degrees.
5. Adherently preserve the budget estimate for subsequent planning.
6. Arranges the library materials or documents in a systematic way.
7. The library should maintain the most recent issues of periodicals on hand so that patrons can benefit from having access to the most recent data.
8. It is important to maintain the Bound Volume section to ensure proper library maintenance.
9. The library ought to take action to gather additional writings by renowned Kamrup residents, like Kaliram Medhi.

Conclusion :

A library is a space where dialogue can foster the development of new perspectives. Community engagement takes place in libraries, whether they are private or public. The community plays a remarkable role in sustaining the library regardless of the circumstances or conflicts that may arise. By involving the community, we can work toward equitable decision-making, sustainable results, and strengthened bonds of trust between the community and the library. Reading books from the library that appeal to different tastes can provide an environment of relaxation and stress relief for the elderly and retired members of society. Since the study library is a privately owned rural library, encouraging and enhancing the rural society's reading habit will help the area become more informed and knowledgeable, which will help the area support sustainable development.

References:

1. https://bridgestoprosperity.org/blog-sustainable-development/ (Accessed on 22/11/23)

2. https://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=2030&context=iatul (accessed on 22/11/23)

3. https://www.degruyter.com/document/doi/10.1515/pdtc-2022-0024/html?lang=en (accessed on 22/11/23)

4. https://www.ifla.org/wp-content/uploads/2019/05/assets/alp/103-fbradley-

alp.pdf(accessed on 22/11/23)

5. https://pdfs.semanticscholar.org/e39d/51ca406d5ed2a3467d93ccb64e0fcfd6c42d.pdf

6. https://www.citizenlab.co/blog/civic-engagement/promoting-sustainable-development-with-community-engagement (accessed on 22/11/23)

7. Ochoa, P and Pinto, L.G (2014)"Sustainability Metrics in Library and Information Services: A Quality Management Framework." In *Proceedings of the IATUL Conferences*. Paper 5. Retrieved from https://docs.lib.purdue.edu/iatul/2014/plenaries/5

8. Panda, S and Das, S.K. (2022). Role of Public Libraries in Promoting Social Sustainability for the United Nations Sustainable Development Goals (SDG): An Exploratory Study. *Library Waves* 8(2). 129-138. Retrieved from www.librarywaves.com.

9. Pandey, U.C., and Kumar, C. (2019). Engagement with the Community and Sustainable Development. In: Leal Filho, W. (eds) *Encyclopedia of Sustainability in Higher Education*. Springer, Cham. Retrieved from https://doi.org/10.1007/978-3-319-63951-2_344-1)

10. 10 Reasons for Environmental Sustainability in (Public) Libraries. Retrived from https://www.ifla.org/wp-content/uploads/2019/05/assets/alp/103-fbradley-alp.pdf

11. Rogers, B. and Robinson, E. 2004. *The benefits of community engagement: a review of the evidence*. London: Home Office.

12. Sung, H.Y and Hepworth, M (2013). Modelling Community engagement in public libraries. *Malaysian Journal of Library & Information Science 18(1).1-13. Retrieved from* https://www.researchgate.net/publication/220889460_Community_engagement_in_public_libraries/link/5c2f21b4299bf12be3ab8bc1/download

Sustainable Data Management Through Library Best Practices: A Case Study of Sipajhar College

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ABSTRACT: This paper mainly focuses on various best practices adopted by Central Library, Sipajhar College. It discusses importance of introducing best practices in academic library for sustainable data management to optimize resource utilization and deliver high quality, efficient services to library users. This paper includes traditional best practices as well as information technology (IT) based best practices for data management. The article will be a useful guide to other college libraries to get an idea how to prepare for sustainable data management through library best practices.

Keywords Data Management, Sustainable Data Management, College Library, Library Best Practices, Library Services

1. Introduction

Data management is the practice of collecting, organizing, storing and utilising data for various purposes, such as supporting productivity, efficiency, and decision-making[1]. It is the overall management of institutional data for easy retrieval and sharing. Therefore, data management is very much essential for any organizations for future growth.

Sustainable data management is a relatively new discipline that requires a unique set of tools, processes, and procedures to meet institutional demands. It must have the primary objectives of accurately measuring, tracking, calculating, and reporting information[2].

In the present age of information explosion, the libraries and information centre play not just an important learning-support function, but the library itself has been emerging as a data management centre. The developments and changes in the ICT have changed the patrons' expectations from the academic libraries in different ways. Particularly in case of a college library, library is the single store

house to manage institutional data and knowledge. To manage institutional data effectively and efficiently, college libraries need to adopt some best practices. National Assessment and Accreditation Council of UGC has recommended some best practices to college libraries.

1.1 Definitions of Best Practices

Best Practices can be defined as follows –

Online Dictionary of Library and Information Science describes Best Practices as, "In the application of theory to real-life situations, best practices are identified by examining empirical evidence of success."

Oxford English Dictionary describes Best Practices as "quality of most excellent or desirable type or most appropriate, advantageous, highly improved, outstanding, excellence services or the customary or expected procedure or way of doing something".

According to National Assessment and Accreditation Council (NAAC) "Best practice may be innovative and be a philosophy, policy, strategy, program, process or practice that solve a problem or create new opportunities and positively impact on organizations".

Thus, library best practices are nothing but some initiative and activities that can enhance the academic information environment and usability of the library.

2. Objectives of the Study

The study aims to find out the library best practices introduced at Central Library, Sipajhar College for sustainable data management.

3. Methodology

This is a case study of Central Library, Sipajhar College. Hence, an in-depth study was conducted for collecting the primary data. As the author herself the librarian of this particular library, therefore, participatory observation tool is used for collecting the primary data.

4. About the Library

The Central Library, Sipajhar College is the hub of the academic activities supporting the institution's mission of achieving excellence in education and research. All students, faculties and employees of the college are entitled to make use of the library facilities. The library also renders services to people from outside the college community after receiving due permission from the college authority. It is a modern computerized library with SOUL 2.0 software through which all the house-keeping operations of the library such as acquisition, cataloguing, circulation, serial control and OPAC are being operated. Moreover, we have a digital library with DSpace software, where all the college publications such as books, journals, magazines, prospectus, conference proceedings, project reports, question papers, class notes are being preserved. The library with its open access system and spacious reading area provides an atmosphere favorable to the excitement of mental discovery. Here, students are always encouraged to do the optimum utilization of the library resources by creating a user-friendly atmosphere. Moreover, each department of the college has an individual library called departmental library, which provides additional help to students and teachers in their academic pursuits. The library also provides access to e-resources to the teachers and students of the college through N-LIST consortia and NDLI platform. The library remains open from 9:00 A.M. to 5:00 P.M. on all working days. Book-bank facilities are offered to needy and deserving students who may borrow books for the whole academic session.

5. Discussion

The Central Library, Sipajhar College has introduced few innovative best practices to ensure sustainable data management for the college. These best practices are as follows–

5.1 Binding of Newspaper Clippings on Specific Topics:

A college library can bind together the newspaper clippings on special topics like- NEP 2020, Central Budget, War between Russia and Ukraine etc. This activity can lead sustainable data management in a traditional way. The Central Library, Sipajhar College has preserved the newspaper clippings on COVID 19 pandemic. The source of the articles is 'Dainik Asom', an Assamese daily newspaper and the coverage of the period is from January 2020 to December 2021.

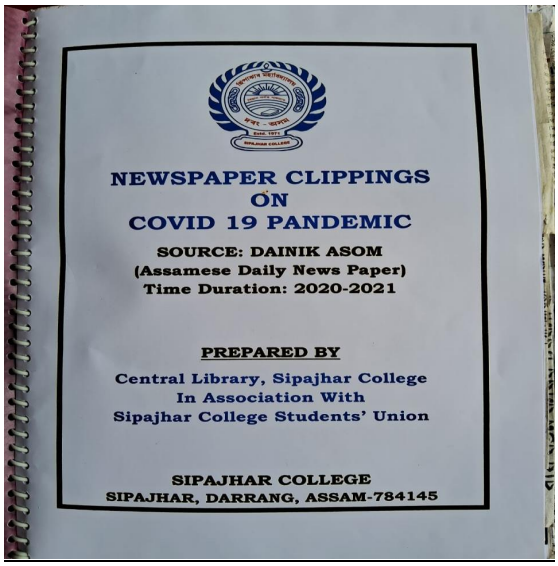


Fig. 1: Binding of newspaper clippings

5.2 Binding of Students' Publications:

The Central Library, Sipajhar College has undertaken an endeavor to collect students' publications, published in different edited books, journals, magazines and newspapers etc. After that, these are bound together for preservation. These types of activities encourage students to publish more and it enables the library to sustainable data management.

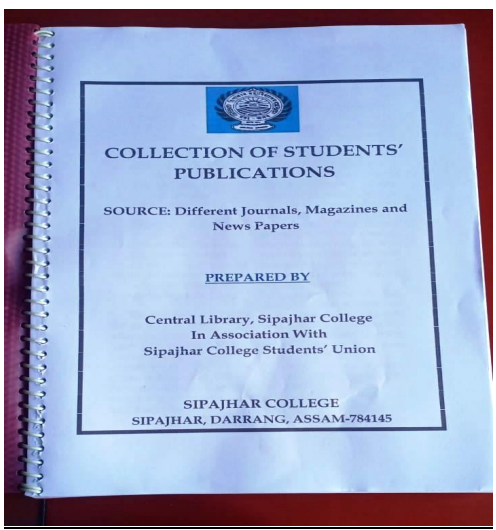


Fig. 2: Binding of Students' Publications

5.3 Directory of Govt. Rural Libraries of Darrang District: Rural libraries play a vital role in the upliftment of rural community. But, due to lack of publicity and awareness, people do not know about their nearest rural library. Hence, the Central Library, Sipajhar College has prepared a directory of the Govt. Rural Libraries of its parent district. Right now, there are 11 numbers of government rural libraries in Darrang District. In the directory details of these libraries are given in an alphabetical order. Moreover, the college organises training programme time to time for the rural librarians.

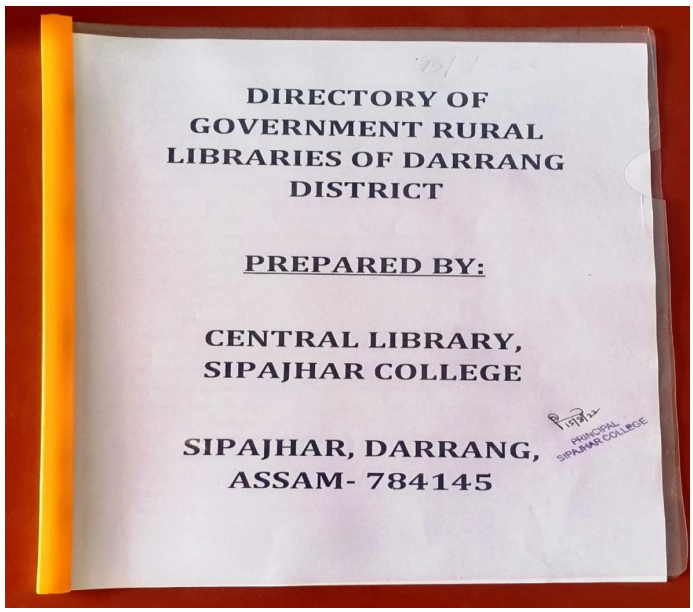


Fig. 3: Directory of Govt. Rural Libraries of parent district

5.4 Library Portal:

A library portal provides a library with a website to offer its services and to tell its story to its community. It is the single window access to various web enabled library services. It enables the library professionals to upload current information regarding their libraries by himself. Moreover, it also enables library users to make a query or suggestions to the library. The Library portal of Central Library, Sipajhar College is quite vibrant and informative. It provides data like month wise total collection of printed books, list of printed journals, new arrival of books, book reviews, important links, online membership form, meeting minutes of library committee, library photo gallery, updates of Library Book Club, Online notices etc.

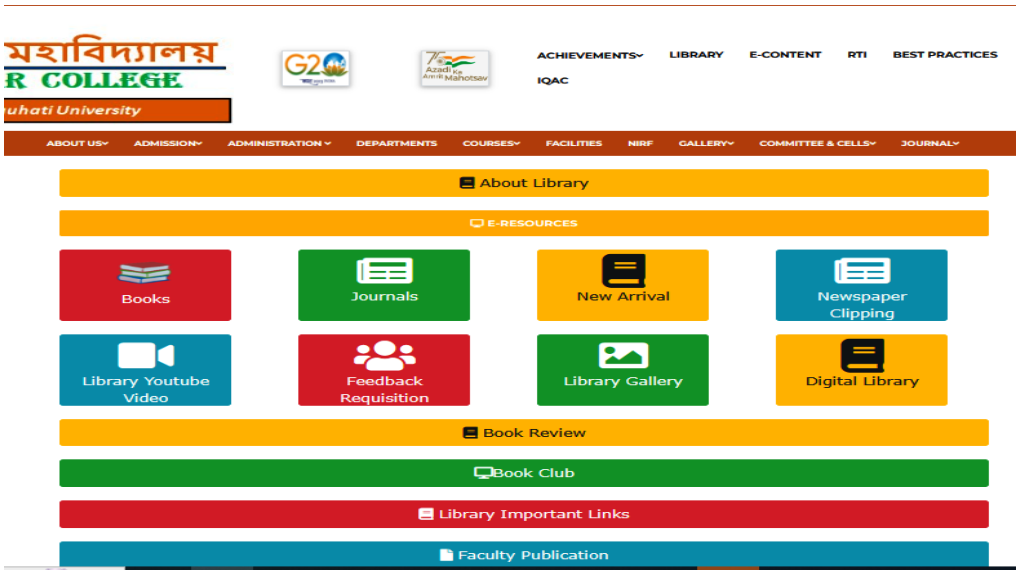


Fig. 4: Library Portal (Library| Sipajhar College)

5.5 Institutional Repository:

An institutional repository is an archive for collecting, preserving, and disseminating digital copies of the intellectual output of an institution. Academics also utilize their institutional repositories for archiving published works to increase their visibility and collaboration with other academics. However, most of these outputs produced by academic institutions are not effectively accessed and shared by researchers and other stakeholders. As a result, academic institutions should be involved in the development and implementation of an institutional repository so that it can be utilized as an institutional data management tool. Clifford Lynch said, "An institutional repository can be viewed as a set of services that an institution offers to members of its community for the management and dissemination of digital materials created by the institution and its community members."

The institutional repository of Sipajhar College is solely responsible for the sustainable data management of college publications. It includes institutional data like – class notes, question papers, college prospectus, college magazines, college journals, seminar proceedings, souvenir of Silver Jubilee and Golden Jubilee, research projects, teachers' publications etc.

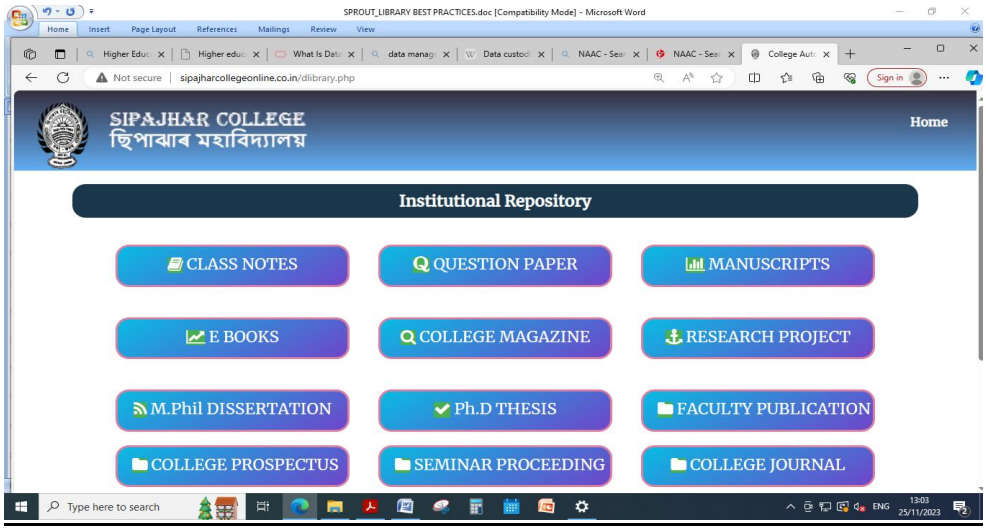


Fig. 5: Institutional Repository (College Automation (sipajharcollegeonline.co.in))

5.6 Library instructional videos through Library YouTube Channel:

YouTube is an online video sharing and social media platform headquartered in United States. It is the second most visited website in the world, after Google Search. The Central Library, Sipajhar College has started a YouTube channel, where all the instructional videos related to library are shared in Assamese language. Currently the channel has videos on N-LIST, NDLI, Open Educational Resources, OPAC, SOUL2.0, Bar-coded attendance system, Library Orientation, Library Tour etc.

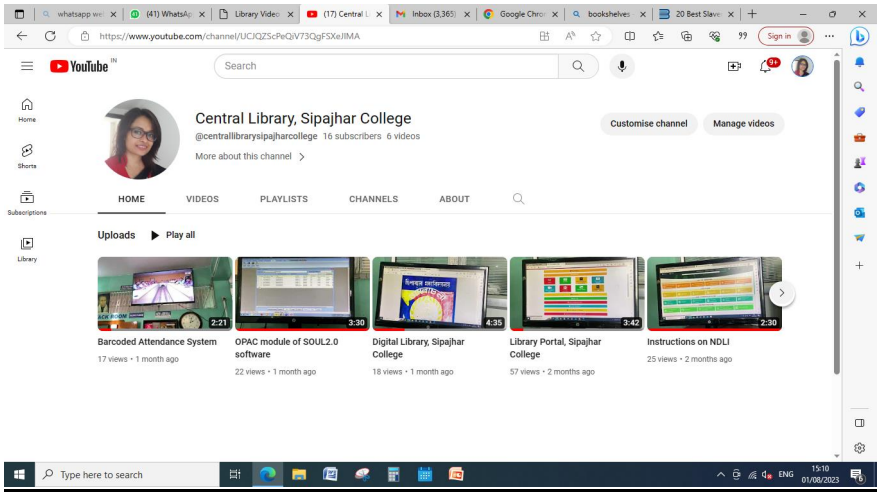


Fig. 6: Library YouTube Channel

5.7 Month wise update of total printed collection:

In the end of every month, Central Library, Sipajhar College gives the update of total collection of printed books through the library portal. It helps the library in preserving the stock data monthly.

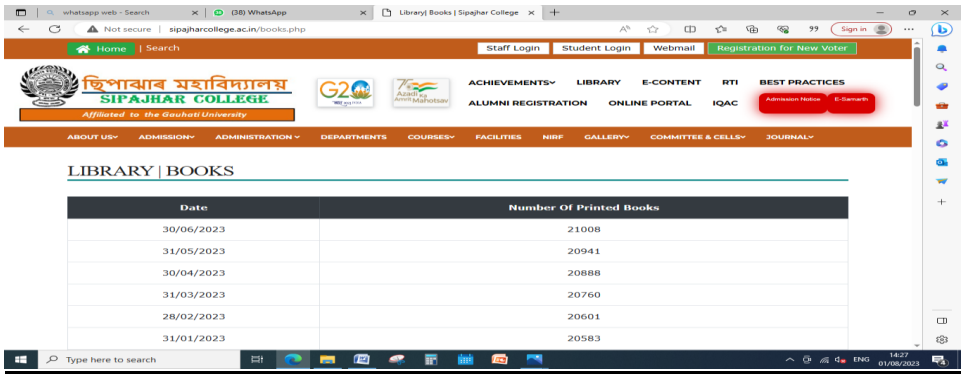


Fig. 7: Month wise update of total printed collection

5.8 Requisition/Feedback Form:

The library users of Sipajhar College can share their feedback and suggestion to the central library. Moreover, they can request the library to purchase a book which is not available in the library. For that, an online form is attached on the library portal. Here the library users have to put their name, contact number and e-mail id along with the message in fifty words. As soon as the users click on the submit button, immediately the messages go to the administrator's interface.



Fig. 8: Requisition/Feedback Form

5.9 Electronic Bulletin Board:

Every day, the Central Library, Sipajhar College displays the Word of the Day, Historical Importance of the Day, Question of the Week, Quotation of the Week,

Book of the Month, important days on the month etc. through electronic bulletin board.

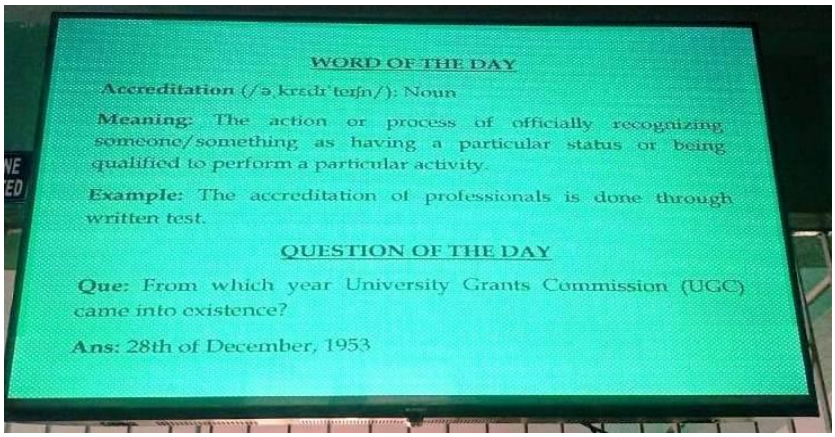


Fig. 9: Electronic Bulletin Board

5.10 Department wise colour specific spine label:

Data retrieval is one of the important parts of sustainable data management. Data is worthless if it cannot be retrieved on proper time. Therefore, the Central Library, Sipajhar College has started an innovative practice for the easy retrieval of the books. It is the department wise colour specific spine label of library books. Generally, the spine labels of books are of white color, but, for easy retrieval and shelving, Sipajhar College has started department wise colour specific spine label. Moreover, the location of a book is written on the spine label of the book for easy retrieval.

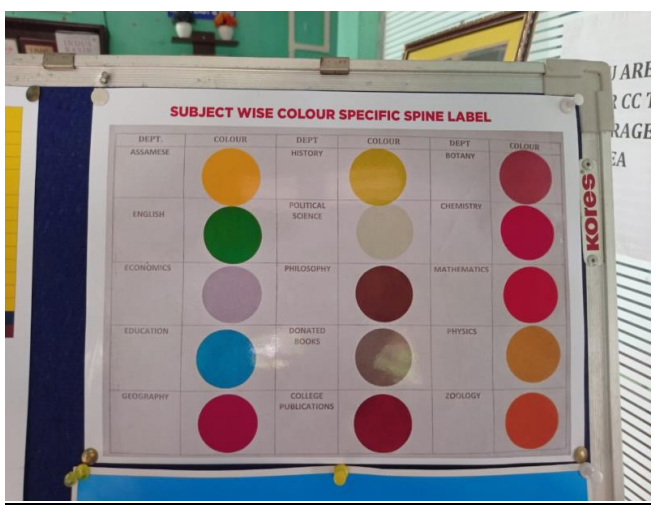


Fig. 10: Department wise colour specific spine label

5.11 QR code-based Service:

Data sharing is a vital part of data management. Data is of no use, if it is not shared among the target audience on proper time. Hence, the Central Library, Sipajhar College has started QR code-based services of Digital Library, E-Resources, Online Membership form and Online Book Requisition cum Feedback form. It helps the students to go directly to a specific service available through the library portal. Moreover, it helps the library to share their content promptly.



Fig. 11: QR code-based services

5.12 WhatsApp based Services:

The Central Library, Sipajhar College has started WhatsApp based services, where all the library related information is shared through WhatsApp groups. Right now, there are four WhatsApps groups running under the umbrella of Central Library, these groups are – BA/BSc Major, BA/BSc General, Library Book Club, Training & Placement Cell. Library users can become a member of any WhatsApp group by scanning WhatsApp QR code.



Fig. 12: WhatsApp based Services

5.13 Collection on Darrangi (Local) Literature:

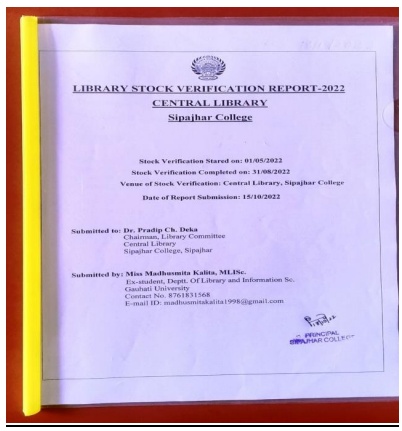
Collection is one of the important processes of data management. The Central Library, Sipajhar College has started a movement to collect local literature (Darrangi Literature) from the local public, associations, temples, NGOs, writers etc. The movement was started in the year 2020 and it is still going on. To appeal the public to donate local literature, the library gave advertisement in the newspaper. The primary objective behind this initiative is to make the library as the hub of local literature, and to preserve these resources for the future.



Fig.13: Collection on Darrangi (Local) Literature

5.14 Library Stock Verification:

Stock verification is very much important for data management. The Central Library, Sipajhar College carries out stock verification in every year. During the winter break, library conducts the stock verification, so that normal library routine does not get hampered. After the verification, the report is approved by the library committee.


LIBRARY STOCK VERIFICATION REPORT-2022
CENTRAL LIBRARY
Sipajhar College

Stock Verification Stared on: 01/05/2022
Stock Verification Completed on: 31/08/2022
Venue of Stock Verification: Central Library, Sipajhar College
Date of Report Submission: 15/10/2022

Submitted to: Dr. Pradip Ch. Deka
Chairman, Library Committee
Central Library
Sipajhar College, Sipajhar

Submitted by: Miss Madhusmita Kalita, MLISc.
Ex-student, Deptt. Of Library and Information Sc.
Gauhati University
Contact No. 8761831568
E-mail ID: madhusmitakalita1998@gmail.com

PRINCIPAL
SIPAJHAR COLLEGE

Fig. 14: Library Stock Verification Report

5.15 Library Annual Report:

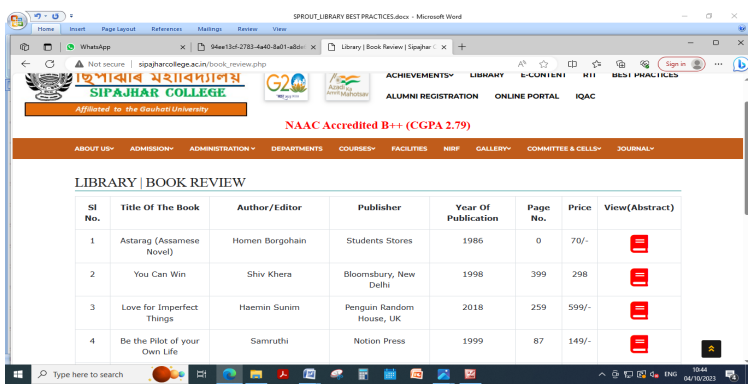
Like stock verification report, library annual report is also very much important for data management. Therefore, Central Library, Sipajhar College publishes library annual report every year during the time of new admission. It includes information about the sections of the library, library facilities, library services, library activities, library resources, library rules, library equipment, best library users etc.



Fig. 15: Library Annual Report

5.16 Book Reviews:

Utilization of data is one of the important processes of data management. Therefore, at the Central Library, Sipajhar College, students are asked to read all the books and give his/her review on those books. These reviews are displayed on the notice board as well as uploaded on the library portal. These types of reviews help other students to decide whether to read or not read a particular book. Moreover, to motivate students to use the library fullest, Best Reader Award is provided on the basis of the utilization of the library.



Sl No.	Title Of The Book	Author/Editor	Publisher	Year Of Publication	Page No.	Price	View(Abstract)
1	Astarag (Assamese Novel)	Homen Borgohain	Students Stores	1986	0	70/-	
2	You Can Win	Shiv Khera	Bloomsbury, New Delhi	1998	399	298	
3	Love for Imperfect Things	Haemin Sunim	Penguin Random House, UK	2018	259	599/-	
4	Be the Pilot of your Own Life	Samruthi	Notion Press	1999	87	149/-	

Fig.16: Book Reviews

6. Conclusion

For any organizational success, data management becomes an integral part of the operation. As handling data is tough, most organizations need to hire trained professionals to manage data. Data management can go wrong if it is not done properly, which can result in overall management failure. In case of academic institutions, library is considered as the knowledge data center. And being the custodian of data, librarians play a vital role in data management. Similarly, in case of colleges, libraries play a vital role in academic data management. In this study, it is found that the Central Library Sipajhar College is effectively managing the academic data with the help of some innovative best practices. These best practices are – binding of news paper clippings on a specific topic, binding of students' publications, preparation of directory of rural libraries, sharing data through library portal, institutional repository, library YouTube channel, library WhatsApp groups, electronic bulletin board, library annual report etc. Moreover, the Central Library, Sipajhar College has started a movement to collect local literature (Darrangi Literature) from the local public, associations, temples, NGOs, writers etc. Furthermore, the Central Library, Sipajhar College has started an innovative practice for the easy retrieval of the books. It is the department wise colour specific spine label of library books.

At the end we can conclude with the note that unlike university libraries, college library has limited scope for academic data management. At the same time, it is the duty of the college libraries to manage the academic data ensuring that every piece of data is accurately collected, scientifically processed, systematically stored and democratically shared. And the Central library, Sipajhar College has been successful to some extent in this matter.

References:

1. Lynch, Clifford. (2023) *"Institutional Repositories: Essential Infrastructure for Scholarship in the Digital Age"*. Association of Research Libraries. Retrieved on 3 November 2023.
2. Higher Education for sustainability: a global perspective, retrieved from https://www.sciencedirect.com/science/article/pii/S2666683921000195
3. NAAC (www.naac.gov.in)
4. Safdar, Muhammad (2021). *"Students' Perception about Institutional Repository and Impact of Electronic Contents on their Research: A Pakistani Perspective"*. Library Philosophy and Practice (E-journal).
5. What is data management? | IBM retrieved from https://www.ibm.com

Community Engagement for Sustainability in Library Science

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ABSTRACT: Sustainability has become a key issue for libraries and information organizations in recent years. Engaging with local communities is an important way for libraries to promote sustainability initiatives and make a positive impact on the environment. This paper examines the role of community engagement in enabling libraries to become leaders in sustainability. It explores various strategies libraries can use to actively engage with their communities on sustainability topics. The paper concludes that community engagement is vital for libraries to spread awareness, spark dialogue, influence attitudes and build support for sustainability efforts. Libraries should utilize community partnerships, outreach programs, and their position as information hubs to engage and educate on issues like energy conservation, waste reduction, green spaces, and sustainable development.

Keywords American Library Association (ALA), Sustainability, Community Engagement, Library Science

Introduction

Sustainability focuses on meeting the needs of the present without compromising the future. It involves balancing environmental, economic and social concerns. Issues like climate change, loss of biodiversity and resource depletion have made sustainability an urgent priority worldwide. Libraries and information organizations are well positioned to promote sustainability as community hubs and trusted public institutions. Library associations like the American Library Association (ALA) encourage sustainability through initiatives like the Sustainability Round Table (Sustain RT). However, libraries must move beyond adopting sustainable practices within their own buildings to engaging communities on sustainability issues. As Dempsey (2022) argues, "A key part of the library's expanding role and relevance to society is to take sustainability engagement out into the community."

Community engagement enables libraries to spread awareness, motivate action and lead change around sustainability. This paper analyzes the importance of community engagement for libraries to champion sustainability causes and effectively meet their communities' needs.

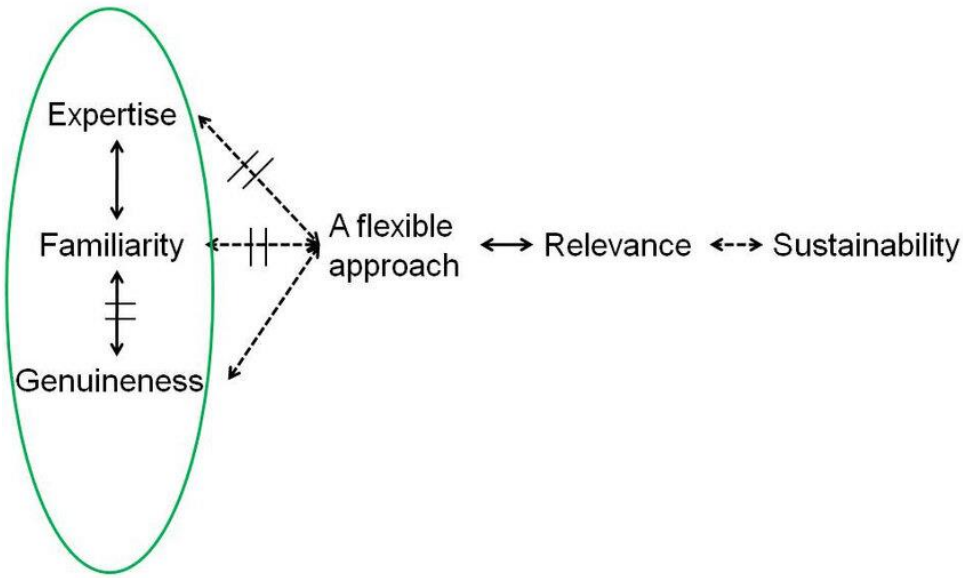


Fig. 1: Willingness to Learn' ('Genuineness', 'a Flexible Approach' and 'Relevance' Relationship to 'Sustainability')

The Value of Community Engagement

Community engagement is the process of developing relationships with community members and partner organizations to work collectively on shared goals like sustainability (Moore, 2022). Engaging communities is essential for libraries to promote sustainability for several key reasons:

1. Raises awareness and educates the public

   Libraries can utilize their role as information providers to educate communities on sustainability topics like renewable energy, conservation, environmental justice, green spaces, etc. Programs, exhibits and workshops can showcase solutions and best practices. Libraries can also point community members to reliable resources for self-education.
2. Influences attitudes and behaviors

   Libraries provide a neutral forum to start conversations and influence mindsets around sustainability issues that community members may find

political or controversial. By sparking dialogue and reflection, libraries can slowly shape attitudes and behaviors that benefit the environment.

3. Enables libraries to better understand community needs

   Engagement creates opportunities for community input so libraries can better understand sustainability priorities and concerns. Libraries can then tailor programs and services to meet those specific needs.

4. Builds partnerships to increase impact

   Engaging with groups like environmental nonprofits, student associations, local government agencies, and business councils allows for collaborative efforts that increase the library's impact. Partnerships combine resources and expertise.

5. Garners community support

   Developing relationships with community members through outreach and engagement fosters public support for the library's role as a sustainability leader. This support enables libraries to take bolder steps in implementing green policies and practices.

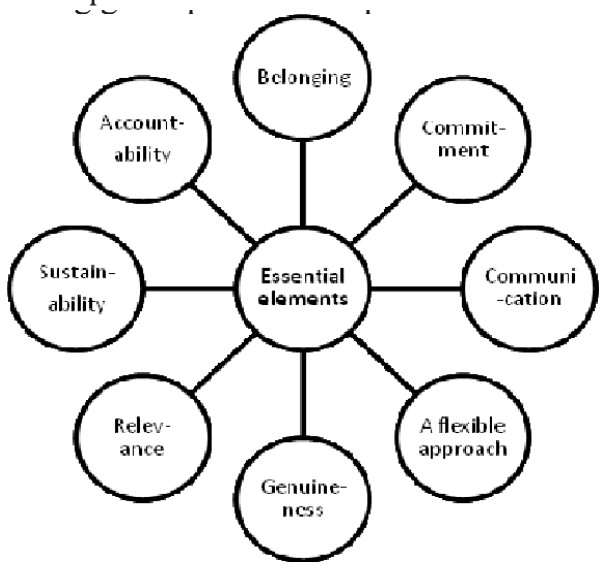


Fig. 2: Elements of Community Engagement

Strategies for Community Engagement

Libraries can utilize a range of strategies to engage with communities around sustainability:

1. Host events and workshops

   Libraries can organize public events like sustainability speaker series, panel discussions, film screenings, DIY workshops (teaching recycling/ up cycling crafts, gardening, etc.), and community reads on environmental books to spark conversation and awareness.

2. Offer sustainability programs and exhibits

   Libraries can develop programs like establishing little free seed libraries, planting trees or community gardens on library grounds, setting up sustainability-themed exhibits and displays, providing sustainability-focused reading recommendations, etc.

3. Partner with environmental groups

   Libraries can partner with local environmental nonprofits on events like e-waste drives, programs to support pollinators and urban wildlife, lecture series, community gardens, etc. This allows each partner to share resources and expertise.

4. Engage through outreach

   Libraries can participate in community events like farmers markets and street fairs to engage residents through games, giveaways, demonstrations, etc. on sustainability topics like recycling or energy conservation. Libraries can also visit schools and community centers.

5. Promote sustainability collections and resources

   Libraries can develop designated sections featuring books, DVDs and other resources about environmental topics, and promote these collections through displays, programs tied to new acquisitions, and online guides.

6. Use the building as a teaching tool

   Libraries can provide tours and signage to showcase any sustainable building features like solar panels, low-flow fixtures, local/green materials, etc., and explain how these help conserve resources.

7. Advocate for sustainability policies

   Libraries can build relationships with local policymakers and leverage their position as trusted institutions to advocate for policies and regulations that advance sustainability like renewable energy investments, green building codes, plastic bag/bottle bans, etc.

8. Train staff as sustainability ambassadors

   Providing staff training on sustainability issues equips them to integrate sustainability into programs, answer patron questions, and promote green practices in the library. It also allows staff to serve as ambassadors in the community.

9. Use social media to engage online

   Libraries can raise awareness about sustainability events, programs and resources through social media, create shareable online content like videos and info graphics, and participate in online discussions.

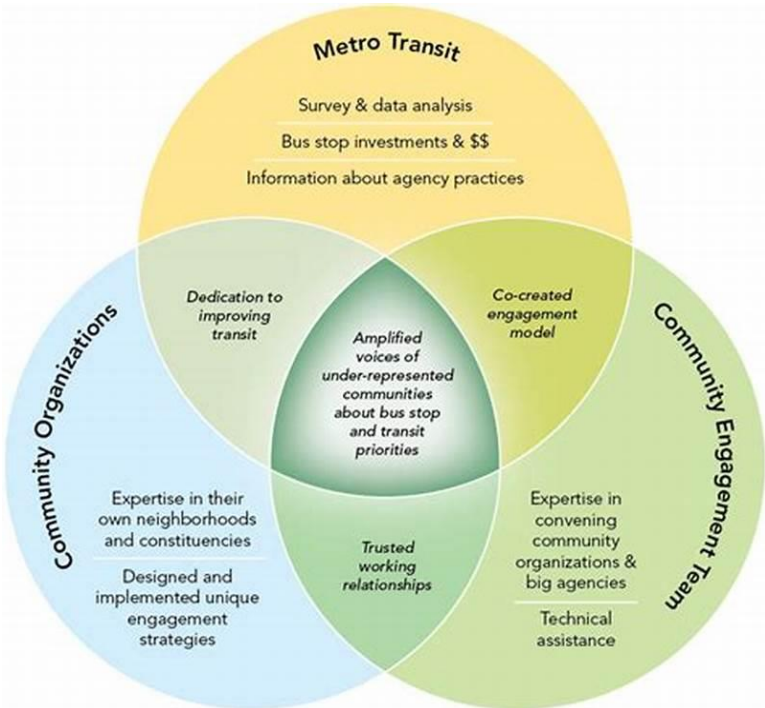


Fig. 3: Community Engagement Strategies

Table 1 summarizes these key community engagement strategies, along with examples of specific approaches libraries can take.

Table 1: Strategies and Examples for Libraries to Engage Communities on Sustainability

Strategy	Example Approaches
Host events and workshops	Public film screenings on climate solutions; Gardening workshops; Up cycling craft programs
Offer sustainability programs and exhibits	Little free seed libraries; Pollinator gardens; Sustainability-themed exhibits and book displays; Reading recommendations lists on environmental justice
Partner with environmental groups	E-waste recycling events; Native plant giveaways; Lecture series on renewable energy

Strategy	Example Approaches
Engage through outreach	Visit schools to provide eco-activities for kids; Participate in a farmers market to promote library resources on home energy conservation; Hold story times in local parks
Promote sustainability collections/resources	Displays highlighting new books and DVDs on environmental topics; Online research guides on renewable energy sources
Use the building as a teaching tool	Provide tours explaining solar panels or other green building features; Install signage highlighting sustainability facts/stats
Advocate for sustainability policies	Build relationships with city policymakers; Submit letters/ comments supporting plastic bag bans
Train staff as sustainability ambassadors	Provide professional development on sustainability topics; Encourage staff to model sustainable choices at work
Use social media to engage online	Share event announcements and program highlights; Develop info graphics on benefits of recycling

Case Studies of Impactful Library Sustainability Engagement

Real-world examples from diverse communities demonstrate the tangible impacts libraries can have on local sustainability when they actively engage their communities.

A. Oakland Public Library, California

Oakland Public Library developed a "Climate Action Literacy" initiative engaging diverse community partners to help educate, motivate and activate the public, especially youth, around climate change. They partnered with 16 organizations like schools, nonprofits and city agencies to offer programs including:

- A teen ambassador program where students gained climate literacy and leadership skills to initiate projects. One team installed water bottle refilling stations across the city.
- Climate Action Road shows bringing interactive activities to community events at local parks, street fairs and farmers markets.
- Supporting local teachers to integrate climate change education into curriculum.

This robust engagement initiative succeeded in spreading climate awareness and empowering Oakland youth and families to take tangible sustainability actions (Katz, 2022).

B. Cerritos Public Library, California

In Cerritos, the public library worked to promote sustainability and environmental awareness through creative partnerships with city government and the private sector. Some initiatives included:

- A recycled art contest with local students with up cycled art installations in the library from contest entries. This promoted creativity and skills around reuse.
- Free energy and water conservation home audit kits to borrow created in partnership with the local water agency.
- An interactive eco-friendly demonstration home exhibit with a solar-powered model home, co-created with Southern California Edison, teaching families about clean energy options.

Through these inventive community partnerships, Cerritos Library increased green knowledge while also demonstrating sustainable solutions in action (Kurkjian, 2022).

C. Edmonton Public Library, Alberta

Edmonton Public Library established a rooftop Pollinator Park containing beehives and native flower gardens to create habitat for pollinators while educating the public on their ecological importance. Programming includes:

- Public tours of the pollinator gardens and hives.
- A Homegrown program teaching community members gardening skills for supporting pollinators.
- DIY workshops on building bee houses.
- Exhibits on threats to pollinators and the role of gardens in conservation.

This initiative transformed the library into a space facilitating hands-on learning and community-driven environmental stewardship (Henderson, 2022).

Conclusion

As trusted institutions embedded in their communities, libraries have tremendous potential to lead and educate on sustainability causes. But to become sustainability change agents, libraries must go beyond greening their own operations. Active engagement with their communities is vital. Libraries can raise awareness, influence mindsets, build strategic partnerships, meet local needs and garner

public support for sustainability through outreach, programming, exhibits, events, social media and advocacy. With creativity and commitment to engagement, libraries can plant seeds to grow a greener, more sustainable future across their whole community.

References

1. Dempsey, B. (2022). *Libraries as Drivers of Sustainability*. American Libraries Magazine.
2. Henderson, S. (2022). *Pollinator Park*. Edmonton Public Library.
3. Katz, M. (2022). *Oakland Public Library's Climate Action Literacy Initiative*. California State Library.
4. Kurkjian, C. (2022). *Cerritos Library "Goes Green"*.
5. American Libraries Magazine. Moore, M. (2022). *Community Engagement*. Queens Library.

Library as a Well-Being Supportive Space: Application of Perma Framework

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ABSTRACT: A library in a higher education institution plays an important role in assisting students' learning and changing demands. One of the most important indicators of a successful education is the well-being of learners, and in this context, academic libraries may provide several opportunities to improve students' well-being. Learner wellbeing has been advocated as a central goal of education by Eastern and Western scholars alike since ancient times (Cambridge Assessment International Education), and various studies also document positive associations between learner wellbeing and higher academic achievement. One of the notable contributors to well-being research, Martin Seligman, proposed the PERMA model of well-being as a key framework for understanding and attaining human flourishing, in which well-being is described as a construct built on five intertwined elements: positive emotion, engagement, relationships, meaning, and accomplishment. From the review of existing literature related to the topic, it has been found that research on libraries and their function in fostering well-being has been done, but no studies have been discovered that apply Martin Seligman's PERMA model to libraries. Therefore, this study attempts to examine what libraries can do for well-being using Seligman's PERMA model of well-being and assess how they contribute to each aspect of well-being. It explores ways to design an academic library as a place that fosters learners' well-being through a survey of existing related literature.

Introduction:

The United Nations' 2030 Agenda for Sustainable Development, provides a framework for the country's long-term development. Good health and well-being are deemed significant among the 17 Sustainable Development Goals, ranking third. This goal aims to ensure healthy lives and promote well-being for all ages, which is crucial for sustainable economic growth and poverty reduction. While defining mental health, the World Health Organisation also requires people to be in a state of well-being in order to manage life's stressors, recognise their strengths, study and work successfully, and contribute to their community. Well-being is the experience of positivity with health, happiness and prosperity. It paves the way for striving and thriving from mere surviving. *APA Dictionary of Psychology defines well- being as a state of happiness and contentment, with low levels of distress, overall good physical and mental health and outlook, or good quality of life.*

Human subjective well-being has long been a focus of social science (Huppert et al. 2005). In the past decade, the challenge of finding routes to human happiness has taken a new turn, with an explicit focus not only on the causes of suffering, but now also on the origins of positive states of well-being (Kahneman et al. 1999). Psychology's quest for repairing the worst to making life most worth living gave rise to the positive psychology movement. In Western thought, wellbeing is a multidimensional state of being most commonly attributed to positive psychology (Seligman & Csikszentmihaly, 2000). The founder of positive psychology Martin Seligman stated that the topic of positive psychology is well-being, that the gold standard for measuring well-being is flourishing, and that the goal of positive psychology is to increase flourishing (Seligman, 2011). Seligman presents the PERMA model of well-being as a key framework for understanding and attaining human flourishing, in which well-being is described as a construct built on five intertwined elements: positive emotion, engagement, relationships, meaning, and accomplishment. One of education's key goals is to foster well-being and human flourishing. Learner wellbeing has been advocated as a central goal of education by Eastern and Western scholars alike since ancient times (Cambridge Assessment International Education). Research documents positive associations between learner wellbeing and higher academic achievement (Kirkcaldy et al., 2004; Suldo et al., 2011). Conversely, research suggests lower learner wellbeing is associated with an increased risk of academic underachievement (van Batenburg-Eddes & Jolles, 2013). Seligman's PERMA theory is one among that are used in education to increase student well-being.

A library is a vital component of education and offers several opportunities to support students' wellbeing. The word 'library' derives from the Latin word liber which means 'book.' In the word of George Eberhart "A library is a collection of resources in a variety of formats that is (1) organized by information professionals or other experts who (2) provide convenient physical, digital, bibliographic, or intellectual access and (3) offer targeted services and programs (4) with the mission of educating, informing, or entertaining a variety of audiences (5) and the goal of stimulating individual learning and advancing society as a whole" (Eberhart, G. M., 2010). The 21st century has witnessed a profound evolution in libraries, transforming them from being static collections of books to vibrant centres of learning, technology, and community engagement. Libraries can play a valuable role by providing a space to foster mental, emotional, and societal health. A review of the literature on libraries and wellbeing indicates that several notable institutions throughout the globe are working to establish well-being spaces in their libraries (e.g., University of Stirling, Glasgow Caledonian University, University of

Sheffield etc.). These well-being spaces often named as room to recharge, relax and renew space, the garden room.

For making total human being the role of education goes beyond providing knowledge. The aim of education in ancient India was not just the acquisition of knowledge as preparation for life in this world, or life beyond schooling, but for the complete realization and liberation of the self (NEP, 2020). National Education Policy 2020 also based on the principle that education must not develop only cognitive capacities but also social, ethical, and emotional capacities and dispositions. Noddings (2003) stated in her book *Happiness and Education* that happiness should be an aim of education, and a good education should contribute significantly to personal and collective happiness. Furthermore, in this era of extreme competition and extensive use of digital devices, students often suffer from physical and mental issues. In this scenario, discussing the evolving role of academic libraries to promote well-being by creating spaces, programmes, and resources that aid in the development of positive emotional, social, physical, and mental health in young people is relevant. Exploring the multifaceted role that libraries may play in general well-being is crucial in 21st century. From the review of existing literature related to the topic it has been found that research on libraries and their function in fostering well-being has been done, but no studies have been discovered that apply Martin Seligman's PERMA model to libraries. This study attempts to examine what libraries can do for well-being using Seligman's PERMA model of well-being and assess how they contribute to each aspect of well-being.

Theoretical Framework:

Martin Seligman, former president of the American Psychological Association is known as the father of Positive Psychology for his groundbreaking work in the field of human flourishing. The PERMA theory of well-being, developed by Dr. Seligman, provides a comprehensive response to the question of what constitutes and supports human flourishing. There are five building blocks enumerated in the theory which enable flourishing and defines the construct of well-being. The five elements are positive emotion, engagement, relationships, meaning and accomplishment for the mnemonic PERMA. Increasing in each measures increase flourishing in life. Martin Seligman in his book *Flourish: A Visionary New Understanding of Happiness and Well-being* explains each measurable and contributory elements of well-being with some exercises.

Positive Emotion:

Positive emotion is the first element and cornerstone of well-being theory. Positive emotions have attracted increased scientific attention in the past decade (Fredrickson, B. L., & Cohn, M. A., 2008). This element focuses on increasing positive emotions about the past (e.g., gratitude, forgiveness), present (e.g., mindfulness) and future (e.g., hope, optimism). Here the route to well-being is limited to how much an individual can experience positive emotions.

Engagement:

The experience of engagement comes from when someone fully deploy their skills, strengths and attention for a challenging task. It provides a sense of flow and absorption. The activity is its own reward. Flow is experienced when one's skills are just sufficient for a challenging activity, in the pursuit of a clear goal, with immediate feedback on progress toward the goal. It is a state when concentration is fully absorbed in the moment, self-awareness disappears and the perception of time is distorted in retrospect, e.g., time stops.

Relationships:

Relationships are fundamental to well-being. Seligman explains how nurturing meaningful relationships and building strong bonds contribute to a flourishing life, emphasizing the role of relationships in enhancing overall well-being. Here one experiences great joy, laughter, a feeling of belonging, pride in accomplishment and the ability to bounce back. Research shows that doing acts of kindness for others produces an increase in well-being.

Meaning:

Here Seligman emphasizes exploring how aligning one's values and aspirations with a sense of purpose can lead to a more fulfilling and meaningful existence. It can be derived from belonging to and serving something bigger than the self. There are various societal institutions (e.g., family, work organisation, community) that enable a sense of meaning.

Accomplishment:

Setting and achieving goals at per one's values and strengths contribute to a sense of achievement and overall well-being. In the job, in sports, in games, in hobbies, and in other contexts, people want achievement, competence, success, and mastery for their own sake. Even when success doesn't always result in happy feelings, meaningful relationships, or meaningful work, people nevertheless strive for it.

Objectives:

This research attempts to address why promoting well-being in educational institution is important and how to build a library of higher educational intuitions as a supportive space for well-being with reference to the PERMA Model of Well-Being designed by American psychologist Martin Seligman.

Methods:

The paper is based on secondary sources or already-published works on the subject. An attempt is made to determine how to design an academic library as a place that fosters learners' well-being through a survey of the material that is already accessible.

Library as a Supportive Space:

Raising well-being has manifold attainment. Research demonstrates that well-being is not only valuable because it feels good, but also because it has beneficial real-world consequences and well-being can be taught with some positive psychology exercises. The science of well-being has also important implications for institutional application. The PERMA model of Martin Seligman was initially proposed in the context of individual well-being, its principles can be applied to various settings, including libraries. Here an analysis is made how PERMA model can be applicable in an academic library context and how library of a college or university can promote each element of PERMA among learners for flourishing.

Positive Emotion:

Life at college or university can be stressful for students due to exam pressure and numerous personal issues. College and university students are basically in their late teens or early twenties, the age termed as *emerging adulthood* (18–29-year-old) by Jeffrey Jensen Arnett. They experience instability, identity exploration, self-focus, feeling in-between, high hopes (Arnett, 2014). It is crucial to foster their minds with positive emotions for a fulfilling life in future. The broaden-and-build theory suggests that positive emotions enhance attention and cognition, leading to an increase in emotional well-being (Fredrickson, & Joiner, 2002). For promoting positive emotion library can create a space where opportunities should be given for relaxation. Research shows that practicing relaxation is paramount to managing stress and aids positive thinking, concentration, memory and decision-making. The space should separately with comfy seating, cushions, blankets, an assortment of materials designed to enhance sense of wellbeing and ample resources of health and well-being (University of Stirling, Glasgow Caledonian

University, University of Sussesx, University of Sheffield, Queens University Belfast etc. have created this space in its library). Resting in libraries is natural according to Wise (2018), who noted that libraries are ideally situated as places to nap; as teens and young adults are notoriously sleep deprived, offering quiet places with comfortable furniture may be an important way that libraries can support student wellbeing. In addition to these, libraries do a lot in fostering some positive emotion related to past, present and future. Seligman explained some of the exercises in his book *Flourish: A Visionary New Understanding of Happiness and Well-being,* the exercises can be implemented in an academic library setting. For example, to practice the exercise of gratitude visit (writing gratitude letter), what-went-well exercise (counting blessings at the end of the day), a space can be kept aside in the library. In the walls and reading corners some inspirational quotes can be pasted. Inspirational quotes give students positive energy (Yagcioglu, 2014; Bedrov and Bulaj, 2018; Littlechild et al., 2013; Klassen, S. L., 2020).

Engagement:

Students frequently suffer from mental illnesses and participate in anti-social or pointless activities when they have nothing significant to do. Cell phones are a major distraction these days, preventing students from losing themselves in an activity. This is particularly concerning; excessive screen time has been linked to increased rates of anxiety and depression among young people. Research reveals that mobile phone distraction has a significant negative association with psychological well-being, it limits the cognitive ability of users to focus on daily routine activities which leads to negative psychological well-being (Bianchi and Phillips, 2005; Thomee et. al., 2011; Zheng and Lee, 2016; Chu, et al., 2021). Moreover, without engaging in meaningful activities, students may struggle to develop important life skills such as problem-solving and decision making. Libraries can encourage engagement by offering resources that cater to diverse interests and learning styles. Providing interactive learning materials, technology, and opportunities for active participation in discussions or events can enhance engagement among library users. Libraries can give students opportunities to play some serious games to challenge during study breaks, which can shift their focus from engaging in unnecessary activities (e.g., University of Cambridge, Edinburgh Napier University created a series of virtual jigsaws, coloring books, crafting materials, mind games etc., in their library). Library can create a leisure collection, creating a leisure collection or a relaxing library space implies a stress release model (Cox and Brewster, 2020). The growing interest in mindfulness practices, including meditation, and their proven contribution to overall well-being has led many libraries to designate areas where users can

pursue a wide range of contemplative activities (Bladek, 2021). Academic libraries should provide 'community engagement' opportunities to students. Growing need for enhanced undergraduate research opportunities offered by faculty, which will contribute to student retention and employment opportunities, encourages academic librarians to undertake community engagement activities in order to strengthen institutions capacity in transposing their expertise into real economic and social improvements (Khattab, et al., 2019). In response to the growing call for community engagement resources, the American Library Association (ALA) created **Libraries Transforming Communities**, an initiative that reimagines the role libraries play in supporting communities (ALA).

Relationships:

Social neuroscientist John Capioppo stated that the pursuit of relationships is a rock-bottom fundamental to human well-being, as loneliness is such a disabling condition. George Vaillant, the Harvard psychiatrist discovered the capacity to *be loved* as master strength. As Seligman discussed in his book Flourish*: A Visionary New Understanding of Happiness and Well-being,* the exercises of *gratitude visit* strengthen relationships with people. In this connection, libraries can provide a space to students for practicing this exercise. Libraries may offer counselling services to students and foster a sense of belongingness, allowing them to discuss their opinions without fear of being judged. University of Sheffield run a programme as *Togetherall* which allows patrons to access free 24/7 online mental health advice from qualified professionals. Libraries a crucial role in building relationships within the community through the community engagement activities. The relaxing library space can facilitate interaction among users. Academic libraries must provide appropriate spaces for learning, socializing, and relaxing activities. An open-plan space setting, which is actively applied to academic libraries to support collaboration among users, raises several issues in functional environments (Kim & Yang, 2022). By establishing rapport with patrons, understanding their needs, libraries can create a sense of belongingness contributing to overall well-being.

Meaning:

As Seligman explained 'meaning' can be derived from belonging to and serving something bigger than the self and it is develops self-esteem, leadership qualities, happiness among others. Dambrun (2017) found that selflessness was positively and significantly related to authentic–durable happiness. Volunteers' motives can have a significant positive impact on life span (APA, 2011). Libraries can provide various opportunities for serving beyond self. Participation in library's community engagement activities patrons may find meaning contributing to social

justice. Bangani & Dube (2023) found the need of academic libraries to beyond their traditional roles and participate in community engagement not only as an expected social responsibility but also as a contribution to a socially just society and development. Keeping a collection of books on great personalities, library can promote learners the sense of doing something greater than self. Prior (2018) in her book *On reading well: Finding the good life through great books* stated that great books offer perspective more than lessons. Facilitating discussions on societal issues can contribute to patrons finding meaning in their pursuits. This not only promotes personal development, but it also motivates people to take action and make great changes in their communities. Furthermore, libraries play an important role in developing a socially equitable society by offering access to information and encouraging meaningful debates that motivate people to contribute to the betterment of the society.

Accomplishment:

Libraries can support patrons in achieving their goals by offering resources for personal and professional development. Providing access to educational materials, workshops on skill development, and resources for career advancement can contribute in learners' accomplishments. In the context of changing labor market, libraries should work as an information hub for learners searching for career in diverse fields. Libraries are in a position to be a prime player in the delivery of career and job sources and services (Anderson, 1992). Loehr (1941) discussed the need of occupational guidance service in a library set up. Reward is associated with sense of accomplishment and motivation for future endeavours. To encourage students to make the most use of the resources available to them and to experience a sense of achievement, the library might provide an annual best library user award. Additionally, libraries might offer possibilities for online assessments to identify an individual's best qualities; one such test is Seligman's Signature Strength Exercise. As the use of this exercise in the Penn Resiliency Program shows Students take the Values in Action Signature Strengths test (www.authentichappiness.org) and use their highest strength in a new way at school in the next week.

Conclusion:

Libraries now serve as contemporary multifaceted facilitators rather than just as traditional repositories of books. Academic libraries may take on new tasks in the face of twenty-first century challenges. Student mental health and well-being has become an increasing area of activity (Cox, & Brewster, 2020). Library

can promote each aspect that contributes to individual's overall well-being with initiatives as discussed. Academic librarians are natural connectors, guiding their users to not only resources, but also connecting them to people, services, and spaces that can provide assistance (Ramsey and Agar, 2018). Thus, concept of library can be redefined from "library anxiety" as Mellon (1986) stated to the most open, comfortable, peaceful space.

References:

1. American Library Association. Resource guide. https://libguides.ala.org/library-definition
2. American Library Association. What is community engagement. https://www.ala.org/tools/librariestransform/libraries-transforming- communities/engagement
3. American Psychological Association. (2011). Selfless volunteering might lengthen your life, research suggests. https://www.apa.org/monitor/2011/11/volunteering
4. Anderson, B. (1992). Delivering career and job information: A place for libraries. *The Reference ssLibrarian*, *16*(36), 17-32.
5. Arnett, J.J. (2014). *Emerging adulthood: The winding road from the late teens through the twenties*. Oxford University Press.
6. Bangani, S., & Dube, L. (2023). South African academic libraries as contributors to social justice and ubuntu through community engagement. *IFLA Journal*, 03400352231166751.
7. Bedrov, A., & Bulaj, G. (2018). Improving self-esteem with motivational quotes: opportunities for digital health technologies for people with chronic disorders. *Frontiers in psychology*, *9*, 2126.
8. Bianchi, A., & Phillips, J. G. (2005). Psychological predictors of problem mobile phone use. *Cyberpsychology & behavior*, *8*(1), 39-51.
9. Bladek, M. (2021). Student well-being matters: Academic library support for the whole student. *The Journal of Academic Librarianship*, *47*(3), 102349.
10. Cambridge Assessment International Education. Education brief: learner wellbeing. https://www.cambridgeinternational.org/Images/612684-learner-wellbeing.pdf

11. Chu, J., Qaisar, S., Shah, Z., & Jalil, A. (2021). Attention or distraction? The impact of mobile phone on users' psychological well-being. *Frontiers in psychology*, *12*, 612127.

12. Cox, A., & Brewster, L. (2020). Library support for student mental health and well-being in the UK: Before and during the COVID-19 pandemic. *The Journal of Academic Librarianship*, *46*(6), 102256.

13. Dambrun, M. (2017). Self-centeredness and selflessness: happiness correlates and mediating psychological processes. *PeerJ*, *5*, e3306.

14. Eberhart, G. M. (2010). *The Librarian's Book of Lists: A Librarian's Guide to Helping Job Seekers*. American Library Association.

15. Edinburg Napier University. Student well being campaigns in the library. https://staff.napier.ac.uk/services/information-services/ISScoops/Pages/Student-Wellbeing-in-Libraries.aspx

16. Fredrickson, B. L., & Joiner, T. (2002). Positive emotions trigger upward spirals toward emotional well-being. *Psychological science*, *13*(2), 172-175.

17. Fredrickson, B. L., & Cohn, M. A. (2008). Positive emotions. *Handbook of emotions*, *3*, 777-796.

18. Huppert, F. A., Baylis, N., & Keverne, B. (Eds.). (2005). *The science of well-being*. Oxford University Press.

The Role of Librarians' in Using Library Campaigns as a Strategy for Achieving Sustainable Development Goals in India

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Abstract: Libraries are recognized as strategic hubs for disseminating knowledge, fostering education, and promoting social development. In the context of the 21st century and global sustainability challenges, libraries in India, with their diverse cultural landscape, serve as crucial platforms for raising awareness and driving action towards the 17 Sustainable Development Goals (SDGs) established by the United Nations. The paper highlights India's progress in aligning its national initiatives with the SDGs, emphasizing the need for sustainable and equitable development. It introduces the concept of library campaigns as effective strategies for promoting SDGs, detailing various approaches such as awareness programs, information dissemination, collaborations, technology integration, and innovative programs. The correlation between library campaigns and SDG achievement is underscored, with libraries serving as catalysts for knowledge-sharing and community-driven efforts. Librarians are identified as instrumental in this process, contributing through innovative campaigns that address poverty, gender inequality, health, economic development, technology literacy, and environmental awareness. The challenges librarians face in India includes limited resources, the digital divide, and language diversity. The paper concludes by advocating for a multi-stakeholder approach to address these challenges, positioning libraries as powerful catalysts for sustainable development and contributors to education, inclusivity, and lifelong learning for all.

Background to the Study

Libraries play a fundamental role in disseminating knowledge, facilitating education, and fostering social development. In the 21st century, amidst numerous global challenges related to sustainability, libraries have emerged as strategic hubs for promoting and achieving the Sustainable Development Goals (SDGs)(Abata-Ebire et al., 2018). These goals, established by the United Nations, encompass many critical issues, including poverty, inequality, education, healthcare, environmental

sustainability, and access to information(United Nations, 2020). Libraries act as central hubs for accessing information, fostering community engagement, and enabling learning, thus serving as ideal platforms for raising awareness and inciting action towards these goals(Onwubiko, 2021). India, known for its rich cultural diversity and complex developmental challenges, boasts a diverse library landscape, encompassing national libraries, academic institutions, public libraries, and small community libraries.

Beyond being custodians of information, librarians also serve as facilitators of knowledge exchange, providers of research support, and coordinators of community programs(Singh, 2010). With this focus, librarians have the potential to become pivotal drivers in the pursuit of SDGs.

Objectives

The objectives of the study

(i) Highlight the strategies employed in library campaigns to promote the achievement of the Sustainable Development Goals (SDGs) in India.
(ii) Explore the initiatives and efforts made by India towards achieving the SDGs.
(iii) Establish the correlation between library campaigns and the attainment of the SDGs
(iv) Propose effective campaign strategies that librarians can employ to actively support the attainment of the SDGs.
(v) Evaluate the challenges and barriers faced by librarians in their endeavors to contribute to the actualization of the SDGs in India.

Sustainable Development Goals

The Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by the UN's 193 member states in September 2015 as part of the 2030 Agenda for Sustainable Development (United Nations Development Programme, 2021). This agenda provides a shared blueprint for peace and prosperity for people and the planet. The UN's Global 2030 Agenda encompasses 17 SDGs, 169 targets, and 232 indicators. While building upon the Millennium Development Goals (MDGs), the SDGs are more comprehensive and inclusive, recognizing the interconnected nature of development issues(Brundtland, 2018). These goals are designed to address a wide range of social, economic, and environmental challenges

confronting the world, aiming to ensure a more sustainable and equitable future for everyone(UCPSARnet Africa, 2023).

The specific 17 Sustainable Development Goals are(United Nations, 2020):

Goal 1: No Poverty: End poverty in all its forms everywhere

Goal 2: Zero Hunger: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture

Goal 3: Good Health & Well-being: Ensure healthy lives and promote well-being for all at all age

Goal 4 Quality Education: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

Goal 5: Gender Equality: Achieve gender equality and empower all women and girls

Goal 6: Clean Water & Sanitation: Ensure availability and sustainable management of water and sanitation for all

Goal 7: Affordable & Clean Energy: Ensure access to affordable, reliable, sustainable and modern energy for all

Goal 8: Decent Work & Economic Growth: Promote sustained, inclusive, and sustainable economic growth, full and productive employment and decent work for all

Goal 9: Industry, Innovation, & Infrastructure: Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation

Goal 10: Reduce inequality: Reduce inequality within and among countries

Goal 11: Sustainable Cities & Communities: Make cities and human settlements inclusive, safe, resilient and sustainable

Goal 12: Responsible Consumption & Consumption: Ensure sustainable consumption and production patterns

Goal 13: Climate Action: Take urgent action to combat climate change and its impacts

Goal 14: Life below Water: Conserve and sustainably use the oceans, seas, and marine resources for sustainable development

Goal 15: Life on Land: Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Goal 16: Peace, Justice, & Strong Institutions: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels

Goal 17: Partnership for the Goals: Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

Achieving the SDGs in India

The SDGs are a guiding framework for achieving comprehensive and sustainable development in India. The nation has achieved notable advancements across various sectors aligned with the SDGs. Initiatives to reduce poverty have led to a decline in poverty, lifting millions of people out of impoverished conditions. Additionally, India has made significant strides in enhancing educational access, attaining nearly universal primary school enrolment. Maternal and child health indicators have witnessed improvement, reflected in reduced maternal and under-five mortality rates. The increased access to clean water and sanitation facilities has positively impacted the quality of life for many. India's commitment to the SDGs is evident through policy initiatives, partnerships, and data-driven approaches to track progress and accelerate efforts towards achieving these goals(Walia, 2023).

During the first meeting of Finance Ministers and Central Bank Governors under India's G20 Presidency on February 24-25, 2023, Prime Minister Narendra Modi expressed concern about the apparent deceleration in progress toward SDGs. Despite global advancements, the sheer size of India's population underscores its pivotal role in achieving SDGs worldwide(Subramanian, 2023). While there is substantial confidence that India will emerge as the world's third-largest economy in the next decade, it is crucial to emphasize that translating this economic growth into social and human development advancements is equally imperative.

In the 2023 United Nations SDG Index and Dashboards Report, evaluating global advancement toward the SDGs, India holds the 112th position among 166 countries(Walia, 2023). The country achieved an overall index score of 63.5 percent and a spill-over score of 99.4 percent.

Library Campaign as a Strategy for attaining SDGs

Library campaigns are crucial in promoting awareness and action toward achieving the SDGs in India. These campaigns often employ various strategies to raise awareness, educate the public, and facilitate community engagement(Ejiro &

Stella, 2019;Unegbu et al., 2023). Here are some common strategies employed in library campaigns for SDGs in India:

Awareness and Education Programs:

- Libraries organize workshops and seminars to educate the community about the SDGs, their significance, and the role individuals can contribute.
- They also arrange community forums, group discussions, talk shows, and interactive sessions to encourage community involvement and sharing ideas on sustainable development.

Information Dissemination:

- Libraries serve as information hubs, providing access to resources related to sustainable development, climate action, poverty alleviation, and other SDG-related topics.
- They disseminate literature, reports, and multimedia materials to inform the public about the goals and potential solutions.

Collaborations and Partnerships:

- Libraries collaborate with governmental and non-governmental organizations and government agencies working on SDG-related initiatives to amplify the impact of their campaigns.
- Collaboration with schools, colleges, and universities helps reach out to students and educators, fostering a culture of sustainability.

Technology Integration:

- Libraries leverage social media platforms to share information, success stories, and updates related to SDG campaigns.
- The library's digital platforms provide access to e-books, articles, and online resources related to sustainable development.

Monitoring and Evaluation:

- Libraries assess the impact of their campaigns on the community's awareness and actions related to the SDGs, allowing for continuous improvement.
- Establishing feedback mechanisms helps libraries understand the needs and preferences of the community, tailoring their campaigns accordingly.

Innovative Programs:

- Libraries organize events like hackathons and competitions focused on finding innovative solutions to address specific SDGs, encouraging community participation.

Hosting events such as film screenings and organizing exhibitions related to sustainable development generates interest and raises awareness.

Advocacy and Policy Influence:

- Libraries engage in advocacy efforts to influence local policies that align with SDGs, promoting sustainable development at the policy level.
- They may organize events that bring together policymakers, researchers, and community members to discuss strategies for SDG implementation.

By implementing these strategies, libraries contribute significantly to promoting the achievement of the SDGs in India, fostering a sense of collective responsibility, and encouraging sustainable practices at the community level.

India's Initiatives towards the SDGs

India has been working towards achieving the SDGs set by the United Nations. It has integrated 17 goals into its national development agenda and has implemented their achievement through various initiatives. Here are some critical efforts made by India towards achieving the SDGs:

- *National Institution for Transforming India (NITI Aayog):* NITI Aayog is the premier policy think tank of the Indian government and is responsible for coordinating and monitoring the implementation of SDGs in India(Home | NITI Aayog, 2023). It has developed the SDG India Index, which ranks states and union territories based on their performance in achieving the SDGs.
- *National Health Mission (NHM):* India has significantly improved health outcomes through the National Health Mission(Banerjee, 2017). Initiatives like Ayushman Bharat, providing health insurance coverage to vulnerable populations, contribute to achieving SDG 3 (Good Health and Well-being).
- *Swachh Bharat Mission (Clean India Mission):* Launched in 2014, this mission aims to achieve universal sanitation coverage and eliminate open defecation in India, aligning with SDG 6 (Clean Water and Sanitation) and SDG 11 (Sustainable Cities and Communities)(Prime Minister's Office, 2017).
- *Pradhan Mantri Jan Dhan Yojana (PMJDY):* Launched in 2014, this financial inclusion program aims to provide access to banking, savings accounts, and insurance to all households in India, supporting SDGs such as poverty alleviation (SDG 1) and economic growth (SDG 8)(Government of India, 2019).
- *National Rural Livelihood Mission (NRLM):* Focused on reducing poverty

through self-employment and organizing rural poor into self-help groups, this initiative aligns with SDG 1 (No Poverty)(Government of India, n.d.).

- *Pradhan Mantri Ujjwala Yojana (PMUY)2.0:* Launched in 2016, this scheme provides free LPG connections to women from below-poverty-line households, contributing to SDG 7 (Affordable and Clean Energy) and SDG 5 (Gender Equality)(*PMUY : Home*, 2016).
- *National Skill Development Mission (Skill India):* This initiative enhances youth employability through skill development programs that contribute to SDG 8 (Decent Work and Economic Growth)(NSDC, 2020).
- *Digital India:* Focused on transforming India into a digitally empowered society and knowledge economy. It contributes to several SDGs, including SDG 9 (Industry, Innovation, and Infrastructure) and SDG 4 (Quality Education)(Rajan, 2017).
- *Gender Equality Initiatives:* Various programs and initiatives, such as Beti Bachao Beti Padhao, aim to promote gender equality and empowerment, aligning with SDG 5 (Gender Equality)(UNICEF, 2020).
- *Mahatma Gandhi National Rural Employment Guarantee Scheme(MGNREGS): MGNREGS* guarantees 100 days of wage employment to rural households, contributing to SDG 1 (No Poverty) and SDG 8 (Decent Work and Economic Growth)(Kapur et al., 2018).
- *Education Initiatives:* Schemes like Sarva Shiksha Abhiyan and Rashtriya Madhyamik Shiksha Abhiyan ensure inclusive and quality education for all, supporting SDG 4 (Quality Education)(India. Ministry of Education, 2023).
- *Renewable Energy Initiatives:* India has set ambitious targets for renewable energy capacity under the National Solar Mission and National Wind Mission, aligning with SDG 7 (Affordable and Clean Energy)(Ministry of New and Renewable Energy, Govt. of India, 2019).

Library Campaign and SDG's

Library campaigns are pivotal in advancing the SDGs attainment by fostering a culture of education, information dissemination, and community engagement. These campaigns serve as dynamic platforms that empower individuals with knowledge and skills, addressing multiple dimensions of the SDGs. Libraries, as information repositories, contribute significantly to SDG 4 (Quality Education) by promoting literacy and providing resources supporting lifelong learning. Access to quality education is possible only with a well-equipped library and committed personnel to ensure information to its users. Additionally, they enhance access to information related to health, gender equality, and environmental sustainability,

aligning with SDGs 3 (Good Health and Well-being), 5 (Gender Equality), and 13 (Climate Action). Moreover, library campaigns often promote inclusivity and community participation, reinforcing SDG 10 (Reduced Inequality) and SDG 16 (Peace, Justice, and Strong Institutions)(IFLA, 2018). Thus, the correlation between library campaigns and the achievement of SDGs lies in their ability to serve as catalysts for knowledge-sharing, empowerment, and community-driven efforts toward a more sustainable and equitable future.

Role of Librarians Contribute to SDGs through Library Campaign

Librarians play a crucial role in contributing to SDGs through innovative library campaigns. Libraries are not just repositories of books; they are dynamic community spaces that can be leveraged to promote education, inclusivity, environmental awareness, and other critical aspects of sustainable development. Librarians contribute to SDGs through various campaigns. They can organize campaigns promoting literacy, lifelong learning, and access to education resources, including literacy programs, workshops, and events for diverse age groups (SDG 4 - Quality Education). Additionally, librarians serve as community hubs, engaging in campaigns that address poverty and gender inequality and reduce inequalities within communities by organizing workshops, seminars, and outreach programs to empower marginalized groups and promote social inclusion (SDG 1 - No Poverty, SDG 5 - Gender Equality, SDG 10 - Reduced Inequalities).

Moreover, libraries can play a role in health-related campaigns, providing information on preventive healthcare mental health and promoting healthy lifestyles through workshops, seminars, and access to health-related literature (SDG 3 - Good Health and Well-being). Librarians can also initiate campaigns that foster collaboration and partnerships within the community, bringing together local organizations, businesses, and residents to create a network focused on addressing various SDGs collectively (SDG 17 - Partnerships for the Goals). Furthermore, librarians contribute to economic development by organizing campaigns focusing on entrepreneurship, job training, and financial literacy, serving as valuable resources for individuals seeking to improve their economic well-being (SDG 8 - Decent Work and Economic Growth). They also contribute to technological literacy through campaigns promoting the use of technology for education, innovation, and community development, including training on digital tools, coding, and other relevant skills (SDG 9 - Industry, Innovation, and Infrastructure). Advocating for access to information as a fundamental right, librarians can run campaigns to promote open access to knowledge, freedom of expression, and transparency in governance, contributing to peaceful and just

societies (SDG 16 - Peace, Justice, and Strong Institutions). As cultural hubs, librarians can organize campaigns to preserve and celebrate cultural diversity within their communities, fostering a sense of identity and belonging (SDG 11 - Sustainable Cities and Communities)(Chuenchom et al., 2022).

Additionally, they can raise awareness about environmental issues and promote sustainable practices through campaigns that may include initiatives to reduce waste, conserve energy, and educate the community about climate change and biodiversity (SDG 13 - Climate Action, SDG 15 - Life on Land, SDG 14 - Life Below Water). They work towards providing equitable access to information and promoting literacy by organizing campaigns to enhance digital and information literacy skills, ensuring that communities have the knowledge they need to participate in education and make informed decisions (SDG 4 - Quality Education). By leveraging resources and community connections, librarians can have a significant impact on promoting and achieving the SDGs, contributing to building a more inclusive, equitable, and sustainable world(IFLA, 2018;Eblida, 2020).

Challenges Facing Librarians towards the Actualization of SDGs

In the context of India, librarians encounter various challenges that impede their efforts in contributing to the realization of SDGs. Some of these challenges include:

- Limited Resources: Many libraries in India, mainly in rural areas, face resource constraints such as inadequate funding, outdated technology, and a lack of modern infrastructure. Insufficient staffing levels can hinder the efficient functioning of libraries, impacting services and outreach programs related to SDGs.
- Digital Divide: India confronts a significant digital divide, with rural areas having limited access to the internet and digital resources access. Librarians face the challenge of bridging this gap to provide equal access to information, hindering progress towards goals such as quality education and reduced inequalities.
- Lack of Awareness: Many individuals, especially in rural areas, may not be aware of the SDGs and their significance. Librarians must proactively raise awareness and educate communities about the goals and how they can contribute to their achievement.
- Language Diversity: India is linguistically diverse, with numerous languages spoken across regions. Librarians may encounter challenges in catering to linguistic diversity and providing resources in multiple languages to reach a broader audience and promote inclusivity.

- Policy and Advocacy: Librarians may encounter challenges related to policy support and advocacy for the importance of libraries in achieving the SDGs. Stronger policy frameworks recognizing and promoting the role of libraries in sustainable development may be needed.
- Environmental Sustainability: Libraries may face challenges related to environmental sustainability, including energy consumption, waste management, and the ecological impact of printed materials. Librarians must explore sustainable practices to align with SDG 12 (Responsible Consumption and Production) and other relevant goals.
- Professional Development: Continuous professional development is vital for librarians to stay abreast of evolving information technologies and best practices. Limited opportunities for training and development can hinder librarians' ability to leverage new tools and methods to support SDG-related initiatives.

Addressing these challenges requires a multi-stakeholder approach involving governments, policymakers, library associations, and communities. Librarians need support regarding resources, training, and advocacy to effectively contribute to the realization of SDGs in India (Samantaray, 2017). Overcoming these challenges can position libraries as powerful catalysts for sustainable development, promoting education, inclusivity, and lifelong learning for all.

Conclusion

The study highlighted the role of libraries and librarians in advancing SDGs, particularly within the context of India. The global challenges of the 21st century highlight the significance of libraries as strategic hubs for disseminating knowledge and fostering social development. The SDGs, established by the United Nations, encompass critical issues ranging from poverty and inequality to education, healthcare, and environmental sustainability. In India, a country marked by cultural diversity and developmental challenges, libraries serve as diverse platforms, and librarians act not only as custodians of information but also as facilitators of knowledge exchange and coordinators of community programs.

The significance of library campaigns in India is emphasized as a crucial strategy for promoting awareness and action towards the SDGs. The campaigns employ various strategies, including awareness and education programs, information dissemination, collaborations and partnerships, technology integration, monitoring and evaluation, and innovative programs. These campaigns are instrumental in empowering individuals with knowledge and skills, addressing

multiple dimensions of the SDGs, and fostering a culture of education, information dissemination, and community engagement.

In essence, the crucial and multifaceted role of libraries and librarians in India contributes to realizing the SDGs. The challenges outlined highlight the need for collective action to support libraries in their mission to be catalysts for sustainable development, promoting education, inclusivity, and lifelong learning for all.

References

1. Abata-Ebire, B. D., Adetayo, A. J., & Ojokuku, B. Y. (2018). Achieving Sustainable Development Goals (SDGs) In Nigeria : The Roles of Libraries. *International Journal of Applied Technologies in Library and Information Management*, 4(2), 89–95.

2. Africa, Ucpsar. (n.d.). The Sustainable Development Goals. https://ucpsarnet.org/sdgs

3. Banerjee, B. (2017). National Health Mission. *DK Taneja's Health Policies and Programmes in India*, 86–86. https://doi.org/10.5005/jp/books/13071_8

4. Brundtland, G. H. (2018). Sustainable development: The challenges ahead. *Sustainable Development*, *1*, 32–41.

5. Chuenchom, S., Wimonsittichai, N., Chaimin, C., Ammarukleart, S., Timakum, T., Putthima, S., & Wipawin, N. (2022). Libraries for Sustainable Development Goals (SDGs). *TLA Bulletin*, *66*(2), 1–27.

6. Eblida. (2020). Sustainable Development Goals and Libraries–First European Report. *Journal of Language Relationship 16*(1-2), 3-39. https://doi.org/10.31826/9781463240134-toc

7. Ejiro, U. S., & Stella, E. (2019). The Roles of Librarians and Libraries Campaign as a Strategy for the Attainment of Sustainable Development Goals in Nigeria. *International Journal of Research and Innovation in Social Science*, 3(4), 2454–6186.

8. Government of India. (n.d.). *DAY-NRLM Aajeevika*. https://aajeevika.gov.in/

9. Government of India. (2019). Pradhan Mantri Jan-Dhan Yojana | Department of Financial Services | Ministry of Finance. In *Government website* (86163). https://www.pmjdy.gov.in/scheme%0Ahttps://pmjdy.gov.in/account%0Ahttps://pmjdy.gov.in/scheme%0Ahttp://www.pmjdy.gov.in/account

10. *Home | NITI Aayog*. (n.d.). https://www.niti.gov.in/

11. IFLA. (2018). *Libraries and the Sustainable Development Goals: a Storytelling Manual*. 1–29.https://www.ifla.org/files/assets/hq/topics/libraries-development/documents/sdg-storytelling-manual.pdf

12. India. Ministry of Education. (2023). *Major Initiatives | Government of India, Ministry of Education*. https://www.education.gov.in/en

13. Kapur, A., Aggarwal, A., & Deshpande, D. (2018). Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) GOI, 2017-18. In *Budget Briefs* (Vol. 9, Issue 3). www.nrega.nic.in.

14. *Ministry of New and Renewable Energy, Govt. of India*. (2019).

15. NSDC. (n.d.). *National Skill Development Corporation, Ministry of Skill Development and Entrepreneurship, Government of India*.

16. Onwubiko, E. C. (2021). Role of librarians and libraries in the realization of the United Nations Sustainable Development Goals: An empirical study Nations Sustainable Development Goals: An empirical study, *Library Philosophy and Practice (e-journal)*. 6497.

17. *PMUY : Home*. (n.d.). https://www.pmuy.gov.in/

18. Prime Minister's Office. (2017). Swachh Bharat Abhiyan | Prime Minister of India. In *Government of India*. https://www.pmindia.gov.in/en/major_initiatives/swachh-bharat-abhiyan/

19. Rajan, C. (2017). Digital India. In *International Journal of Emerging Research in Management and Technology,* 6(10), 49.

20. Samantaray, M. (2017). Role of Libraries in Quality Education for Achieving SDG. *Journal of Advances in Library and Information Science*, *6*(1), 31–35. http://www.albayan.ae

21. Singh, S. (2010). Librarians as Information Providers and Facilitators : The Irving K. *Barber Learning Centre as a Model for the Expansion of the Role of Academic Libraries in University-Community Management,* 1–8.

22. Subramanian, S. V. (2023). *India, its SDG pledge goal, and the strategy to apply*.

23. Unegbu, M. C., Immaculata, O., & Emuchay, B. N. (2023). Information Literacy and Sustainable Development Goals Implementation: The Role of Libraries and Librarians. *International Journal of Social Science and Education Research Studies*, *03*(01), 107–112.

24. UNICEF. (2020). Gender equality | UNICEF. In *Unicef*.

25. United Nations. (2020). United Nations Sustainable Development (SDGs) – 17 Goals to Transform Our World. In *United Nations*. https://www.un.org/sustainabledevelopment/

26. United Nations Development Programme. (2021). Sustainable Development Goals | United Nations Development Programme. In *United Nations Development Programme*. https://www.undp.org/sustainable-developmentgoals%0Ahttps://www.undp.org/sustainable-development-goals%0Ahttps://www.undp.org/sustainable-development-goals?utm_source=EN&utm_medium=GSR&utm_content=US_UNDP_PaidSearch_Brand_English&utm_campaign=CENTRAL&c_s

27. Walia, S. (2023). *India's Achievements in Sustainable Development Goals and the Role of Social Capital*. https://www.linkedin.com/pulse/indias-achievements-sustainable-development-goals-role-smriti-walia.

Academic Libraries' Community Engagement Initiative For Sustainability: A Study on the Selected College Libraries of Golaghat District, Assam

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ABSTRACT: This study explores the role of academic libraries in fostering community engagement programs for sustainability in Golaghat district, Assam. It emphasizes the vital responsibility of libraries to provide equal access to information and knowledge, transcending beyond the campus community to serve a broader population. The literature review underscores the transformative potential of library extension services and examines global initiatives aligning with Sustainable Development Goals. Employing a descriptive study approach, the research analyzes major sustainability engagement programs adopted by academic libraries, revealing a positive trend in community participation. Findings indicate widespread awareness and active involvement in eco-friendly initiatives, particularly in seven out of eleven college libraries. While a majority perceives their participation positively, significant challenges such as financial constraints, limited collaboration, and insufficient support underscore the need for strategic interventions. The study contributes valuable insights into the strengths and challenges faced by academic libraries, highlighting their pivotal role in community well-being and sustainable development.

1. Introduction

History has repeatedly proven that society requires "trained minds" to address present problems, identify future ones, and create the foundation for creativity. When it comes to several responsibilities for the welfare of humanity, no other institution has ever received as much recognition as the library. Since libraries retain written records of human history and knowledge, they support educational progress and contribute to social, cultural, political, economic, and recreational transformations. However, it is the library's responsibility to ensure that the intended users receive the necessary information which would include not only the campus community but also a much broader community.

Academic libraries are a crucial part of the formal education system, which spans from primary school to university. These libraries share similar responsibilities in

supporting organizations with their fundamental duties of community services, research, and teaching. They are responsible for producing a skilled workforce contributing to the country's progress. Along with its primary users, an academic library should also provide its resources and services to other members of the community in which it is located. Particularly in rural areas without public libraries, this is increasingly important. While public libraries are not found in every Indian village, every village does have schools, and some even have colleges. Due to this, an academic library needs to do everything in its power to provide equal access to all community members, irrespective of their employment status, religious beliefs, age, class, or ideology. One such service that helps in fulfilling this initiative is the extensive services.

ALA Glossary of Library and Information Science 1983 defines extension services as "*the provision by a library of materials and services (including advisory services) to individuals and organizations outside its regular service area, especially in an area in which library service is not otherwise available*."

Extension services aim to create a stronger bond between the library and the community it serves. Although each library may have its unique vision and set of activities, the objective is always the same: to provide equal access to information and knowledge that will benefit the community. The services and activities offered may vary, but the primary goal is to communicate important issues to improve the community's welfare. This study analyses the major sustainability engagement initiatives adopted by the academic libraries of the selected colleges of Golaghat district, Assam.

2. Objectives

The study addresses the following objectives-

(a) To find out whether or not community participation initiatives are organized.
(b) To explore the major community engagement programme organized by the selected college libraries of Golaghat district for sustainability.
(c) To identify the major problems associated with organizing the community engagement programme.

3. Review of Literature

Chowdhury (2014) proposes a model for studying the sustainability of digital libraries, emphasizing the integration of sustainability into library and information

science education and research. The role of public libraries in community engagement is emphasize by Kumari & Singh (2017), who highlight various extension services such as library orientation, study circles, cultural programs, and mobile library services. These services aim to transform public libraries into social and cultural institutions. Okuonghae & Igbinovia's (2019) study explores how Nigerian academic libraries can contribute to UN developmental goals, emphasizing collaboration to disseminate information. The study identifies challenges like insufficient staff training and poor networking. Embree & Gilman (2020) showcase the transformation of an academic library into a Campus Sustainability Hub, emphasising partnerships and community involvement. Their programming focuses on sustainability research and activism, fostering relationships with like-minded individuals and organizations. Additionally, in the academic context, Bangani's (2023) study assesses community engagement programs in South African academic libraries, revealing alignment with Sustainable Development Goal 4, emphasizing education and lifelong learning. Initiatives include information literacy training, reading promotions, and computer literacy sessions.

4. Scope and Methodology

The survey-based approach of descriptive study was used for the present study. What, where, when, and how questions are investigated in a descriptive study. To gather pertinent data regarding the topic, a structured questionnaire was prepared focusing on the research problem of the study and distributed among the librarians of the selected college libraries of the Golaghat district. Out of eleven college libraries, all were retrieved, constituting a 100% response rate. Tables are used to present the gathered data.

The following college libraries were selected.

Table 1: List of College Libraries Selected for the Study

Sl.No	Name of the College	Name of the Library
1	Dergaon Kamal Duarah (DKD) College	Naren Sharma Library
2	Debraj Roy (DR) College	Debraj Roy College Central Library
3	Jogananda Deva Satradhikar Goswami (JDSG) College	JDSG College Library
4	Sarupathar College	Sarupathar College Library
5	Kamargaon College	Kamargaon College Library

Sl.No	Name of the College	Name of the Library
6	Joya Gogoi college	Joya Gogoi College Library
7	Golaghat Commerce College	Chintataranga Chora
8	Hemo Prabha Borbora (HPB) Girls College	HPB Girls College Library
9	Furkating College	Furkating College Library
10	Marangi College	Marangi College Library
11	Chandra Nath Bezboruah (CNB) College	CNB College Library

5. Sustainable Development Goals and Libraries

The Sustainable Development Goals (SDGs) are a set of 17 goals that all 193 UN Member States have committed to carrying out by 2030. A new set of objectives ensures not only the need for development but also that it must advance equality and be sustainable. Development must be inclusive of all nations with no way to leave anyone behind, even while accounting for distinct national realities. Since the United Nations passed the resolution "Transforming our World: the 2030 Agenda for Sustainable Development" in 2015, there has been a lot of discussion about sustainability. While the environmental and economic aspects of sustainable development are frequently linked to the climate crisis, social sustainability is associated with the problems of widening social and economic divides, segregation, and increasing distrust of social organizations as well as among individuals and groups of people. Since libraries are an essential component of our social infrastructure and promote social services and community involvement, they inevitably support the SDG goals that are focused on individuals. They facilitate evidence-based solutions development for a better and more sustainable future for all by providing access to high-quality research and information.

Ranganathan's Five Laws of Library Science provide a powerful framework for libraries to actively contribute to the achievement of the 17 Sustainable Development Goals (SDGs). Libraries, as vital institutions, can play a transformative role in addressing each SDG. For instance, they can combat poverty by disseminating information on poverty-alleviation schemes, promoting agriculture for zero hunger, conducting health awareness programs for good health, and offering educational resources for quality education. Furthermore, libraries can contribute to gender equality, water resource management, clean energy, and economic growth by organizing relevant activities and providing information. Additionally, they can address inequality, support sustainable cities, advocate responsible consumption and production, engage in climate action, and promote the preservation of aquatic and land ecosystems. Moreover, libraries can foster peace, justice, and strong institutions by organizing discussions on cultural and

political leaders. Lastly, through partnerships, libraries can facilitate information exchange to contribute to the overarching goal of sustainable development.

6. Community Engagement Programs for Sustainability

Libraries can bring diverse Community Engagement Programs for Sustainability to involve community members in eco-friendly initiatives. The Green Reading Challenge is a comprehensive effort to encourage sustainable practices through curated literature and structured reading challenges. Activities include book club meetings, discussions, and collaboration with local authors and environmental experts. The EcoWorkshops initiative facilitates hands-on learning experiences, covering topics like composting, up cycling, energy conservation, and sustainable gardening. The Sustainable Living Lecture Series offers informative sessions on climate change and renewable energy, fostering community education. The Community Green Space Initiative transforms library surroundings into eco-friendly spaces through a community garden, tree-planting events, clean-up initiatives, and educational signage. The Film Series engages the community through regular screenings, discussions, and collaborations with local filmmakers and environmental organizations. Collaboration with schools and organizations is a key focus, aiming to integrate sustainability education into curricula and expand the program's impact.

7. Data Analysis and Interpretation

As previously mentioned, the survey-based approach was adopted to meet the study's objectives, and a questionnaire was given to all the librarians of the selected colleges to gather primary data.

7.1 Organization of community engagement initiatives.

Table 2: Availability of Community Engagement Program

Sl. No	Community Engagement Program	No of Respondents	Percentage
1	Reading Club	5	45.45%
2	Exhibition	2	18.18%
3	Seminars, Conferences, etc	4	36.36%
4	Story Telling Hours	1	9.09%
5	Meetings	6	54.54%
6	Special Talks	7	63.63%
7	Book Display	6	54.54%
8	Fair and Festival	2	18.18%

In response to a question about the existence of community engagement programs, all of the participants answered in the affirmative. Table 2 presents data on the Community Engagement Programs conducted, along with the corresponding number of respondents and the percentage of respondents for each program. The percentages indicate the proportion of respondents involved in each community engagement program, providing an overview of the distribution of participation across various activities.

7.2: Major community engagement programme organized by the selected college libraries of Golaghat district for sustainability.

Upon inquiry, it was revealed that out of the 11 college libraries, seven of them actively participate in organizing community engagement programs aimed at promoting environmental sustainability. This indicates a significant effort towards raising awareness and taking concrete steps towards a greener future. The major community engagement programs that were organized were found to be similar to those shown in Table 2.

7.3 Major problems associated with organizing community engagement programmes.

When evaluating the extent of participation in community engagement programs, the responses revealed a positive trend, with 70% of participants indicating that the programs were perceived as "good," signifying a commendable level of engagement. An additional 23% found the engagement level "satisfactory," while a smaller 7% expressed dissatisfaction, rating it as "poor."

Table 3: Major problems associated with Organizing Community Engagement Programs

Sl. No	Major Problems	No of Respondents	Percentage
1	Financial Constraints	8	72.72%
2	Lack of interest from authority	4	36.36%
3	Poor Staff Strength	1	9.09%
4	Lack of collaboration from the user community	5	45.45%

Table 3 outlines the primary challenges faced in organizing these programs. Notably, financial constraints emerged as the most significant hurdle, with 72.72% of respondents highlighting this issue. This underscores the widespread difficulty organizers face due to budget limitations. Furthermore, 45.45% identified a lack

of collaboration from the user community, suggesting a need for strategies to enhance community involvement.

In addition, 36.36% cited a lack of interest from authoritative figures as a significant challenge. This emphasizes the importance of garnering support from key contributors to ensure the success and sustainability of community engagement initiatives. Lastly, 9.09% indicated that poor staff strength posed a hindrance, emphasizing the critical role of a capable and well-supported team.

In summary, while the majority view participation in community engagement programs positively, challenges such as financial constraints, community collaboration, authority interest, and staff capacity require targeted attention for continued improvement and success.

8. Findings

The study yielded the following key findings:

(i) Everyone surveyed knows about community engagement programs, showing that these programs are recognized by all.

(ii) Seven out of eleven college libraries in Golaghat actively work on programs for a greener environment. This suggests a strong effort from these institutions to contribute to a more eco-friendly future.

(iii) Most people (70%) enjoyed taking part in community programs, and another 23% found it okay. Overall, people had a positive view of their involvement.

(iv) The main issue in organizing community programs is not having enough money, with 72.72% of people saying budget limits are a significant challenge.

(v) Almost half of the respondents (45.45%) think that community members aren't collaborating enough. This finding emphasizes the importance of devising strategies to enhance community involvement and participation.

(vi) More than a third of respondents (36.36%) feel that getting support from authoritative persons is a challenge. This means it's crucial to get key people involved to make community programs successful.

(vii) About 9% of people think that having a small or less skilled team is a problem for community programs. This highlights the need for a capable and well-supported team to make these programs work well.

9. Conclusion

The study sheds light on the crucial role of academic libraries, particularly in Golaghat district, Assam, in fostering community engagement programs for sustainability. The findings reveal widespread awareness and active participation in diverse initiatives, especially those promoting environmental consciousness. The positive perception of program participation is encouraging, with 70% expressing satisfaction. However, significant challenges such as financial constraints, limited collaboration from the user community, and insufficient support from authoritative figures underscore the need for strategic interventions. The study highlights the importance of addressing these challenges to ensure the continued success and impact of community engagement programs. Moreover, the alignment of these initiatives with Sustainable Development Goals reflects the libraries' crucial role in advancing societal well-being and sustainable development. Overall, these findings provide valuable insights into the strengths and challenges faced by academic libraries in Golaghat in their pursuit of community engagement for a sustainable future.

References

1. Bangani, S. (2023). Academic libraries' support for quality education through community engagement. *Information Development*. https://doi.org/10.1177/02666669231152862

2. Birdi, B., Wilson, K. and Cocker, J. (2008). The Public Library, Exclusion and Empathy: A Literature Review, *Library Review, 57*(8), 576-592.

3. Bradley, F. (2016). *Contribution of Libraries to the SDGs*. Retrieved from http://www.ifla.org/files/assest/wlic/201 5/Contribution of Libraries to the SDGs - United Nations Partnerships for SDGs platform.

4. Choudhury, G. (2013). Sustainability of Digital Information Services. *Journal of Documentation*. *69*(50),602-622

5. Choudhury, G. (2014). Sustainability of Digital Libraries: A Conceptual Model and a Research Framework. *International Journal of Digital Libraries.14*, 181-191

6. Embree, J & Gilman, N. (2020). The Library as a Campus Sustainability Hub: A Case Study in Increasing Community Engagement & Collaboration in Sustainability through Academic Libraries. *International Journal of Librarianship*. *5(*2*)*. 26-44. 10.23974/ijol.2020.vol5.2.172.

7. Goulding, A. (2008). Libraries and Cultural Capital*. Journal of Librarianship and*

Information Science, 40(4), 235-237.

8. IFLA, *How do Libraries Further Development?* 2017. Retrieved Nov 9, 2023 from IFLA.org/node/7408

9. Kranish, N. (2005). *Libraries and Democracy. The Cornerstones of Library*. Chicago. American Library Association

10. Kumari,M. & Singh ,S. (2017). Extension Services in Public Library. *World Wide Journal of Multidisciplinary Research and Development, 3* (9), 351-353

11. Mehra, B. and Srinivasan, R. (2017). The Library Community Convergence Framework for community action: Libraries as catalysts of social change, *Libri, 57*(3), 123-139.

12. Melville, N. (2010). Information Systems Innovation for Environmental Sustainability. *MIS Quarterly, 34*(1), 1-21

13. Nathan, L.P. (2012). Sustainable Information Practice: An Ethnographic Investigation. *Journal of the American Society for Information Science and Technology, 63*(11), 2254-2268.

14. Okuonghae, O. and Igbinovia, M. (2019). The Role of Academic Libraries towards the Attainment of Sustainable Development Goals: The Nigerian Perspective. *Convenant Journal of Library and Information Science. 2*(2), 51-68

15. Ranganathan, S. R. (1931). *The Five Laws of Library Science*, Madras Library Association. Madras.

16. Rogers, B. and Robinson, E. (2004). *The Benefits of Community Engagement : A Review of the Evidence*. London

17. Spink, A. (1999). Information Science in Sustainable Development and deindustrialization, *Information Research*, *5*(1), 22-25

18. Taylor, B. and Park R. (2008). *Community Libraries Programme Education: An Overview of the baseline for community engagement in libraries.* London, MLA.

19. Townsand, A.K. (2014). Environmental Sustainability and Libraries: Facilitating User Awareness. *Library Hi-Tech News, 31*(9), 21-23

20. United Nations, the 17 Goals (2015). *Department of Economic and Social Affairs*, Retrieved Nov 9, 2023 from https:sdgs.un.org/goals

21. Watson, R., Boudreau, M. & Chen A. (2010). Information Systems and Environmentally Sustainable Development: Energy Informatics and New Directions for the IS Community. *MIS Quarterly, 34*(1), 23-38

The Role of Anganwadi Workers in disseminating Health-related Information in India: A Literature overview

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ABSTRACT: ***Background*** The Anganwadi program is a government-funded childcare program in India that aims to provide early childhood education, supplementary nutrition, and health care services to children under the age of six. Anganwadi Workers (AWWs) are the frontline workers who deliver the program at the community level. They are responsible for providing a wide range of services, including nutrition counselling, immunization, and health education.

Objectives This review aims to explore the role of AWWs in disseminating health-related information in India.

Methodology A literature review was conducted to identify and analyze relevant studies.

Results The review found that AWWs play a critical role in disseminating health-related information to rural communities in India. They are trusted community members and well-positioned to reach out to people with health education and promotion messages. Studies have shown that AWWs' interventions can effectively improve knowledge of health topics, promote healthy behaviours, and increase the uptake of health services.

Introduction:

The Anganwadi program is a crucial child care program in India established in 1975 as part of the Integrated Child Development Services (ICDS) scheme. "Anganwadi" means "courtyard shelter" in Hindi, and these centres are typically located in rural areas. The program aims to provide services to children under six, including early childhood education, supplementary nutrition, and health care. It is run by the Ministry of Women and Child Development and is considered one of the most extensive childcare programs in the world.

The Anganwadi program plays a crucial role in the development and well-being of young children in India. It focuses on providing holistic care and support to

children during their early years, a critical period for their overall growth and development. Let's explore the different aspects of the program in more detail.

Firstly, the Anganwadi centers offer early childhood education to children. This means that they provide a safe and nurturing environment where children can learn and play. Trained teachers or caregivers engage children in various activities that promote their cognitive, social, and emotional development. They may use toys, books, and interactive games to make learning fun and engaging for the children. Through these activities, children develop important skills such as language and communication, problem-solving, and creativity.

In addition to education, the Anganwadi program also focuses on providing supplementary nutrition to children. Many children in rural areas of India suffer from malnutrition, which can have long-term effects on their health and development. The program ensures that children receive nutritious meals and snacks during their time at the center. This helps to improve their overall health, boost their immune system, and support their physical and mental growth. The meals provided at the Anganwadi centers often include a balanced combination of carbohydrates, proteins, vitamins, and minerals.

Furthermore, the Anganwadi program offers health care services to children. Trained health workers or nurses are present at the centers to monitor the health of the children and provide necessary medical care. They conduct regular health check-ups, administer vaccinations, and provide treatment for common illnesses. This ensures that children receive timely medical attention and preventive care, which is crucial for their well-being. The health workers also educate parents and caregivers about proper hygiene practices, nutrition, and child care, empowering them to take better care of their children's health.

The Anganwadi program also extends its services to pregnant women and nursing mothers. These women receive prenatal and postnatal care, including regular check-ups, nutritional support, and counselling on breastfeeding and infant care. This helps to ensure the health and well-being of both the mother and the child. The program also focuses on educating women about family planning and reproductive health, empowering them to make informed decisions about their own health and the size of their families.

The Anganwadi program is not just limited to education, nutrition, and health care. It also plays a crucial role in community development. The centers act as a hub for various community activities and awareness programs. They organize health camps, immunization drives, and workshops on topics such as hygiene, sanitation, and women's empowerment. The program actively involves parents,

community leaders, and local organizations in its activities, fostering a sense of ownership and collective responsibility towards the well-being of children and the community as a whole.

To better understand the importance of the Anganwadi program, let's consider an analogy. Imagine a young sapling that needs proper care and nourishment to grow into a strong and healthy tree. The Anganwadi program acts as the caretaker of these young children, providing them with the necessary support and resources to thrive. Just like a sapling needs water, sunlight, and nutrients to grow, children need education, nutrition, and health care to develop their full potential. The Anganwadi program ensures that these essential elements are provided to children, giving them a strong foundation for their future growth and success.

In conclusion, the Anganwadi program in India is a comprehensive child care program that focuses on the holistic development and well-being of young children. It provides early childhood education, supplementary nutrition, and health care services to children under the age of six. The program plays a crucial role in addressing issues such as malnutrition, lack of access to education, and inadequate health care in rural areas. By providing a nurturing and supportive environment, the Anganwadi program empowers children to reach their full potential and lays the foundation for a healthier and brighter future.

Objective:

This article provides a comprehensive literature overview on the pivotal role played by Anganwadi Workers in India in the distribution of health-related information. With a focus on their responsibilities, challenges faced, and the impact of their efforts on community health, this review aims to shed light on the critical contributions of Anganwadi Workers in promoting public health awareness. Some of the significant objectives of this review paper includes:

(a) **Examining the role of Anganwadi workers:** The review paper aims to explore the specific role of Anganwadi workers in disseminating health-related information in India. It seeks to understand the responsibilities, tasks, and challenges faced by these workers in promoting health awareness and education among the communities they serve.

(b) **Assessing the effectiveness of health information dissemination:** The review paper aims to assess the effectiveness of the efforts made by Anganwadi workers in disseminating health-related information. It examines existing research and literature to determine the impact of their

interventions on improving health knowledge, behaviors, and outcomes among the target population.

(c) **Identifying the strategies and approaches used by Anganwadi workers:** The review paper aims to identify the strategies, approaches, and methods employed by Anganwadi workers in disseminating health-related information. It examines the different communication channels, tools, and techniques utilized by these workers to effectively reach and engage with the communities they serve.

(d) **Exploring the challenges and barriers faced by Anganwadi workers:** The review paper aims to explore the challenges and barriers faced by Anganwadi workers in disseminating health-related information. It examines the contextual factors, resource constraints, and cultural considerations that may hinder their efforts and impact the effectiveness of health communication.

(e) **Assessing the impact on health outcomes:** The review paper aims to assess the impact of health information dissemination by Anganwadi workers on health outcomes. It examines whether the dissemination of health-related information leads to positive changes in health behaviours, preventive practices, and overall health outcomes among the target population.

(f) **Identifying gaps and areas for improvement:** The review paper aims to identify gaps in the existing literature and areas that require further attention or improvement in the role of Anganwadi workers in disseminating health-related information. It critically analyses the current state of knowledge to determine areas where interventions, training, or policy changes may be needed to enhance the effectiveness of health communication.

(g) **Providing recommendations for policy and practice:** The review paper aims to provide recommendations for policymakers, program managers, and stakeholders involved in the Anganwadi program. It suggests potential strategies, interventions, or policy changes based on the findings of the review to strengthen the role of Anganwadi workers in disseminating health-related information and improve health outcomes among the target population.

Review of literature:

R.K. Chudasama (2013) evaluates supplementary nutrition activities and their related issues at Anganwadi centres. The study found that the beneficiaries needed

more supplementary nutrition and that the SN supply had been interrupted. A consistent and sufficient supply of SN will enhance the service.

S.B. Patil and Doibale M. K. (2013) Study of Anganwadi workers' Profile, knowledge, and problems in ICDS blocks: A cross-sectional study. To assess knowledge of AWWs and problems faced by them while working. In a cross-sectional study, Anganwadi centres were selected by stratified sampling technique. From each block, 10% of AWWs were enrolled in the study. The functioning of AWWs was assessed by interviewing Anganwadi workers for their literacy status, years of experience, knowledge about the services rendered by them, and problems faced by them.

Sandhyarani and Rao (2013), In the article "Role and responsibilities of Anganwadi workers, with special reference to Mysore district," examined the roles and responsibilities of Anganwadi workers in the Mysore district and concluded that these individuals are very active and effective in providing their services to the beneficiaries. They said that Anganwadi employees serve as an interface between the local population and ICDS.

Srinidhi et al.(2013) Suggest implementing regular oral health education sessions to educate AW and raise awareness about oral health. Knowledge assessment about food safety and hygiene, described by Priyanka Sharma et al., revealed that Anganwadi staff and supervisors need more understanding about fortified meals. Therefore, the Department of Women and Child Development should intensify its efforts to raise awareness and ensure that this knowledge is effectively communicated to local communities by front-line workers.

S. Raj. et.al (2014) study compared the effect of two oral hygiene training packages or programs on the ability and knowledge of Chandigarh's Anganwadi workers. Project 1 (A knowledge base training package and Project 2 (A skill-based training package) were provided to AWWs. The impact of the research before and after both projects is compared. The skill-based training package significantly increased the skills of AWWs compared to the knowledge-based training package, indicating its advantages to the latter.

M. Shilpa et.al (2014) reveal that the curriculum of AWW should include oral health care training and skills with general health training.

P. Kakodkar...et.al (2015) The study indicated that workers can serve as effective oral health educators after receiving oral health training. The questionnaire was given to the study group and control group. After the intervention, there was a 42.58% rise in the mean proportion of participants who provided the correct

responses. The finding shows that the study group's dental knowledge has increased, whereas the control group's knowledge has remained the same.

Thakur et al. (2015)'s article "A study to assess the knowledge and practises of Anganwadi workers & availability of infrastructure in ICDS Programme, at district Mandi of Himachal Pradesh" conducted an empirical study on AWWs to access the socio-demographic data, knowledge, and practise of AWWs and AWCs. They discovered that the AWWs needed more knowledge of the services provided under ICDS, were dissatisfied with their pay, experienced delays in receiving funds and other supplies, were overburdened with the burden of record maintenance, and complained of infrastructure-related issues.

R.S. Gambhir et al. (2016) systematically analysed observational research to assess AWW's knowledge and awareness regarding oral health. The results of this review demonstrated that there was insufficient knowledge and awareness of AWWs. Therefore, there is an urgent need for more training in oral disease prevention, treatment and maintenance.

Delivering training to Anganwadi workers can empower them to serve as oral health advisers. refresher training programmes should regularly be conducted to improve the knowledge of grass-root level health workers to ensure good quality services (Urvashi et.al, 2016).

S.S. Baliga and P. R. Walvekar (2017) conducted a cross-sectional survey with 76 Anganwadi workers from each AWW operating under the three urban health centres. A scoring system was developed to evaluate Anganwadi workers' knowledge. Each AWW's knowledge assessment score was calculated based on their responses to a questionnaire.

P. Bhagia..et.al (2018) investigate how the educational level of Anganwadi workers affects the oral health education programme and the preschoolers' oral health in Muradnagar block, Ghaziabad. Early childhood caries, which can also result in malocclusions and many other dental conditions, are among preschoolers' most prevalent dental conditions. According to the findings of this study, one barrier to promoting better oral hygiene among preschoolers is the educational level of Anganwadi workers.

K. Joshi (2018) conducted a study on the profile of Anganwadi workers (AAW) to evaluate the knowledge of AWWs and the challenges they encounter at work. The structure and equipment of AWCs must be enhanced, and AWWs must receive additional in-service training and educational opportunities. In the present study, 55% of AWWs identified various infrastructure-related concerns and limited play

material as their significant problem, whereas 24% reported Insufficient water, electricity and drainage (10%) caused delays in collecting finances and essentials like paraffin oil and cooking supplies, (8%) had honorarium issues. In comparison, only (3%) had record maintenance issues.

Akshatha and Surekha Sankangoudar (2019) measured the knowledge Anganwadi workers provided about children's holistic development.

P. Sharma et al. (2022) conducted a study to verify the food safety and hygiene knowledge of Anganwadi supervisors and North East and North Delhi workers. 30 Anganwadi workers and 40 Anganwadi supervisors were selected by simple random sampling method. The study reflected that Anganwadi workers and supervisors are unaware of fortified foods, so efforts to be expedited by the Department of Women and Child Development to bring out awareness so that the same knowledge could be delivered to local people by front-line workers.

I. Debata and T.S Ranganath (2023) The study attempted to identify the challenges in providing ICDS services by assessing the effectiveness of AWWs, which would increase the well-being of the beneficiaries. Findings suggested that The medical professionals may arrange for refresher training affiliated with the tertiary hospital for the AWWs, working with the regional administrative bodies to enhance their performance in providing ICDS services, such as prompt referral and ongoing follow-up, delivering adequate nutrition and health education to beneficiaries.

Dev HR (2023) states that Udaipur city's Anganwadi and ASHA staff have sufficient oral health literacy. Anganwadi workers should get regular dental health training to increase their effectiveness and knowledge. Oral hygiene, brushing procedures, and other oral health messages should be added to the training manuals and educational materials at Anganwadi centres (Dr Yogesh et.al).

M. Shilpa et.al (2014) reveal that the curriculum of AWW should include oral health care training and skills with general health training. Akshatha and Surekha Sankangoudar (2019) measured the knowledge Anganwadi workers provided about children's holistic development.

Discussion and recommendations:

The past literature analyses the evaluation of health-related information comprehension among Anganwadi workers in India, emphasising the significant contribution of these frontline health workers in advancing mother and child health in the nation. The findings indicate a diverse range of comprehension and consciousness among the Anganwadi workers, revealing both areas of expertise

and deficiencies in their knowledge foundation.

An important finding from the literature assessment is the need for health information understanding across various locations and communities. While several Anganwadi workers showed a thorough comprehension of crucial health practices, others displayed a restricted awareness, particularly in distant and underserved regions. This highlights the necessity for focused actions to address the need for more information health information in all areas.

Moreover, the literature also highlights the significance of continuous training and capacity-building initiatives for Anganwadi workers. Efficient training programs may comprise workshops, seminars, and technology-based learning modules to augment their comprehension of vital health practices, illness prevention, and nutrition. Enhancing the workers' knowledge base can significantly enhance healthcare delivery, improving health outcomes, particularly for vulnerable groups like pregnant women and children.

Furthermore, the literature study emphasises fostering community involvement and consciousness. Involving local populations in health-related activities helps cultivate a conducive atmosphere for the successful execution of health programs. Additionally, it can provide Anganwadi workers with the essential tools and resources to effectively tackle the unique health issues that are widespread in their communities.

The result

According to the study's findings, Accredited Social Health Activists (AWWs) played a crucial role in disseminating health-related information to rural areas in India. These people hold a high standing in society and are in an advantageous position to communicate health education and promotion messages to others in an efficient manner. Research has established that the interventions carried out by Accredited Social Health Activists (AWWs) can effectively promote understanding of health-related topics, encourage healthy practises, and boost the use of healthcare services.

Challenges faced

Despite the tremendous importance of the issue, AWWs have a number of challenges when attempting to successfully disseminate information relating to health. The following are some examples of the challenges:

- Knowledge and capabilities that are severely lacking
- An excessive amount of labour is required.
- Assistance that is insufficient

Strategies for Improvement

It is possible to improve the function that AWWs play in the dissemination of health-related information in a number of different ways. The following are the strategies:

- Providing Auxiliary Women Workers (AWWs) with in-depth training on a variety of topics related to health.
- Allowing unlimited access to educational materials and other resources for Auxiliary Women Workers (AWWs).
- reducing as much as possible the workload of Auxiliary Women Workers (AWWs).
- Making certain that Auxiliary Women Workers (AWWs) have adequate support.

Conclusion

In India, AWWs are crucial in the dissemination of knowledge concerning various aspects of health. We can further enhance their effectiveness in advocating for health and well-being in the communities they serve if we address the challenges they face and provide them with the assistance they require.

The findings of this analysis will have substantial repercussions, not only for the formulation of policies but also for their actual application. The following are some proposals that should be taken into consideration by policymakers:

- Increase the amount of money that is set aside for the Anganwadi programme so that Accredited Social Health Activists (ASHAs) can receive the appropriate level of education and access to the necessary materials.
- Develop and carry out procedures that will reduce the amount of work that Accredited Social Health Activists (AWWs) need to do.
- Make it a priority to offer the AWWs the assistance they require so that they can carry out their responsibilities effectively.

The following are some considerations that should be taken into consideration by practitioners:

- Collaborate with Accredited Social Health Activists (AWWs) to determine what training requirements they have and to assist them in enrolling in relevant training programmes.
- Develop and disseminate individualised instructional materials and supplementary resources that have been meticulously crafted to cater to the special needs of AWWs.
- Make sure that AWWs have access to reliable supervision and support at all times.

References:

1. Basavaraj, S. P., Basha, S., Kumar, P. G. N., Manjunath, P. G., Hirekalmath, S. V., & Imranulla, M.(2013). Knowledge of early childhood caries among anganwadi workers in davangere city, India. *International Journal of Oral Health Sciences*, *3*(2), 75-78

2. Gambhir, R. (2016). Knowledge and awareness regarding oral health among anganwadi workers in India: A systematic review. *Journal of Indian Association of Public Health Dentistry, 14*(2), 231-236.

3. Gotarkar, S., & Ingole, A. (2018). Knowledge of anganwadi worker with respect to early childhood development. *Journal of Datta Meghe Institute of Medical Sciences University*, *13*(4), 168-170.

4. John, A. N. (2020). Factors influencing the performance of community health workers: a qualitative study of Anganwadi workers from Bihar. *Plos one, 15*(11).

5. Joshi, K. &. (2018). Knowledge of Anganwadi workers and their problems in Rural ICDS block. *IP Journal of Paediatrics and Nursing Science, 1*(1), 8-14.

6. Kakodkar, P. M. (2015). Anganwadi workers as oral health guides: An interventional study. *J Dent Res Sci Develop, 2*(2), 33-37.

7. Patil, K. S. (2016). Knowledge and utilization of integrated child development services (ICDS) scheme among women in an urban slum-a community based study. *Indian J Forensic Community Med, 3*(4), 261-71.

8. Raj, S. G. (2014). Raj, S., Goel, S., Goel, N. K., Sharma, VEvaluation of short term impact of two training packages on oral health knowledge and skills of Anganwadi workers of a Northern City of India: Before and after comparison study. *SRM Journal of Research in Dental Sciences,, 5*(4), 237

9. Sankangoudar, S. (2019). Knowledge perception of Anganwadi workers regarding overall development of children. *Journal of pharmacognosy and Phytochemistry*, *8*(3), 1938-1942.

10. Sharma, P., Zubair Meenai, D. H., Patel, A., & Chopra, N. (2022). Assessment of knowledge of ICDS supervisors and workers towards food safety and hygiene. *Journal of Current Research in Food Science*, *3*(2), 23-6.

11. Shilpa, M., Jai, J., Ananda, S. R., Hiregouda, M., Abhishek, K. N., & Sneha, C. K. (2014). Knowledge, attitude, and practices of anganwadi workers regarding oral health of children in Virajpet Taluk. *Journal of Advanced Oral Research*, *5*(3), 18-23.

12. Thakur K, C. H. (2015). Thakur K, Chauhan H, G A study to assess the knowledge and practices of Anganwadi Workers & availability of infrastructure in ICDS program at District Mandi of Himachal Pradesh. *International Multidisciplinary Research Journal (RHIMRJ), 2*(1), 1-6.

13. Urvashi, A. C., Sharma, S., Girdhar, S., Satija, M., Kaushal, P., & Chawla, J. (2016). Assessment of impact of training on knowledge of Anganwadi Workers of district Ludhiana, Punjab: pre and post training evaluation. *NUTRITION*, *57*(143.4), 0-001.

14. Yogesh, S. A., Mamta, T. B., & Satpathy, S. K. (2015). Knowledge, attitude and practice of Anganwadi workers about oral health in Palwal district. *Int J Adv Res*, *3*(10), 1958-1965.

Unveiling the Keystone: A Comprehensive Exploration of Behavioral Competencies of Librarians for Fostering Sustainable Library Development

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ABSTRACT: Purpose: The advancement of science and technology has significantly enhanced and facilitated the delivery of information to users, and it has compelled librarians to expand their areas of responsibility to keep up with society's needs and trends for sustainable development. This study's main purpose is to explore librarians' behavioural competencies for sustainable library development.

Design/ approach: The study is fundamentally analytical and qualitative in nature. The analysis of behavioural competencies and sustainable development goals is done one by one. The attempt is made to establish a relationship between sustainable development goals, library, and behavioural competencies of librarians. For an effective result for this study, we analyzed six Government-aided general degree college libraries of Darjeeling District, West Bengal.

Findings: The present study explores various discussions and ideas about the innumerable aspects of librarians' behavioural skills and competencies that are crucial for sustainable library development and focuses on the required behavioural competencies of LIS professionals in the contemporary information system for fostering sustainable development goals.

Practical implications: This study will be helpful for library professionals to develop their competency according to the needs of the hour. Librarians' responsibilities in the twenty-first century increasingly include advocacy, setting the pace and creating the image, managing knowledge resources, developing information technology, providing user services, managing human resources, sharing resources, networking, etc. By articulating these behaviours, librarians can play a vital role in fostering a culture of sustainability and contributing to the achievement of sustainable development goals.

1. Introduction:

Competencies refer to the essential skills, knowledge, abilities, and additional traits necessary for proficient job execution, according to Jackson and Schuler (2003). In contrast, a competency is a group of specified behaviors that furnish a systematic framework for recognizing, assessing, and fostering these behaviors in individual employees, as outlined by B. W. Palm (2004). Competency plays a vital role in enhancing professional progress and defining the goals and objectives of an organization. In the library, the Librarian plays a crucial role in supporting sustainability development by facilitating access to information, promoting literacy, and fostering a culture of lifelong learning. It's crucial to emphasize that libraries and librarians play a vital role in enhancing services that promote stakeholder involvement and acceptance through their sharing, collaboration, and facilitation mechanisms. The users' familiarity with their libraries enables the sensitivity, acknowledgment, and visibility of opportunities and challenges associated with the implementation of Sustainable Development Goals. As it was pointed out by researchers, that in every sector in the world depends on the library for its knowledge and resources, and the library has all that is required to support the sustainable development goals to be achieved because of its characteristic dependability and inclusiveness (Gani et al., 2019). Competencies are the characteristics employers look for in their employees. Many competency studies have been done to analyze the need for necessary competencies to achieve fixed targets and make the organization successful. The competencies are based on the organization's values, sharpen the professional's ability, and contribute to organizational success in the long run. Behavioural competencies encompass knowledge, skills, attitudes, and actions that distinguish excellent performers. Librarians and libraries should get involved in advocacy programs such as road-walks, distributing informative flyers, radio jingles, and social media campaigns to inform the public about the SDGs. To effectively contribute to sustainability development, librarians should possess a set of behavioural competencies that align with the goals and principles of sustainable development (Chakrabarty R., & Sharma. J,2015). In this paper, the authors try to explore the behavioural competencies of librarians for sustainable library development.

2. Literature review:

In Considering significant technological changes in the profession, researchers over the last decades have studied a variety of issues and trends related to the roles and competencies of library professionals. Below is a summary of relevant studies.

As librarians take responsibility for promoting library resources and their expertise, they may find their role moving from information providers to mentors who empower library users as independent researchers. (Ferebee and Davis, 2011) The Chartered Institute of Library and Information Professionals (CILIP, 2002) notes that many professionals now have information-intensive roles and argues that "information management and specialization is not the exclusive preserve of the information profession". Librarianship's traditional purpose, as defined by Rubin (2004), is service that not only meets the information needs of individuals but, more importantly, communicates knowledge for the betterment of the individual and society.

Recent technological developments have brought a sea change in information production, leading to information explosion, which affects information acquisition, circulation, and usage. Technological, organizational, and educational differences significantly affect the library and information profession, as observed by Corrall (2005). These changes have expanded librarians' role as educators, which matches the evolution of new technology (Hao-Chang, Kuannien, Chishu & Wen-Hui, 2011).

Traditional competencies included knowledge of the profession and skills such as cataloguing, classification, indexing, and abstracting, besides personal attributes that make a library professional successful. (sengi.s,2015) With technological advancements, new competencies have evolved, which require an employee to have advanced technological knowledge and skills to handle the latest technology. Reviewed articles suggested new competencies, including knowledge of information architecture, computers, web applications, online searching, metadata standards, and markup language, besides having a basic understanding of the profession. The desirable skills mentioned in the literature are marketing, negotiating, and leadership, computer, ICT, and communication skills. The library also influences the conceptualization of its roles; however, from the pool of many quotes, the quote by Luis Herrera was adopted, which states that: "Libraries are more relevant than ever. They are a place for personal growth and reinvention, a place for help navigating the information age, a gathering place for civic and cultural engagement, and a trusted place for preserving culture"(sengi,2015).

3. Statement of the problem:

This study is entitled "**Unveiling the Keystone: A Comprehensive Exploration of Behavioural Competencies of Librarians for Fostering Sustainable Library Development**." Behavioral competencies refer to behaviors, attitudes,

or personal traits that serve as indicators of a candidate's potential success in a job application. These competencies encompass knowledge, skills, and actions that set a candidate apart from others in the hiring pool. According to IFLA's guidelines' *How libraries contribute to Sustainable Development & the SDGs IFLA ALP: Building Better Library Communities'* the library is related to all 17 Goals of sustainable development goals. So, librarians need the skills and competencies to serve their users efficiently. For this purpose, library professionals needed to develop their behavioural competency level to build strong relationships between users and professionals. So, the statement of the problem may be extended "***to find out how behavioural competencies act as a useful tool for sustainable library development to fulfilling sustainable development Goals***."

So, the statement of the problem warrants some **Research Questions,** which are as follows:

1. How are libraries related to sustainable development goals?
2. How do librarians' behavioural competencies affect sustainable development goals?
3. What are the major roles of behavioural competencies of librarians for sustainable development goals in libraries?
4. What are the impacts of behavioural competencies of librarians in sustainable development goals?

4. Objectives of the study:

The objectives of this study are:

- To explore various discussions and ideas about the numerous aspects of behavioural skills and competencies crucial for sustainable library development.
- To explore LIS professionals' existing and required behavioural competencies in the contemporary information system.
- To elucidate the role of behavioural competencies of librarians in the sustainable development of libraries.
- To exhibit the impact of behavioural competencies of librarians in sustainable development goals.

5. Research Methodology:

The study is fundamentally analytical and qualitative. The analysis of behavioural competencies and sustainable development goals is done one by one. The

attempt is made to establish a relationship between sustainable development goals, library, and behavioural competencies of librarians. Here, we use IFLA's guidelines for 'libraries and sustainable development goals' a storytelling manual as strategies for this study connecting libraries and sustainable goals, and outline effective behavioural competencies of library professionals. Lastly, we analysed six government-aided general degree college libraries in the Darjeeling district, west Bengal, for the effective result of this study.

6. Behavioural competencies of librarians:

Competencies are components of a job that are reflected in behaviour that is observable in a workplace. The most frequently mentioned common elements are knowledge, skills, abilities, aptitudes, personal suitability behaviour, and impact on performance at work. (Sangi, 2015, p-14). However, the common denomination is 'observable behaviour in the workplace. The criteria of competency are superior performance and effective performance.



Source adopted from Spencer and Spencer (1993:11-15)

Fig. 1 : Competencies Model

To understand and identify the existing and required behavioural competencies we have conducted a survey has been carried out. We have selected six government-aided general degree college libraries in the Darjeeling District for these findings. The colleges are Siliguri College, Siliguri College of Commerce, Siliguri Mahila Mahavidyalaya, Munshi Premchand College, Naxalbari College, and Kalipada Ghosh Tarai Mahavidyalaya. The following results are found:

Table 1: Variables of Behavioural Competencies

Behavioural Competencies	**Total score**	**Mean**
Effective communication skills (ECS)	400	66.67
willing to further study (WTFS)	420	70.00
Organize various workshops/seminars (OVW/S)	380	63.33
Organize a continuing education program (OCEP)	340	56.67
Adaptability to work in a changing environment (AWCE)	400	66.67
Creative thinking (CE)	400	66.67
Recognize the value of professional thinking (RVPT)	360	60.00
Approachable behaviour (AB)	380	63.33
Committed to lifelong learning and personal career planning (CLL &CP)	360	60.00
Advocacy and policy engagement (A& PE)	320	53.33
Manage time for personal development (MTPD)	340	56.67

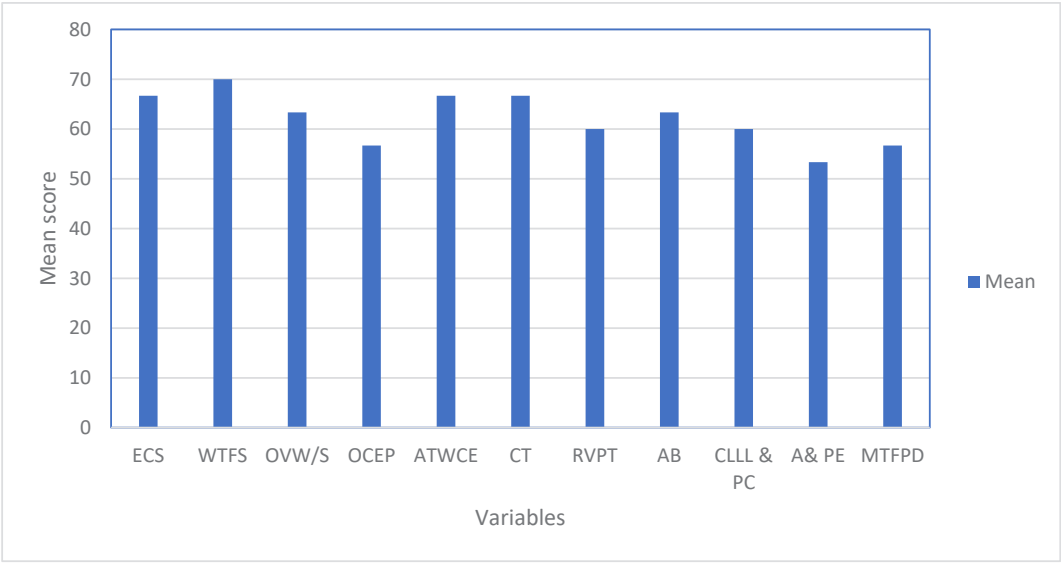


Figure 2: variable of behavioural competencies

The following variables are considered for the analysis of behavioural competencies. These are Effective communication skills, Willing to study further, Organize various workshops/seminars, Organize a continuing education program, Adaptability to work in a changing environment, Creative thinking, Recognize the value of professional thought, Approachable behaviour, Committed to lifelong

learning and personal career planning, Advocacy and policy engagement, Manage time for personal development. The total score for an individual variable is given as 100. The weightage score of particular variables is based on the performance activity done by the librarian. The second variable, i.e. willingness to further study, scored highest (420 out of 600) among all variables of behavioural competencies. The tenth variable, i.e. Advocacy and policy engagement, scored lowest (320 out of 600). According to this mean score, it can be readily interpreted that the respondents have given maximum importance to the three components: 1. Effective communication skills, 2. Adaptability to work in a changing environment, 3. Creative thinking and less engagement in two components: 1. Advocacy and policy engagement, 2. Manage time for personal development.

7. Libraries and sustainable development goals:

The library stands as the core of any institution. Recent research characterizes sustainable development as the comprehensive transformation of a nation's economic, social, political, educational, religious, and cultural values, with the aim of improving human dignity and the overall well-being of its citizens. The Sustainable Development Goals (SDGs) hold global significance, aspiring to create a more favorable world for habitation. Sustainable development is a proactive initiative designed to address the needs of both current and future generations. As Nicholas and Perpetual (2015) posit, sustainable development entails a holistic advancement in any society concerning individual progress. Encompassing a broad spectrum of interconnected environmental, economic, social, and political concerns, sustainable development operates within the constraints of the Earth's natural resources to ensure universal peace and prosperity by the year 2030. Moreover, Shah (2012) defines sustainable development as the kind of development that enhances the quality of life for present and future generations. The selection of sustainable development goals in 2015 resulted from a global consultation process. These goals encompass:

Table 2: Sustainable development goals

Goal 1	No Poverty
Goal 2	Zero hunger
Goal 3	Good health and well-being
Goal 4	Quality education
Goal 5	Gender Equality
Goal 6	Clean water and Sanitation

Goal 7	Affordable and clean energy
Goal 8	Decent work and economic Growth
Goal 9	Industry innovation and infrastructure
Goal 10	Reduced Inequalities
Goal 11	Sustainable cities and communities
Goal 12	Responsible consumption and production
Goal13	Climate action
Goal 14	Life below water
Goal 15	Life and Land

The IFLA Statement on Libraries and Development (2013) states that libraries contribute to the delivery of Sustainable Development in the following ways:

- Libraries provide opportunities for all.
- Libraries empower people for their self-development.
- Libraries offer access to the worldwide knowledge.
- Librarians provide expert guidance.
- Libraries are part of a multi-stakeholder society.

For library inclusiveness, the activities of librarians go beyond listing, taking charge, and delivering relevant information to the users to drive and actualize sustainable developmental goals. Therefore, librarians must provide well-articulated services and target by item the goal according to the mandate of the library and the audience they serve. IFLA has also developed a manual for 'The Libraries and the Sustainable Development Goals (SDGs) ' – a storytelling manual and a guide for librarians and library advocates to support librarians' advocacy efforts. The Library Map of the World (LMW) team has compiled tips and valuable information for writing compelling stories about library activities, projects, and programs and their impact on communities.

8. Impact of librarians' behavioural competencies on sustainable development in libraries:

After the above discussions, we have proposed some comprehensive (required) behavioural competencies and actions that can be very effective for the library community for sustainable development in libraries. These are as follows:

8.1 Information Literacy Advocacy:

- **Behavioural Competency:** Librarians should actively advocate for information literacy as a key skill for individuals to make informed decisions related to sustainability.
- **Actions:** Develop and promote programs that enhance information literacy skills, collaborate with educators to integrate information literacy into the curriculum, and create resources that support information literacy in the context of sustainability.

8.2 Community Engagement:

- **Behavioural Competency:** Actively engage with the community to understand its needs and provide relevant resources and services that support sustainable practices.
- **Actions:** Organize community events, workshops, and outreach programs on sustainability topics, seek feedback from the community, and collaborate with local organizations working on sustainability initiatives.

8.3 Digital and Environmental Stewardship:

- **Behavioural Competency:** Demonstrate a commitment to minimizing the environmental impact of library operations and promoting digital resources to reduce paper use.
- **Actions:** Implement sustainable practices in library operations (such as energy-efficient lighting and recycling programs), advocate for the use of digital resources, and explore partnerships with publishers for sustainable content delivery.

8.4 Inclusivity and Diversity:

- **Behavioural Competency:** Foster an inclusive and diverse environment within the library that reflects the principles of sustainability and social responsibility.
- **Actions:** Curate a diverse collection of resources, promote inclusivity in library programs and services, and create a welcoming space for all community members, irrespective of their backgrounds or perspectives.

8.5 Lifelong Learning and Professional Development:

- **Behavioural Competency:** Demonstrate a commitment to continuous learning and professional development in sustainability and related fields.
- **Actions:** Attend relevant conferences and workshops, stay informed about current trends and issues in sustainability, and share knowledge with colleagues and the community.

8.6 Partnership and Collaboration:

- **Behavioural Competency:** Actively seek and foster partnerships with local organizations, educational institutions, and businesses working towards sustainability goals.
- **Actions:** Collaborate on joint initiatives, share resources, and participate in community networks focused on sustainability.

8.7 Advocacy and Policy Engagement:

- **Behavioural Competency:** Advocate for policies that support sustainable practices and contribute to developing local, national, or international sustainability initiatives.
- **Actions:** Engage with policymakers, contribute expertise to relevant policy discussions, and advocate for integrating sustainable principles in library policies.

8.8 Critical Thinking and Problem-Solving:

- **Behavioural Competency:** Apply critical thinking skills to assess information, identify challenges, and develop solutions contributing to sustainability goals.
- **Actions:** Provide guidance on evaluating information sources, develop strategies to address community-specific sustainability challenges, and contribute to broader sustainability discussions.

These competencies can collectively contribute to the Librarian's role as a facilitator of knowledge and a promoter of sustainable practices within their communities. By embodying these behaviours, librarians can play a vital role in fostering a culture of sustainability and contributing to the achievement of sustainable development goals.

9. Conclusion:

After the whole study, it is concluded that the library can be seen as a major resource in fulfilling all the 17 sustainable development goals. To achieve that each and every librarian should play a pivotal role by adhering to the above mentioned proposed behavioural competencies. Government can take an initiative to provide appropriate resources along with a specific government policy to enhance behavioural competencies.

References:

1. Anderson, M. P. (2020). "Information Literacy and Instructional Competencies for Librarians: A Review of Current Trends." Reference Services Review, 48(3), 291-307.

2. Baker, S. E. (2021). "Ethical Competencies in Librarianship: A Framework for Professional Practice." Library Management, 42(1/2), 42-56.

3. Brown, C. D. (2015). "Leadership Competencies for Academic Librarians." College & Research Libraries, 76(4), 430-446.

4. Ekere, J. N., Benson, O. V., & Amaechi, N. (2016). Areas of Partnership between Non-Government Organizations, Private Sector and Libraries towards Actualization of Sustainable Development Goals in Nigeria. Paper Presented at Nigerian Library Association Conference/AGM, Funtaj Academy, Abuja.

5. Garcia, E. A. (2023). "Assessing the Technological Competencies of Academic Librarians: A Comparative Study." Journal of Information Science, 49(1), 87-104.

6. Johnson, B. R. (2012). "Communication Competence in Librarians: A Key to Effective Service." Journal of Librarianship and Information Science, 44(2), 89-102.

7. Johnson, L. K. (2019). "Cultural Competence in Library Services: A Review of Literature and Implications for Librarians." Public Library Quarterly, 38(1), 52-68.

8. Martinez, J. M. (2018). "Teamwork and Collaboration in Libraries: A Study of Competencies and Best Practices." Journal of Academic Librarianship, 44(5), 591-598.

9. Smith, A. (2010). "The Role of Emotional Intelligence in Librarianship." Library Trends, 58(3), 349-366.

10. Thomas, R. J. (2022). "Digital Literacy Competencies for Librarians in the 21st Century." Information Technology and Libraries, 41(2), 56-72.

11. White, H. F. (2023). "Strategic Planning and Management Competencies for Librarians: A Case Study Analysis." Library Administration & Management, 57(3), 187-204.

Innovative Library Services in Library and Information Centres including COVID 19 Period

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ABSTRACT: This Article is about the library and ICT implementation of library services. Hybrid libraries are having different types of collections from print with electronic collections. The services they started providing from the normal reference service, circulation, document delivery, current awareness service, photocopy, etc. As the technology has changed, the libraries started creating their own digital libraries with servers and implementation of RFID technologies, etc. For the DBs and e-resources they try to use the cloud computing facilities. The libraries started providing Innovative information services from digital library, cloud computing, mobile technology applications, augmented reality, social media applications, etc. It also emphasized the services being provided during COVID 19. Almost all the libraries have updated their homepage with COVID related information in order to help the society as a whole, not only making the e-resources available online for their users during this period. They also took the assistance from the publishers for the already subscribed e-resources to have access remotely also. It is suggested that librarians have to think creatively to support and provide innovative information services to their users' needs at all time.

KEYWORDS: innovative services, covid 19, ICT, cloud computing, augmented reality.

Introduction

Libraries started as store houses, where books were more preserved than utilized and librarians acted like some form of custodians and their interaction with users were minimal, for example only in locating books and serving users, then there was a shift as a result of information communication technology. The users were expected to use the library on their own. At most, if a user asked for a book, then the service that would be offered by the librarian was to pass on the book and leave the user alone. From the ancient times to present, this trend in services has tremendously changed to due information technology. Librarians play an important role in providing access to information, organizing it, and helping users to find the information they need. Consequently, information services have become a key

element for libraries. The present user's interest is to get the information in need within a given timeframe. For example, the timeframe for a surgeon preparing for an operation before entering a theatre is much shorter and critical than that of a teacher preparing for the next lecture. However, the present users are able to access to the vast amount of information on the Internet and online databases. For the Libraries, ICTs has tremendously changed the management of resources or housekeeping operations as well as the way services are delivered. While general IT application tools and Integrated Library Management Systems are largely used in housekeeping operations, like acquisition, cataloguing, circulation control, serials control etc; Internet has been used extensively as a resource as well as a tool to deliver the Library and Information Services. The advancement in information technology enhancing information access and dissemination opens a vista for the adoption of innovative tools for the provision of library instruction and services to the library patrons. In this Article it has been discussed regarding the different types of collections and the innovative services provided by libraries using the available technological opportunities.

Types of Collections

Libraries used to have only print collections of different type of resources like books, periodicals, thesis, standards, etc. Due to the advancement of technology the resources are now available in e-format. Therefore, the libraries are trying to procure either on its own or through co-operative methods of consortia different types of e-resources to satisfy their users different types of information needs.

E-Resources

An electronic resource, also known as an e-journal, e-book, and online databases in varied digital formats, webpages (.html, .asp, etc.), adobe acrobat documents (.pdf), etc. E-resource is a book publication made available in digital form, consisting of text, images, or both readable on the flat-panel display of computers or other electronic devices. E-resources mainly include e-books, e-journals, e-reference works, scholarly databases, online e-book libraries, value-added information portals, etc. (Fig. 1).

Users are subscribed to e-resources (e-books, e-journals, and databases, etc.) by the higher educational institution to provide current information within the stipulated time.

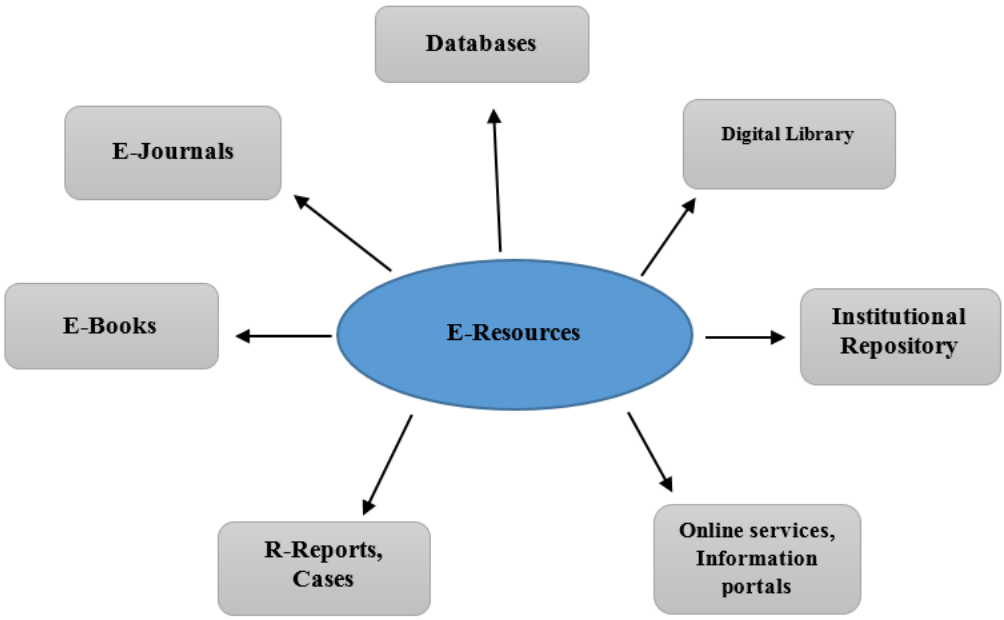


Fig. 1. Different types of E-resources

Most major publishers prefer to publish e-editions before the print edition arrives. In the case of journals, the e-edition is published one month before the publisher of the print edition. The abundance of URLs and web sites on library portals and library sites makes it difficult for information professionals to manage them. Currently, many different access models are being offered by publishers for e-resources. Some of the E-Databases include EMBASE, Web of Science, Science Direct, Wikipedia, Springer Link, J-Gate, Capital Line, EBSCO, Info Track, SCOPUS, UpToDate, Clinical Key, Jaypee Digital, DOAJ, Nature, Mathscinet, etc. The collections depend upon the types of libraries. For example, college library should stock recommended text books, periodicals and serials needed for the curricula, reference and rare books required for special studies, general books for making the students book conscious and materials needed for faculty members. The collections in university libraries have wider scope as they include, besides the prescribed text books, classics, special and rare book collections, major reference books which are highly priced, complete sets and files of academic and scholarly journals, government publications, union catalogues, patents, standards, bibliographies, dissertations and theses, etc., and provide access to electronic publications on CD-ROMs or online. The other types of E-resources are Digital libraries, Institutional repository and Library Portal, which are created and maintained by the library / organisation / institution.

The consortia play an important role in acquiring licenses and sharing electronic resources by acting as a platform for promoting activities and programs in the area of electronic resources sharing. A consortium is community of two or more information agencies which have formally agreed to co-ordinate or consolidate certain function to achieve mutual objective. The consortium was offered very attractive prices form the vendors not only because combined strength of its members of also due to the edgeless of publishers to enter the Indian Market. Other than these e-resources, there are other open access resources like open access books, open access journals, MIT Open courseware, NPTEL Video lectures, free audio books, YouTube links, open access repositories, links to the institutions of similar interest etc.

Library Services

The library services are the cornerstone of the education system at any University. The mission of library services is to facilitate the creation of new knowledge through acquisition, organization, and dissemination of knowledge resources. The services offered by these libraries also vary accordingly. The school libraries, besides offering routine book issuing facility, offer other services such as library hours, storytelling hours, conduct of debates on current topics, film shows and cultivation of reading habits among students. The college library renders additional services such as introduction to library and its services, reader's advisory service, lending service, bibliographic service, access to Internet, etc. On the other hand, university libraries offer a wide variety of services that include reference, current awareness, selective dissemination of information, bibliographic, documentation, lending and inter library loan, newspaper clippings, network-based services such as access to Online Public Access Catalogue (OPAC), Internet and consortia-based services, etc. It has added some more new services, due to the advancement of ICT and use of mobile technology, their users are kept abreast of global developments. The new functions include:

- Providing Internet facility to all users to access global information in their specific discipline.
- Creating and maintaining library website.
- Maintaining OPAC of their library to provide access to its collection not only to its users through campus networks but also to users' world over.
- Taking part in establishment of e-journal consortia to share journal resources through a central agency. e.g. UGC-Infonet.
- Providing access to wide variety of information resources including

reference sources, indexes, full text articles and complete journals.

- Building specific electronic collections of the library with CD-ROM collections and in-house databases.
- Promoting the use of information technology, and speeding up the document retrieval.
- Taking up digitisation projects to preserve the manuscripts and other rare documents.

Reference Services: Reference services are concerned with direct personal assistance to the user seeking information. It covers direct services such as assistance to the user in the use of the library and its tools, assistance in searching and locating documents, ready reference and long range reference service, literature search and compilation of bibliography, helping in research etc and indirect services such as selection, organization and maintenance of library material for reference service, and other tasks of reference section such as keeping a record of reference queries, preparation of publicity material, evaluation of reference section etc.

Circulation Service

A circulation or lending service is one of the key services of a library, which is near the main entrance. The students, staff, and faculty may check out library reading materials, place holds or renew items, as per their eligibility. Reference books and periodicals are non-circulating and may not be checked out. No renewals may be made by telephone.

Inter Library Loan

All libraries whether academic, public or special ones, build collections to fulfil the needs of their users as well as to support the mission of the parent institution to which they belong. However, no library even the largest one, can afford to have a sufficient collection to satisfy all the requirements of its users. At times, the user requires a document that is not available in its own library, but may be available in some other library. For this, libraries usually have an agreement with other libraries to share their resources on reciprocal basis. Under this agreement the required document is then borrowed from another library on Inter Library Loan and is given to the user.

Inter Library Loan Service

Developing Library Network (DELNET) is very well known throughout India. DELNET has a database of 2,28,45,202 bibliographic details of books which can

be obtained through one of its services known by the name of Inter Library Loan (ILL). DELNET provides its services to more than 8361 in India and 24 out of India Institutes and Universities in South Asia and USA. Most of the libraries are member of DELNET and have access to DELNET collection to its users. As such, the users can access databases hosted by DELNET.

Document Delivery Service

Document Delivery Services (DDS) supports scholarly research by obtaining library materials such as books, periodical articles, dissertations, government documents and technical reports that are unavailable in the library.

New Arrivals Display

List of new books acquired by the library are displayed in New Arrivals Display racks at library entrance for one week after that they will be made available to borrow. The New Arrivals list also displays on Online Public Access Catalogue (OPAC) and also being sent to faculty time to time.

User Orientation – Information Literacy

Libraries, particularly academic libraries, normally organize 'user orientation' or 'user initiation' programmes for the new students every year in the beginning of the academic session. Such programmes acquaint the user with the library and its facilities such as general rules and regulations of the library, the library collection and its location, catalogue of the library and how to use it, lending and borrowing facilities, and about reference and information services of the library. The basic aim of the user orientation programmes is to introduce the library and its services to the new user. These programmes are in the form of a lecture by the librarian followed by a tour of the library; or a brochure containing all the information which is distributed to the students; or an audio/visual kit that is prepared to introduce the library to the new comer.

Current Awareness Services

To keep users abreast of the current developments in their respective field of interest, current awareness services are offered to the users. This involves scanning the newly available documents in print as well in non-print form, selecting items relevant to the needs of individual or group of users, recording them and disseminating them to the users on a regular basis. Current awareness services meet the current information needs of the users.

Reprography Service

Reprography deals with reproduction of various types of documents, such as books, journal articles etc. by photocopying, photography, microfilming or digital imaging using some machines. Most of the libraries these days use a photocopier to give copies of the documents (parts of books or journal articles) to the users on demand. This service is called reprographic service. The service is offered either free or users are charged nominally for the service to curb misuse of the facility.

Translation Service

This service deals with the translation of contents of a document from one language to another language on demand. Translation service is a specialized service requiring a number of language experts as well as subject experts to carry out the translation. Most of the libraries do not have an in-house facility for translation. But libraries can play active role by having information about translation centres, professional associations, government agencies and private agencies providing translation services. Institutions like National Institute for Science Communication and Information Resources, New Delhi (NISCAIR) and some of the other national research institutions have professional translators who carry out the translation from the foreign language into English. Some of the websites also offer free translation services.

Online Public Access Catalogue

It is a computerized catalogue of library resources available to public for searching online. Earlier OPACs was developed as stand-alone online catalogue, which users searched on the computer terminal available in the library. With the arrival of Internet, most of the libraries have made their OPACs accessible via Internet, which is accessible to users all over the world on a 24X7 basis. Users can search OPAC remotely and find information online. The search facility apprises the users about the availability of each item for circulation, including the current status of individual copies of a title and the reservation status.

Library Website

A web presence is very important for the library to reach its users. On the library website, users can search library resources through Online Public Access Catalogue (OPAC) from anywhere and at any time using Internet without personally visiting the library. Users can reserve a book; make suggestions for purchase of a book, and renew online the book borrowed from the library. Many libraries are providing

links to OPAC of other libraries which are useful for their users. Some libraries are also providing online access to union catalogue of books, theses, conference proceedings etc. of the participating libraries which users can search remotely.

Innovative Information Services

In the current era, many academic libraries are making use of the robotic technology, mobile technology, virtual reality, augmented technology, artificial intelligence, cloud computing, and social media, all of which are digital resources deployed for effective information service delivery. McClure, Lankes, Gross, and Choltco-Devlin (2002) alluded to the fact that people have become increasingly comfortable with the use of digital services as part of their way of life.

Digital Library

Libraries started creating digital libraries and also by having access to the DBs of E-books, E-journals, etc. started providing services from them. Users are allowed to have access / browse or search them and get their required information. By preparing a mailing list as per subject category / department wise, librarians are able to send e-mails / SMS alert about the new arrivals of the e-journals or the Table of Contents. Researchers are more benefitted for compiling literature review and for writing the thesis from these digital libraries (DL). For users, DL is a portal, an easy-access interface to support their information needs. The interface is "designed taking into account the information needs of everyone and their expectations with regard to access, functionality and personalization". Information professionals provide induction and training courses to educate users to use the digital library. All kinds of materials such as FAQs, online help and self-guided information resources are prepared in anticipation of users' questions to help them find answers on their own. Reference librarians are also waiting for users' questions at the reference desk, on the telephone, via email or an interactive system, etc. They offer personal help to users in a variety of ways.

Mobile Technology

The emergence of mobile computing technologies enables access to e-mails, chat, web-browsing, useful network services and applications. Smart phones, PDA, and other mobile devices become more powerful for mobile web experience. Libraries share techniques for creating and promoting mobile services. Library in Your Pocket Techniques for developing successful mobile services the cell phone is one of the most rapidly growing new technologies in the world. Mobile phones are used effectively in the educational setup through libraries. Mobile applications

as powerful gateways to their online resources. Libraries might use SMS services in the following domains like i) To send SMS to collect the requested books ii) Reminding the user if, book is due in his/her account; informing user about the exact fine iii) Acknowledging the user about renewal of a book iv) OPAC service v) Users may request the opening and closing hours of the library vi) Users can suggest the books or other information resources through SMS or emails via mobile phones and many more.

Cloud Computing

Cloud Computing (CC) is a completely new IT technology and is known as the third revolution after PC and Internet in IT. The basic principle of CC is making tasks distributed in large numbers of distributed computers but not in local computers or remote servers. Library possesses a major area where cloud services can be applied to increase the benefit of the library to its users and as well as society. Cloud is being used to host library website, increasing storage capacity, resource sharing and content searching as well as in the area of library automation and so on. One can provide cloud-based access to library's book and AV collections through the online catalogue (OPAC) that is part of integrated library system (ILS). World Cat service of resource sharing is popular service of OCLC as a cloud service. Repository solutions like DSpace, Fedora, Dura Space provides cloud-based services, developed by the Dura Cloud, to support to preserve and access the documents by academic libraries, research institutions, and other cultural and heritage organizations. It is a non-profit organization from 2011, offering cloud storage by "Dura Storage" across multiple commercial & non -commercial organization and as well as libraries.

Artificial Intelligence (AI)

AI is the broadest term applying to any technique that enables computers to mimic human intelligence, using logic, if-then rules, decision tress, machine learning (including deep learning). For example, the use of expert system i.e., a computer program that provides expert advice, decision, or recommended solution for a given situation. Used for cataloguing, indexing, collections and reference services, Information Search and Retrieval. Ex: Ask Librarian, CoalSORT (Indexingtool), BIOSIS (anIndexerAid), CANSEARCH.

Augmented Reality

Augmented Reality (AR) is a technology that super imposes a computer-generated image on a user's view of the real world, thus providing a composite view. Mobile augmented reality uses include augmenting physical book stacks browsing,

library navigation, optical character recognition, facial recognition, and building identification mobile software for compelling library experiences. The AR applications in Libraries include i) Augmented books ii) Guided tours iii) Searching for Media / Additional Information iv) Gamification and v) Shelf Maintenance.

Robots and Drones

Robots and robotic technologies are now mature enough to leave the research lab and come to the consumer market in large numbers. Robots are becoming more intelligent with AI advancements. In this smart era, robots can provide an improvement to tedious tasks usually performed by librarians, like labouring down aisles to sift through, sort, arrange and pickup books. Robots can steer, navigate and conduct searches for missing, misplaced or out-of-sequence volumes, by means of scanning RFID tags, during off-peak hours or when the institution is closed. Drones would be responsible for delivering the books either to the door steps of the users who ordered a book–or to their hands–irrespective of their location. Drones can deliver packages and both to users based on their real time location via GPS.

Virtual Reality

Virtual reality – the computer-generated simulation of images or whole environments that can be experienced using special electronic equipment – is progressing in several ways, including traditional virtual reality that creates environments, allowing people to be "present" in an alternative environment, augmented reality that starts with the real world and overlays virtual objects and information; and spherical or 360-degree video that captures an entire scene in which the viewer can look up, down, and around. Virtual reality technologies have been developed over several decades, including advances and contributions by researchers working in academia, aerospace, and the military, all trying to create alternative realities and experiences through digital technology. Virtual Reality will continue to be a tool for creative storytelling as well.

Social Media

Social network sites such as MySpace, Facebook, Windows Live Spaces, Orkut have attracted millions of users and they are used for many different purposes (Bicen and Cavus, 2010). According to the Nielsen Company 2010 statistics, people throughout the world spend a staggering 110 billion minutes on social network sites and 75% of all people visit social media sites (even if they are not members). A social networking site (SNS) is defined as an internet-based service that gives individuals three major capabilities: first, the ability to construct a public or semi-

public profile; second, the ability to identify a list of other users with whom a connection is shared; third, the ability to view and track individual connections as well as those made by others (Boyd & Ellison, 2008). Having managed to surpass its competitors within only five years of its launch in 2004, Facebook is currently the most popular SNS worldwide. A sample of Library of Congress, USA webpage under Facebook, wherein users can have access for all the services.

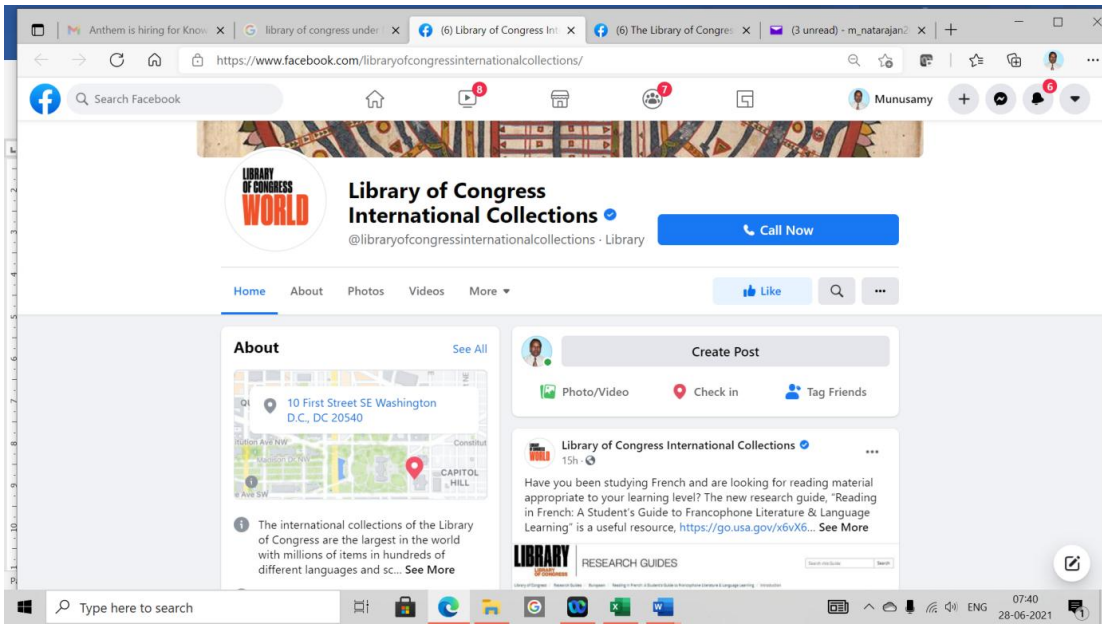


Fig.2 Library of Congress Facebook page

During COVID, the web pages are updated with COVID 19 information also, along with the access mechanism for the available DBs and other resources online.

COVID 19 Impact

Italy was the first country after China to be invaded by the pandemic, with a very high number of infected and dead Italians: 224,000 infected and more than 30,000 confirmed deaths. The impact of COVID was not just on health, but also on the economy, with the loss of many jobs. A great impact was also on education, with the closure of all schools and the transition to distance learning (Anna Maria Tammaro, 2020). All teachers and students went on e-learning suddenly, with education from primary schools to higher education brought home. Impact on libraries has been great, leading them to closure. After February 23, 2020, all the libraries in the red zone (Lombardy and Veneto) were closed, while the rest of the

libraries began to have restrictions on the service. After March 8, all libraries of every typology and in every region were closed.

Library Services during the Pandemic

The alarmingly swift spread of COVID-19 has been accompanied by a concomitantly rapid and exigent need for reliable information around the world. Researchers, health care providers, patients, their caregivers, and other stakeholders have sought information about the virus. Information needs range from elucidation of the structure, function, replication, and genetics of SARS-CoV-2 to the pathophysiology of COVID-19, the populations

at risk, and its transmission rates and patterns. In response, librarians have found themselves pointing researchers, patients, and the public in the direction of quality information as it is released. Public libraries, special libraries, and academic libraries have all engaged in improving COVID-19 related health literacy by providing quick access to critical consumer health information resources about the virus. Most library home pages have incorporated quick links to general consumer health information resources, from respectable, scientific organizations, along with federal and state health agencies. In many cases, libraries have also built resource guides with more expansive lists of reliable information resources. Some of the resources' libraries have gathered in public health focused pathfinders include links to symptom checkers, maps of the spread of the disease globally and nationally, lists of verified testing centres, and links to local and state restrictions meant to slow the spread of the disease.

Libraries around the world have been facing lockdown challenges in providing access to its collections and services. The application of Information and Communication Technologies (ICT), the Internet and particularly the World Wide Web have revolutionized library activities, hence there has been changes in the normal functioning of Libraries in the digital world. All types of libraries have promoted their digital services during the corona virus pandemic situation. Libraries having significant number of e-resources may have enough opportunities to serve their users even in the lockdown period throughout the world. Several Libraries have brought out their digital services organizing virtual exhibitions, highlighting content on the websites and Lets Read Together online campaign. There have also been major efforts to boost access to the library resources online as well as offline, for example by increasing the number of e-Books/ e-Journals/ CD-DVD, etc. in order to lower the risk of virus spread. Librarians are looking

forward, exciting to discover new services and opportunities to build a stronger library-user interface in the future. In order to achieve these goal libraries, need to be equipped with latest infrastructure, ICTs and skilled manpower. They started providing virtual library services like i) Virtual Reference service like chat/e-mail ii) Self check-in and checkout of books iii) Scanning of chapters from books, journals articles for remote users iv) LibGuide - List of resources available in the library v) Updated library website, dynamic content and useful tutorials. The librarians are giving to their users the freely accessible digital library resources like i) National Digital Library of India (https://ndl.iitkgp.ac.in) ii) Internet archive (archive.org) iii) Hathi trust (www.hathitrust.org) iv) world digital library (www.wdl.org/en) v) Project Gutenberg (www.gutenberg.org) vi) open library (www.openlibrary.org) and vii) Khan academy (www.khanacademy.org) and many more.

Risk related to handling of study materials in the libraries are also discussed. Although, there is a huge risk of infection through objects carrying coronavirus yet the use of library resources is equally important to carry out research on the on-going projects. Librarian now a day has to extend library services on a safer mode by following the standard operation procedure or as per the Government Guidelines. In the view of these, some libraries have imposed a waiting period (quarantine) for issue/ return of books. Different countries have set their own operating procedure to handle the library resources, for example Australian Library and Information Association has suggested cleaning with alcohol wipes with plastic covers, such as DVDs, etc. The Italian Library Association, in addition to the above, has suggested that users could be asked to indicate if materials being returned have been in contact with someone with the virus.

This is time for library professionals to avail opportunities and improve their skills/ability for outreach in virtual environment. They are able to organize virtual seminar or webinar, with the help of software it is called as the webinar. Now a day, there has been a trend of webinar and there are some specialized applications / software to conduct virtual meeting, webinar, video conferencing, live chat, etc. Web-based (virtual) seminar platform can be used to conduct online meetings, lectures and conferences. Webinar software provides online platform, where mutual interaction between the speakers and attendees takes place to carry out audio-visual communication.

Role of publishers

Publishers and information aggregators are also providing free access to COVID-19 related information, ranging from relevant articles to new research to models

for homemade PPE. One of the most visible of the aggregator efforts is EBSCO's Information Portal at https://covid-19.ebscomedical.com/, which focuses on open access information sources. It includes data maps and visualizations, again including that of Johns Hopkins, as well as government resources and news stories. It presents scoped searches of trending news topics for easy access and is a useful tool for keeping tabs on the breadth of new information. EBSCO also offers a keyword search of all of its collected sources with assorted filters, and presents its search results with research articles visually separated from news stories.

Taylor and Francis are also committed to helping public health authorities, researchers, clinicians and the general public contain and manage the spread of COVID-19. They provide links and references to all relevant COVID-19 research articles, book chapters and information that can be freely accessed on Taylor & Francis Online and Taylor & Francis eBooks in support of the global efforts in diagnosis, treatment, prevention and further research into COVID-19. As signatories to NIH's Access to Research initiative, along with the Wellcome Trust's coordinated action on sharing research data and findings relevant to the outbreak, Taylor & Francis has been working with WHO to ensure this content is clearly signposted. They are also aligning with the PubMed and are currently working with them to ensure rapid human and machine-readable access to research articles and data through the NLM's LitCovid portal. The other publishers like Springer, Nature, John Wiley are also supporting by providing the resources online to the society.

Conclusion

Digital technology has contributed significantly to the development of libraries, making it easy for users to access the library. Digital information sources are being made available all the time, but more during COVID 19 period. The libraries (academic, public, school and special) should at this time rise up to their responsibility of rendering selective dissemination of information service on COVID 19 related information to the doctors and individuals around them who may be seeking for such information. Technological advancements have revolutionized the library services in digital era. Libraries on the web have become more competent and confident in terms of resource management and digitalization. The outbreak of COVID-19, caused by SARS-COV-2, represents one of the most substantial global challenges in this Century. The move to remote working during the COVID-19 pandemic has leaned heavily on the digital infrastructure to keep people connected, informed and able to work remotely. As more staff may probably work from home more often in the future precipitated by the COVID-19

pandemic, how this may change search behaviour in the enterprise is an area for further research. This chapter discussed the normal library services like reference, circulation, document delivery, etc. Innovative information services like services from digital library, cloud computing, mobile technology applications, augmented reality, social media applications, etc. Librarians will need to think creatively to support the users' needs at all time. As a way of supporting researchers, clinicians, and the public, libraries can rethink and reshape their resources and services to provide helpful resources in a time of crisis.

References

1. Anna Maria Tammaro. (2020). COVID 19 and Libraries in Italy, *International Information & Library Review*, 52 (3), p. 216-220.

2. Bicen, H., Cavus, N. (2010). "The most preferred social network sites by students", *Procedia Social and Behavioral Sciences*, 2, p. 5864-5869.

3. Boyd, D.M. & Ellison, N,B. (2008). Social network sites: Definition, history and scholarship. *Jl of Computer-Mediated communication*, 13, p. 210-230.

4. COVID-19 and the Global Library Field accessed on 02/06/2021 from https:// www.ifla.org/covid-19-and-libraries.

5. McClure, C., Lankes, R., D., Gross, M., & Choltco-Devlin, B. (2002). Statistics, measures and quality standards for assessing digital library services: Guidelines and Procedures. ERIC Clearinghouse. Retrieved June 2, 2021 from http://quartz. syr.edu/rdlankes/tiki-download_file.php? fileId=7.

6. Singh KK, and Asif M, (2019). Emerging trends and technologies for digital transformation of libraries. *IP Indian J Lib Sci Inf Technol,* 4(2), p. 41-3.

7. https://duraspace.org/wp-content/uploads/2013/08/corp_profile.pdf (retrieved 2 jun 2021)

8. https://www.ebsco.com/covid-19-resources

9. https://authorservices.taylorandfrancis.com/covid-19

Theme-4

Green Partnership and Collaboration

EmpoweringLibrariesasHubsofEnvironmentalActivism:Developing Citizen Science Initiatives for Community Engagement and SustainableContributionstoEnvironmental Causes

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ABSTRACT: CitizenSciencehasbeenanemergingareaofstudywhereinlibrariescanactaseducational hubs for enchanting knowledge in Biodiversity. There are different types ofinitiativesthelibrariescanundertaketomakethecommunityengageinmanyenvironmental causes. Several perks of having Citizen Science and Library collaborationhave been discussed in the paper. The paper also provides a picture of Citizen Science intheIndiancontext.ThereportsofCitiSciinIndiahavebeenshownintheformofimages.Theopportunitiesandchallengesof CitizenSciencehavebeenexplainedindetail.

KEYWORDS: Sustainable Development, Libraries, Community engagements, EnvironmentalIssuesandCitizen Science

1. Introduction

In a general sense, the Oxford Dictionary defines the meaning of Citizen Science as "scientific work undertaken by the members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions". Citizen Science is a growing method in which both the parties i.e. scientists and citizens work andcollaborate to produce new knowledge for science and society. It is to be remembered that the term Citizen Science was coined in the 1990s and has gained huge popularity since the beginning. With the evolution, it was seen that the term "Citizen Science" has gained recognition in the growing fields such as science, policy, and education (Alshurideh et al., 2023).

It is to be noted that the European Citizen Science Association (ECSA) has determined citizen science based on the ECSA's 10 principles of Citizen Science for good practice(Sankar & Kavitha, 2015). It is important to understand citizen

literacy to make them aware and understand the informed decisions surrounding such as science, technology, and environmental issues.

With the evolution of time, it is important for libraries to understand that it is going through a battle as the library landscape has made a dramatic change because of which new practices such as citizen science initiatives have been incorporated to reinforce the concepts such as gathering, meetings and collaboration spaces with the context to shared community and learning resources. However, there isn't much practical data to support the idea that the most transparent and interactive approaches that CS suggests may coexist with and benefit from the fundamentals of public libraries. At the same time, it isimportant to note that the role of librarians and users in connection to the public library is still underdeveloped. With the growing time, the number of initiatives for CS programs will continue, and hence to collect evidence on the impact and the capacity of CS practices should also be gathered.

Citizen Science has gained popularity in the recent decade as it has played an important role in implementing the broader idea of Open Science that in return marks a considerable change in the culture of research, education, and innovation. Apart from the implementation of open access to data, publications, and many others, CS also facilitates the active participation of citizens in the scientific research process. Thus, we can say that the CS provides both the aim and enabler of Open Science(Sankar & Kavitha, 2015). Libraries' use of CS may help to ease the shift to more open knowledge, as they form a vital component of the infrastructure for Open Science.

2. Libraries in Context of Citizen Science:

Libraries, often regarded as repositories of knowledge, are increasingly transforming into dynamic hubs of community engagement, and their potential as catalysts for environmental activism should not be underestimated. This study aims to explore the concept of empowering libraries to play a pivotal role in environmental activism through the development of citizen science initiatives, fostering community engagement and sustainable contributions to environmental causes.

Libraries have traditionally been spaces for learning and information dissemination. However, in the face of escalating environmental challenges, there is a growing recognition that they can serve as vital community resources for promoting environmental awareness and action.

Citizen science involves engaging the public in scientific research projects, allowing themto actively contribute to data collection and analysis. By incorporating citizen

science initiatives into library programs, these institutions can facilitate a direct connection between the community and environmental issues.

Libraries are no longer confined to being silent repositories of books; they are evolving into dynamic spaces that actively engage with the communities they serve. Recognizing the pressing need for environmental action, libraries are embracing a multifaceted approach to address ecological concerns. The integration of citizen science initiatives marks a strategic move towards fostering community involvement and sustainable contributions to environmental causes.

Libraries are no longer confined to being silent repositories of books; they are evolving into dynamic spaces that actively engage with the communities they serve. Recognizing the pressing need for environmental action, libraries are embracing a multifaceted approach to address ecological concerns. The integration of citizen science initiatives marks a strategic move towards fostering community involvement and sustainable contributions to environmental causes.

3. Objectives of Citizen Science in Library Context:

(a) **Citizen Science: A Collaborative Endeavor:** At the heart of this transformation is the concept of citizen science. Citizen science involves the participation of the public in scientific research, allowing individuals to contribute actively to data collection, analysis, and problem-solving. Libraries, with their accessibility and community focus, are well-positioned to facilitate and spearhead citizen science initiatives.

(b) **Empowering Communities through Participation:** Libraries act as catalysts for empowering local communities to actively participate in environmental monitoring and research. By providing resources, training, and collaborative space, libraries create a platform where citizens become stakeholders in the scientific process. This empowerment not only enhances environmental literacy but also instills a sense of ownership and responsibility among community members.

(c) **Education and Awareness Programs:** Incorporating citizen science initiatives into library programs opens avenues for environmental education. Workshops, seminars, and public lectures can be organized to disseminate information about local environmental issues, the scientific methods employed in citizen science projects, and the broader implications of community engagement. This educational outreach serves as a foundation for building a community that is informed and proactive in environmental matters.

(d) **Data Collection and Analysis Hub:** Libraries, equipped with modern technology and information systems, can become hubs for storing, managing, and analyzing data collected through citizen science initiatives. This wealth of information contributes to a deeper understanding of local environmental dynamics, trends, and potential threats. Moreover, it positions libraries as valuable contributors to the global scientific community by actively participating in data-driven research.

(e) **Advocacy and Policy Influence:** Armed with credible data and insights gatheredthrough citizen science, libraries can play a pivotal role in advocacy efforts. They can collaborate with local environmental organizations, policymakers, and governmental bodies to influence evidence-based decision-making. The ability to present concrete findings from citizen science projects enhances the library's credibility as a reliable source of information, thereby amplifying its impact on environmental policies.

4. Perks of Library-Citizen Science Collaboration

(a) Community Empowerment: Libraries, as neutral and accessible spaces, empower community members to actively participate in addressing environmental concerns. This involvement fosters a sense of ownership and responsibility.

(b) Education and Awareness: Citizen science initiatives provide unique opportunities for environmental education. Libraries can organize workshops, lectures, and exhibitions to raise awareness about local ecological challenges and solutions.

(c) Data Collection and Analysis: Leveraging the collective power of citizen scientists enables the gathering of large datasets, essential for understanding environmental trends. Libraries can become hubs for storing and analyzing this information.

(d) Advocacy and Policy Influence: Armed with data collected through citizen science, libraries can advocate for evidence-based policies and contribute to local and regional environmental decision-making.

5. Challenges and Opportunities in Library-Led Citizen Science Initiatives

While the benefits of library-led citizen science initiatives are evident, challenges persist. Resource constraints, technological barriers, and the need for sustained community interest are among the hurdles that libraries may face. However, these challenges present opportunities for collaboration, innovation, and strategic partnerships.

(a) **Resource Constraints and Collaborative Solutions:** Limited budgets and staffing constraints can impede the initiation and sustainability of citizen science initiatives. To overcome this challenge, libraries can explore partnerships with local universities, environmental organizations, and government agencies. Collaborative efforts not only alleviate resource constraints but also enrich the diversity of expertise involved in the initiatives.

(b) **Technological Barriers and Community Empowerment:** Access to technology can be a barrier for some community members. Libraries can address this challenge by providing training sessions on basic technological skills, partnering with local tech organizations, or securing funding for the acquisition of necessary tools. Bridging the technological divide ensures that citizen science initiatives remain inclusive and accessible to all members of the community.

(c) **Sustained Community Interest and Programming Innovation:** Maintaining community interest in citizen science projects requires continuous innovation in programming. Libraries can implement rotating themes, incorporate gamification elements, or organize community competitions to keep the initiatives fresh and engaging. Regular communication through newsletters, social media, and community events can also help sustain interest and involvement.

6. Some of the highlighted case studies that is leading the Library Ahead:

(a) The GLOBE Program: This worldwide science and education program encourages students and the public to collect data on Earth's environment. Libraries, such as those in the GLOBE network, have actively embraced this initiative, integrating it into their community engagement strategies.

(a) The Public Library of Science (PLOS): This open-access scientific journal collaborates with libraries to promote citizen science projects. Libraries subscribing to PLOS can provide their patrons with opportunities to engage in meaningful environmental research.

7. Citizen Science Report of 2022 in Indian Context (CitiSci Conference for Biodiversity)

The conference for Biodiversity was held virtually for anyone who has involvement in Citizen Science building including people from different segments of people such as researchers, practitioners, educators, students, policymakers, and many

others who has immense contribution to the development of Citizen Science in India(King et al., 2021).

CitiSci India 2023 held the Annual National Conference on Biodiversity on the following specific phenomena. It includes topics such as Citizen Science and Education and Inclusion in Citizen Science. The conference is organized under the umbrella of the Biodiversity Collaborative, a network of institutions and individuals who have the vision to promote biodiversity science in India. The reports of the conference have been shownin the followings parameters:

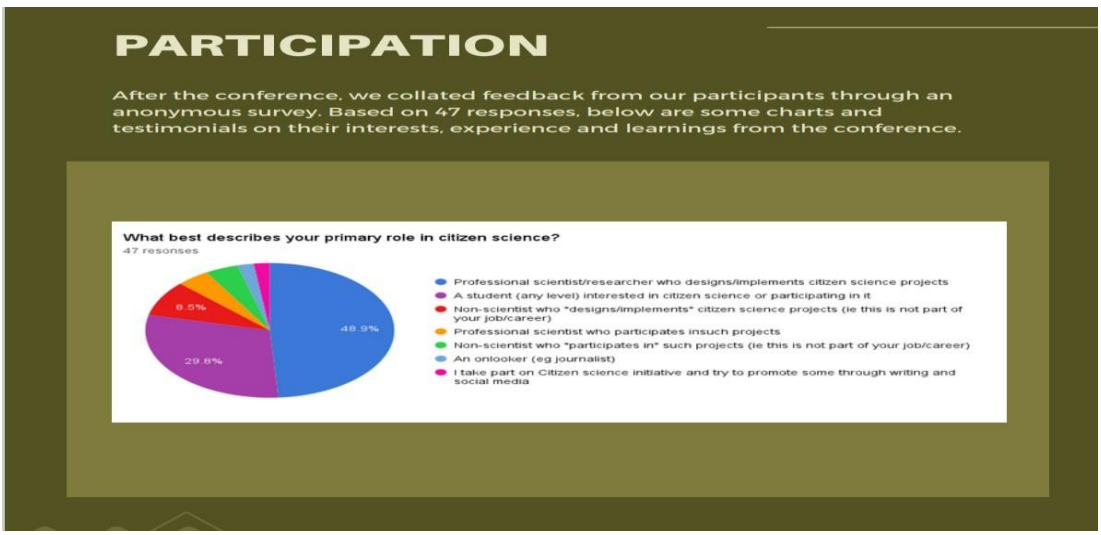


Fig1: Report of the conference on Biodiversity participation on Citizen Science in Indian Context in 2022.

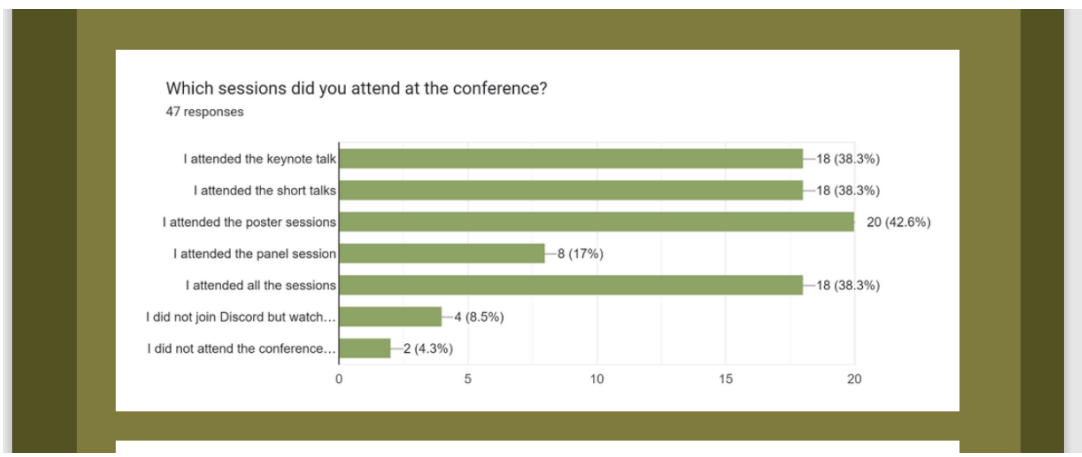




Fig1: Report of the conference on Biodiversity participation on Citizen Science in Indian Context in 2022.

8. Conclusion

In conclusion, the evolving role of libraries as hubs of environmental activism through citizen science initiatives reflects a paradigm shift in the way communities engage with ecological issues. By empowering individuals, fostering education and awareness, serving as data hubs, and influencing policy, libraries emerge as essential contributors to the broader environmental movement. As libraries continue to adapt to the changing needs of their communities, their role in environmental activism is poised to grow, making themindispensable allies in the pursuit of a sustainable and resilient future.

Libraries, by embracing their evolving role as hubs of environmental activism, have the potential to effect positive change in communities. Through citizen science initiatives, they can empower individuals to contribute actively to environmental causes, fostering a sense of shared responsibility and sustainable engagement. As we navigate an era of environmental challenges, libraries stand as beacons of knowledge and collaboration, essential in the collective pursuit of a more sustainable future.

Libraries have traditionally served as bastions of knowledge and learning, housing books, journals, and resources that span a multitude of subjects. However, in recent times, therehas been a paradigm shift in the role of libraries, with a growing

emphasis on community engagement and activism. One domain where libraries are increasingly making a significant impact is environmental activism, and the development of citizen science initiatives has emerged as a powerful tool in this regard.

9. References

1. Alshurideh, M. T., Al Kurdi, B., Alhamad, A., Hamadneh, S., Alzoubi, H. M., & Ahmad, A. (2023). Does social customer relationship management (SCRM) affect customers' happiness and retention? A service perspective. *Uncertain Supply Chain Management*, *11*(1), 277–288. https://doi.org/10.5267/j.uscm.2022.9.015

2. King, A. C., Odunitan-Wayas, F. A., Chaudhury, M., Rubio, M. A., Baiocchi, M., Kolbe-Alexander, T., Montes, F., Banchoff, A., Sarmiento, O. L., Bälter, K., Hinckson, E., Chastin, S., Lambert,

3. E. V., González, S. A., Guerra, A. M., Gelius, P., Zha, C., Sarabu, C., Kakar, P. A., … Gardiner,

4. P. A. (2021). Community-based approaches to reducing health inequities and fostering environmental justice through global youth-engaged citizen science. *International Journal of Environmental Research and Public Health*, *18*(3), 1–29. https://doi.org/10.3390/ijerph18030892

5. Sankar, P., & Kavitha, E. S. (2015). Librarians and altmetrics: a birdseye view. *E-LibraryScience Research Journal*, *2030*(1), 1–7.

6. GLOBLE PROGRAM. (n.d.). About GLOBE. (https://www.globe.gov/about)

7. PLOS. (n.d.). Public Library of Science. https://www.plos.org/

8. Riesch, H., Potter, C., & Davies, L. (2013). Combining citizen science, bioclimatic envelope models,and observed habitat preferences in the face of climate change. Conservation Biology, 27(1), 106–115.

9. Shirk, J. L., Ballard, H. L., Wilderman, C. C., Phillips, T., Wiggins, A., Jordan, R., ... & Bonney, R. (2012). Public participation in scientific research: a framework for deliberate design. Ecology and Society, 17(2), 29.

10. Silverman, D. (2015). Interpreting Qualitative Data: A Guide to the Principles of Qualitative Research. Sage.

11. Haklay, M., & Weber, P. (2008). OpenStreetMap: User-generated street maps. Pervasive Computing, IEEE, 7(4), 12–18.

Significance of Green Library in 21st Century Modern Library Services: An Overview

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ABSTRACT: Libraries are platform for lifelong learning and provide users with information and knowledge they require. Green Library Movement which comprises of librarians, libraries, cities, towns, college and university campuses is committed to greening libraries and reducing eco-degradation. Sustainability is meeting the needs of present generation without compromising the ability of future generations to meet their needs. The spiral concept of Green Library is captivating to the 21st century modern library professionals worldwide. This is also called sustainable library. Green libraries expound the needs of a library, sustainable design and real cost savings in energy consumption. Green Libraries can provide pleasant environment to the user community. 21st century modern library professionals should move beyond environmental sustainability exemplified by various practices of Greening libraries and must focus on effective steps to guarantee future sustainable development of libraries.

Keywords: Definition of Green Library, Standards for Green Libraries, Solutions for Greening Libraries, Role of Librarians, Green Library Movement in India.

1. Introduction

According to IFLA, "A Green and Sustainable library is a library which takes into account environmental, economic and social sustainability. Green and Sustainable libraries may be of any size but they should have a clear sustainability agenda which includes Green buildings and equipments, Green office principles, Sustainable economy and Sustainable library services." According to Online Dictionary for Library and Information (ODLIS), Green libraries are "designed to minimize negative impact on the natural environment and maximise indoor environmental quality by means of careful size selection, use of natural construction materials and biodegradable products, conservation of resources (Water energy, paper) and responsible waste disposal (recycling etc.)".

It is worth noting that today's libraries as knowledge gateways are especially accountable for not just promoting the concept of sustainability but also for leading by example. The phrase "green library" enters in library domain and it colloquially refers to a library building that is environmental friendly building.

Green Library contributes towards maintaining the natural ecological balance in the environment and preserving the planet and its natural systems.

2. Review of Literature

Antonelli, M (2008) in her article discussed about various web pages and web sites related to green library buildings. Meher, P (2017) focussed on growing interest on green revolution worldwide. Brown (2003) provided emerging trends of green libraries and discussed about Green Library movement. Neale, J.C. (2008) discussed how libraries can be more eco-friendly and how librarians can effectively utilise green strategies. Nikam, S.S. (2017) stressed upon the importance of green library and role of green librarians. Rabidas, S (2016) pointed out what green library building really is and what is the future of green library. Trotter, D.W. (2008) explained about three environmentally friendly libraries and talked about how librarians can make libraries greener. Yudelson, J (2007) expounded the importance of water conservation and use of recycled materials for green library.

3. Objective

Salient Objectives of this paper are as followed:

- To understand how libraries can become Green
- To discuss about standards for Green Libraries
- To understand about major Green library initiatives in the World and India
- To discuss about how to create awareness about Green Libraries

4. Methodology

The discussions and deliberations in this article are based on the concepts, definitions, ideas, theories, discussions etc. derived from various websites, dictionaries and relevant research articles/papers taken from different journals. All the sources used by the author are duly acknowledged in the text of this article. The literature survey was done by online scholarly search engines like Google Scholar, RefSeek etc.

5. Results & Discussions

5.1 Objectives of Green Library

- Environmentally sustainable building
- Conserving resources and energy

- To create awareness of library's social responsibility and leadership in environmental education
- Environmentally sustainable information resources and programming
- Locally and globally for the development of green library ventures

5.2 How Libraries can become green?

There are many ways to go green. Few are as follows:

- **Proper way of using electric power**: Turning off lights during bright daylight, turning off fans, computers when not in use, use of CFL lights instead of tube lights with proper maintenance can minimize expenses.
- **Building materials:** The materials used in the construction of a building can improve the sustainability of the library by reducing the need for mechanical systems to improve the indoor environment quality.
- **Site Selection:** Library should be at an appropriate site or locality so as to make users concentrate on their reading and or study. In this regards, myriad guidelines are provided by different organizations like LEED, USGBC and Indian Green Building Council (IGBS) in order to develop Green library.
- **Water conservation:** The library has several ways to save water. It mostly depends on the selection of the right site. If a site is properly selected, then irrigation can be used to capture main water. Another technique is to use low flow capital and waterless urinal.
- **Indoor Air Quality**. The air should be recycled and should not be stagnant. Least use of air conditioners will reduce emission of harmful gases responsible for holes in ozone layer and in a way curb global warming.
- **Energy Efficiency**: Energy is generated by sources such as solar, air hydro(water). Generate energy by solar power can convert sunlight into electricity which can be used inside the library and power can be stored.
- **Reducing Pollution:** Use public vehicles for transporting; avoid machines as much as possible. It is important that we reduce the carbon footprint of our buildings. The term carbon footprint is defined as "the total amount of greenhouse gases produced to directly and indirectly support human activities usually expressed in equivalent tons of carbon dioxide (CO2)".
- **Effective Way of Paper Usage:** Papers are prepared from woods. If single paper is saved the tree is saved. Papers should not be wasted. Two sides of the paper should be utilised. Papers should be reused or recycled effectively. More e-books and e-journals should be used in order to save papers. Digitization of rare books also can be done to save papers.

- **Recycling non-biodegradable products:** Put a separate container next to your trash can or printer making it easier to recycle your bottles, can or papers. Plastics should be avoided. Reusable pens can be used instead of ball point pens. Polythene covers should be avoided consciously. This is also kind of saving earth.
  - Use of maximum Natural light and wind can save electricity.
  - Eco friendly pesticides can be used at time of pest control.
  - Eco friendly materials can be used for stacking purpose.
  - Using network printers instead of personal printers.
  - Installing a new server and running multiple servers on one server box.
  - Re-fill toner cartridges instead of buying new.
  - Putting computers in sleep mode when in not use.
- **Social Responsibility:** As Green Libraries play a paramount role towards the welfare of mankind, this could be used as a part of the marketing strategy of the library as a socially responsible body which can have a big impact on the library's image.

5.3 Standards for Green Libraries:

(a) **Chicago Illinois Standards** :

Chicago is one of the first cities to incorporate environmental friendly practices into public buildings and developed its own standard. This standard is highly influenced by LEED Green Building Rating System. According to this satndard, Green building and sustainable building both refer to the design and construction of buildings that have a minimal impact on the environment.

(b) **BREEAM Green Building Standard** :

BREEAM stands for Building Research Establishment Environmental Assessment Method. It was founded in the United Kingdom in 1990 by the Building Research Establishment (BRE). It is one of the most popular and internationally recognized green building rating systems in the world. It encapsulates multiple technical standards in the following arenas i.e. Environmental Social Governance, Net-zero carbon emissions, health and social impact etc. The standard can be used to assess all existing non-domestic building types against nine environmental categories: Energy, Water, Transport, Management, Waste, Pollution, Health and Well-being, Land use and Ecology, Materials.

(c) **Brown Green Standard :**

California Governor Jerry Brown expounded the emerging trend of green libraries and proclaimed that the libraries were on the cutting edge of Green design. New or renovated state buildings over 10,000 sq. feet will have to reach the U.S. Green Building Council's LEED Silver Certification or higher as well as incorporate clean energy generation.

(d) **IGBC Indian Green Building Council Standard :**

In 2001, Confederation of Indian Industry (CII) introduced IGBC with a vision to enable a sustainable build environment for all. IGBC has licensed the LEED Green Building Standard from the U.S Green Building Council and in Collaboration developed Gold rating system to promote Green Buildings in India.

(e) **Green Rating for Integrated Habitat Assessment (GRIHA) :**

TERI (The Energy and Resources Institute, New Delhi) is another organization that is in forefront of the Green building movement in India. It was TERI who predicted the need for development of an indigenous tool for rating of green building in India which led to the formation of 'GRIHA'.

5.4 Major Green Library Initiatives in World:

SL.NO	NAME OF THE LIBRARY	INITIATIVES
1.	ANYTHINK BRIGHTON, BRIGHTON	It is the first carbon-negative library in the United States. Certified LEED Gold, this sustainable facility includes children's area, large programming spaces and computer labs. The building includes a 108 kw photo voltaic system which generates more than a third of the building's power and will save the library £30,000 a year in energy costs. It also uses geothermal heating and cooling.
2.	BLAIR LIBRARY, USA	It is one of the first public libraries in the USA to register with the U.S Green Building Council (USGBC). The library opened in October 2004 and was completed in 2006. The 88,000 square foot facility features a cistern to catch rainwater for irrigation a membrane roof, cork flooring, recycled content furnishings, waterless urinals low VOC finishes and fabrics etc. It received LEED Silver NC certification.

SL.NO	NAME OF THE LIBRARY	INITIATIVES
3.	BUDLONG WOODS BRANCH, CHICAGO PUBLIC LIBRARY	Officially opened as a green library in 2003 and incorporates a 16 kw photovoltaic system which provides 7% of the buildings energy. It also incorporates improved wall, roof insulation, lighting controls and windows that keep heat out but let in light.
3.	SPANISH PEAKS LIBRARY, WALSENBURG, UK	It is the recipient of Stephen H Richard award in 2010. The interior of the library building was designed around an intuitive layout for wayfinding and sustainability. Paint colours, furnishing fabrics and materials were thoughtfully selected to increase the customer's ability to self-navigate throughout the library without the heavy use of signage. Major sustainable components include recycled rubber-flooring, chairs made from recycled car battery plastic, recycled shelving from another library, geothermal heating and cooling etc.
4.	THE NATIONAL LIBRARY, SINGAPORE	The Singapore National Library has been called the greenest building on the planet. Designed by Ken Yeang, it opened in July 2005. The design of the building has two blocks separated from each other by an atrium. The atrium is fully day-lit and semi-enclosed to drive light into the various parts of the building while helping facilitate ventilation. The larger block of the project accommodates the library which is located over a naturally ventilated civic plaza that is open to the sky.
5.	FAYETTEVILLE (AR) PUBLIC LIBRARY	The library was the first building in Arkansas to register with the U.S. Green Building Council in June 2001 and achieved the silver LEED designation in 2006. During construction, any trees removed were harvested and used for furniture or donated to local parks. The library's green roof saves about £ 4,000 a year in energy savings. The building's reading spaces and circulation desks were situated to take advantage of the natural sunlight without over working the building's air conditioners.

5.5 How to Create Awareness:

- Set library links to environmental sites.
- Libraries should inspire people by preparing and displaying charts on conserving natural resources.
- Aggressive awareness campaign of green libraries should be organised.
- Conferences should be organised for librarians on the basic skills of greening the libraries
- Programmes, competitions can be organised for the users.
- Select collection materials on organic gardening and composting or green computing and energy conservation.
- Forge outreach relationships with users interested in environmental concerns.
- Green library concept should be integrated into the curriculum of the library and information science programme.

5.6 Role of Librarians:

- Encouraging users to use E-books, E-Journals etc. which can work as space, paper saving tools.
- Librarians by adopting green library design add to reputation and overall image of the library.
- Librarians may perform an important role to establish a balance of the two parameters i.e. economy and ecology which are crucial for sustainable libraries.
- Indicators and monitoring methods should be developed for sustainable libraries.
- An individual employee must be supported by librarians in implementing sustainability through commitment. An environmental training, tips for best practices and instructions on how to measure success and encouragement are essential.
- Librarians should adopt green library standards to design library building in order to achieve sustainability.
- Librarians can also encourage sustainability internally.
- Librarians must motivate users to participate in green library project by introducing them with the benefits of green library.
- Customer communication should receive more attention because libraries have considerable opportunities to improve their customer environmental

awareness through communication and environmental education as well as acting as an example.

- The intrinsic role of library in sustainable development should be emphasized more. Library activities in itself ecological which deserves to be highlighted more. However, the role of the library in promoting social sustainability needs to be reinforced.

Agashe 2013 has assigned following roles to a librarian in making Green Libraries:

- The green librarian role is most extraordinary here called eco-librarian who has to handle the budgets to support the organizations.
- The resources should be provided on site help to the people to locate library materials and many documents and organizations that are oriented towards a helpful future.
- These are two most important things- Economy and Ecology for making healthy and prosperous sustainable libraries. Librarian has to keep in mind essentially.

5.7 Green Library Movement in India:

India is currently fighting with myriad problems pertaining to pollution explosion, dwindling resources, illiteracy, poverty, unemployment, threats of terrorism among others. In this scenario, little emphasis is given on emerging issues like hygiene and environmental awareness. Indian libraries have started to obtain provisions for natural lights as much as possible, energy saving bulbs in the reading rooms and other places within library premises, provision of natural air, emphasis on cleanliness, hygienic toilets, adequate provision of waste bins at appropriate places, proper disposal policies for weeded library materials / equipments etc. The Energy and Resources Institute (TERI) has been in the forefront of the Green Library movement in India. This organisation has created first USGBC rated Green Building in India i.e. CII-Godrej Green Business Centre in 2001. TERI thought of the need for development of an indigenous tool for rating of green buildings in India. This rating system – GRIHA (Green Rating for Integrated Habitat Assessment) has been created by the government of India as the National rating system. In Kerala COSTFORD (Centre of Science and Technology for Rural Development) a non-profit organization established in 1985 focuses on development of housing and made significant gains in providing alternative philosophy and technologies in order to take major responsibility in improving Green Library Movement in India.

5.8 Standards and Prospects in India

(a) Indian Green Building Council (IGBC)

- IGBC, part of the Confederation of Indian Industry (CII) was formed in the year 2001 to promote and rate Green buildings in India.
- It is India's premier certification body headquartered at Hyderabad.
- It is the founding member of World Green Building Council.
- The council offers a wide array of services which include developing new green building rating programmes, certification services and green building training programmes.

(b) Leadership in Energy and Environmental Design (LEED-India)

- LEED certification is a rating system developed by the U.S. Green Building Council (USGBC) to check and ensure sustainability while making new buildings and renovations.
- LEED India projects registered with IGBC till June 2014 would be certified by IGBC. LEED projects in India registered after June 2014 would be certified by the Green Building Certification Institute (GBCI).

5.9 Green Library Initiatives in India:

SL.NO	NAME OF THE LIBRARY	INITIATIVES
1.	NIT, SILCHAR	The Central Library, NIT Silchar with its modern collection of knowledge resources and innovative information services strongly supports students, faculty and the surrounding community in their intellectual pursuits. The initiatives for Greening the library taken by NIT, Silchar is probably the first of its kind in the entire North East Region of India. The New Library Building under construction is designed according to LEED certification system of U.S which can be the role model for developing green libraries in Barak Valley.
2.	CHENNAI'S GREEN LIBRARY-ANNA CENTENARY LIBRARY	The library building is made in an environmentally responsive way which employs both passive design features and resource efficient active elements to increase sustainability. Designed by CRN, the nine floors Anna Centenary Library building houses a total area of 30,950 square meters and has a capacity to accommodate 1.5 million books. The project has achieved the LEED Gold rating given by Indian Green Building Council.

SL.NO	NAME OF THE LIBRARY	INITIATIVES
3.	DELHI UNIVERSITY LIBRARY	Delhi University Library System (DULS) consists of more than 34 libraries and is accomplishing its task of reaching to wider academic community. The Library Building is naturally cool and pleasant with broad opening for natural lights. In order to prevent excessive heat of the Delhi Summer, desert coolers are installed which have pads with indigenous material ' Khus khus'.
4.	MADRAS UNIVERSITY LIBRARY	It is a symmetrical mixture of Indian and British architectural style. Wide corridor and large windows with sunshades outside enable to accelerate fresh air, preventing direct sunlight and allowing entry of adequate natural lights.
5.	PERNA KARPO LIBRARY, LADAKH IN INDIAN HIMALAYAS	Solar panels, surrounded by white lotus garden, innovative technologies.
6.	KARNATAKA UNIVERSITY LIBRARY	No books, book shelves, chairs or tables but benches are installed under the trees so that students can comfortably sit and read the books taken from the university library.

Apart from these, Green initiatives have been taken up effectively by Calcutta University Library System and Mumbai University Library System. The University Library Buildings are being converted into modern buildings known as "Knowledge Resource Centre" which are based on the concept of "Green Building" providing open space learning environment and provisions for natural lights, natural air and other sustainable facilities.

5.10 Going Green Challenges for Libraries:

Notwithstanding the green library movement and sustainable practices are realized across the world, still there are a few challenges to be dealt with:

- Libraries are facing real issues in meeting green goals as they are subject to stringent budget cuts especially when reengineering or reconstructing library structures.
- Library buildings are mostly neglected especially in colleges. At most places librarians are clueless as he has to work in an allotted space even when new buildings are being proposed or are under constructions.

- Green practices in sustainable manner demand considerable degree of expertise from general management to ordinary level of maintenance throughout library functions. It is being observed that those employees who have been recruited with traditional knowledge and skills are mostly unaware of green technology.
- Attitudinal barriers can play significant role in slowing down the sustainable practices in libraries. There are possibilities to convince the administration who would otherwise object the idea executing green library practices due to their unawareness.

6. Conclusion:

Modern trends in 21st Century Libraries is not just exploring latest tools and technologies for storage and retrieval of information but also to provide sustainability to the libraries in an eco-friendly manner. It is to be noted that today's libraries as gateways for knowledge are particularly responsible not only for disseminating the idea of sustainability but also for leading by example. The notion of a Green library is still a new concept in the paradigm of modern library services and open space learning. Green library is a kind of system where technology is nicely juxtaposed with environment to achieve sustainability. The Nobel Prize winning Intergovernmental Panel on Climate Change concluded in their report that "global warming is unequivocal and that the human activity is very likely causing most of the rise in temperatures"**(Rosenthal & Revkin, 2007, para.1)**. The time is apt for libraries to step up and help communities to become green and sustainable. Like other developing countries people in India too have started gaining awareness about green libraries and Government also has started taking steps in this direction. Going for a green library with the specific standards as developed by IGBC in India with a LEED certification will truly influence the quality of services modern libraries provide to their users.

7. References:

1. Antonelli, M. (2008). The Green Library Movement: An Overview and Beyond. Electronic Green Journal, UCLA Library, UC Los Angeles. Vol. 1, Issue 27, January, 2008. ISSN: 1076-7975. Pp. 1-12. Available at: https://escholarship.org/uc/item/39d3v236.

2. Aulisio, George J. (2013). Green libraries are more than just buildings. Electronic Green Journal, 1, 35, 1-8.

3. Bhattacharya, A. (2017). Green Library and Its Utilities in Modern Day Library Service: A Study. IJNGLT Journal, Vol.3 Issue 3, 20-29.

4. Brown, B. (2003). The new green standard: With the LEED rating system in place it is easier to make sure your new library saves money as it treads lightly on natural resources [Electron Version]. Library Journal, 128, 20, 61-4.

5. Chowdhury, G. (2012), "Building environmentally sustainable information services: A green IS research agenda", Journal of the American Society for Information Science and Technology, Vol. 63 No,4, pp. 633-647.

Sustainable Library: Making the Libraries Eco-Friendly in the Modern Era

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ABSTRACT: A sustainable library or green library, is a library built with environmental concerns in mind. A library can attain sustainability by incorporating green architecture in its design, devising strategies for development of sustainable collection and adopting eco-friendly practices. Utilising energy-efficient resources during the construction, maintenance, and life cycle of the structure is the primary goal of green buildings. Sustainable collection can be developed by thoughtful consideration of materials, resources and users' needs. As knowledge gateways, libraries are not only responsible for serving as advocates of sustainability, but also as models, serving as beacons of change. The paper discusses the concept of sustainability, need of developing green libraries, their features, the standards and practices for making libraries sustainable. Furthermore, the paper also highlights the obstacles that libraries have to face in the way attaining sustainability.

KEYWORDS: Green library, Sustainability, Green library building, Sustainable practices.

1. Introduction:

"Sustainability" refers to "the ability to be maintained at a steady level without exhausting natural resources or causing severe ecological damage," according to the Collins Dictionary. The United Nations defines sustainability as "meeting the needs of present generations without compromising the ability of future generations to meet their needs".

Recently, the concerns about sustainability have been felt in almost every industry, and the library is no exception. There is growing interest in a green movement in almost every sector. Libraries naturally contribute to a society's ecological sustainability by facilitating the sharing of books and other resources and by

serving as a hub for socialization, education, and the preservation of cultural heritage. However, libraries are also structures that use a lot of energy for air conditioning, lighting, computer systems, and occasionally photocopiers; none of these uses can be deemed sustainable. (Hauke & Werner, 2013)

In the face of an uncertain future, libraries need to capitalise on their strengths for developing more responsible operational models in terms of economical, social and environmental impact. Green principles ought to be ingrained in library operations. A key element of library operations should be the long-term growth of the collections and services offered. (Wilson, 2012)

The American Library Association's (ALA) Task Force on the Environment identifies three key dynamics in its framework for a responsible approach to the future: economy, ecology and equity, i.e., ecologically sound, socially equitable and economically feasible activities. (Sharma, 2022)

2. Green/Sustainable Library:

In Oxford English Dictionary (1989) the term "green" is defined as "pertaining to or supporting environmentalism". The term "sustainable" has been related to the "forms of human economic activity and culture that do not lead to environmental degradation especially avoiding long-term depletion of natural resources".

According to the Online Dictionary of Library and Information Science (ODLIS) green/sustainable libraries are basically "designed to minimize negative impact on the natural environment and maximize indoor environmental quality by means of careful site selection, use of natural construction materials and biodegradable products, conservation of resources water, energy, soil, paper, and responsible waste disposal recycling, etc."

Aulisio (2003) proposes that "we shift the trend and use term 'green library' to refer to any library that promotes sustainability through education, operations, and outreach."

In the present time the advancement of modern technology, life styles of human being towards development are evolving in a rapid speed. The curiosity and interest in technological innovations are in a continuous process to fulfil the unending demands. So, in between this we are lapsing something important that should be recognized before sustainable development and this indefinite productive development can only be possible to make the environment a sustainable one. The word "Green" has a great importance here for a healthy survives. Over the past few years, it has been seen that there is an increasing interest towards green

revolution in every sector and library is one of them. The term Green Library refers to a library that's environmentally conscious in numerous ways. Green library practices are witnessed and impressed for bettered library services.

The "Green Library" movement came out in the 1990s and it gained popularity in 2003. The formation of green libraries is gaining popularity in the field of library and information profession. A green library which is also called a sustainable library that is designed, constructed, renovated, and operated with environmental concerns in mind. It refers to a building that certifies the library as an environmentally friendly building. It is a combined effort of all human beings to make a green planet by lessening global warming. Green libraries contribute towards supporting the natural ecological balance in the environment and preserving the planet as well as natural resources. It also improves the daily operations and processes of the library and intimates the community about responsible environmental practices. (Bhattacharya, 2017)

Brown (2003) has identified the following green design elements which can be incorporated into libraries:

- **Community Collaborations:** Make sure that community resources are effectively used and help to maintain public support
- **Daylight:** Set daylight with artificial lighting to reduce the cost of energy
- **Green materials:** Use renewable materials like bamboo, wood, cork, and linoleum
- **Green roofs**
- **Raised floor systems**
- **Energy efficiency**
- **Natural ventilation**
- **Green power and renewable energy**
- **Indoor environmental quality**

A green and sustainable library is a library which takes into account environmental, economic and social sustainability. Green and sustainable libraries can be of any size, but they should have a clear sustainability agenda which includes:

- *Green buildings and equipment*: The emissions, or carbon footprint, of the building and equipment are actively decreased.
- *Green office principles*: Operational routines and processes are environmentally sustainable.
- *Sustainable economy*: Consumption is restrained, circular and sharing econ-

omy practices are advanced and are made accessible to the community.

- *Sustainable library services*: Relevant and up-to-date information is easy to access for users, shared spaces, devices, and environmental education is offered, and operations are efficient. The library has a positive carbon handprint.
- *Social sustainability*: Good education, literacy, community engagement, cross cultural diversity, social inclusion, and overall participation are considered. The library works actively to reduce inequality.
- *Environmental management*: Environmental goals are SMART (Specific, Measurable, Achievable, Realistic and Timebound), and the library works to decrease its own negative impact on environment. Communications are done to a broader audience related to the library's environmental policy, its implementation and the results of environmental work to a broader audience.
- Commitment to general environmental goals and programmes: Commitment is guided by the UN Sustainable Development Goals, the Paris Climate Agreement and related environmental certificates and programmes.

2.1 Concept of Green Library:

The 'Green library' concept is of recent origin and is under the method of evolution. So, being an evolving concept, it is gaining popularity among the researchers, academicians, and library professionals all over the world. The formation of Green Library is proceeding towards a turning point, giving rise to the green library movement comprising of libraries, librarians, towns, cities, colleges, and university campuses executing to greening libraries and lessening their environmental impact. Various green oriented concepts and movements emerge over a period of time, which have a big relevance to the natural environment. So, "Green Library" is one among such concepts and movements. Green Library refers to a library which is environmentally conscious in numerous ways. (Ingole, A. R. & K, S., 2021)

The green/sustainable library is a new concept which is gaining popularity among the library professionals. The American Library Association Task Force on The Environment (TFOE) introduced the concept of "green" in librarianship and has a goal of making the libraries and educating librarians by organizing the environmental related programs and giving open access to the Electronic Green Journal.

When we say 'Green Library' it necessarily means overall library operations and library buildings. Here the concept seems to be much comprehensive but in simple

words we can say that 'Green Library' is nothing but environment friendly or eco-library. So, therefore in short it can be said that green library can be characterizes as 'Environment Friendly Library or 'Sustainable Library'.

2.2 Types of Green Library:

Green libraries can be divided in two ways. Some libraries are built as green libraries with eco-friendly architecture, structure, and other building effects, whereas some of them also internally follow eco-friendly and green practices like energy generation, energy conservation, green collection development, reduce, reuse the waste or manage the same and many more.

Some examples of the first type of libraries are:

- Anythink Brighton, USA
- Dexter Library, Ashland
- Crowfoot Branch, Calgary Public Library, Canada
- TERI University library, India
- Anna Centenary Library, India

Some examples of the second type of libraries are:

- My Tree House, Singapore
- Vallila Library, Helsinki, Finland

2.3 Need for Green Libraries:

All buildings uses resources such as land, energy, water and materials to fulfill the functional needs of a space. As such, there can be no building without environmental impact. A building is green when it is resource efficient and fulfills the functional requirement of the space with minimum negative impact on the environment over the longest possible time.

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The need for the green library may be essential due to the following reason: Due to the pollution caused by materials such as cement, bricks, steel, etc. used in the formation of the normal libraries. (Shukla, R., Sharma, A., & Singh, M., 2020)

- ✓ The construction cost of green libraries is lesser as compared to the general libraries.

- ✓ Most of the resources are finite so we should use them responsibly in the right manner.
- ✓ The green libraries will help in controlling the pollution level and release of greenhouse gases which are very harmful to our environment.
- ✓ The green libraries can be used in energy and water conservation through the installation of solar panels and harvesting of the rainwater.
- ✓ With the changing environment, the image of the library also needs to be changed for the engagement of more users in the library.
- ✓ It will provide an eco-friendly environment for the users as well as staff.

2.4 Features of Green Library:

Green library is basically characterized as environment friendly library and every green library necessarily possess certain essential features and those are as follows: (Kulkarni, P. P., 2018)

- ☐ There should be a proper location or a more suitable site for a green library
- ☐ Utilization of natural, recycled, and regionally materials available
- ☐ Making use of reflective roof and ground
- ☐ Making use of insulating windows
- ☐ Conservation of resources such as paper, water, and energy
- ☐ Minimizing the consumption of using energy-efficient lighting
- ☐ There must be a system for optimized cooling
- ☐ There must be plantation both inside and outside the building
- ☐ There should be a circulation of healthy and fresh air
- ☐ Making use of environmentally friendly technology

2.5 Importance of Green Library:

In the present world preserving the environment is a requisite part of mankind which is affected by various reasons such as global warming, the greenhouse effect, carbon dioxide, and ozone depletion are the main cause for the environment. Time is changing fast, and our natural resources are limited. Everybody is holding the responsibility of leaving a healthy planet for the next generations. The future generation will not be able to survive at all if the use of natural resources will not be done wisely. Today, people are affected by many natural disasters like floods and drought. These are very much influencing mankind's life and health. In the ongoing green system, the importance of a green library is also included because libraries are repositories for knowledge for the future generation which requires a significant amount of energy, water, and other resources to survive. (Shukla, R.,

Sharma, A., & Singh, M., 2020)

The importance of making the green library is that the cost of making green buildings has become cost-effective, so now it is possible for the libraries to construct green buildings on available budgets. Green buildings produce less emission of gas and less consumption of electricity than conventional buildings. The library with green roofs is sheltered by the vegetation, which absorbs rainwater and provides insulation that results in less heat and at the

same time the green roofs also make the building beautiful and attractive. Secondly, the most easily available resources are finite resources of energy and we must lessen the carbon footprint of our buildings. The outline of the library space according to the green library standards will reduce less consumption of energy Aulisio.

3. Sustainable Architecture:

"There must be a better way to make the things we want, a way that doesn't spoil the sky, or the rain or the land." - Paul McCartney

This quote by The English singer, song-writer and musician who is best known as the former frontman for The Beatles, beautifully summarises the sustainability approach.

Sustainable library architecture focuses on eco-friendly materials, energy-efficient interior design options, comforting shelf and study area layouts, and a suitable indoor environmental quality. Sustainable architectural design strategies include reducing energy consumption and creating a healthier and more enjoyable interior environment (Edwards, 2011). They emphasise using renewable energy sources, using ecological and non-toxic materials and furniture and reduce maintenance costs through recycling and reusing and innovative technologies for construction and management. Moreover, the building should be structured and designed in a manner that the surroundings of the library, the entrance, stairs, elevators, sections should be accessible for persons with different kinds of disabilities.

3.1 Sustainable Building Structure:

The structure of the green library should be framed considering the guidelines prescribed by the LEED (Leadership in Energy and Environmental Design). The following five areas framed by LEED must be considered strictly before the formation of green buildings. (Aulisio, 2013; Mondal, 2021)

- ✓ ***Site Location:*** The location of the library should make it convenient for people to use public transit to get to it. In order to save people from having to travel far, the site should be in a populous region with proximity to other key services. Parking spaces are required for the structure, especially for vehicles that use less energy. (Shukla, Sharma & Singh, 2020)
- ✓ ***Water Conservation:*** Water is a natural resource that is fast running out; therefore, we must conserve it. Rainwater should be harvested in green building designs so that it may be used for toilet flushing, and other purposes. Rain gardens consisting native or adapted plants, vegetated swales can allow rainwater to reabsorb into the ground. (Sharma, 2022)
- ✓ ***Energy Conservation:*** Energy conservation is the most crucial and demanding element in the process of creating a green building. The building's construction should be planned with a dependence on natural factors in mind. For example, using daylight during the day and having adequate ventilation may reduce the need for artificial lighting, fans, air conditioners, coolers, and other appliances especially during the summer, when electricity consumption is higher. LED bulbs can be used in place of the normal bulbs. By installing solar panels on the building's top, power can also be produced directly from the sun, and the electricity generated by the solar panels can also be saved and conserved. For the conservation of electricity motion and light sensors, timers and energy saving dimmers, glass technology can be used. (Barnes, 2012; Sharma, 2022)
- ✓ ***Building Material:*** It is imperative that the building materials be chosen carefully and sensibly. Only materials that generate very little trash and does not disturb or harm the environment may be chosen. Building walls can be constructed using wool bricks and paper insulation, which keeps the walls insect- and fire-proof. The flooring can be covered with linoleum. Steel can be substituted with bamboo and cork when making furniture. Low or no VOC materials for items like adhesives, and paints, can be used. Whenever possible, recycled and reusable material should be used. (Barnes, 2012)
- ✓ ***Indoor Air Quality:*** A proper ventilation system is necessary in the building to enhance the indoor air quality. Effective design of the windows and doors will ensure that occupants never feel confined. Because air conditioners generate extremely harmful fumes that are bad for the health, they should only be used when absolutely necessary. Indoor plants can be placed to filter the air inside the library. Additionally planting trees around the library's premises may be considered and rooftop planting can also be implemented, if possible, to cool the space and offer clean, pure air.

3.2 Standards for Green Buildings:

- ***Chicago Illinois Standards:*** Chicago established its own standard and was among the first cities to integrate green construction practises into public buildings. A major factor influencing these criteria is the LEED Green Building Rating System. It states that the design and construction of buildings with a minimal impact on the environment is referred to as sustainable and green. All stages of design, material selection, and construction—including life-cycle analysis and energy efficiency—are included in green building. (Mondal,2021)
- ***Brown Green Standard:*** Governor Jerry Brown of California declared "green libraries" to be the pinnacle of environmentally friendly architecture looking at their growing popularity. Any new or remodelled state buildings larger than 10,000 square feet needs to have sustainable energy generation and a LEED Silver certification or above from the US Green Building Council. (Mondal, 2021)
- ***Building Research Establishment Environmental Assessment Method (BREEAM):*** Based in Watford, England, it is one of the longest established systems in the world for evaluating, classifying, and accrediting a building's environmental and sustainable features. It has been actively involved in the construction of more than 550,000 BREEAM-certified buildings in more than 50 countries worldwide.
- ***IGBC Indian Green Building Council Standard:*** Confederation of Indian Industry (CII) founded IGBC in 2001 with the goal of facilitating the creation of a sustainable environment for all. In order to promote green buildings in India, IGBC collaborated with the US Green Building Council to licence the LEED Green Building Standard and devised a gold grading system. (Pangail, 2015)
- ***Green Rating for Integrated Habitat Assessment (GRIHA):*** Another group leading the Indian green construction movement is TERI (The Energy and Resources Institute, New Delhi). TERI foresaw the need to create an indigenous instrument for India's green building grading system, which resulted in the establishment of "GRIHA". (Pangail, 2015)
- ***Centre of Science and Science*** and Technology for Rural Development (COSTFORD): It is a volunteer non-profit is a Thrissur city-based organization that was established in 1984 with the goal of giving the public access to green building technology support. It offers affordable, environmentally friendly housing that is suitable for habitation to the people. It minimizes the use of materials like cement, bricks, steel, etc.

and emphasizes the use of energy-efficient techniques and materials like exposed brickwork, bamboo, brick jali, etc. (Ingole & Kumar, 2021)

- ***Habitat Technology Group (HTG):*** It is a government non-profit organization that was founded in Kerala in 1987. Additionally, it has a few response centers abroad. It effectively designs structures with minimal impact on the environment and at a reasonable cost. HTG has created more than a million green buildings worldwide till date. (Ingole & Kumar, 2021)

4. Developing Green Library Collections:

To develop a green collection, the very first effort that needs to be given on the knowledge about green practices, green collection resources and green programming materials on which librarians need to educate themselves. The second effort that needs is to gather green information in the library for its patrons.

ALA (2009) suggests some ways to support community needs for green information and those are as follows:

- Offer open forums for green book clubs and amenities for environmental video viewings or lecture presentations.
- Create occasions for children to get to know their environment and its impact through poster competitions or poems or essays on the subject of environment.
- Select collection materials on organic gardening and composting or green computing and energy conservation.
- Set library computer links and bookmarks to environmental issue sites.
- Create outreach relationships with local groups interested in environmental concerns and inquire about their information needs.
- Work with local schools to support green curriculum and projects, such as murals or models of ecosystems.

4.1 Strategies for Developing Sustainable Collections:

Green design strategies that are to be adopted: (Afacan, Y. 2017)

(a) For making the collection sustainable the indoor environmental qualities such as thermal comfort, temperature and humidity levels should be monitored and enhanced whenever possible.

(b) In addition to Cleanliness is a vital part of the maintenance of the collection and using non-toxic materials for cleaning of the walls, floors, ceilings, shelves, etc. should be considered.

(c) A collection room should also consider the outside view. A design with a controlled outside view can motivate users and enhance interior environmental quality in terms of daylight, natural ventilation and thermal comfort.

(d) A digital collection can supplement the conventional collection of printed resources. Digital collections take less space for storing and it can last for a longer period of time when stored properly and updated from time to time. There should be innovative web technologies to make items available and searchable and easy access to the collections for the online community of users.

(e) Building a good digital collection requires long-term sustainable processes, procedures and workflows to digitize the materials.

5. Sustainable Library Practices:

Most of the libraries which were built before global warming and climate change were critical issues. Constructing green libraries are basically part of a larger environmental building movement. Leadership in Energy and Environment Design (LEED) green building rating system, is an organization which encourages in global adoption of sustainable green building. Due to shrinking of library budgets it is not possible for every library to construct new library building according to LEED certification. So, instead they can implement environmental practices by looking at their existing buildings. (Mavily, P & T.M., V, 2019)

a. Materials & Equipments:

All the materials and equipments which are used in the library should be selected keeping in mind the green library practices such way that it reduces the overall consumption of energy So, below are the following measures which may be practiced to make the library green.

- Charging system may be through software. Reader's ticket should be avoided, as it is made of plastic.
- Application of membership may be made through online mode. Supporting documents which requires may be collected in soft copy only.
- Card catalogue may be removed and OPAC may be provided.
- Provide online services by making use of web2.0 technologies
- E-receipts may be given instead of paper receipts.
- All the electronic equipments used in the library may be according to

the latest star rating for reducing the consumption of electricity and also reduces the electricity bill.

- Lighting of the library may be in such a way that natural light may be most used during day time and their arrangements may be made in such a way that no constraints can block the passage of natural light.
- Light sensors may be used for lighting so that the areas will be lighted when in use by users.
- LED bulbs and tubes may be used for lightning.
- Laptops which use less electricity than desktop versions may be used.
- Scanning of documents may be promoted by providing scanning service instead of xerox which reduce use of paper.
- Old electricity consuming equipments may be changed into new star rated products.
- Natural products may be used for preservation of books.
- Solar panel may be placed on library building for creating solar energy and inturn for use in the library.
- Library building may be in modular structure so that solar energy and also roof top vegetation can be made by team work of the library staffs. It increases the inter personal relationship and at the same time it also provides a good message to the society about the awareness on sustainability.
- Indoor air quality may be increased by growing indoor plants.
- Avoid A.C. in library as far as possible and as it emits toxic elements to nature. Only digital library and labs where we cannot avoid A.C can be used only.
- OPAC may be started by the first user who approaches and training for that may be given in orientation program.
- Paper pens may be used by staff and users.

b. Waste Management:

In making libraries sustainable, waste management plays an important role. Repair, recycle and reuse are the three principles which needs to be followed in making the libraries green. So, proper maintenance of the waste by cooperating with other departments of the parent institutions make the library equip to follow the green principles. The following measures may be practiced by the librarians in achieving the proper maintenance of the waste.

- Reuse and recycle water, paper etc.

- Recycle computers and buy recycled ink cartridges and other supplies.
- Get rid of waste by composting and stop using plastic bags.
- Discard weeded books by selling it to used book dealers, exchange library materials with other participating libraries or donate to other libraries.
- Old furniture may be sent to other needed departments or recycled and used again.

6. Challenges:

Although the green building movement as whole and sustainable libraries are related, libraries present additional difficulties due to their unique requirements. Some of them are as follows:

- ✓ Books need to be protected from moisture, temperature fluctuations, and sunshine, especially its harmful UV rays, in order to preserve them. Sunlight, however, also contributes significantly to green design since it may be utilized to lessen the need for artificial lighting.
- ✓ Libraries must be constructed with flexibility to accommodate future additions. Since library buildings are long-term investments, architects must consider the next 50 or 100 years while constructing them. All that needs to be done is to start the project with the library's unique demands in mind. (Mondal, 2021)
- ✓ Even if other organizations can now afford to develop green buildings, libraries will struggle to reach their green targets due to strict budget constraints, particularly when it comes to reengineering or reconstructing library facilities, which comes with a high cost. (Brodie, 2012)
- ✓ A significant level of proficiency, ranging from general administration to routine maintenance across all library activities, is needed to implement green practices in a sustainable manner.

7. Conclusion:

At present time, reducing the carbon footprint of constructed areas and their continuous influence on the environment is of paramount importance. Given the current situation, libraries must work promptly to convert from traditional to green libraries. Libraries can help the environment by choosing more environmentally friendly options. There are a plethora of programs and rating systems around the world, that offer a framework for environmentally friendly, economical, and efficient green buildings. Digital services and the previously mentioned architectural design

concepts in planning, implementation, and management must work together to create a sustainable library. But adopting sustainable principles alone won't make a project green; before creating new libraries or renovating old ones, architects and designers need to consider users' satisfaction and preferences. At the same time, it's critical to remember that sustainability is a dynamic process and that a sustainable library is one that continuously adopts new sustainable practices into its operations and advances environmental sustainability knowledge. Since the goal of the library is to disseminate information, librarians have an obligation to raise awareness of the need for sustainability among library users and the community at large by offering accurate information on green buildings, renewable energy options, and sustainable practices.

8. References:

1. Afacan, Y. (2017). Sustainable library buildings: Green design needs and interior architecture students' idea for special collection rooms. *The Journal of Academic Librarianship, 43*, 375-383.

2. Aulisio, G. J. (2013). Green libraries are more than just buildings. *Electronic Green Journal*, 35(1).

3. Barnes, L. L. (2012). Green buildings as sustainability education tools. *Library Hi Tech*.

4. Bhattacharya, A. (2017). Green library and its utilities in modern day library service: A study. *International Journal of Next Generation Library and Technologies (IJNGLT), 3*(3), p. 1-11.

5. Brodie, M. (2012). Building the sustainable library at Macquarie University. *Australian Academic & Research Libraries*, *43*(1), p. 4-16.

6. Edwards, B. W. (2011). Sustainability as a driving force in contemporary library design. *Library trends*, 60(1), p. 190-214.

7. Gaffar, Sk Abdul, N., Sindhu P. & Kumar. S. Kishore (2021). The green library initiatives in Indian perspective: A study. *Library Philosophy and Practice* (e-journal). Retrieved from https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=11829&context=libphilprac

8. Hauke, P., & Werner, K. U. (2013). Going green as a marketing tool for libraries: environmentally sustainable management practices.

9. Ingole, A. R., & Kumari, S. (2021). Green library: Concept, sustainable development, features, importance, standards and overview in Indian scenario. *International Journal of Creative Research Thoughts (IJCRT)*, *9*(12), 15.

10. Kulkarni, P. P. (2018). Green library: Concept, features and elements. *Journal of Emerging Technologies and Innovative Research (JETIR), 5*(1), 1456-1460.

11. Mavily, P & T.M., V. (2019, February). *Going green: Libraries for sustainable development.* Paper presented at National conference on innovations and transformations in libraries. Retrieved from https://www.researchgate.net/publication/331319223 _Going_Green_Libraries_for_Sustainable_Development

12. Meher, P. (2017). Green library: An overview, issues with special reference to Indian libraries. *International Journal of Digital Library Services (IJODLS), 7*(2), 62-69.

13. Mohapatra, N. (2020). Feed green to read green: Green library movement for sustainable development. In Gunjal, B. [et all.] (Eds.), *Next generation libraries: Emerging technologies, community engagement & future librarianship* (pp.67-79). N.D.: Ess Ess.

14. Mondal, H. (2021). An overview of green library: A step towards sustainable world. *Influences of Green Technology in Academic Libraries*, 15-32.

15. Pangail, R. K. (2015). Green libraries: Meaning, standards and practices. *Episteme*, *4*(3), 1-9.

16. Sharma, J. (2023). The Pressing Need for Rejuvenating Public Libraries in the Light of Sustainability. In *International Conference on Library beyond Campus: Resurrecting Public Library Services for the Generation Next.*

17. Shukla, R., Sharma, A., & Singh, M. (2020). Sustainability development of green libraries and its features, importance, and standards. *International Journal of Information Dissemination and Technology*, *10*(4), 219-226.

18. Sustainability. (n. d.). Retrieved from https://www.un.org/en/academic-impact/sustainabi lity.

19. Sustainability. (n. d.). Retrieved from https://dictionary.cambridge.org/dictionary/english /sustainability.

20. Wilson, L. A. (2012). Creating sustainable futures for academic libraries. *Journal of Library Administration*, *52*(1), p. 78-93.

Building the Future: Sustainable Architecture and Design (Green Library)

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ABSTRACT : This research paper explores the sustainability of the library in this current era. In the present era, this study article investigates the viability of libraries. The green revolution has garnered more attention in the past few years in a number of worldwide sectors, namely in the information resources that serve the demands of the present generation without jeopardizing the legacy for future generations. The study focuses on the sustainable architecture and interior design of the library to maintain the natural ecological balance and preserve the e-management that can contribute to sustainability and help in mitigating climate change. The article also provides a general overview of sustainability, green libraries, and some initiatives such as the UNDP, LEED and more.

Keywords: sustainability, green library, architecture, interior design

Introduction :

The advancement of human cultures has been expedited by the speedy growth of contemporary technology. Because implementing an environmentally sustainable library initiative is similar to starting a business, this should be kept in mind. For this reason, entrepreneurial mental mapping tools are useful planning tools for green library initiatives. Green libraries are one example of how the architecture and interior design of libraries should be planned to address issues like water management, energy efficiency, pollution reduction, natural resource conservation, and employing sustainable ecological practices. Green, or sustainable, libraries are made to protect the e-management that can support sustainability and help to mitigate climate change, as well as the natural ecological balance.

Objective :

1. To make a small contribution to the creation of a green earth.
2. To make use of things that can be repurposed?

3. To make effective use of technology in order to cut library costs.
4. A successfully designed building will function as an integrated system.
5. To save energy by adding flora to the library compound.
6. Promoting the green library movement

What is Sustainability?

Sustainable development is development that "meets the needs of the present without compromising the ability of future generations to meet their own needs" (Our Common Future, Brundtland Report, UN). This encompasses all varieties of libraries, which have a major and active role to play in sustainable development. A library that considers sustainability in the social, economic, and environmental spheres is considered green and sustainable. Green libraries, as defined by the Online Dictionary for Library and Information Science, are "designed to minimize negative impact on the natural environment and maximize indoor environmental quality by means of careful site selection, the use of natural construction materials like nature and biodegradable products, conservation of resources (water,paper, solar, and energy), and responsible waste disposal (recycling, etc.)."

The Role of Libraries in Sustainability :

Libraries, traditionally seen as repositories of knowledge, have evolved into dynamic hubs that play a pivotal role in advancing sustainability. In an age characterized by increasing environmental awareness and the urgent need for responsible resource management, libraries have become crucial stakeholders in promoting sustainable practices. This section explores the multifaceted role libraries play in supporting environmental, social, and economic sustainability within their communities and the broader world. From providing access to vital information on eco-friendly practices to actively participating in green initiatives, libraries have emerged as powerful agents of change in the pursuit of a more sustainable future.

Sustainable Architecture Principles :

Sustainable architecture principles guide the design, construction, and operation of buildings with a focus on minimizing their environmental impact while creating healthier, more efficient, and sustainable spaces. These principles are essential for promoting environmentally responsible and resource-efficient architectural practices. Here are some key sustainable architecture principles:

1. Energy Efficiency:

- Reduce energy consumption through efficient building design, insulation, and the use of high-performance windows.
- Implement passive solar design to maximize natural heating and cooling.
- Incorporate energy-efficient HVAC (heating, ventilation, and air conditioning) systems and lighting technologies.

2. Renewable Energy Sources:

- Utilize renewable energy sources, such as solar energy, wind energy, biomass energy (such as ethanol), hydropower, and geothermal power, to generate clean energy on-site.
- Connect to local renewable energy grids when feasible.

3. Materials Selection:

- Choose sustainable and low-impact materials, such as recycled, reclaimed, or rapidly renewable materials.
- Prioritize materials with low volatile organic compound (VOC) emissions.
- Reduce waste through efficient construction practices and recycling.

4. Water Efficiency:

- Implement water-saving fixtures and technologies like water-saving faucets, low-flow toilets, and smart irrigation systems.
- Design landscapes with drought-tolerant plants and efficient irrigation systems.

5. Site Selection and Planning:

- Choose building sites that minimize environmental impact, such as brownfield redevelopment or urban infill.
- Optimize the building orientation for passive solar gain and natural ventilation.
- Protect and restore natural habitats and ecosystems on the site.

6. Waste Reduction and Recycling:

- Design for adaptability and deconstruction to facilitate the recycling of materials at the end of a building's life.
- Implement waste reduction strategies during construction and promote recycling.

7. Indoor Environmental Quality:

- Provide ample natural daylight and views to the outdoors to improve occupant well-being.
- Ensure good indoor air quality through the use of low-VOC materials and proper ventilation.
- Consider acoustics and thermal comfort for occupant satisfaction.

8. Adaptive Reuse and Historic Preservation:

- Encourage the adaptive reuse of existing structures to reduce the need for new construction.
- Preserve historic buildings and their architectural value while improving their sustainability.

9. Life Cycle Assessment:

- To determine the environmental impact of building systems and materials over the course of their whole life cycle, conduct life cycle evaluations.
- Use this data to make informed decisions about material selection and design choices.

10. Resilience and Climate Adaptation:

- Design buildings to withstand climate-related challenges, such as extreme weather events and temperature fluctuations.
- Incorporate strategies for climate adaptation, such as flood-resistant design and passive cooling.

11. Community Engagement:

- Involve the community in the design process to ensure that the building meets local needs and desires.
- Promote education and awareness about sustainable design and practices within the community.

12. Certification and Standards:

- Seek accreditation from organizations that grade sustainability, such as the Leadership in Energy and Environmental Design (LEED), Building Research Establishment Environmental Assessment Method (BREEAM), Green Rating for Integrated Habital Assessment (GRIHA), and Indian Green Business Center (IGBC).
- Adhere to local and national building codes and green building standards.

These sustainable architecture principles are integral to creating buildings that are not only environmentally responsible but also economically viable and conducive to the well-being of their occupants. By incorporating these principles, architects and designers can contribute to a more sustainable built environment.

Sustainable Architecture and Design

Sustainable Architecture and Design Sustainable architecture, also known as green or eco-friendly architecture, focuses on designing and constructing buildings that minimize their environmental impact and promote sustainability. Key principles include energy efficiency, the use of renewable materials, and integration with the natural environment. Sustainable buildings often incorporate features like solar panels, green roofs, efficient insulation, and rainwater harvesting systems to reduce energy consumption and resource use. These practices aim to create environmentally responsible and resource-efficient structures that benefit both people and the planet.

1. Use Sustainable Building Materials:

   When building up your library or renovating your library in a new area or in a new construction building, be sure to use sustainable building materials. This includes materials like cork, bamboo, wool and recycled materials. Using sustainable materials is a great way to reduce your environmental impact and create a more sustainable library. Additionally, be sure to select building materials that are low-maintenance and long-lasting. This will help you save money in the long run and reduce your environmental impact even further.
2. Courtyard Library:

   Some outdoor space for the patrons in a natural environment should be created. As the patrons will get natural light, air, and an environment for study, they will learn to innovate.

   Similar to earlier times, gurukul is the source of education. I'm not talking about the system in the end; rather, I'm talking about the hut design or infrastructure, both of which are necessary for today's generation. Huts served as the hub of education. The ideals of elevated thinking and simple living are reflected in the Gurukul complex. The several structures are situated in close proximity to each other. The majority of the huts in West

Bengal are built in the traditional vernacular style, which uses straw, bamboo, and locally burned bricks. These huts hold a strong connection with nature and natural elements.





3. Interior Design and Equipments :
    - Microfiber towels that capture dust and green cleansers are used by janitors to keep the interior of libraries healthy for patrons and staff. Entryway mats lessen pollution and grime that is tracked in.
    - Encouragement of Plants on Roofs Using natural insecticides to preserve books Well-placed windows will let in natural light and maybe reduce the cost of heating and cooling. In order to produce considerably more energy-efficient CPUs, compare energy-efficient CPUs.
    - It is simple and costly to retrofit energy-saving dimmers, motion and light sensors, and timers into already-existing buildings.
4. Management of waste:
    - computer recycling is possible.
    - Compost garbage instead of throwing it in plastic bags.
    - Launch the paper drive.
    - Request old newspapers from the audience to be recycled; they might become a new book.
    - Students choose softer, more comfortable furniture that is designed for lounging and reclining, with arms and back support, as well as comfy tables composed of bamboo. These are a few examples of what we could make for the library based on our preferences and designs.





5. Lighting :

   Use eco-friendly light bulbs, which will save money and electricity. Using bamboo-designed fan LED lights or solar energy, we can use natural lights, which may not affect our health but are also eco-friendly.



6. Small desk plants :

   Small plants are to be kept on the tables to maintain an eco-friendly environment that is pollution-free and to create positive vibes.



7. Plantable bookmarks :

   Bookmarks are used by students and faculties for notes or to remember important lines. We need a bookmark, so can't we use eco-friendly bookmarks? Here it is.



8. Solar-powered chargers :



9. Sustainable library services:

   Users may easily access current and pertinent material; shared areas and devices are available; environmental education is provided; and operations are efficient. The carbon footprint of the library is positive.

Challenges and Barriers Sustainable Libraries:

- Identify challenges and barriers to implementing sustainable architecture in libraries.
- Discuss financial, regulatory, and cultural obstacles.
- Suggest possible solutions to these challenges.

Benefits of Sustainable Libraries:

- Highlight the environmental, social, and economic benefits of sustainable libraries.
- Discuss the potential for energy savings, reduced environmental impact, and enhanced community well-being.

Findings and suggestions:

- After investigating the literature on sustainability,eco-friendly architecture, and design, it was found that initially the concept of a sustainable, green library was confined to green buildings only, but now it has broadened its nature and scope. There are different measures and practices that can contribute to building green libraries, such as green building designs, green practices in the day-to-day functioning of libraries, and green library literacy.
- LEED and GRIHA are two prominent rating systems used in India. A maximum of 110 credit points can be achieved in LEED and 105 in GRIHA.
- IFLA is a well-known international organization in the library community; it promotes the concept of green libraries through the IFLA Green Library Award, where libraries get the opportunity to showcase their work and motivate other libraries to go green. Green libraries also contribute to four sustainable goals: affordable and clean energy, responsible consumption and production, and climate action.

Suggestions:

- Proper guidelines and policies are required to assess the impact of libraries on environmental sustainability, architecture, and design.
- Sufficient funds will be provided for the green library development.
- Increasing public awareness of librarians' ecological initiatives on a regular basis via social media or other channels.
- Library Information Science students should learn about sustainability in library structures so that the next generation will embrace this concept.
- A few notice boards need to be changed to raise awareness of library maintenance and green building initiatives.
- Locally available, environmentally friendly materials should be promoted for constructing library buildings.
- Raised floors maximize the effectiveness of heating and cooling by allowing for underfloor circulation.
- Water conservation outside benefits the bay. Compared to traditional landscaping, landscaping with drought-tolerant plants and intelligent irrigation saves roughly 50%.
- Water-efficient plumbing fittings can save up to 40% indoors. Cut down on waste: Over 75% of the waste from construction was recycled.

- Buying carpets, paints, and furniture styles can help reduce the amount of dangerous chemicals released into the atmosphere. Concrete, ceiling tiles, and street framework were among the building components with recycled content.

Conclusion:

The library always has issues with space and funding, and books have had issues with dust, moisture, and fungus, necessitating particular care. The green library, also known as a sustainable library, is a modern library that uses as little electricity as possible while maximizing the usage of renewable resources such as air, sunlight, and trees. Greening the library environment is now far more important for a library. Librarians must make various decisions in order to create a green library. Participate in the green library movement as well. Many national and international organizations are assisting in the creation of a green library.

Hence, libraries are continuously expanding their horizons and acting as role models for an eco-friendly, sustainable environment.

Reference:

1. Retrieved from https://www.ijlsit.org/html-article/16827
2. Retrieved from https://www.net.publication/355007348_The_Green_Library_Initiative _in_Indian_p
3. Retrieved from erespective_A_Study
4. Retrieved from https://www.emarls.com/insight/content/doi/10.1108/JD-08-2021-0156/full/html? skipTraking=true
5. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3851100 ssrn
6. Retrieved from https://www.tandfonline.com/doi/abs/10.1080/01616846.2022.2116886 tylor&francis
7. Retrieved from https://www.ijodls.in/uploads/3/6/0/3/3603729/7ijodls217.pdf
8. Retrieved from https://www.ijlis.org/articles/green-library-a-new-vision-of-the-21st-century-91833.html

9. Retrieved from https://www.ifla.org/g/environment-sustainability-and-libraries/ifla-green-library-definition/ifla

10. Retrieved from chrome-extension://efaidnbmnnnibpcajpcajpcglefindmkaj/https://cdn.ifla.org/wp-

11. Retrieved from content/uploads/GreenLibsTools_v01_202210-1.pdf

12. extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www/ala.org/rt/sites/ala.org.rt/files/content/

13. SustainRT/SustainRT/Evaluating%20Vendor%20Swag.pdf

14. Retrieved from https://www.ijraset.com/best-journal/manifestation-of-spaces-in-gurukul-system-of- education

15. Retrieved from https://www.sustainably-chic.com/blog/sustainable-furniture-eco-friendly-companies

16. Retrieved from bamboo lightings/1005004130648418.html

17. Retrieved from https://www.webjunction.org/news/webjunction/growing-library-garden-programs.html

18. Retrieved from https://blog.degruyter.com/six-ways-to-make-your-library-greener/

19. rary-greener

Transforming Libraries for Sustainability Through Green Information Literacy

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ABSTRACT: Green information literacy enables people to make informationbehaviourchoices and see how their actions will affect the environment. This paper discusses libraries the role of in obtaining sustainability through green information literacy, using a review of various literatures. The concept of green information literacy is described and the methods in providing such type of literacy are also listed out and described. Methods include education awareness, training programmes for staff and users and collaboration. Provision of green information literacy are also in line with the United Nations Sustainable Development Goals (SDGs) and this paper mentions this connection as well.The study also describes the challenges faced by libraries in providing green information literacy. Challenges include resistance to change, lack of resources, awareness and training. The study concludes that green information literacy is the need of the hour and libraries have a major role in providing such type of literacy.

1. Information Literacy

"People trained in the application of information resources to their work can be called information literates. They have learned techniques and skills for utilizing the wide range of information tools as well as primary sources in molding information solutions to their problems" (Zurkowski,1974)

In the current digital era, where information is both plentiful and frequently overwhelming, information literacy is essential. It enables people to develop into lifelong learners, critical thinkers, and responsible information producers and consumers. Information literacy skills development among diverse populations is greatly aided by libraries, educational institutions, and other organisations.

2. Green Information Literacy

Green information literacy is the integration of sustainability into informationliteracy (Hauke, 2018). It develops a set of skills consisting of sustainable thinking that enables people to make informed information behavior choices and see how their actions will affect the environment (Kurbanoğlu and Boustany, 2014). They also defined it as a set of conventional skills expanded to include sustainable thinking, which takes into consideration how our information behaviour choices and information actions affect our environment.

Developing green information literacy entails remaining current with environmental research, recognizing the interdependence of environmental concerns, and being able to make educated decisions that support sustainability in personal, professional, and societal contexts.

This implies that Green Information Literacy applies the skills, assessing the credibility and reliability of various information sources, utilizes information related to environmental sustainability, involves understanding to ethical principles in information use and dissemination, and develops critical thinking skills applicable across a broad spectrum of subjects and disciplines.

3. Role of Libraries inproviding Green Information Literacy

Libraries can be the only source in providing access to a diverse range ofinformation sources, including books, journals, databases, and online resources related to environmental sustainability.

"Public access to information enables people to make informed decisions that can improve their lives. Communities that have access to timely andrelevant information for all are better positioned to eradicate poverty and inequality, improveagriculture, provide quality education, and support people's health, culture, research, andinnovation. Providing access to information as well as teaching information literacy skills in library classes has always been a core issue of libraries." (Hauke, 2018). Also, the challenge at hand for libraries is to go one step further and incorporate sustainability literacy skills via a socio-environmental paradigm that defines sustainability literacy as the capacity to analyse, problem solve, make decisions, and act.

Libraries provide a curated collection of information concentrating on green practices, climate change, renewable energy, conservation, and other pertinent themes, making and encouraging a local area of ecologically proficient residents. Abiolu and Okere (2012) specified the role of the library in environmental

education which is to create a special collection of materials and to provide a pleasant and conducive environment that will attract users and encourage their interest in becoming environmentally information literate.

4. Methods in providing Green Information Literacy

The emergence of the green information literacy concept will certainly require a new approach to information literacy instruction. Information literacy instruction can be bonded with environmental sustainability and contribute to the green library movement in several ways. Greening information literacy instruction is two-fold. On one hand, instruction sessions can embrace green operations and practices. This aspect entails incorporating eco-friendly practices into library operations, such as energy-efficient equipment, waste reduction initiatives, and sustainable material purchases.

On the other hand, information literacy instruction can be engaged with environmental sustainability by embedding sustainable thinking into it. It is about making users conscious about how to go green while searching, selecting, using, and communicating information. (Kurbanoglu& Boustany, 2014)

By adopting a two-fold approach, green information literacy strives to create a symbiotic relationship between information literacy skills and environmentally sustainable practices. This integration not only aligns with the values of the green library movement but also contributes to the development of environmentally conscious information users.

There are various ways to promote a green library through education, awareness, and literacy programmes (Aulisio, 2013) (Datta & Research Scholar, 2015).

To promote the concept of sustainability, libraries need to maintain a useful collection of green resources and online materials and ensure better reach to those resources.

Kurbanoglu& Boustany, (2014) provided the following suggestions :

- To create awareness among students by conducting programmes, campaigns, and events, such as organizing talks, competitions, video-making, painting, poetry, and photography on the 'green' concept, which will educate the users and nurture creativity among them.
- Libraries can play the leadership role by indulging in and making connections with like- minded people with the intention to promote sustainability by educating the students and faculty.

- To become aware of what other libraries are doing and train the library professionals, so that the new generation librarians will adapt to this idea.
- To include green libraries which contain elements such as green buildings, green operations and practices, green programs and services, green information systems and green collections.
- Proper policies and guidelines must be implemented to provide essential collections in libraries while also promoting environmental sustainability and contributing to the development of an eco-friendlier community.

Following are some recommendations for greening information literacy and information literacy instruction:

- promoting scholarly research
- developing expertise in environmental issues and green library practices
- embedding sustainable thinking into information literacy concepts and instruction
- adapting information literacy standards to embrace environmental viewpoints and sustainable thinking
- writing reports on how information literacy instruction can support environmental sustainability and sharing them with the decision makers.
- embeddingsustainability in information literacy policy documents as well as
- library policy and strategic planning
- collaborating for information literacy instruction with faculty in disciplinary areas which touch on studies of the environment and sustainability.
- compiling information on the impact of information behaviors and actions on the
- environment and presenting and sharing this information widely with users
- exploring means of sharing ideas on goinggreen in information literacy activities.

We can conclude that green information literacy and the greening of information literacy instructional initiatives can contribute, in different ways, to the creation of a Library Movement.

5. Training of Librarians/Library Staff for Green information Literacy

Libraries, as community hubs and educational institutions play a crucial role in fostering awareness and understanding of environmental issues. They should provide a more hands-on and practical approach in professional teaching for making societies and communities information literate. Maria

Anna Jankowska in her book *Focus on Education for Sustainability: Tookit for Academic Libraries* claimed the 'libraries' and 'librarians' commitment to advance sustainability education. The book emphasizes a new role for academic libraries, infusing sustainability content into information literacy, collection development, scholarly publishing and communication, services, actions, and the education of future leaders." (Hauke,2018)

ENSULIB is the Environment, Sustainability and Libraries Special Interest Group of IFLA. Its mission is to address :(i) Effects of climate change on libraries (modification of the conditions of storage and preservation, buildings insulation, impacts on library finances and management)(ii)Applications of environment-friendly practices in libraries (recovery of rainwater, use of renewable energy sources, printing control, paper recycling, etc.). (iii)Proposed environmental recommendations for the profession (recycling of outdated documents, use of biodegradable materials, etc.). (iv)Increasing and promoting sustainability-related library resources and services (development of collections on environmental themes, exhibitions, outreach, etc.). (v) Increasing librarians' own awareness of environmental concerns." (Hauke, 2018)

In addition to providing resources and information on environmental issues and green living, librarians need to offer innovative and unique green programmes to their communities in an effort to raise awareness such as workshops and educational outreach initiatives, as well as adoption of green practices like recycling and food security, which help others green their own homes, businesses, and daily lives(Kurbanoğlu and Boustany, 2014).

6. Libraries &United Nations Sustainable Development Goals

Libraries can contribute significantly to the achievement of Sustainable Development Goals (SDGs) of the United Nations Organization through green information literacy. Here are a few goals on how libraries align with and support various SDGs:

- Quality Education: Libraries serve as educational hubs, providing access to a diverse range of resources. They contribute to lifelong learning, literacy, and the development of critical thinking skills.
- Climate Action: Libraries can raise awareness about climate change and promote
- environmental sustainability. They often engage in community programs and initiatives that address environmental issues.

- Sustainable Cities and Communities: Libraries contribute to community development and cohesion. They provide safe, inclusive spaces and promote access to information that supports urban sustainability.

Through their resources, programmes, and initiatives, libraries actively support the objectives outlined in the United Nations' Sustainable Development Goals, contributing to a more sustainable and equitable work.

Libraries can achieve sustainability by embracing green building designs, green practices, literacy programmes, and the use of green technologies. IFLA Green Library initiative is a great effort to promote green libraries and get inspiration, ideas, and innovative techniques implemented by libraries worldwide. Soon, libraries should be the focal point of driving the green movement; they should act as a critical agent of environmental stewardship. Hence, libraries are continuously expanding their horizons and act as role models for an eco-friendly, sustainable environment.(Gupta, 2020)

7. Problems faced by libraries in providing Green InformationLiteracy

While the integration of Green Information Literacy (GIL) in libraries is valuable for promoting environmental awareness and sustainability, there are several challenges that libraries may face in implementing these initiatives. Some common problems include:

Limited Resources: Many libraries, particularly smaller ones, or those with limited finances, may experience difficulties allocating resources for green initiative implementation. This can hinder the adoption of energy-efficient technologies, sustainable building designs, and the implementation of other eco-friendly practices.

Resistance to change: The issue is that library personnel and patrons are reluctant to adopt new, ecologically friendly procedures.

Lack of awareness: A lack of awareness might lead to a lack of interest or commitment to green information literacy practices, making implementation challenging.

Limited Training and Education: Without proper knowledge and skills, library staff may struggle to adopt sustainable practices into their everyday operations and successfully educate users.

Policy and Regulatory Challenges: The lack of policies supporting green information literacy can make it difficult to develop and sustain environmentally friendly practices.

"Understanding the impact of everyday information choices on the environmentbecomes moreandmore importantandlibraries,especiallyinstruction librarians canplay a key role here. As Miller states, libraries are challenged with the new role of connecting the public with environmental awareness and education.However, according to Stark they have not fully approached the role they could play inembedding sustainability into information literacy. It is their responsibility to fostersustainable thinking in information literacy instruction fully engageenvironmental sustainability in their teaching mission. Embedding sustainablethinking can make information literacy instruction much more interesting and rich(Kurbanoğlu&Boustany, 2014).

"Green library service intends to provide information support more quickly and easily. However, streamlining library services and improving user experience underlines enhanced technological involvement that in turn has a detrimental environmental impact. Library space management is also a major challenge faced by many libraries. Green library requires considerable floor heights for smooth movement of air. However, libraries with increased stack-weight give little space for air movement and impact on library health." (Manna & Sarkar,2022).

8. Conclusion

Considering the threats faced by the environment today, all stakeholders need to play their role in sustaining it. Many governmental and non governmental organizations are going green today. One of the methods through which the environment can be salvaged is green information literacy. This is the need of the hour. And who better than libraries to provide such type of literacy? This study tried to describe the role of libraries in providing green information literacy, including the methods and challenges in doing so. Libraries need to overcome the challenges and make green information literacy a mandatory and long term part of their services.

References:

1. Abiolu, O. and Okere, O. (2012). Environmental literacy and the emerging roles of information professionals in developing economies, IFLA Journal, 38(1) 53–59.

2. Aulisio, G. J. (2013). Green libraries are more than just buildings. *Electronic greenjournal*, 1(35).

3. Datta, S. (2015). Green is the new black: bringing the libraries into the green scene. *International Journal of Digital Library Services*, *5*(3), 59-68.

4. Gupta, S. (2020). Green library: A strategic approach to environmental sustainability. *International journal of information studies and libraries*, *5*(2).

5. Hauke, P. (2018). *From Information Literacy to Green Literacy: Training Librarians as Trainers for Sustainability Literacy. In: IFLA WLIC. Kuala Lumpur: IFLA, 1–8.*

6. Jankowska, M. A., & Marcum, J. W. (2010). Sustainability challenge for academic libraries: Planning for the future. *College & research libraries*, *71*(2), 160-170.

7. Kurbanoğlu, S. & Boustany, J. (2014). *From green libraries to green information literacy. Communications in Computer and Information Science*, 492, 47-58. DOI: 10.1007/9783-319-14136-7_6.

8. Kurbanoğlu, S., & Boustany, J. (2014). From green libraries to green information literacy. In *Information Literacy. Lifelong Learning and Digital Citizenship in the 21st Century: Second European Conference, ECIL 2014, Dubrovnik, Croatia, October 20-23, 2014. Proceedings 2* (pp. 47-58). Springer International Publishing.

9. Mannaa, D. & Sarkar, T (2022) From Sustainable development initiatives in libraries: A critical analysis. *Annals of Library and Information Studies* Vol. 69, December 2022, pp. 282- 293 DOI: 10.56402/alis.v69i4.66044

10. Sarkar, D. (2020). Sustainable development as a goal: Special reference to green library. *Int. J. Res. Libr. Sci*, *6*, 182-189.

11. Stark, M. R. (2011). Information in place: Integrating sustainability into information literacy instruction. *Electronic Green Journal*, *1*(32).

12. Zurkowski, P. G. (1974). The Information Service Environment Relationships and Priorities (Report No. NCLIS-NPLIS-5). Retrieved from https://files.eric.ed.gov/fulltext/ED100391.pdf

Bibliometric Analysis and Network Visualization of Global Research Trends in Green Libraries (1985-2023)

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ABSTRACT: This paper assesses the worldwide research landscape of green libraries based on data extracted from the SCOPUS database spanning 1985 to 2023. Notably, since 2007, there has been a consistent rise in research accomplishments within the green library domain. Our study delves into the preferred primary sources for publication, identifies prolific authors, and explores current trends in the field. Utilizing Vosviewer for coauthorship analysis and MS Excel for graphical and statistical analyses, we present a comprehensive overview. The findings highlight the United States as the primary contributor to green library research, with the year 2018 standing out as the most prolific. Despite the relatively early stage of green library research, the discernible upward trends underscore the growing significance and attention devoted to this field.

Keywords: Green Libraries, SCOPUS, Vosviewer, United States, green library research

Introduction:

Rapid economic development has led to resource shortages and environmental pollution. All sectors worldwide have begun to focus on ecological and environmental issues, and the concept of the green library has emerged. Present environments are endangered by climate change and other threats including social inequalities. All organizations should strive to protect the environment through sustainable development. This includes all kinds of libraries, which can play an active and significant role in sustainable development (IFLA).

(ALA, 2019) has concentrated on the concept of a green library by emphasizing the link between sustainability and libraries. A green library, according to the Online Dictionary of Library and Information Science (ODLIS), is "a library that uses particular methods to limit negative effects on the natural environment while maximizing household environmental quality". International Federations of Library Associations and Institutions (IFLA) defines "a green and sustainable

library as a library that takes into account environmental, economic, and social sustainability. Green and sustainable libraries may be of any size, but they should have a clear sustainability agenda that includes green buildings and equipment, green office principles, sustainable economy, sustainable library services, social sustainability, environmental management, and commitment to general environmental goals and programs".

The International Federation of Library Associations and Institutions (IFLA) – representing the profession of library and information sciences – established the Environment, Sustainability and Libraries Special Interest Group (ENSULIB) to uphold and further develop the library movement. The group helps provide a voice to green librarians and library projects worldwide and promotes discussion forums so that librarians can inspire communities to act in an environmentally sustainable manner. The ENSULIB also proposed the concept of green librarianship, which considers green information, library services, and social participation in the era of false information, alternative facts, and limited information skills and literacy (IFLA, 2020). Additionally, IFLA also established the Green Library Award to reward libraries expressing their commitment to environmental sustainability worldwide (IFLA 2020), thereby attracting the attention of library academics on environmental issues and sustainable development (Simin Li & Feng Yang, 2023).

Literature Review:

In recent years, the concept of sustainability has gained increasing attention across various sectors, including libraries. As information institutions at the heart of educational and cultural endeavors, libraries play a pivotal role in promoting environmental responsibility and sustainable practices. The emergence of "Green Libraries" as a field of research reflects a growing awareness of the ecological impact of library operations and the potential for libraries to contribute to broader environmental goals. An attempt has been made to review the literature published on the green library research. Few related studies have been observed before conducting this study. Among those studies, one of the studies was done by Tariq (2023) measured the level of green computing (GC) awareness and adoption among university librarians. It found that most librarians are aware of the benefits of GC, but they are primarily motivated by cost savings rather than environmental concerns. The study recommends that policymakers implement new technologies to reduce environmental problems by improving computing performance.

Simin Li and Feng Yang (2023) conducted a significant study that provides a comprehensive overview of the global research landscape on green libraries. It also highlights the need for greater international collaboration in this area. The

findings of the study can help to inform future research on green libraries and to guide the development of policies and programs that support the adoption of green practices in libraries around the world. The study also found that research on green libraries has shifted from pure environmental impact assessment to a multi-directional combination, with information technology applications and green practices in libraries at the core.

Rachman and Ratnasari (2022) summarized a study that investigated the current practices of sustainable library preservation and conservation in academic libraries. The study found that the majority of academic libraries have implemented some sustainable practices, but there is still room for improvement. The most common sustainable practices implemented were related to energy use, while areas such as policy and regulation, alternative eco-friendly materials, and waste management need further development. It provides a valuable snapshot of the current state of the field and highlights areas where further research and development are needed.

Manna and Sarkar (2022) emphasized a study that reviews sustainable development (SD) initiatives in academic and public libraries worldwide. It identifies parameters contributing to the sustainable development intent of libraries and showcases current practices for implementing green library strategies. The study also identifies and discusses challenges faced by libraries in their efforts to go green. The overview of SD initiatives in different libraries can improve librarians' and information science professionals' understanding of the adoption of green indicators.

Fedorowicz-Kruszewska (2021) summarized a bibliometric analysis of green libraries published between 1991 and 2020, indexed in the Web of Science database. The study found that the number of publications on green libraries has increased significantly over time, with the most rapid growth occurring between 2007 and 2020. The study also found that the most frequent theme in the literature on green libraries is the issue of green building and its management. The findings of the study can help to inform future research on green libraries and to guide the development of policies and programs that support the adoption of green practices in libraries around the world. They further noted that there is a modest representation of theoretical and synthetic texts dealing with the issue of green libraries. It aimed fill this gap by providing a comprehensive overview of green library indicators and their potential applications. The author describes the expansion of green library indicators, which can be used to develop a codebook for the content analysis of documents in the discussed area. The author also suggests that this article may contribute to the development of methods for the evaluation of activities and the development of green libraries.

Singh and Dixit (2021) conducted a study that examines sustainable strategies adopted by selected state university libraries in Lucknow, Uttar Pradesh, India. It finds that library professionals are aware of green libraries and sustainable development, and are using guidelines from these initiatives in their libraries. The article concludes that government support is needed to further promote green libraries and sustainable development goals.

Gaffar et. all (2021) explored the concept of green libraries in India, highlighting the role of librarians, features of green libraries, and initiatives taken by green libraries in India. The study finds that green libraries minimize negative environmental impact, enhance indoor environmental quality, and conserve resources. The study concludes that green libraries are important for promoting health and the environment.

Kumar (2014) discussed the importance of green libraries and identified standards, initiatives, and techniques for greening libraries in India. It concludes that librarians should be aware of sustainability trends and promote green practices in their libraries.

Aulisio (2013) highlighted that a green library is more than just an environmentally friendly building. It is a library that has a green mission and implements green practices in its operations. The author supports this argument by pointing out that there are very few academic libraries in the United States that are LEED-certified, even though many colleges and universities have adopted sustainability in their curriculum and operations. This suggests that LEED certification is not necessary for a library to be considered green.

Objectives:

The purpose of this study is to assess research work in light of the following objectives.

- To assess the global evolution of green library literature over time and identify patterns in research output
- Identifying the primary source titles preferred for publications in Green Library research and determining the most frequently contributing authors.
- To find out the most prolific authors in Green Library research.
- Examining the distribution by document type.

- To examine the keywords and identify the current trends within the subject area.

Methoodology:

Due to the interdisciplinary scope of green library research, which spans disciplines such as architecture, ecology, and engineering we sought to ensure the comprehensiveness and reliability of our data collection by employing Scopus, the world's largest bibliographic database. This extensive resource covers prominent scholarly journals, books, and proceedings across the sciences, social sciences, and arts and humanities, providing a comprehensive overview of the entire citation network. Through a trial-and-error approach, we developed a comprehensive search strategy to extract relevant data from Scopus. This search strategy is as follows

TITLE-ABS-KEY (Green Libraries) OR TITLE-ABS-KEY (Sustainable Libraries) OR TITLE-ABS-KEY (Environmentally Friendly Libraries) AND PUBYEAR > 1984 AND PUBYEAR < 2024

The utilization of the "OR" search operator is deliberate in order to encompass all items directly associated with the searched terms. This choice is made to avoid excluding important and relevant papers, a situation that might arise when using the "AND" operator, potentially incorporating irrelevant documents and compromising the accuracy and precision of search results. Following the filtration process, we ultimately preserved 139 records, capturing essential details such as title, authorship, keywords, abstracts, and country affiliations. These curated records formed the basis for conducting analyses encompassing annual research trends, international distribution, key thematic areas, and notable aspects of green development within libraries. These analyses effectively represent the research progress in this field. Additionally, citations were extracted, quantified, and analyzed using Microsoft Excel, Microsoft Access, and VOSviewer software.

Limitations:

This study focuses solely on bibliographic and citation data related to green libraries available in the Scopus database. Scopus is considered the most trustworthy and efficient database for bibliometric and scientometric analysis due to its extensive coverage. Consequently, Scopus was chosen as the data source. Furthermore, the extracted data was filtered and confined to the years between 1985 and 2023.

Result and Analysis

Global research output on Green Libraries

The concept of green libraries emerged in 1989 with the publication of the first paper on the topic in SCOPUS. A second paper followed this in 2000, which received 12 citations, indicating a growing interest in the field. From 2007 onwards, there has been a steady stream of publications on green libraries, though the number of papers has varied over time. Table 1 provides an overview of the research output on green libraries, while Figure 1 illustrates the significant increase in publications in 2018. Prior to 2007, research in this area was relatively nascent, with limited findings and researchers. However, from 2008 onwards, a growing number of scholars have turned their attention to green libraries, leading to a surge in publications, particularly in 2018. This trend reflects the increasing recognition of the importance of green libraries in promoting sustainability and environmental stewardship.

Table 1. Global publication output on Green Libraries during 1985-2023

Year	Total Publication (TP)	Total Citation (CP)	Citation Per Paper (CPP)
1985-1988	0	0	0
1989	1	15	15
2000	1	12	12
2003	4	24	6
2004	1	10	10
2005	1	2	2
2007	1	0	0
2008	7	31	4.43
2009	6	66	11
2010	4	91	22.75
2012	5	48	9.6
2013	4	48	12
2014	4	58	14.5
2015	4	41	10.25
2016	7	57	8.14
2017	10	54	5.4
2018	23	82	3.56

Year	Total Publication (TP)	Total Citation (CP)	Citation Per Paper (CPP)
2019	14	23	1.64
2020	6	10	1.67
2021	13	53	4.07
2022	12	7	0.58
2023	11	5	0.46

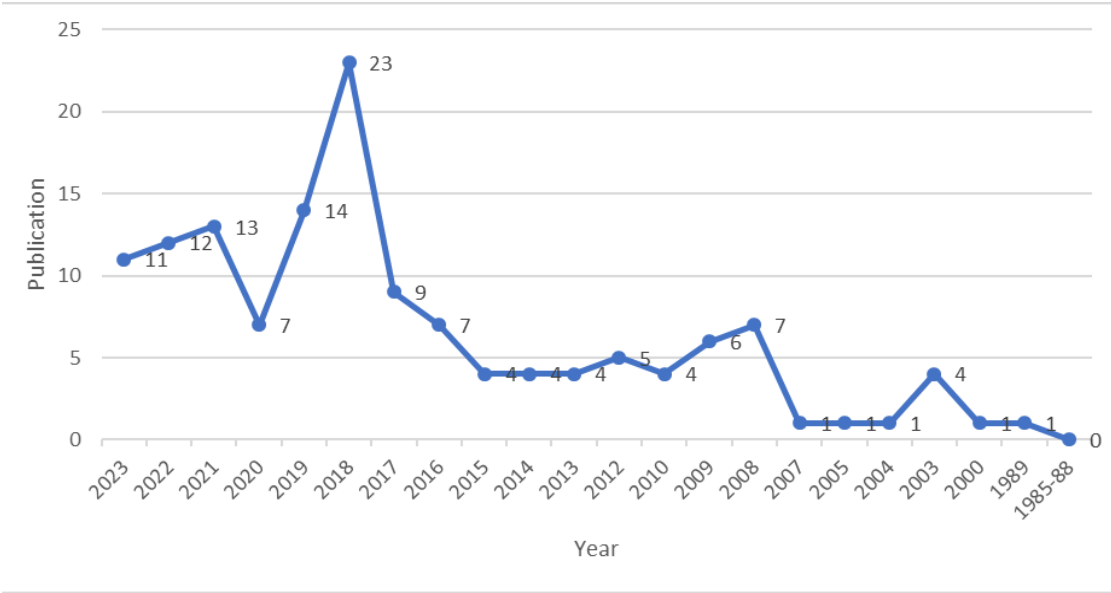


Figure:1 Global research output on Green Libraries

Top 5 Source Titles Used for the Publication

Table 2 provides insights into the top 5 source titles favoured by authors interested in publishing on Green Library. The most productive titles among the top 5 contributed to 39 papers, garnering a total of 177 citations. Vjesnik Bibliotekara Hrvatske stands out with the highest research output, publishing 5 papers that received 26 citations. Following closely are Library Philosophy and Practice, which published 8 papers with 15 citations, and Library Management, contributing 7 papers with 57 citations. Additionally, both Bottom Line and Journal of Academic Librarianship each published 5 papers, accumulating 32 and 27 citations, respectively. Journal of Librarianship and Information Science follows with 4 papers and 22 citations. The H-index varies, with the highest at 64

for Journal of Academic Librarianship and the lowest at 6 for Vjesnik Bibliotekara Hrvatske. Notably, the Journal of Academic Librarianship boasts the highest SJR value of 0.899.

Table:2 Top 5 Source Titles

Source Title	TP	TC	SJR	ACPP	HI	Country
Vjesnik Bibliotekara Hrvatske	10	24	0.174	2.4	6	Croatia
Library Philosophy And Practice	8	15	--	1.87	25	USA
Library Management	7	57	0.439	8.14	38	UK
Bottom Line	5	32	0.788	6.4	20	UK
Journal Of Academic Librarianship	5	27	0.899	5.4	64	UK
Journal Of Librarianship And Information Science	4	22	0.664	5.5	35	UK

Prolific Authors in Green Library Research

In Table 3, we can observe the leading four authors who have significantly contributed to the early-stage research in green library studies. These top authors collectively authored 52 articles, constituting 37.41% of the total research output, and garnered 310 citations, representing 42.06% of the total citations. Notably, Fedorowicz-Kruszewska, M emerged as the most prolific author, credited with a maximum of 5 publications. Conversely, Marcum, J.W received the highest citation count, amassing 89 citations across his 4 publications. Following closely is Jankowska, M.A., who received 79 citations for his 2 publications.

Table 3. Prolific authors in Green Libraries

Author	Total Publication	Total Citations	Average Citation Per Paper
Fedorowicz-Kruszewska, M.	5	26	5.2
Marcum, J.W.	4	89	22.25
Mwanzu, A.	4	6	1.5
Sahavirta, H.	3	12	4
Baharuddin, M.F.	2	0	0
Bosire-Ogechi, E.	2	3	1.5

Author	Total Publication	Total Citations	Average Citation Per Paper
Cardoso, N.B.	2	2	1
De Sarkar, T.	2	1	0.5
Dragaš, B.	2	5	2.5
Fernandez, S.	2	4	2
Gotal, E.	2	0	0
Hauke, P.	2	12	6
Izhar, T.A.T.	2	0	0
Jankowska, M.A.	2	79	39.5
Jones, L.	2	20	10
Khalid, A.	2	13	6.5
Kraljević, I.	2	14	7
Manna, D.	2	1	0.5
Mazlan, M.A.	2	0	0
Odero, D.	2	3	1.5
Shoid, M.S.M.	2	0	0
Wong, W.	2	20	10

Author co-authorship analysis

Collaborations among researchers are commonplace in the production of scholarly work. Figure 2 illustrates the co-authorship network derived from bibliographic data using VOSviewer. Each circle (or node) represents an author, and the circle's size corresponds to the number of papers published. Links between circles indicate collaborative relationships between authors, with the thickness of the link representing the strength of collaboration. Only authors with a minimum of two publications were considered. Out of 249 authors, 22 met this threshold. Baharuddin, M.F., Shoid, M.S.M., Mazlan, M.A., and Izhar, T.A.T. stand out as the leading collaborative authors, having produced the most papers together.

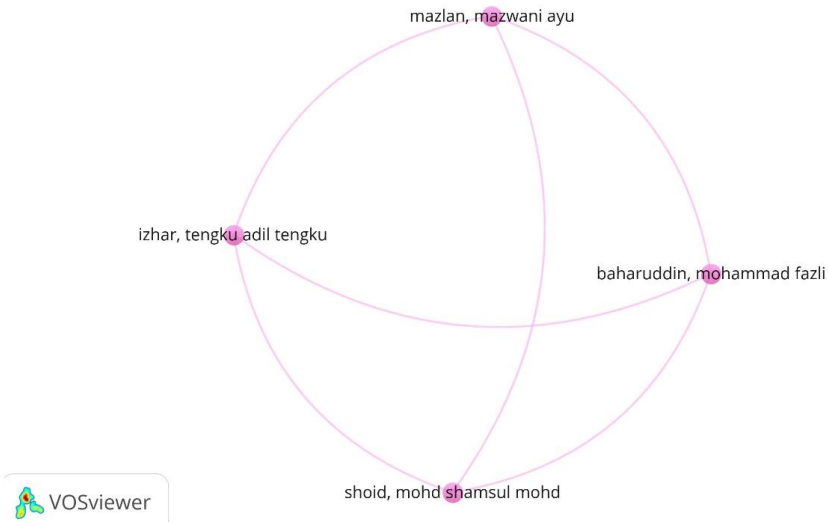


Figure:2 Co-authorship network

Subject-Wise Distribution of Research Output

Subject-wise distribution of research output is an important aspect of this study as it provides insights into how particular subject disciplines are influenced by green library research. Figure 3 displays the subject-wise distribution of research output. It's important to note that SCOPUS categorizes documents into different subject categories, and a single document may belong to multiple categories. As a result of this, the total number of documents under all subject disciplines exceeds the actual number of documents considered for the study during the period. Notably, Social Science emerges with the highest number of papers.

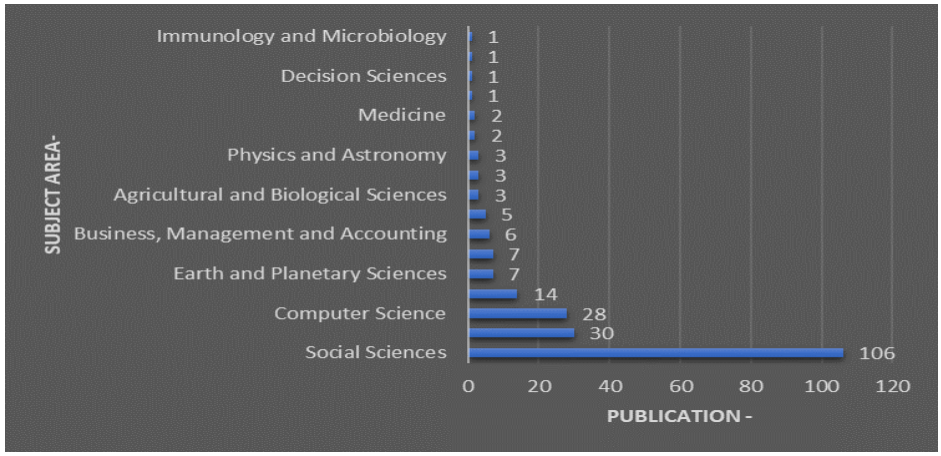


Figure: 3 Subject-Wise Distribution of Research Output

Distribution by Type of Document

Scopus categorizes documents into 8 types, providing various avenues for scientific communication. Scholars can choose to convey their ideas through scholarly articles or contribute in the form of book chapters. Despite the diverse ways in which views are expressed, the platform consistently updates academic communities in their respective fields. Unquestionably, articles emerge as the most preferred source. In the current investigation, a predominant number of documents, 98 (70.5%), take the form of articles, followed by 17 (12.23%) conference papers, 16 (11.51%) book chapters, 3 (2.15%) reviews, 2 (1.43%) notes, 1 (0.71%) book, 1 (0.71%) editorial, and 1 (0.71%) erratum.

Table: 4 Documents type

Documents Type	Quantity
Article	98
Conference Paper	17
Book Chapter	16
Review	3
Note	2
Book	1
Editorial	1
Erratum	1

Research Output by Country

Table 5 provides insights into the research output and total publications of the top 10 countries. The findings indicate that the majority of papers, specifically 28 (20.14%), originated from the USA, followed by India with 14 (10.07%), Croatia with 11 (7.91%), China with 10 (7.19%), Germany with 8 (5.76%), and Poland with 6 (4.31%) papers. Brazil, Kenya, and the United Kingdom each contributed 5 (3.59%) papers, while Australia contributed 4 (2.88%) papers. Additionally, Canada, Finland, Malaysia, and Turkey each contributed 3 (2.15%) papers. France, Ghana, Hong Kong, Indonesia, Nigeria, Pakistan, South Africa, and Spain each had 2 (1.43%) papers.

Table 5. Distribution of research output by top 10 countries

Country	Total Publication
United States	28
India	14
Croatia	11
China	10
Germany	8
Poland	6
Brazil	5
Kenya	5
United Kingdom	5
Australia	4
Canada	3
Finland	3
Malaysia	3
Turkey	3
France	2
Ghana	2
Hong Kong	2
Indonesia	2
Nigeria	2
Pakistan	2
South Africa	2
Spain	2
Taiwan	2

Most Popular Keywords

Analyzing high-frequency words proves to be an effective strategy for highlighting current research trends, while keyword clustering offers a comprehensive overview of key research areas. A crucial component of bibliometric analysis is the examination of keywords. In our study focused on green library research, we identified 400 keywords. We specifically chose keywords that appeared at least twice, resulting in a selection of 58 keywords meeting this criterion. Subsequently, we generated a network map (Figure 4) representing the interrelationships among these 58 keywords, which were further categorized into 10 distinct clusters. The

figure vividly illustrates the clustering outcomes, with green libraries, sustainability, and the sustainable development of academic and public libraries emerging as the most prominent topics. Additionally, library buildings, green information literacy, and ecology also exhibit noteworthy significance in the research landscape. Table 6 reveals the top 10 most frequently used keywords in the documents analyzed for the study of global research output on Green Libraries. Unsurprisingly, the keyword 'Green Libraries' appears the most frequent (31 times), followed by 'sustainability' (28 times).

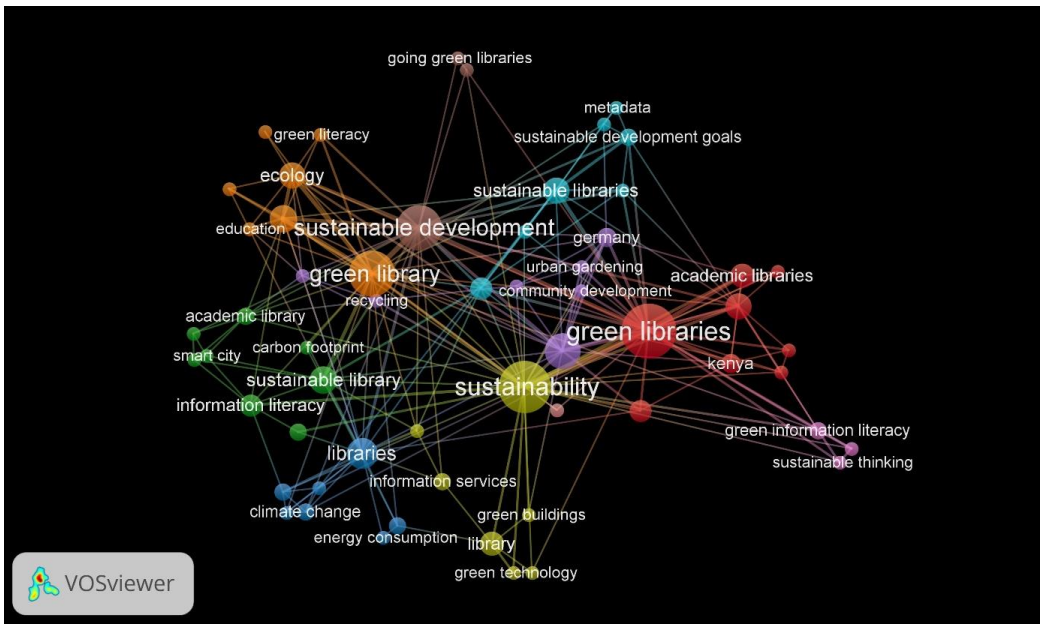


Figure: 4 Popular Keywords

Table 6: Most Popular Keywords

Rank	Keyword	Occurrence
1	Green Libraries	31
2	Sustainability	28
3	Green Library	22
4	Sustainable Development	21
5	Public Libraries	13
6	Libraries	10
7	Environmental Protection	8
7	Sustainable Library	8

Rank	Keyword	Occurrence
8	Ecology	7
8	Environmental Sustainability	7
8	Sustainable Libraries	7
9	Academic Libraries	6
10	Librarianship	5
10	Information Literacy	5

Conclusion

Despite the relatively early stage of green library research, the limited number of researchers and publications, and the modest impact of the existing research, it is encouraging to observe a growing interest in this field. As environmental concerns continue to escalate, the significance of green library research will undoubtedly become more evident, and its contributions to global sustainable development will become increasingly valuable. In the broader societal sustainable development context, there is an aspiration for green library research to actively contribute to fostering environmentally friendly practices within libraries. This, in turn, can play a crucial role in advancing the overall global sustainable development process. The research outcomes span various countries, with the United States leading in the number of published documents, closely followed by India. The study effectively offers insights into significant source titles, prolific authors, country-specific contributions, and influential document types that have played a key role in advancing green library research. This type of analysis is valuable for conducting a comprehensive review and understanding the current trajectory of green library research worldwide.

References

1. Li, S., & Yang, F. (2022, August 31). Green Library Research: A Bibliometric Analysis. *Public Library Quarterly*, *42*(4), 424–443. https://doi.org/10.1080/01616846.2022.2116886

2. Fedorowicz-Kruszewska, M. (2021, December 7). Green library as a subject of research – a quantitative and qualitative perspective. *Journal of Documentation*, *78*(4), 912–932. https://doi.org/10.1108/jd-08-2021-0156

3. Rachman, Y. B., & Ratnasari, W. (2022, October 1). Academic Libraries' Sustainable Preservation and Conservation Practices. *Preservation, Digital Technology & Culture*, *51*(3), 121–129. https://doi.org/10.1515/pdtc-2022-0024

4. Aulisio, G. J. (2013, May 1). Green Libraries Are More Than Just Buildings. *Electronic Green Journal*, *1*(35). https://doi.org/10.5070/g313514058

5. Fedorowicz-Kruszewska, M. (2020, December 17). Green libraries and green librarianship – Towards conceptualization. *Journal of Librarianship and Information Science*, *53*(4), 645–654. https://doi.org/10.1177/0961000620980830

6. Tariq, M. S., & Khalid, A. (2023, September). Placing Green IT awareness and practices among universities' librarians: A NAT perspective. *The Journal of Academic Librarianship*, *49*(5), 102770. https://doi.org/10.1016/j.acalib.2023.102770

7. Khalid, A., Malik, G. F., & Mahmood, K. (2021, May). Sustainable development challenges in libraries: A systematic literature review (2000–2020). *The Journal of Academic Librarianship*, *47*(3), 102347. https://doi.org/10.1016/j.acalib.2021.102347

8. Sarkar, D. (2020, July 9). Sustainable Development as a Goal: Special Reference to Green Library. *International Journal of Research in Library Science*, *6*(1), 182. https://doi.org/10.26761/ijrls.6.1.2020.1322

9. Boyden, L., & Weiner, J. (2000, June). Sustainable libraries: teaching environmental responsibility to communities. *The Bottom Line*, *13*(2), 74–83. https://doi.org/10.1108/08880450010327699

10. Mathiasson, M. H., & Jochumsen, H. (2023, August 25). The Sustainable Library: A retrospective case study of a public library sharing initiative. *Journal of Librarianship and Information Science*. https://doi.org/10.1177/09610006231190131

11. Borgohain, D. J., Zakaria, S., & Kumar Verma, M. (2021, October 26). Cluster Analysis and Network Visualization of Global Research on Digital Libraries during 2016–2020: A Bibliometric Mapping. *Science & Technology Libraries*, *41*(3), 266–287. https://doi.org/10.1080/0194262x.2021.1993422

12. Gaffar, Sk Abdul; N, Sindhu P. Mrs; and Kumar, S. Kishore Mr, "The Green Library Initiative in Indian perspective: A Study" (2021). *Library Philosophy and Practice (e-journal)*. 6189. https://digitalcommons.unl.edu/libphilprac/6189

13. Singh, M P. and Dixit, Shraddha, "sustainable strategies towards green libraries: a study of state university libraries of lucknow, uttar pradesh" (2021). *Library Philosophy and Practice (e-journal).* 4968. https://digitalcommons.unl.edu/libphilprac/4968

14. Sustainable development initiatives in libraries: A critical analysis. (2022, December). *Annals of Library and Information Studies*, *69*, 282–293. https://doi.org/10.56402/alis.v69i4.66044

15. Pagore, R., & Chalukya, B. V. (2022, June 15). Green library: An overview. *IP Indian Journal of Library Science and Information Technology.* https://doi.org/10.18231/j.ijlsit.2022.007

16. *Environment, Sustainability and Libraries Section – IFLA*. (n.d.). https://www.ifla.org/units/environment-sustainability-and-libraries/

Sustainable Horizons: Challenges, Disparities, and Strategies for Green Libraries in the Indian Subcontinent

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ABSTRACT: In the ever-evolving realm of libraries, the pursuit of sustainability takes center stage through the lens of Green Libraries. This article navigates the multifaceted journey towards forging a sustainable future for libraries in the Indian Subcontinent, with a keen focus on the themes of resilience and adaptation. Unfolding in four integral chapters, the narrative begins by unravelling the essence of Green Libraries and their inherent sustainability. It then delves into the intricate challenges faced by institutions in implementing green initiatives and transitioning traditional libraries into eco-friendly spaces. A critical examination follows, punctuated by illuminating charts that expose the surprising absence of Indian Subcontinent countries in the prestigious winners' list of the International Federation of Library Associations and Institutions (IFLA) Green Library Awards, despite compelling environmental parameters. This revelation substantiates the outlined challenges in embracing green library concepts in the region. In response, the article propounds strategic pathways to empower the library community, fostering resilience and embracing adaptation to catalyze transformative shifts within the library landscape. The conclusion underscores the imperative role of resilience and adaptation in crafting a sustainable narrative for libraries, envisioning them as resilient chapters in the unfolding story of environmental consciousness and institutional transformation.

Introduction :

In the ever-evolving landscape of contemporary libraries, the imperative to cultivate sustainability has given rise to the pivotal concept of Green Libraries. These innovative institutions, designed with a holistic commitment to ecological responsibility, are sought to minimise their environmental footprint while maximising their impact. Green Libraries, as entities committed to sustainable practices, embody a paradigm shift towards environmental consciousness in the traditionally conservative realm of libraries. The genesis of this article was inspired by the author's persistent observation of the prestigious International Federation of Library Associations and Institutions (IFLA) Green Library Awards

over an extended period. Motivated by the desire to comprehensively understand the global landscape of recognized environmentally conscious libraries, the author undertook a unique approach. By mapping out the geographical locations of award-winning libraries, the intent was to uncover patterns, disparities, and notably, the absence of representation from the Indian Subcontinent. This exploration prompted an insightful examination into the challenges faced by libraries in the region, ultimately framing the narrative that follows. As the article unfolds across four essential segments, from defining the core essence of Green Libraries to proposing strategies for empowerment, it is underpinned by the initial impetus to uncover the geographic contours of sustainability in the library landscape. In essence, the article aims to contribute not only to the discourse on sustainable libraries but also to prompt critical reflections on the global distribution of recognition and the imperative for transformative change within the library community.

Review of Literature :

Libraries in developing nations often struggle to align with environmental policies. Research by Jankowska and Marcum (2010) reveals hesitancy among university libraries to establish sustainability indicators, and there is a lack of policies or recommendations for waste management (Dempsey & Palilonis, 2012) and environmental strategies for library collections (Brodie, 2012).

The adoption of Green Libraries faces significant challenges. Fourie (2012) notes a lack of importance given to the go-green initiative and climate change, with Boyden and Weiner (2000) emphasizing that a failure to take initiative hinders sustainability improvements. Chowdhury (2012) and Dempsey and Palilonis (2012) identify a lack of understanding among both consumers and library staff as a substantial challenge. Turner (2014) highlights the absence of sustainability in Library and Information Science (LIS) curricula, contributing to a limited understanding of green libraries among graduates.

Transitioning from print to electronic formats in a green manner poses challenges, particularly in securing budgets for technology adoption (Flinchbaugh & Murtha, 2019). Rapid technological and digital advancements are identified as significant obstacles, with Li (2017) stating that libraries, especially, struggle to keep up with these changes. Wolfe (2012) suggests that relying solely on green technologies is insufficient for sustainability, and Kruse (2011) argues that continuous technological developments in library equipment have adverse environmental effects.

Inadequate funds further impede initiatives in libraries, especially in developing countries. Idiegbeyan-Ose et al. (2019) note that insufficient funding for public libraries in Nigeria hampers their ability to provide modern materials and services. The same has been traced out by Kumar & Goel (2023) in their research about Indian progress.The Sustainable Libraries are becoming more like an fashion without its actual necessity (Fedorowicz-Kruszewska, 2019).The concept has a lot of barriers in actual infield implementation which needs to be addressed first (Fedorowicz-Kruszewska, 2023).

Objectives Of The Study :

- Understand the fundamental principles that define Green Libraries and their role in promoting sustainability within the library context.
- Compile a comprehensive list of recipients of the International Federation of Library Associations and Institutions (IFLA) Green Library Awards, discerning patterns, trends, and exemplary practices.
- Analyse the presence or absence of Indian Subcontinent countries in the IFLA Green Library Award winners' list, particularly focusing on the geographical distribution of recognized environmentally conscious libraries.
- Investigate the obstacles and challenges faced by institutions when attempting to integrate green initiatives into traditional or conventional library structures.
- Explore and suggest practical approaches and strategies to motivate library authorities to embrace and implement sustainable practices, fostering a transition towards Green Libraries within the Indian Subcontinent.

By addressing the above objectives, the study aims to contribute valuable insights into the challenges, recognition, and potential pathways for promoting sustainability within library communities, with a specific focus on the Indian Subcontinent.

Scope and Limitations of the Study :

This article ambitiously navigates the landscape of Green Libraries within the Indian Subcontinent, focusing on challenges, adaptation strategies, and sustainable practices. It conducts a thorough analysis of the International Federation of Library Associations and Institutions (IFLA) Green Library Awards, emphasizing the surprising dearth of representation from the Indian Subcontinent. The

exploration extends beyond challenges to draw insights from successful global models, offering inspiration for libraries in the Indian Subcontinent. The scope also involves a comparison of sustainable library prizes, acknowledging regional and cultural variations, and proposing strategic pathways for empowering the library community, fostering resilience, and catalyzing transformative shifts.

The study's limitations stem from potential data constraints, relying on existing literature and available information to glean insights into green library practices. It may not fully capture the nuances of every locality within the Indian Subcontinent. The article's timeframe is confined to existing literature and the IFLA Green Library Awards, potentially overlooking recent developments in green library concepts. This implies that, while there are many libraries in the Indian Subcontinent claiming to be green, this article specifically examines whether they have received the prestigious IFLA award. Not receiving an award does not imply that their practices are not aligned with the Green Library initiative.

Despite these limitations, the article endeavors to provide valuable insights into the challenges and opportunities for sustainable libraries in the Indian Subcontinent. It is framed by resilience, adaptation, and a global perspective. The proposed strategic recommendations carry a degree of subjectivity, and their practical applicability may vary based on specific library contexts.

Research Methodology :

The research methodology employed for this study combines a desk research approach with a targeted website survey to investigate green library initiatives, focusing on the Indian Subcontinent. Through comprehensive literature review and analysis, including academic journals and organizational reports, the study aims to discern global trends and historical data on green library practices, emphasizing insights from the IFLA Green Library Awards. A dedicated survey on the official IFLA Green Library Awards website will collect specific data on winners' geographic locations and criteria for recognition, facilitating a geographic analysis to understand the absence of winners from the Indian Subcontinent. The research will delve into identifying pain points, such as financial constraints and resistance to change, faced by libraries in the region. The ultimate goal is to propose community-building suggestions drawing from successful global models, considering the socio-economic and cultural context, and addressing challenges to encourage widespread adoption of green library initiatives. Adhering to ethical guidelines, the research aims to contribute valuable insights while respecting privacy, confidentiality, and research integrity.

Findings and Analysis :

I. Green library: an initiative of libraries, walking towards sustainability

Growing environmental concerns in recent decades have caused the call for sustainability of buildings. Sustainable design needs to achieve the saving of energy and resources in the production and maintenance of a building. Libraries should respond to the growing emphasis on the Green Movement and serve as role models to the society for sustainability by offering appropriate and pertinent answers to problems such as community well-being, economic viability, environmental conservation, global responsibility and so on.Green libraries refer to library practices and designs that prioritise environmental responsibility and resource efficiency. These libraries aim to minimise their ecological footprint by incorporating eco-friendly technologies, energy-efficient systems, and sustainable building materials. According to IFLA, "*a green and sustainable library is a library which takes into account environmental, economic and social sustainability*." The goal is to create library spaces and operations that contribute to environmental conservation and promote a more sustainable and resilient community. This involves utilizing natural building materials and biodegradable products, managing resources like water, energy, and paper efficiently, indoor air quality, enhancing the usage of natural lighting and implementing responsible waste disposal and recycling systems.

- **Sustainable Library:**

  A sustainable library is a library that incorporates environmentally friendly practices and principles into its design, operations, and services to minimize its ecological impact and promote long-term well-being. Sustainable libraries prioritize resource efficiency, energy conservation, and community engagement.

  Key features of a sustainable library may include:

  - **Green Building Design**: Sustainable libraries often have eco-friendly building designs that utilize energy-efficient systems, natural lighting, and environmentally responsible materials.
  - **Renewable Energy Sources**: Integration of renewable energy sources, such as solar panels or wind turbines, to power library facilities and reduce dependence on non-renewable energy.
  - **Water Conservation**: Implementation of water-saving technologies and practices to minimize water usage and promote efficient water management within the library.

- **Waste Reduction and Recycling:** Sustainable libraries emphasize waste reduction by promoting recycling, composting, and responsible waste disposal practices.
- **Digital Initiatives:** Promoting digital resources and technologies to reduce the need for paper and physical materials, contributing to a more sustainable and resource-efficient library.
- **Energy-Efficient Equipment:** Utilizing energy-efficient appliances, lighting systems, and HVAC (Heating, Ventilation, and Air Conditioning) systems to minimize energy consumption.
- **Flexible and Adaptable Spaces:** Designing library spaces that are flexible, adaptable, and multipurpose, allowing for long-term use and reducing the need for frequent renovations.
- **Local and Sustainable Sourcing:** Choosing locally sourced and sustainably produced materials for construction and library resources whenever possible.

In essence, a "green library" typically concentrates on eco-friendly features and practices, while a "sustainable library" extends its commitment to include a holistic approach that considers the library's impact on the community and its long-term viability in economic terms as well. i.e., green libraries primarily emphasize environmental considerations and eco-friendly practices, whereas, a sustainable library encompasses a broader scope, considering not only environmental aspects but also social and economic sustainability. Where green libraries enforces implementation of environmentally friendly technologies, energy-efficient systems, and the use of renewable energy sources, often focusing on reducing the ecological impact of the library's physical infrastructure and operations; sustainable libraries goes beyond just "green" practices to include community engagement, social responsibility, and economic viability, which includes educational programs, community partnerships, and practices that contribute to the overall well-being of the community.

The implementation of the sustainable library isn't an easy task. IFLA acknowledges the efforts made by libraries worldwide, promotes and encourages such undertakings and provides two awards in two categories each year.

II. FLA Green Library Awards :

The International Federation of Library Associations and Institutions (IFLA) initiated the IFLA Green Library Awards in 2016, marking a significant step

towards promoting global sustainability in library practices. This distinguished award program was designed to recognize libraries worldwide for their exceptional efforts in implementing environmentally conscious practices. In its inaugural year, the ENSULIB reviewing committee, consisting of 15 librarians from diverse countries and continents, diligently evaluated 30 submissions from around the globe. The participating libraries, hailing from countries such as Colombia, Germany, Australia, the USA, India, Ghana, and Taiwan, showcased a diverse array of sustainable initiatives, including green buildings, services, and information dissemination. The reviewing committee faced the challenging task of selecting winners due to the high quality and diversity of submissions. This robust start to the IFLA Green Library Awards not only underscored the global commitment to environmental responsibility within library communities but also laid the foundation for an annual celebration of innovative, sustainable library practices worldwide.

- **Objectives of IFLA Green Award :**
  - To reward a Green library / Green Library Projects that best communicate their commitment to environmental sustainability
  - To create awareness of libraries' social responsibility and leadership in environmental education
  - To support the worldwide green library movement, concerned with environmentally sustainable buildings,environmentally sustainable services, activities, programming, information resources, collections and projects, conservation of resources and energy
  - To promote the development of green library initiatives locally, regionally and worldwide
  - To encourage all types of libraries to actively present their green activities to an international audience

Now to fulfil this objectives the two awards are presented by IFLA every year which are as follows :

- Category 1: Best Green Library / Grand Scale Project
- Category 2: Best Green Library Project

But these two categories are prevalent is 2023, IFLA evolves its award name and categories with time so charting with these two awards only can not be possible So the tables are made according to the award and the cycle of years it has been given. But ultimately,by looking at the winners of these prestigious awards we can easily identify which libraries are making an effort to becoming green and their place of existence.

Table 1 :The IFLA Green Library award (2016-2020):

Sl No.	Year	Library name	Rank	Country
1	2016	El Pequeño Sol ecological library (The Little Sun Ecological Library)	1st	Mexico
2	2016	City of Cockburn	2nd	Australia
3	2016	La Tierra para quien la siembra (The Land is for those who sow)	3rd	Colombia
4	2017	Stadtbibliothek Bad Oldesloe	Winner	Germany
5	2017	Sun Yat-sen Library	Runners up	China
6	2017	The Chinese University	Runners up	Hong Kong
7	2017	Library Reading Tree	Runners up	Kenya
8	2017	Uzice's public library	Runners up	Serbia
9	2017	ECOeducation project, Lviv	Runners up	Ukraine
10	2018	Foshan Library	Winner	China
11	2018	Biblioteca Comunala Sirna, Prahova County Library	Runners up	Romania
12	2018	The National and University Library	Runners up	Croatia
13	2018	The National Library and Archives of Iran,	Runners up	Iran
14	2018	The USIU-Africa Library	Runners up	Kenya
15	2018	The Jozsef Attila County and City Library	Runners up	Hungary
16	2019	Biblioteca Pública Municipal Daniel Guillard	Winner	Colombia
17	2019	Sándor Petöfi Town Library	Runners up	Hungary
18	2019	University College Cork Library	Runners up	Ireland
19	2019	Media Library of Saintâ Joseph – Reunion Island	Runners up	France
20	2019	Šentvid Library	Runners up	Slovenia
21	2019	Sustainability Initiative of the New York Library Association	Runners up	USA

Sl No.	Year	Library name	Rank	Country
22	2020	Rangsit University Library	Winner	Thailand
23	2020	Hangzhou Public Library	Runners up	China
24	2020	Juraj ŠiÅgoriÄ Public Library , Sibenik	Runners up	Croatia
25	2020	Ezüsthegy Library, Budapest	Runners up	Hungary
26	2020	Lambaye Learning Center	Runners up	Senegal
27	2020	National Environmental Information Centre, Battaramulla	Runners up	Sri Lanka

In 2016, the inaugural year of the Award, thirty projects were submitted. The evaluation committee also observed that the entries were varied, including representations of green information, green buildings, green services, and other sustainability-related topics.

After 2020 was divided into two categories, namely: The Best Green Library Award and Best Green Library Project Award.

Table 2 : The Best Green Library Award (2021-present)

Sl No.	Year	Name of the library	Position	Country
1	2021	The Edmonton Public Library	Winner	Canada
2	2021	Hobsons Bay Libraries (EnviroCentre), Altona	Short-listed runners-up	Australia
3	2021	Pingshan Library, Shenzhen	Short-listed runners-up	China
4	2021	Knjižnica Ormož, Ormož	Short-listed runners-up	Slovenia
.5	2022	National Library Board Singapore	Winner	Singapore
6	2022	Regional Library “P. K. Yavorov”—“Communal BiblioBurgas”, Burgas Regional Library	Short-listed runners-up	Bulgaria
7	2022	Leonera Cultural Center Public Library, Colombia, Cali, LA	Short-listed runners-up	USA

Sl No.	Year	Name of the library	Position	Country
8	2022	Biblionatura Collserola Library, Barcelona,	Short-listed runners-up	Spain
9	2022	Cambridge Public Library – Valente Branch, Boston	Short-listed runners-up	USA

Table 3 : Best Green Library Project Award (2021-Present)

Sl No.	Year	Name of the library	Project name	Rank	Country
1	2021	Oulu City Library, Oulu	"A Responsible Library as Promoter of Environmental Awareness"	Winner	Finland
2	2021	Saratoga Springs, Southern Adirondack Library System, NY	"Farm-2-Library Program"	Short-listed runner-up	USA
3	2021	National Center of Environmental Education (CENEAM), Valsaín (Segovia)	"RECIDA, The Spanish Network of Green Libraries working for Sustainability"	Short-listed runner-up	Spain
4	2022	La Médiathèque de la Canopée-la Fontaine, Paris	"La Médiathèque de la Canopée : a Pilot Library for Sustainable Development for the Parisian Network"	Winner	France
5	2022	BiblioJette, Jette	"Adopt a Plant at Your Public Library: the Plantotek Project"	Short-listed runner-up	Belgium
6	2022	Médiathèque Mouezh ar gallon	Tourc'h—"A Shared Garden Library to Develop Biodiversity"	Short-listed runner-up	France

Sl No.	Year	Name of the library	Project name	Rank	Country
7	2022	Lier bibliotek, Lier	"The Fish That Take Root"	Short-listed runner-up	Norway
8	2023	West Vancouver Memorial Library, British Columbia	Climate Writer in Residence at the West Vancouver Memorial Library: A Novel Solution	1st place	Canada
9	2023	Biblioteca Civica Villa Valle	The Seed Library	2nd place	Italy
10	2023	Seoul Metropolitan Library, Seoul	Eco Project in Seoul Metropolitan Library for SDGs	3rd place	Rep. Korea:

But this year, IFLA didn't award any library with The Best Green Library Award, and libraries were awarded under the title Best Green Library Project Award and IFLA Green Library/Grand Scale Project Award 2023.

Table 4 : IFLA Green Library/Grand Scale Project Award 2023

Sl No.	Name of the library	Project Name	Rank	Country
1	Biblioteca EPM, Cucuta	Biblioteca EPM – Education for Sustainable Development	1st place	Colombia
2	"Illyés Gyula", Tolna County	Illyés Gyula : Library at the Gates of Cultures & Gemenc	2nd place	Hungary
3	Vietnamese-German University Library, Thoi Hoa ward.	Socialist Rep. of: Vietnamese-German University Inclusive Library for Sustainable Development	3rd place	Vietnam

Mapping of IFLA Green Library Prize w.r.t Continent :

The above tables (Table No.1,2,3,4) charts the history of winners of IFLA awards, but it's interesting to see where this prizes are going in the globe. So the chart

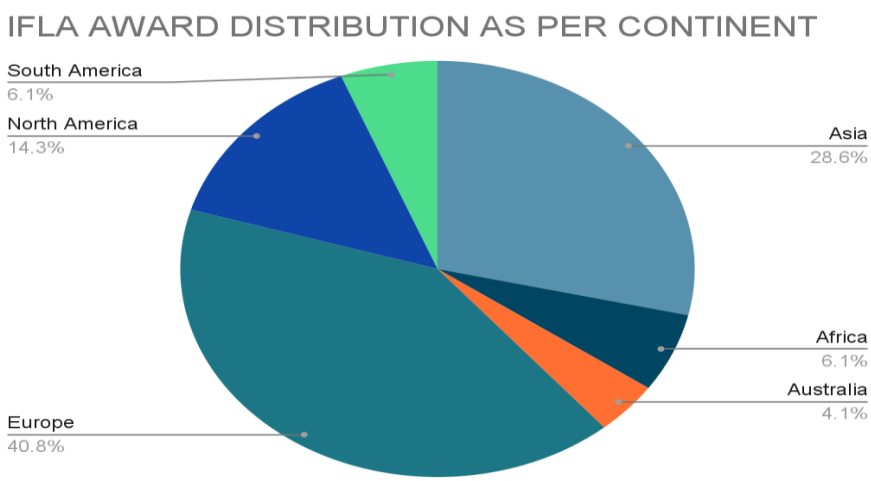
below will showcase how these prizes are distributed among the continents and are performing countries in it.

Table 5 : List of award winning lining as per their continent

Sl No.	Continent	No of IFLA Green Library awards	Country
1	Asia	14	China, Hong Kong, Iran, Thailand, Vietnam, Sri Lanka, Republic of Korea, Singapore.
2	Africa	3	Kenya, Senegal
3	Australia	2	Australia
4	Europe	20	Belgium, Norway, Germany, Ukraine, Romania, Croatia, Spain, Hungary, Ireland, France, Finland, Slovenia, Bulgaria.
5	North America	7	USA, Mexico, Canada
6.	South America	3	Colombia

Note : Antarctica is intentionally not included considering its weather conditions and habitat.

From the table above we can get a pie chart which will show how the distribution is there between the continents:



The analysis of the IFLA Green Library Awards from 2016 to the present underscores a notable absence of winners from the Indian Subcontinent. Despite the global recognition and participation in these prestigious awards, libraries from

India, Pakistan, Bangladesh, and other neighbouring countries have not secured the top positions.

Over the eight-year period, libraries from Asia have secured 14 awards, with China, Thailand, Vietnam, and Singapore being notable recipients. However, the absence of any library from the Indian Subcontinent in the winner's list is conspicuous. Sri Lanka stands as the only representative from the region, securing a runners-up position in 2020.

The continents of Europe and North America have dominated the awards, with libraries from countries like Germany, USA, Canada, and several European nations consistently claiming top positions. This pattern suggests a significant gap in the adoption of green library practices in the Indian Subcontinent compared to other regions.

The absence of representation can be ascribed to several factors, encompassing financial constraints, resistance to change, and conceivably a broader deficiency in awareness regarding the advantages of sustainable practices. Although the global library community embraces green initiatives, the imbalance in award distribution underscores the necessity for targeted efforts to foster and acknowledge sustainable library practices in the Indian Subcontinent. To surmount such challenges, it is imperative to identify the impediments hindering the implementation of this commendable initiative in the Indian Subcontinent, which is particularly crucial due to its vast population that must be served with limited resources. Prioritising sustainability should be of utmost importance in this context.

III. Difficulties in Implementation of Green Libraries :

The concept of running a sustainable library is very important today but implementing it is a little more challenging in most of the libraries. The most common issues with implementing environmentally friendly practices include:

- **Financial Constraints:**
  The forthright costs of implementing green technologies or renovating existing structures to be more sustainable can be major. Most of the time it limits the ability of the library authorities to invest in eco-friendly infrastructure.
- **Resistance to Change:**
  Community members and library staffs often get resistant to any operational changes in or the running physical any conventional library. Resistance can arise due to unfamiliarity with green practices or concerns about trouble during implementation.

- **Awareness Deficiency**:
  Libraries might face challenges in informing their staff and communities about the benefits of sustainable practices.
- **Limited Space and Resources:**
  Libraries, especially those housed in older buildings, may have limited space or resources to implement extensive green technologies. Retrofitting existing structures for sustainability can be logistically and financially challenging.
- **Regulatory Defiance**:
  Libraries may encounter difficulties in navigating and complying with various environmental regulations and certifications. Meeting certain green standards may require additional paperwork, inspections, or compliance measures.
- **Depreciation of Technology:**
  Keeping up with the ever changing advancements of the Green technologies can sometimes be difficult and exhausting. The fear of investing in technologies that may become obsolete can be a barrier to adopting sustainable solutions.
- **Functional Difficulties:**
  Maintaining the standard service quality while transitioning and adjusting with the new operational to become more sustainable changes may often become challenging.
- **Maintenance Issues:**
  A lot of green technologies may require specialized and continuous professional observation and maintenance. Maintenance costs and availability of skilled personnel are additional defy.
- **Contrary to Conventional Library Values:**
  Sustainability frequently gets at odds with traditional library values.The implementation of green infrastructure may disagree with the library users and professionals, who hold traditional views.

In conclusion, the aspiration for running sustainable libraries is undeniably significant in the contemporary landscape, yet the journey is fraught with challenges. Financial limitations, resistance to change, awareness gaps, spatial constraints, regulatory complexities, technological concerns, service quality maintenance, and clashes with traditional values collectively present formidable hurdles. Navigating these challenges requires a strategic approach and a commitment to overcoming obstacles for the greater goal of creating environmentally conscious and resilient

libraries. The ensuing section will delve into actionable suggestions to engage communities and attract their participation in embracing sustainable library practices, acknowledging that fostering collective awareness and involvement is integral to overcoming these challenges.

IV. trategies for Community Building and Overcoming Implementation Challenges in the Indian Subcontinent :

The following are some list of suggestions for Community Building to Overcome Challenges in Implementing Green Libraries:

- **Community Workshops and Awareness Programs:** Conduct workshops and awareness programs within local communities to educate both library staff and community members about the benefits and importance of green library practices. This could include seminars, presentations, and interactive sessions to address any misconceptions and build a collective understanding.

  A greater number of distinguished LIS professionals may try this practise if the Central Government Library Association (CGLA) and other state library associations(like: BLA, DLA, GLA, KSLA, KLA, MLA, PLA UPLA etc) include and emphasise more on green libraries in their conferences, seminars, and webinars on various new developments in the LIS field.
- **Collaborative Initiatives with Educational Institutions:** Forge partnerships with local educational institutions to integrate green library concepts into academic curricula. This collaborative approach can create a ripple effect, fostering a culture of sustainability from an early age and extending into the broader community.

  In order to promote its initiatives to enhance the use of green energy, the Ministry of New & Renewable Energy (MNRE), the nodal agency at the national level for the promotion of grid-connected and off-grid renewable energy in the country, can collaborate with ministry of Culture and national library associations like ILA, ALAMP IASLIC, IATLIS, IALA, YLA, RRRLF, Society for Advancement of Library & Information Science, and other governing bodies. This will help to make libraries sustainable by encouraging the synchronisation of power generated from renewable energy sources.
- **Local Advocacy and Support Groups**: Establish local advocacy groups or support networks comprised of community leaders, environmentalists, and library enthusiasts. These groups can champion the cause of green libraries, garnering community support and creating a platform for open

discussions about the benefits and challenges.

- **Incentivize Green Practices:** Create incentive programs to encourage libraries and communities to adopt sustainable practices. This could involve recognizing and rewarding libraries that demonstrate significant progress in implementing eco-friendly initiatives, fostering healthy competition and motivation.In India only, 2-3 ministries like Ministry of Environment, Ministry of Renewable Energy and Ministry of Culture can come together and give some awards or funds to these initiatives which are excelling in this field, like IFLA does.
- **Community Engagement Platforms:** Utilise community engagement platforms, both physical and digital, to keep the public informed about ongoing green initiatives in local libraries. Regular updates, success stories, and testimonials can inspire a sense of pride and involvement among community members.Newsletters of various library organisations like Universal Breifing, ILA, IASLIC came out in regular intervals. These news letters can feature those libraries which are taking some steps towards sustainable libraries,this will work in both ways ,at one side it will give the persons associated with those libraries recognition and inspire other stake holders of other libraries to do the same.
- **Demonstration Libraries:** Establish a few "demonstration libraries" within the region that exemplify best practices in green library initiatives. These libraries can serve as living examples, showcasing the feasibility and benefits of sustainable practices to both library professionals and the community. Recently Festival of Libraries like event organised in New Delhi, Pragati Maidan, these concepts of model libraries can be showcased there as in line with AutoExpo or DefenceExpo, where they showcase advancement in their field.
- **Accessible Resources and Funding Support:** Create accessible resources, toolkits, and guidelines that assist libraries in overcoming financial constraints and navigating regulatory complexities. Additionally, explore funding support from governmental and non-governmental organisations to facilitate the transition to green libraries. Institutions like RRRLF which work towards development of public libraries can disburse some funds to such libraries who are willing to take this sustainable library initiative.
- **Technology Training Programs:** Develop technology training programs to address the fear of technological obsolescence. These programs can empower library staff with the skills needed to navigate and leverage sustainable technologies effectively. Various library organisation of

state can run certificate program to enhance training of lis professionals regarding technology driven sustainable library features.

- **Public Participation Campaigns:** Launch public participation campaigns that encourage community members to actively engage in the green library movement. This could involve tree-planting drives, eco-friendly book drives, and other community-oriented initiatives that align with sustainable practices.
- **Feedback Mechanisms:** Establish feedback mechanisms to ensure continuous communication between libraries and the community. This can help address concerns, gather suggestions, and foster a sense of shared responsibility in the journey toward sustainable libraries.

By implementing these community-building strategies, libraries in the Indian Subcontinent can overcome challenges and promote the widespread adoption of green practices, fostering a sustainable and environmentally conscious library landscape.

Conclusion :

In conclusion, the quest for sustainable libraries in the Indian Subcontinent is not merely an environmental initiative but a transformative journey that demands collective action and a paradigm shift in our approach to library management. The analysis of the IFLA Green Library Awards has unveiled a stark reality—while libraries in other continents flourish in recognition, there exists a noticeable void in representation from the Indian Subcontinent. This void is a call to action, a summons to confront challenges such as financial constraints, resistance to change, and awareness deficiencies head-on.

To fortify the foundations of sustainable libraries, we must weave a tapestry of community engagement, advocacy, and innovation. The proposed community-building strategies offer actionable pathways to bridge the gaps, empower library authorities, and cultivate a shared sense of responsibility. Collaboration with educational institutions, incentivizing green practices, and creating demonstration libraries are not just steps; they are milestones on the road to a more environmentally conscious and resilient library landscape.

As we navigate the complexities of implementing green libraries, the importance of resilience and adaptation echoes as a guiding refrain. Libraries, as bastions of knowledge and community hubs, must evolve to embrace sustainable practices, not in isolation but as integral components of a broader narrative of environmental consciousness and institutional transformation. The aspiration

for sustainable libraries is undeniably significant, and with strategic community-building endeavors, we can overcome challenges and collectively script a future where libraries in the Indian Subcontinent stand as beacons of environmental responsibility and resilience.

References :

1. Boyden, L., & Weiner, J. (2000). Sustainable libraries: Teaching environmental responsibility to communities. *Bottom Line: Managing Library Finances, The*, *13*, 74–83. https://doi.org/10.1108/08880450010327699

2. Brodie, M. (2012). Building the Sustainable Library at Macquarie University. *Australian Academic & Research Libraries*, *43*(1), 4–16. https://doi.org/10.1080/00048623.2012.10722250

3. Chowdhury, G. (2012). Building Environmentally Sustainable Information Services: A Green IS Research Agenda. *Journal of the American Society for Information Science and Technology*, *63*. https://doi.org/10.1002/asi.21703

4. Dempsey, M. E., & Palilonis, A. (2012). Reuse, recycle … reduce: A greener library with print management. *Library Hi Tech*, *30*(3), 408–417. https://doi.org/10.1108/07378831211266555

5. Divya, P.I and Vijayakumar,K.P, "Green libraries for sustainable development. New information technology interfaces in libraries and information centers", KLA National Seminar Souvenir (July 2013): 67

6. Fedorowicz-Kruszewska, M. (2019). Sustainable libraries-fashion or necessity? *JLIS.It*, *10*, 92–101. https://doi.org/10.4403/jlis.it-12500

7. Fedorowicz-Kruszewska, M. (2023). Green libraries: Barriers to concept development. *Library Management*, *44*. https://doi.org/10.1108/LM-04-2022-0041

8. Flinchbaugh, M., & Murtha, M. (2019). Biz of Acq-Going Green at a Library Near You: Transitioning from Print to Electronic Resources at the University of Baltimore Law Library. *Against the Grain*, *29*. https://doi.org/10.7771/2380-176X.7913

9. Fourie, I. (2012). A call for libraries to go green: An information behaviour perspective to draw interest from twenty-first century librarians. *Library Hi Tech*, *30*. https://doi.org/10.1108/07378831211266573

10. Idiegbeyan-Ose, J., Owolabi, A., Segun-Adeniran, C., Aregbesola, A., Emmanuel Owolabi, S., & Eyiolorunshe, T. (2019). Information Provision by Public Library to

Agricultural Extension Agents in a Developing Country. *Public Library Quarterly*, *38*(1), 103–115. https://doi.org/10.1080/01616846.2018.1555412

11. Jankowska, M., & Marcum, J. W. (2010). Sustainability Challenge for Academic Libraries: Planning for the Future. *College and Research Libraries*, *71*, 160–170. https://doi.org/10.5860/0710160

12. Kruse, T. (2011). Greener library printing and copying. *The Bottom Line*, *24*(3), 192–196. https://doi.org/10.1108/08880451111186053

13. Kumar, S., & Goel, S. (2023). Has the Green Library Movement made Sufficient Progress in India? An Initial Analysis of Web Information. *International Journal of Information Dissemination and Technology*, *13*, 105–110. https://doi.org/10.5958/2249-5576.2023.00020.1

14. Li, H. (2017). Built to succeed: Sustainable learning environment at UC Merced Library. *Library Management*, *38*, 175–180. https://doi.org/10.1108/LM-01-2017-0003

15. Małgorzata Fedorowicz-Kruszewska.(2020). Journal of Librarianship and Information Science. Green libraries and green librarianship – towards conceptualization. doi: 10.1177/0961000620980830 Retrieved from: https://www.proquest.com/results/79BD8688E89640D8PQ/1?accountid=16284/journals.sagepub.com/home/lis

Environment-friendly architecture and design of libraries: A boon for sustainability

Sushmita Bardloi

ABSTRACT: A library is a centre of active interchange of information between the users, the information resources and the librarian that results in the growth of knowledge. The libraries preserve culture, knowledge, philosophy and the creations as well as innovations of a particular society and protect for the future generations. Libraries serve as the foundation of lifelong learning with the help of information resources available in the library. The demands of the user needs have changed over the past years but the necessity for planning the architecture of the library has not yet been changed. Providing clear sight lines and a better opportunity to discover the library is an example of an ideal library building. Deteriorating climate change has become one of the rising issues of the 21st century. Sustainably designed buildings are the need of the hour in mitigating the impact of climate change on humans. Promising and implicating energy-efficient alternatives is one of the best ways a library can develop an environment-friendly model. A library that is user-friendly, appealing, and inviting with better space management and that uses green technology for sustainability is the ideal library for fulfilling the demands of the user community.

Introduction

Libraries are the centre for imagination that fuels one's power of creativity and invention. The physical facilities as well as the safe and secure environment of the location, building and layout most significantly contribute to the enhancement of the quality of services provided by the library. There should always be a scope for future expansion in the design of the library building. Sustainability in general is the meeting needs of the present generation and thinking about the future generation to meet their needs. The dawn of civilization and development of the Information communication technology (ICT) in the information literate society has brought a change in sustainability efforts for creating an environmentally safe design for libraries. The building of a library, its interior design, landscape and furnishing as well as the function of the library are closely related to one another. Library buildings are the place for exploring and learning.

A sustainable library design bears the responsibility of providing knowledge and creating inspirational and conducive communication between the librarian and the users. Creating an environment-friendly library building will not only serve the present generation with information sources but also preserve it for the future

and enhance the reading habits of individuals.

Objective:

The purpose of the study is to maximize space utilization, improve user experience, and build environments that are sustainable and functional for library patrons.

- ❖ To evaluate design choices made by the library with regard to its environmental impact.
- ❖ To optimize resource usage, including energy, water, and materials to reduce waste and promote sustainability.
- ❖ To find out the challenges that inhibit the sustainability of library architecture and design
- ❖ To recommend suitable ecologically sound alternatives for the sustainability of the libraries.

Research Methodology:

- For the collection of data from the librarians, a structured questionnaire consisting of twenty two (22) squestions was sent to the librarians.
- A random sampling technique was used for the present study.
- Informal interviews were conducted through telephonic conversations with the Librarians of respective colleges to get deeper insights about the study area.
- Scaling techniques were applied in the questionnaire to get information from the respondents.
- For analysis of the data collected, the percentage method was adopted.

Area of the Study:

At present Golaghat district has 14 colleges that are affiliated to Dibrugarh University whereas Nagaon district has 15 colleges that are affiliated to Gauhati University except for 1 which is an autonomous college which gives a total of 16 colleges according to the information available on the website of highereducation.assam.gov.in. Out of which eight colleges were taken into consideration from both the districts respectively with no particular order. The present study has been undertaken with a view to understanding the architecture and design of the library buildings.

Literature Review:

This review of literature focuses on library architecture and design, as well as other related topics.

Library design and architecture

Hohman (2006) in her study found that well-designed lighting for libraries affects the atmosphere within, lessens eye strain when reading, eases discomfort, and encourages extended reading sessions.

Javdani, Karami and Mehrpouyan (2015) in their study indicate that there is a strong correlation between the user's mental health and the library's desirability of design and architecture. The primary consideration in the planning and design of a library should be security, health, and the mental and physical comfort of users.

Green Library or Sustainable Library

Ingole and Kumari (2021) in their article discuss the green structures of a library which play an extremely significant role in environmental conservation. Green library structures provide libraries and librarians with excellent opportunities to educate citizens.

Pagore and Chalukya (2022) in their article, depict the green library as a modern library which minimizes waste, maximizes the use of renewable sources, employs eco-friendly building materials, and runs its operations more economically and effectively.

Incorporating Sustainability Into Librarianship and Making Them Sustainable Buildings:

Libraries are not just the repository of information sources but it is the place to foster a community and develop creativity and learning. Sustainability refers to practices that are environmentally friendly, economically feasible and socially acceptable. With the advancements in technologies and a rapid change in the needs of the users, modern libraries have to change and adjust to the users' needs and demands. Driven by the changes in the environment and availability of spaces, modern libraries are to put emphasis on user needs to access information sources. Hence, there is a significant change in the architecture of libraries to a user-oriented and multifunctional library.

Libraries are the service centres that work for the upliftment of the society. Libraries serve as the symbols of the values and attitudes of the present generation

and extend those values to the future generation with a positive impact to it. The sustainable library design and architecture would be able to change its design whenever required in the future with the ability to last for a long time. It should be able to provide an environmentally sound and safe atmosphere that will not only enhance the knowledge of the users but also create a community that supports innovation and creation. The main of sustainable library architecture and design is to save energy and run an environment-friendly library.

Principles of Planning Modern Libraries:

In order to plan a modern library, the principles require that it is designed for an evolving user need while at the same time accepting technology advances and promoting inclusion.

- **Accessibility and Flexibility:** The library should provide a flexible facility that can accommodate a variety of activities and user preferences. It should be accessible to everybody, taking into account various needs, various age groups including those of those with disabilities.
- **Technology:** Modern libraries must smoothly incorporate technology, offering access to digital resources, high-speed internet, and areas for technical activity.
- **Community Centered approach:** Libraries should act as the centre of the community, providing services, activities, and programs tailored to the interests and requirements of the local populace and encouraging a feeling of community.
- **Participatory spaces:** Libraries should provide spaces that encourage conversation, teamwork, and group projects. These areas foster peer-to-peer learning, teamwork, and idea production.
- **Sustainability:** In keeping with environmental responsibility, libraries should integrate eco-friendly features, decreased waste, and energy efficiency into their design.
- **Staff Support and Training:** Providing library employees with continual education on contemporary library procedures, technological advancements, and community involvement guarantees that they will be able to assist patrons in a relevant and efficient manner.
- **Creativity and Innovation:** Spaces should encourage creativity and innovation by providing maker spaces, art nooks, and resources to foster entrepreneurship and creative efforts.

- **Assessment and Adaptation:** Libraries must constantly examine their users› changing demands and adjust their services, layout, and resources accordingly.

Design, Quality, Sustainability And Environmental Conditions In Libraries:

The attitudes and behaviours of library employees and patrons are influenced by the quality of the surrounding design, especially when it comes to areas like productivity and focus. Some key points for design quality, sustainability and environmental conditions in libraries are as follows:

- A well-designed library should have flexible areas for various activities. Lights should be available in all reading areas of the library, which should also have natural ventilation, comfortable chairs for sitting and clearly designated areas for various uses.
- In the library quality refers to furniture and material's appearance, functionality, and longevity. To make sure the area stays welcoming and useful for a long time, it is essential to invest in robust, long-lasting materials that can tolerate heavy use.
- A sustainable library minimizes its environmental impact by employing eco-friendly materials, implementing waste reduction techniques, and energy-efficient systems. Initiatives like recycling and the adoption of digital alternatives for paper products should be used for waste reduction.
- The comfort of library patrons is greatly influenced by environmental factors. Libraries ought to have views of attractive areas and greenery. Planting indoor plants helps to purify the air and control air pollution. Potentially harmful factors including solar glare, overshadowing, and noises from outside should be resolved for a healthy library environment.
- A library can establish an environment that is not only a hub for information and education but also a warm, environmentally friendly space for its patrons by emphasizing an integrated approach that takes into account design, quality, sustainability, and environmental factors.

Analysis and Interpretation:

The captured data is presented analyzed, described and interpreted in a systematic manner. The in-depth study of the main findings can be interpreted with the help of data analysis.

- **Colleges under study**

The details of the architecture of libraries were collected and the information is tabulated below. Total Number of eight colleges was taken into consideration from both the districts four from each respectively. The data is collected from the respective websites of the colleges about their year of establishment. The tabular form is shown below:

Table 1: Colleges under study

Sl No.	Name of the college	Code used in the study	Year of establishment
01	Hemo Prova Borbora Girls' College	HPBGC	1969
02	Golaghat Commerce College	GCC	1972
03	Nagaon Gopinath Nath Dev Goswami Commerce College	GNDC	1984
04	Anandaram Dhekial Phookan College	ADP	1959
05	Joya Gogoi College Khumtai	JGC	1991
06	Debraj Roy College	DRC	1949
07	Nowgong College (Autonomous)	NC	1944
08	Kaliabor college	KC	1969

- **Site selection:**

Location: All the libraries have an excellent location at the centre of the institution. It is close to the target. 100% of the population under study stated that their libraries are situated close to the target community.

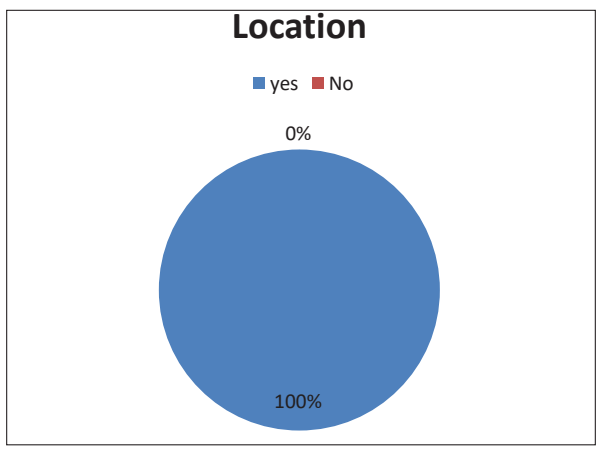


Fig 1: Data on location

- **Interior**

Table 2: Interior

Sl. no	Features	Percentage (%)	
		Yes	No
01	Ventilation	100	-
02	Sunlight	25	75
03	Walkway surface	100	-
04	Closed Circuit Television(CCTV)	87.5	12.5
05	Traffic Free Entrance	75	25
06	Temperature	25	75

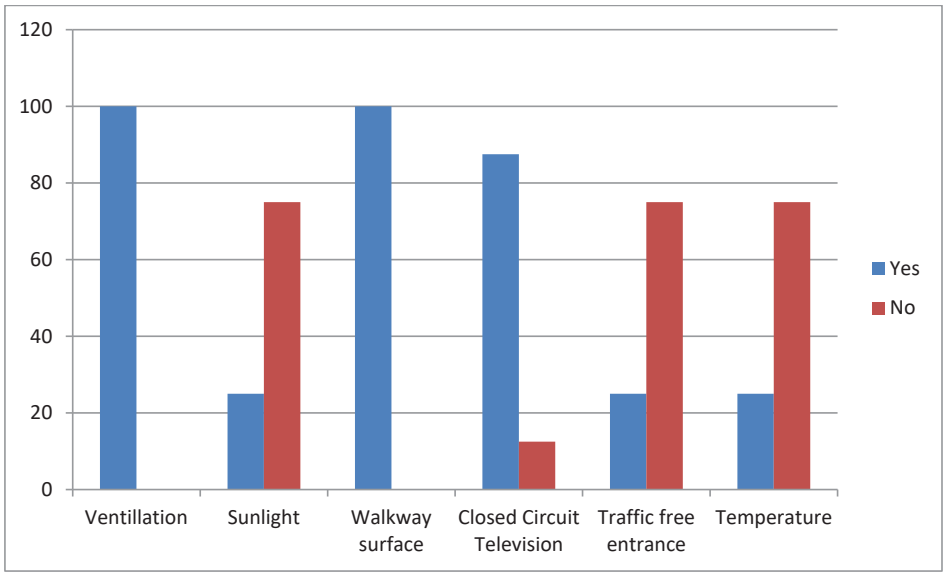


Fig 2: Data on interior of the library

It is evident from Figure 2 that 100 % of the college from our study has proper ventilation facilities resulting in proper air circulation. 75% of the libraries cannot control the sunlight architecturally. The walkway surface is firm and stable in all the libraries. 87.5 % of colleges have a CCTV facility that safeguards the belongings of the users of the library as well as the librarians can keep an eye on the users. 75% of the libraries have a traffic free entrance during the peak period of library hours. Only 25% of the libraries have a pleasant environment during the summer as well as the winter season.

- **Interior Design**

Table 3: Interior Design

Sl. no	Features	Percentage (%)	
		Yes	No
01	Colour of Walls	100	-
02	Windows	87.5	12.5
03	Tables	100	-
04	Seating	75	25
05	Well lighted and secure	100	-

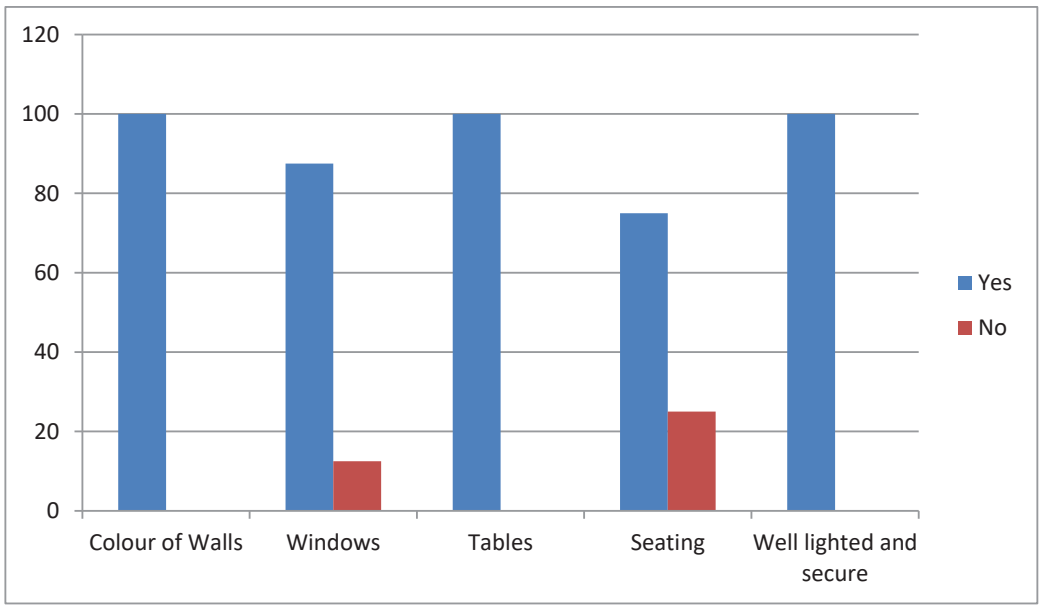


Fig 3: Interior design of the library

All the colleges under study have an appropriate colour for the walls.87.5% college libraries have windows placed close to the ceiling allowing higher intensity of light. The tables of all the colleges have suitable designs of tables to complete the task intended. 75% of the college libraries have a proper seating arrangement.100 % of the libraries are well lighted and secure with a proper safe environment for users.

- **Basic Amenities**

Table 4: Basic amenities

Sl. no	Facilities	Percentage (%)	
		Yes	No
01	Drinking water	87.5	12.5
02	Sanitation	37.5	62.5

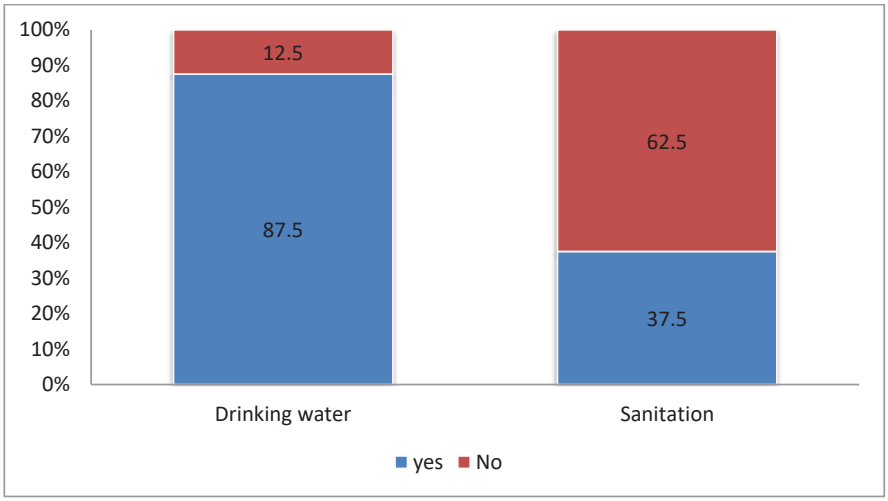


Fig 4: Basic amenities

Drinking water and proper sanitation facilities are some of the most important aspects to keep in mind for designing the architecture of libraries.87% of the libraries have drinking water facilities whereas 37.5% of the libraries have sanitation facilities close to the libraries.

- **Energy**

Table 5: Energy

Sl. no	Facilities	Percentage (%)	
		Yes	No
01	Solar energy	12.5	87.5
02	Power distribution	100	

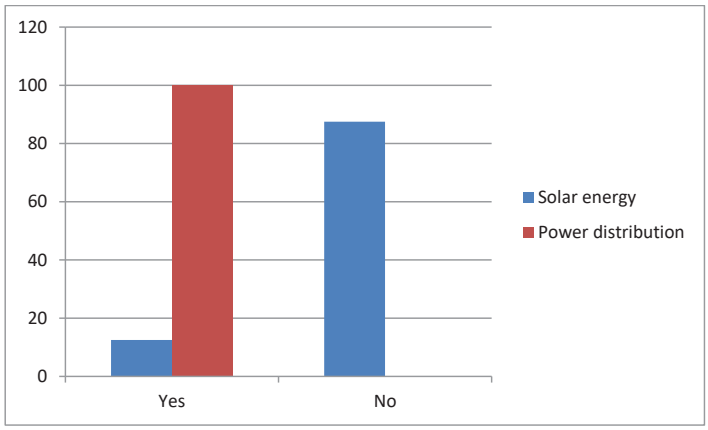


Fig 5: energy

It is seen that 12.5% of the libraries use solar energy for running the library. 100 % of the college libraries have sufficient power distribution throughout the entire library.

- **Exterior**

Table 6: Exterior

Sl. no	Exterior	Percentage (%)		
		Yes	May be	No
01	Landscape	25	62.5	12.5
02	Water drainage	100	-	-

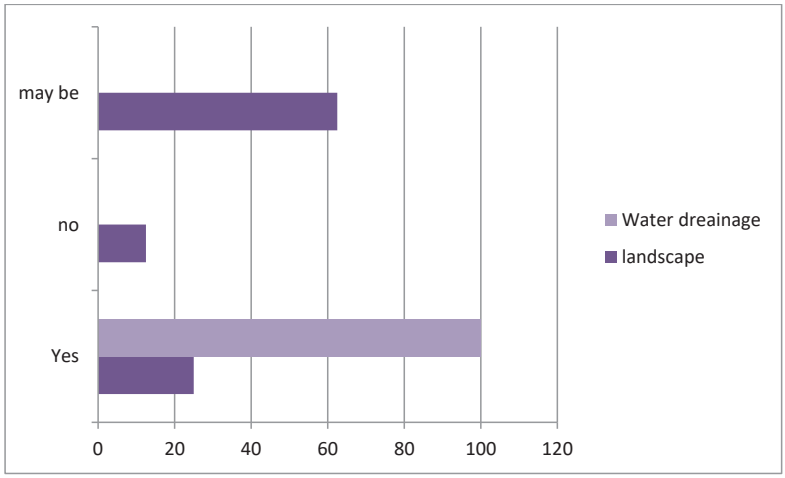


Fig 6: Exterior of the library

The landscape of the library should be such that it enhances the overall design of the library architecture.25% of the respondents having a proper landscape design. It is seen that 100% of the college libraries have proper water drainage systems on the roof for the flow of water after a heavy downpour.

Challenges:

Though building a sustainable library architecture and design is essential for the present scenario, it faces various challenges while designing it.

- **Absence of sustainable strategies:** Lack of sustainable strategies makes it difficult to incorporate environment-friendly elements into library design, which raises costs, has an adverse effect on the environment, and misses opportunities for long-term efficiency and environmental stewardship.
- **Budget constrains:** A higher initial investment is often required for the implementation of sustainable features, which can be a barrier due to budget constraints or conflicting financial priorities.
- **Balancing sustainability with functionality:** The major challenge for libraries is to ensure that sustainable design elements are not detrimental to their functions and usability.
- **Massive energy consumption:** High energy consumption puts a strain on environment-friendly library design and makes it more difficult to create a space that is environmentally conscious.
- **Technological advancement:** To incorporate sustainable technologies and systems requires expertise in specific areas, which may require cost or complexity to adapt the current library structure.
- **Maintenance:** Maintaining sustainable features requires regular maintenance, training, and operational changes which may become more challenging with regard to resource point of view, as well as expertise and adaption of existing operating procedures.
- A multipurpose approach is always reliable in overcoming the obstacles that will fulfil the aim of providing the right information to the user by the sustainably designed libraries.

Recommendations:

Sustainable library architecture is essential for reducing environmental impact, promoting energy efficiency, and creating eco-conscious community spaces. Here are some recommendations for building a sustainable library:

- Controlling temperature is a major issue for an eco-friendly environment. For optimal temperature control, the library can use energy-efficient HVAC (Heating, Ventilation, and Air Conditioning) systems with programmable thermostats.
- To reduce reliance on mechanical systems, the library can incorporate passive design elements such as shading devices and natural ventilation.
- To optimize natural light and minimize artificial lighting, libraries can strategically install large, energy-efficient windows and use UV-coated glass to reduce heat gain.
- To reduce water requirements and promote biodiversity, libraries can consider using native plants in their landscape design.
- To reduce runoff, libraries can install sustainable water drainage systems and permeable surfaces.
- Libraries can integrate solar panels on the library roof to harness renewable energy. By implementing energy-efficient lighting and appliances, libraries can reduce dependence on traditional power sources.
- Libraries can have an open, adaptable interior design that makes use of movable furniture and multipurpose areas.
- Touchless fixtures, water-saving devices, and sustainable materials can all be used to design environment-friendly restrooms in libraries. By encouraging a clean and ecologically responsible atmosphere these sustainable practices improve user comfort and wellbeing.

By implementing above mentioned recommendations, libraries can create a warm, inviting space that can accommodate a range of user needs and encourage community involvement.

Conclusion:

An environment-friendly as well as technically equipped library always enhances the services provided by the library. The study was conducted with the aim of predicting how the libraries of Nagaon and Golaghat will look in the future in terms of their functionality and design in the context of its architecture. The study has a further research scope which can be used to see a clearer picture and detailed information about its architecture.

Refrences:

1. Edwardss, B. W. (2011). Sustainability as a Driving Force in Contemporary Library Design. Library trends, 60(1), 190-214. Retrieved from https://www.ideals.illinois.edu/items/32127

2. Homan, T. (2006). New Aspects of Library Design. Liber Quarterly, 16(2),. https://doi.org/10.18352/lq.7841

3. Ingole, A. R., Kumari, S. (2021). Green Library: Concept, Sustainable Development, Features, Importance, Standards and Overview in Indian Scenario. International Journal of Creative Research Thoughts, 9(12), 373-386. Retrieved from https://ijcrt.org/papers/IJCRT2112037.pdf

4. Javdani, S., Karami, P., Mehrpouyan, A. (2015). Architectural Implications of Public Library Design and Environment for User's Mental Health. Indian Journal of Technical Research and Applications, (27), 63-69. Retrieved from https://www.ijtra.com

5. Khalid, A., Malik, G. F., Mahmood, K. (2021). Sustainable development challenges in libraries: A systematic literature review (2000-2020). The Journal of Academic Librarianship, 47(3),. https://doi.org/10.1016/j.acalib.2021.102347

6. Pagore, R., Chalukya, B. V. (2022). Green library: An overview. IP Indian Journal of Library Science and Information Technology, 7(1), 36-39. Retrieved from https://www.ijlsit.org/journal-article-file/16827

7. Prakumthong, K. (2014). Modern Public Library Buildings and Their functions: A Case Study of Three Public Libraries in the Netherlands (Master's thesis, Leiden University, Netherland). Retrieved from https://studenttheses.universiteitleiden.nl/access/item%3A2610360/view

Let's Go Green Together: The Role of Libraries in Green Literacy Education

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ABSTRACT: With the global community facing escalating environmental issues, the idea of "green literacy" has become increasingly popular as a means of promoting sustainability. Libraries have long been seen as important institutions for the spread of information, education, and community interaction. In the face of mounting environmental issues, libraries' roles have evolved beyond those of conventional information repositories to become catalysts for encouraging green literacy. Green literacy includes knowledge of environmental challenges, sustainable practices, and the value of ecological stewardship. This article investigates the many ways in which libraries help to enhance green literacy and the development of environmentally conscious societies.

Introduction

The term "green literacy" refers to an individual's knowledge of environmental concerns, sustainability, and ecological principles. It requires having the knowledge and abilities to make informed decisions that contribute to living a more sustainable and ecologically friendly lifestyle. The growing need for environmental awareness and sustainable practices has increased the value of green literacy. Libraries, as active community hubs, are well-positioned to play a critical role in promoting green literacy. Libraries play a crucial role in promoting green literacy by providing access to resources, organizing educational programs, adopting sustainable practices, fostering community engagement, and embracing technology and innovation. As trusted community institutions, libraries have the power to inspire positive environmental change by cultivating informed and environmentally conscious individuals. Through strategic partnerships and a commitment to sustainability, libraries can continue to be instrumental in shaping a greenerand more sustainable future.



Fig: The Green Library Poster-IFLA (Source: https://www.ifla.org/the-green-library-poster/)

Literature Review

Alberto (2023) studied green library initiatives that promote sustainability. The green library concept promotes a thorough awareness of the environment and the development of strategies for overseeing library operations and programming with an eye toward the environment. The purpose of this research was to increase librarians' knowledge and awareness of the idea of "green libraries" for environmental sustainability. The Library, Information Science & Technology Abstracts database is searched for relevant material as part of the research methodology. Google Scholar was used to search for papers published between 2010 and 2020 using the keywords "green libraries," and "sustainable/ sustainable/eco-friendly. Each reference's title was examined for suitability and relevancy before being returned. The findings demonstrate that the government, academic community, industry professionals, and international organisations are paying increasing attention and considering into account the notion of green and sustainable logistics.

Vyas & Parmar (2021) Libraries are essential to the advancement of sustainable development because they provide equal access to knowledge without discrimination. Even though there aren't many published works on the subject of green information literacy, the quantity of information on the subject appears to be expanding. Since most people who visit libraries are completely unaware of

the resources and services that library provides, green librarianship consists of providing green information services.

Sawant & Sawant (2018) gave several environmentally conscious ideas and movements that have evolved over a period of time and are very relevant to the natural world. "Green Library (GL)" is one of these ideas and initiatives. Individuals who care about the environment and thosewho use libraries, such as academics, students, and others, expect libraries of today to be more than just information hubs with green spaces. The trend of building green libraries is about to reach a tipping point, sparking the formation of the "green library movement," a collaboration of librarians, libraries, towns, cities, and college and university campuses dedicated to minimising the negative environmental effects of library construction.

The Idea of Green Literacy

One of the most significant issues that the modern world is facing right now is the global ecological crisis. And as a social organization, libraries need to address this issue. According to the IFLA Special Interest Group on Environment, Sustainability, and Libraries (ENSULIB), "The consideration of the role of humanity in climate change and the notion of sustainable development are main concerns of society as well as libraries."

The term environmental literacy" was used as early as 1968. The concept of "ecological literacy"is also not new. In the early 1990s, the phrase "green literacy" was also mentioned. It is the ability to comprehend how human decisions and activities affect the environment by promoting critical thinking and sustainable development. Its goal is to influence an individual's or the institution's overall conduct toward the environment.

Libraries have made a greater effort to be sustainable ever since the Green Library Movement began. Since the 1990s, efforts to promote green, ecological, and environmental literacy have been acknowledged. Since then, teaching green literacy has grown in importance and both the concepts and numerous programs have gained popularity. S. Kurbanoglu and J. Boustany in theirconference paper, "From Green Libraries to Green Information Literacy" address how to make information literacy and its education green, as well as how they might support the Green Library Movement.

One of the Sustainable Development Goals (SDG) indicators is "leaving no one behind," which suggests that those who are not accustomed to reading and

learning can also join the sustainability movement by using a more interactive method, which libraries may provide through suitable programs.

The Role of Libraries in Promoting Green Literacy

Libraries have a moral and legal duty to promote sustainability education by teaching more than just information literacy. As cultural institutions that cater to all ages of society, including children, young adults, and the elderly, libraries should take the lead in teaching sustainability literacy. Libraries are in a unique position to be key players in promoting green literacy since they are dynamic community centres. Although there have been several green literacy programs throughout the years provided by colleges, elementary schools, and other organisations, there aren't many green or sustainable literacy courses taught to or by librarians or libraries. Educating on sustainable literacy should be considered from different angles such as Using Green literacy courses, primarily offered at academic libraries, to teach more theoretical topics, offering Urban Gardening projects, and other hands-on learning opportunities, mostly in public libraries. Libraries play a vital role in fostering environmentally conscious societies by facilitating access to a wide range of information, organising educational initiatives, and implementing sustainable practices (Hinz, 2023).

1. Developing Green Resources

Libraries are knowledge repositories that provide a wide range of materials on ecology, conservation, sustainable development, and environmental science. Libraries make sure that community people have easy access to knowledge necessary for comprehending environmental concerns and solutions by creating collections that focus on these themes. E-books, online databases, and multimedia materials are examples of digital tools that improve accessibility and let users investigate green literacy from many angles.

2. Workshops and educational programmes

Libraries serve as venues for educational programs and seminars addressing environmental concerns. Libraries promote learning experiences that allow citizens to make informed decisions for a greener future, from hosting expert-led talks on climate change to organising hands-on workshops on sustainable living practices. Collaborations with local environmental organisationsand professionals increase the effect of these efforts and develop a feeling of community engagement.

3. Green Initiatives and Sustainable Practices

Libraries can set a good example by implementing green projects and sustainable practices in their own operations. Implementing energy-efficient equipment, trash reduction programs, and eco-friendly building designs not only reduces libraries' environmental impact but also serves asa physical representation of sustainable practices to the community. Libraries can also participate in community-wide environmental activities such as tree planting and recycling drives.

4. Community Engagement and Collaboration

Libraries thrive on involvement in the community, making them perfect venues for promoting environmental awareness. Green literacy projects benefit from collaborations with schools, local businesses, and environmental organisations. Eco-themed reading clubs, film screenings, and environmental events promote discussion and shared learning experiences in the community. Libraries may increase the effect of their green literacy efforts by forming partnerships and leveraging consolidated resources.

5. Innovation and Technology

Libraries are embracing technology and innovation to improve the delivery of green literacy curricula. Immersive learning possibilities are provided via virtual reality experiences, interactive displays, and internet platforms, which appeal to a wide range of learning styles and demographics. Furthermore, libraries may use social media and digital communication channels to convey relevant information, create online discussions, and promote green literacy outside of the actual library space.

6. Role of Librarian/Green Librarian

In addition to their multifaceted responsibilities in preservation, conservation, and security, librarians are instrumental in cultivating an eco-friendly atmosphere within the library. Librarians also raise awareness among library users about the importance of green libraries. By imparting knowledge on eco-friendly initiatives, librarians encourage patrons to contribute to the sustainability efforts within the library community. This proactive approach not only aligns with global environmental concerns but also empowers library users to adopt environmentally responsible behaviors both within and beyond the library space.

Green librarians should always be conscious that maintaining a green library involves more than just protecting the environment—it also entails protecting the

health and well-being of those whowork in it. As part of their purpose to create green libraries, librarians should constantly work to promote the green library movement by -

1. Encouraging the use of electronic books, e-journals, and other similar products, whichcan serve as instruments for saving space and paper while also reducing expenses
2. Making use of techniques that contribute to the best possible use of available space, suchas microfilming old books, creating soft copies, and eliminating out-of-date books
3. Using various electronic media and online communication platforms, such as socialmedia, has several advantages for both library administration and users
4. Locating those who are eager to work in such an environment and operating under aneco-library system, might enhance the movement
5. Motivating fellow librarians to go for green libraries through talks, conferences, andseminars may help to join hands together
6. Handling and managing the library budgets to provide support to the organisations, mightresult in the best possible use of financial resources and operational efficiencies
7. Using wooden furniture and other bio-degradable materials makes the place quite eco-friendly and sustainable one
8. Using wool bricks, which are regarded as environmentally friendly building materials, rather than burned bricks
9. Utilizing solar panels or tiles, or reflective materials, for library roofing to optimise the utilisation of renewable energy sources
10. Using recyclable paper insulation is seen to be the best way to create environmentally friendly buildings
11. Using materials such as bamboo and fiber to replace steel, which is also considered an eco-friendly material
12. Making the required efforts to conserve energy, water, paper, and other resources, not only allows for significant savings in resources and expenditures but also promotes sustainability
13. Making rooftop planting is a fantastic idea because it allows for better temperature control
14. Making appropriate planting, including lawn, both inside and outside the library to reducedust and keep the environment cool.

IFLA Green Library Award

The IFLA Green Library Award was established in 2016 by ENSULIB (SIG) and generously sponsored by De Gruyter Publishing. Following the IFLA Key Initiative 1.1 Show the power of libraries in achieving the Sustainable Development Goals, the award will help advance the profession by illuminating the role of libraries and librarians in the advancement of sustainabilitystandards and the promotion of specialized knowledge within professional practice.

The prize is awarded in two categories:

Category 1: Best Green Library/ Grand Scale ProjectCategory 2: Best Green Library Project

Special recognition may be given to a project that was carried out with minimal resources but hasa big impact. In 2023, The award was presented at the 2023 World Library and Information Congress in Rotterdam, Netherlands, Session 130: IFLA Green Library Award Session.

Winners of the IFLA Green Library/Grand Scale Project Award 2023

1st Place: Biblioteca EPM, Cucuta, Colombia: Biblioteca EPM – Education for Sustainable Development

2nd Place: "Illyés Gyula" Library of Tolna County, Hungary: Library at the Gates of Cultures & Gemenc

3rd Place: Vietnamese-German University Library, Thoi Hoa ward, Socialist Rep. of Vietnam: Vietnamese-German University Inclusive Library for Sustainable Development (*8th IFLA GreenLibrary Award 2023 Results,* n.d.)



Fig: Vietnamese-German University Inclusive Library (Source: https://www.ifla.org/ifla-green-library-award-2023-winners-results)

Winners of the IFLA Green Library Project Award 2023

1st Place: West Vancouver Memorial Library, BC, Canada: Climate Writer in Residence at theWest Vancouver Memorial Library: A Novel Solution

2nd Place: Biblioteca Civica Villa Valle, Italy: The Seed Library

3rd Place: Seoul Metropolitan Library, Seoul, Rep. Korea: Eco Project in Seoul MetropolitanLibrary for SDGs (*8th IFLA Green Library Award 2023 Results,* n.d.)

Conclusion

We have to recognise the underrated idea of "green literacy education," which demands more attention, and how teaching information literacy may incorporate sustainable thinking. Very littlehas been written about this topic up to this point, and further study is required to explain future practices in this domain.

References

1. *8th IFLA Green Library Award 2023 Winners announced.* (n.d.). IFLA. Retrieved fromhttps://www.ifla.org/ifla-green-library-award-2023-winners-results

2. *The Green Library Poster*. (n.d.). IFLA. Retrieved from https://www.ifla.org/the-green-library-poster/

3. Hinz, A. (2023, July 31). 6 Ways to Make Your Library Greener - De Gruyter Conversations. *DeGruyter Conversations.* Retrieved from https://blog.degruyter.com/six-ways-to-make- your-library- greener/

4. Hauke, P. (2017). From Information Literacy to Green Literacy: Training Librarians as Trainers for Sustainability Literacy. *International Federation of Library Associations and Institutions,* 1–10. Retrieved from http://library.ifla.org/id/eprint/2147

5. Vyas, P., & Parmar, K. (2021). Towards The Sustainable Development Goal: Concept of Green Library and Green Information Literacy. *Towards Excellence*, 675–682. Retrieved fromhttps://doi.org/10.37867/te130253

6. Green Library (Gl) And Role of Green Librarian. (2018). *International Journal o f CreativeResearch Thoughts*, 6(2), 1668–1671.Retrieved from https://www.ijcrt.org/

7. Kurbanoğlu, S., & Boustany, J. (2014). From green libraries to green information literacy. In*Communications in computer and information science* ,47–5 Retrieved fromhttps://doi.org/10.1007/978-3-319-14136-7_6

Theme-5

Resillience and Adaptation

Sustainability of libraries: The tri junction of Past, Present and Future

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ABSTRACT: Sustainability promotes developments without compromising the needs of the future generation. To achieve sustainability, three aspects need to be considered in any system, i.e., ecological, social, and economic. The balance between social equity, economic vitality, and environmental integrity helps the system fulfil all the goals for a sustainable future. As a trijunction of past, present, and future, libraries are the best place for implementing sustainability. Libraries need to be sustainable to preserve the heritage they hold and successfully transmit it to future generations. This paper is a theoretical attempt to understand the concept of sustainability in general and in terms of libraries. The paper tries to explore the role of libraries in fulfilling the goals of sustainability. A plan is proposed to achieve the various goals in the three aspects defined to achieve sustainability in terms of objectives and actions that need to be taken.

1. Introduction

The hunger for more led to humans being responsible for the destruction of their own house, the earth. It is noteworthy that in the timeline of the evolution of the earth, humans arrived just a few seconds or perhaps a few nanoseconds ago. But with the logical advancement humans inherit, they try to dominate other species for the advancement of their race and try to occupy earth as much as they can. But in this rat race of having more and more, we forgot that the earth functions properly with the balance of all the species living in it. There are diversities, and because of this diversity of genetics, habitation, and species, the earth is in habitable condition. But due to the rampant deforestation and other activities for the economic advancement of the human race, the earth is losing its balance. No amount of money can reinstall the conditions that are needed for the survival of the species on earth.

The concept of sustainability comes into play when people start to recognize the adverse effects caused by humans. With the increasing global temperature, humans slowly understand the destruction they have been doing to the system, and in attempts to try to mitigate this, the concepts of sustainable development, conservation of the environment, etc. have surfaced. Different sectors try to incorporate such ideas into their businesses, schools, and industries and try to reduce the harm to the environment. Libraries, as a place that propagates ideas, also try to incorporate the idea of sustainability into their services and operations.

This study aims to propose a theoretical basis for the objectives and actions that need to be taken to achieve sustainability in libraries.

Concept of sustainability

Long before the term sustainability, Eastern philosophy, especially that of India's greatest spiritual leader and revolutionizer, Gautam Buddha, emphasized the importance of the environment through his teachings. Buddha, through his spiritual teaching, propagated the idea of "Sabbe Sattaa Sukhi Hontu," meaning that all beings may find everlasting happiness, considering every being in this universe. He advised people to inculcate habits for the greater benefit of this earth by not harming the surroundings—animals, trees—everything around us. Basically, sustainability advocates the idea of living in harmony with nature, and this is the thought Gautam Buddha wants to propagate through his teachings. But with time, as the population increases and people move towards a fast-developing economy, these teachings are almost forgotten, and humans start to identify themselves as being separate from nature.

In 1972, the UN Conference on Human Environment in Stockholm recognized the importance of environmental management and using environmental assessment as management tools (DuBose et al., 1995). The major attempt to integrate development and environment under the concept of conservation came with the release of the International Union for the Conservation of Nature (IUCN) in 1980 (Tryzna, 1995). Later, the World Commission on Environment and Development (WCED) publishes the report of WECD, which is also known as the Brundtland report named 'Our Common Future' and clearly defines the concept of sustainability. The famous Brundtland report in 1987 defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Often, the terms sustainability and sustainable development are used alternatively, as sustainable development leads to the path of sustainability. Sustainability addresses the balance between three aspects: ecology, social equity, and economics. The coordination between these three aspects can lead to a sustainable road. Everything that we consume is obtained from nature or is a byproduct of it. So, the raw materials of everything we eat and drink, be it our basic needs or luxury, are from nature. So, it is very important that we preserve and respect it. By protecting the environment, it does not necessarily mean that we will never use anything from the environment, but that we will use the resources with the utmost care and in an economic way. The importance of ecological sustainability leads to economic and social equity. The distribution of resources on earth is not uniform. A large portion of the world's

population lives in poverty, with a lack of health care facilities, drinking water, and adequate nutritious food. There are differences in the standard of living between developed and underdeveloped countries. Some of the major causes of these are a lack of education, environmental destruction, and economic hardships. There will always be differences in society due to different educational levels, different levels of intelligence, and, of course, willpower and hard work for achieving something. But the probability is there at every point for every individual to excel at everything. That is why everybody needs an equal opportunity to explore their qualities. Social equity means equal opportunity for everyone, rather than equality. Again, the economic aspects of sustainability mean advocating practices that can create long-term economic growth without any negative impact on society and preserve resources for future generations. By meaning economic, it does not mean to increase our economic wealth at any cost. Being economic means sensibly spending the natural resources, innovating ideas to seek alternative options for natural resources that cause less harm to the environment and are also cost-effective.

Sustainable libraries: a holistic approach

There is no better place than a library for implementing sustainability. Libraries are supposed to be sustainable because they are meant to pass on the heritage, they hold to generations to come. For centuries, the libraries have held documentation of the path of evolution for mankind. The library is a place where transformations can happen. It helps all its users immensely in terms of providing the information they need. Imagine that we all exhaust all the natural resources of this planet, causing the failure of various systems solely dependent upon them. Then only the library can help us find the right direction for all the alternative paths we need to unfold. Libraries from centuries hold the ideas of great minds in this world, which can inspire and help someone to generate new ideas, seek new paths, or be led to the path of discovery. Often, when we try to measure profit, we always look for tangible profit—profits that have value in terms of money or resources. But the libraries produce intangible profits like development and progress in the government, health, and education sectors, etc., which in turn raise the standard of people's lives.

Environmental aspect

The library can be a role model for its users by imparting environment-friendly ideas. The library can adapt environment-friendly approaches in terms of its

infrastructure, practices, services, and programs. The concept of green libraries is emerging, and library professionals are doing their bit to make the libraries more environmentally conscious. It is very important for any building to reduce the carbon footprint it produces. The building can reduce its carbon footprint by reducing the emissions from the energy it uses and by checking and revisiting the materials used in construction. Those libraries that are planning new buildings can opt for materials that reduce carbon footprints. There are various standards to rate green buildings, like LEED (Leadership in Energy and Environmental Design), IGBC (Indian Green Building Council), etc., which will help in designing the interior, selecting materials and resources, the indoor environment, energy, and atmosphere of the building. For the already-constructed library building, the carbon footprint can be reduced through the energy they emit during their operation. The library should use natural daylight, solar panels, and sensors that control indoor lighting to improve energy efficiency. Again, the library should emphasize purchasing energy-star-rated electronic equipment to reduce the use of electricity. Less use of papers in terms of operation is one of the things that libraries can look for. Besides using less paper, the library community can appeal to publishers to use eco-friendly paper for publications. More use of glass materials than plastics, the use of non-toxic and light-coloured paints for painting the library wall from time to time, the use of native plants for aesthetic purposes, etc. are some of the green measures that can help the library to support green initiatives. Again, the library can, from time to time, organize some talks on ecological and environmental awareness, wildlife photography competitions, bird watching programs, and exhibitions to spread awareness among its user community.

Social equity

Libraries have already advocated for social equity since their operation. It disseminates knowledge regardless of the caste, gender, or socio-economic status of the user. A library is a place where the barriers of society blur, and everybody enters a library to fulfil their information hunger. The library is a constant source of knowledge for all levels of people in the society. In promoting social equity, out of all the libraries, the public library has a greater responsibility towards society. Public libraries are funded by the taxes from the people, and thus they have some roles and responsibilities to the community they serve. Public libraries are meant for lifelong education. The public libraries can promote their services to the public and encourage them to read. The academic libraries can also do their part in this. They can pick any elementary or intermediate schools nearby their working places and conduct story-telling programs for the students. This will promote the reading

culture among the children, and it will help in advocating social equity in the near future. The libraries can also organize some motivational talks and meditation programs for the students that help them boost and centralize their inner strengths and help them become better human beings. Because social equity can only be achieved through the training of the mind, which helps to purify thinking and actions. To reach out to different sections of society, like the especially abled, the library needs to design the spaces and their services accordingly. Thus, planning various community-centered programs helps the libraries promote social equity in society.

Economic viability

For economic viability, the libraries should plan their services with the motto more with less. The budget for libraries is shrinking, and libraries need to be innovative in terms of their operations and services. The library needs to make the most of its resources, including monetary resources as well as staff, time, and material equipment. The library can act as an information agent among the community by reaching out to different sections of people to strongly portray the library as a valuable source of information. As an example, if a fishing community is there, the library should act as an information agent between the government and the community. They should voluntarily engage themselves in educating the community about the different government schemes, laws, market information, etc., and they can invite people from universities or successful fishery farms to deliver lectures on effective fish farming and how they can increase their production. By doing these types of activities, the libraries can establish themselves as strong agents for the community, thus inviting various funds and schemes that helps to grow the library. This will help in the marketing of the library. In terms of services, to achieve economic viability, the libraries should take measures like optimizing digital library services, online advertising services, digital information services, etc. The library needs to promote itself as a strong information agent by marketing its services and improving its image in society.

The plan

A plan is proposed to understand the library's goals, objectives, tasks, and actions to achieve the different aspects of sustainability in Table 1 below. This plan will help the libraries redesign and reconstruct their services to be more environment friendly, impart social equity, and achieve economic viability.

Table 1: The plan for achieving sustainability for the libraries

Theme (What is the Goal)	Objectives (What we are trying to achieve)	Tasks (What we need to do)	Action (How we achieve this)
Environmental Sustainability	The goal is to make the environment of the library eco-friendly and promote ethical principles among the community to ensure environmental awareness.	- reducing carbon footprint - Promoting green initiatives - making the community aware	- use of less plastics - following green building standards -energy efficient equipment. - less use of papers and promoting eco-friendly paper for publications. - following ways to less consumption of energy. - organizing events such as bird watching, exhibitions, photography competition, talks on environmental issues.
Social Equity	The goal is to create a space where everyone of the community is accepted and identifying everyone as knowledge seeker discarding all cast, religion, physical differences.	- reimaging library services for the community - community outreached program -reorganize the library spaces and services for adapting different section of people.	- Improvement of library spaces and services - organizing invited talks, awareness programs for different section of people like- especially abled person, third gender etc.
Economic Viability	The goal is to achieve more with less in terms of money, staff, time, and materials.	- Improving library image among the community - marketing of library services - acts as a strong information agent	- extending the library services to the community -identify the information needs of the community the library serves and acts accordingly. - optimizing library services in a more cost-effective way.

Conclusion

This world is not only for us. It is the home of millions of species that prepared this earth as a habitable space long before humans came. Ideologically, it is our supreme duty that we respect our surroundings, nature, and mother earth, which help us see the magical horizon of life. The main goal of sustainability is to introduce these ethical and moral teachings into society so that people are aware of their duties and do not harm the environment. We should have respect and gratitude for nature and all its components that help us survive. Libraries can immensely help in promoting moral values and ethics in society through imparting reading and value education. Libraries are the backbone of society, the invisible force that helps to propagate ideas from generation to generation. As a trijunction of past, present, and future, the libraries must adopt sustainability to improve their services and make this world a better place for everyone.

Reference

1. Antonelli, M. (2008). The Green library movement: an overview and beyond. *Electronic Green Journal, 1*(27), 1-11.

2. Chowdhury, G.G. (2012). An agenda for green information retrieval research. *Information Processing & Management 48*(6), 1067–1077

3. Chowdhury, G. (2014). Sustainability of Digital Libraries: a Conceptual Model and a Research Framework. *International Journal on Digital Libraries. 14* (3–4), 181–195. doi:10.1007/s00799-014-0116-0.

4. DuBose, J., Frost, J.D., Chamaeau, J.A., & Vanegas, J.A. (1995). Sustainable development and technology. In *The Environmentally Educated Engineer*, D. Elms, and D. Wilkinsin (eds). Canterbury: Center for Advanced Engineering.

5. Edwards, B. (2011). "Sustainability as a driving force in contemporary library design", *Library Trends.60*(1), pp. 190-214.

6. Hildreth, S. & Sullivan, M. (2015). "Rising to the challenge: Re-envisioning public libraries", *Journal of Library Administration. 55* (8), pp. 647-657.

7. Khalid, A., Malik, G.F. & Mahmood, K. (2021), "Sustainable development challenges in libraries: a systematic literature review (2000-2020)". *The Journal of Academic Librarianship. 47* (3), pp. 1-9.

8. Mansour, E. (2020). "Libraries as agents for development: the potential role of Egyptian rural public libraries towards the attainment of Sustainable Development Goals based on the UN 2030 Agenda". *Journal of Librarianship and Information*

Science.52(1), pp. 121-136.

9. Mathiasson M.H. & Jochumsen H. (2022). Libraries, sustainability, and sustainable development: A review of the research literature. *Journal of Documentation 78*(6): 1278–1304.

10. Nathan, L.P. (2012). Sustainable information practice: an ethnographic investigation. *Journal of American Society Information Science & Technology. 63*(11), 2254–2268.

11. Tbaishat, D. (2021). "Jordanian public libraries in relation to achieving SDGs: shoman library in action". *Public Library Quarterly*.*40*(2), pp. 125-143.

12. Tryzna, T.C. (1995). *A Sustainable World*. Sacramento, IUCN. WCED (World Commission on Environment and Development), 1987. *Our Common Future*, Oxford University Press, Oxford.

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ABSTRACT: **Introduction**: Future protective and adaptive policy planning requires an extensive assessment for research work. The objective of the current study was to assess research activity on Sustainable library practice. Sustainable library practice. **Method**: The Web of Science (WOS) database was chosen as the bibliographic data source. Publications mainly related with library sciences are considered for the study. **Results**: A total of 278 records were retrieved and were manually reviewed to verify that they met the inclusion criteria. All publications not related to library and sustainable practice were removed, and a total of 252 articles were ultimately included. In relation to the 20 authors with the highest scientific production, the author with the most publications was Lloyd A, with 4 articles followed by Abrizah A (3 articles). The journals with the highest number of articles published were Sustainability (48 articles) and the Journal of Academic Librarianship (28 articles), they are from Switzerland and England respectively. The network analysis (co-authorship and co-occurrence of keywords) of this study was conducted using VOSviewer software. **Conclusion**: Research on sustainable library practice is still goring. International research collaboration should be grown and funded as environmental awareness and sustainability is a global issue. Future research should focus on innovative sustainable library practice.

1. **Introduction**

A library that acknowledges social, economic, and environmental sustainability is considered as green and sustainable (IFLA). Libraries are not falling behind and are taking part in green library activities to protect the environment and reduce global warming (Singh & Mishra, 2019). Since libraries are social institutions, they should inspire individuals to perform their responsibilities as citizens. To promote environmental communication and awareness, libraries must encourage their

employees to change their perspectives. The terms "Green library", "Eco-friendly library" and "sustainable library" are generally used synonymously. While there isn't much previous precedent for greening libraries, research has shown that many efforts have already been made to be sustainable in a wide range of library settings. A frequently used definition of sustainability, from the United Nations World Commission on Environment and Development, is "to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations 1987).

Libraries and library associations, like the American Library Association (ALA, 2019) and the International Federation of Library Associations (IFLA, 2020), are advancing, promoting, and incorporating sustainability into their operations all over the world. By explicitly participating in sustainability at their institutional level, libraries can also act as micro-activists and join the broader green movement.

The long-term management and preservation of digital data is referred to as "digital curation." Although digital curation guarantees the long-term sustainability of data, users and data creators can benefit instantly from it as well.

Basically, green library is characterized as environment friendly library or sustainable library. According to the (Keeton, 2010) Green library necessarily possess certain essential features:

- *Proper location or most suitable site*
- *Use of natural, recycled and regionally available materials*
- *Use of reflective roof or green roof and reading garden*
- *Use of insulating windows*
- *Conservation of resources like water, energy, and paper*
- *Use of energy-efficient lighting minimizing consumption*
- *System for optimized cooling*
- *Suitable plantation both inside and outside of building*
- *Circulation of fresh and healthy air*
- *Use of environment friendly technology*

A bibliometric research provides for the quantitative examination of published articles and their activity indicators in terms of the number of publications and productivity over time. This sort of study is less subject to researcher bias than narrative studies since it delivers statistical and quantitative analytical results.

2. Materials and Methods

2.1 Data Source and Search Strategy

The Web of Science (WOS) database was chosen as the bibliographic data source for the study. WOS was selected because it is one of the most used databases for bibliometric studies and it has not been extensively used in previous bibliometric studies on Sustainable practice in libraries.

The search strategy used was ("SUSTAINABLE" OR "Sustainability" OR "Green" OR "Resilience") AND ("library"). However, publications mainly related with library sciences are considered for the study. There were no restrictions on languages, countries or regions, affiliations or WOS categories. The search date was 5th November 2023.

2.2 Data Collection

The inclusion criteria were the following: (1) publications on sustainable practice in libraries; and (2) years of publication: up to 5th November 2023. A total of 278 records were retrieved and were manually reviewed to verify that they met the inclusion criteria. Those publications not related to sustainable practice in libraries were removed, and a total of 252 articles were ultimately included. The full records and cited references of all publications that met the inclusion criteria were exported and downloaded as .txt files with "Full Record and Cited References" to standardize, analyze, and visualize the data. To avoid inconsistent names, misspellings, or word variants (such as plurals or synonyms), manual standardization was done to combine certain authors, institutions, and keyword phrases in a thesaurus.txt file.

2.3 Bibliometric Analysis

The papers that were obtained were analyzed using network indicators and bibliometric analysis. The BibExcel tool was utilized to determine quantitative bibliometric indicators, including the evolution of yearly production, the most prolific authors, the most productive nations, the most cited articles, and the journals with the largest number of publications. The network analysis (co-authorship and co-occurrence of keywords) of this study was conducted using VOSviewer (version 1.6.18). The color of the connecting line shows the average appearance of the year of origin, while the width indicates the intensity of the relationship or co-occurrence.

3 Results

A total of 252 papers on sustainable practice in library published in 130 sources were identified in the WOS database. Of the articles included, 181 were original articles;

20 were editorials; 20 were letters; 19 were review articles; and 12 were conference abstracts. The first publication on the subject was in 1993, and the largest number of publications was in 2021 (35 articles) (Figure 1).

In relation to the 20 authors with the highest scientific production, the author with the most publications was Lloyd A, with 4 articles followed by Abrizah A (3 articles), for whom the majority of their work was published around 2015.

Distribution of Publications:

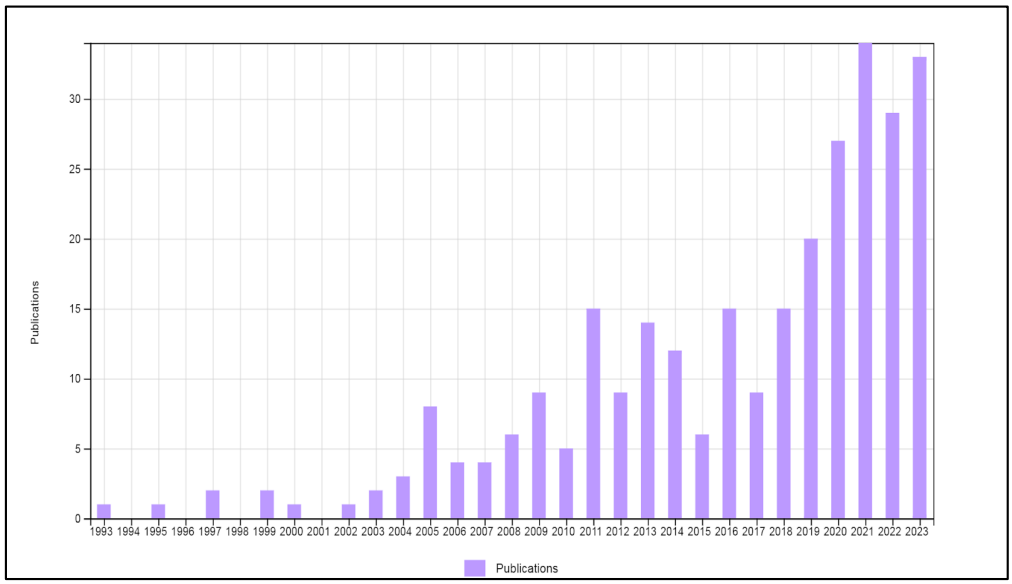


Fig. 1

Top Twenty journals with the highest number of publications:

Journal	Publisher	Freq	%	IF
Sustainability	BMC	48	16.73%	3.9
Journal Of Academic Librarianship	Elsevier	29	10.11%	1.533
Journal Of Librarianship and Information Science	Sage	21	7.32%	1.7
Electronic Library	Emerald	20	6.97%	1.675
Journal Of Documentation	Emerald	20	6.97%	2.034
Library Trends	John Hopkins university press	18	6.27%	0.474
Library Hi Tech	Emerald	17	5.92%	1.623
Information Development	Sage	13	4.53%	1.9

Journal	Publisher	Freq	%	IF
College Research Libraries	Association of College & Research Libraries	10	3.48%	1.814
Libri International Journal of Libraries and Information Studies	Walter De Gruyter	7	2.44%	0.667
Australian Library Journal	Routledge	6	2.09%	1.18
Interlending Document Supply	Emerald	6	2.09%	0.427
Serials Review	Routledge	6	2.09%	0.6
Zeitschrift Fur Bibliothekswesen Und Bibliographie	Vittorio Klost.	6	2.09%	0.11
Australian Academic Research Libraries	Routledge	5	1.74%	NA
Health Information and Libraries Journal	Wiley	5	1.74%	3.8
Information Research an International Electronic Journal	Univ Sheffield Dept. Inf. Studies	5	1.74%	0.744
Learned Publishing		5	1.74%	2.711
Library Information Science Research	Elsevier	5	1.74%	3.209
Library Resources & Technical Services	American Library Association	5	1.74%	0.206
*Freq= Frequency of publication *IF= Impact Factor of Journal				

Fig. 2

The journals with the highest number of articles published were *Sustainability* (48 articles) and the *Journal Of Academic Librarianship* (28 articles), they are from Switzerland and England respectively. **Emerald** is the top contributing publisher publishing a total of 63 articles (21.95%).

Top 5 most productive countries

Country	N	%
USA	79	27.53%
ENGLAND	24	8.36%
AUSTRALIA	22	7.67%
PEOPLES R CHINA	22	7.67%
SOUTH AFRICA	17	5.92%

Fig. 3

Top ten most prolific Author:

Author	N	%
Lloyd A	4	1.394
Abrizah A	3	1.045
Bangani S	3	1.045
Jochumsen H	3	1.045
Khan SA	3	1.045
Kiszl P	3	1.045
Poole AH	3	1.045
Shahzad K	3	1.045
Vårheim A	3	1.045
Aabo S	2	0.697

Fig.4

Top ten contributing Institutions:

Institution	N	%
ROBERT GORDON UNIVERSITY	7	2.44%
UNIVERSITY OF SOUTH AFRICA	7	2.44%
UNIVERSITY SYSTEM OF OHIO	7	2.44%
UNIVERSITY OF BORAS	6	2.09%
ISLAMIA UNIVERSITY OF BAHAWALPUR	5	1.74%
UNIVERSITI MALAYA	5	1.74%
UNIVERSITY OF COPENHAGEN	5	1.74%
BOWLING GREEN STATE UNIVERSITY	4	1.39%
STATE UNIVERSITY SYSTEM OF FLORIDA	4	1.39%
UNIVERSITY OF CALIFORNIA SYSTEM	4	1.39%

Fig.5

Country co-authorship pattern:

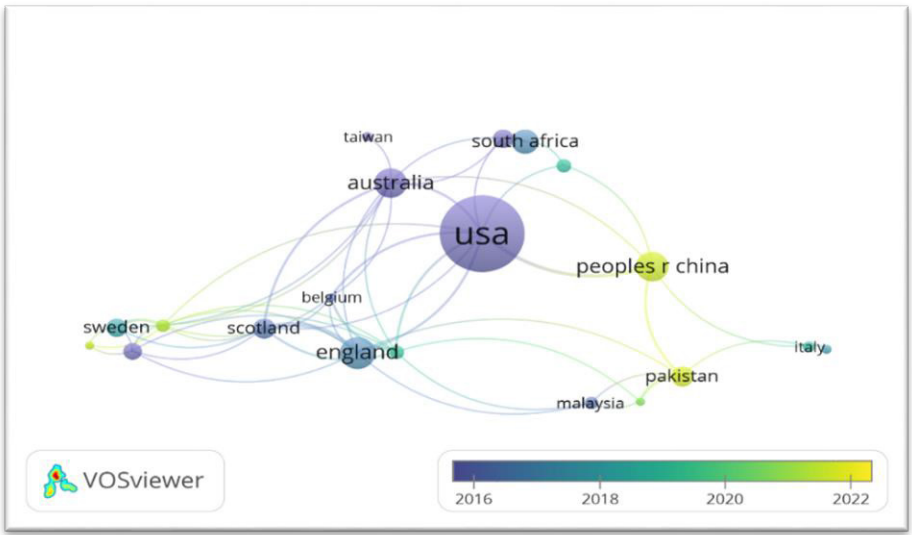


Fig. 6

Network analysis of co-occurrence of terms:

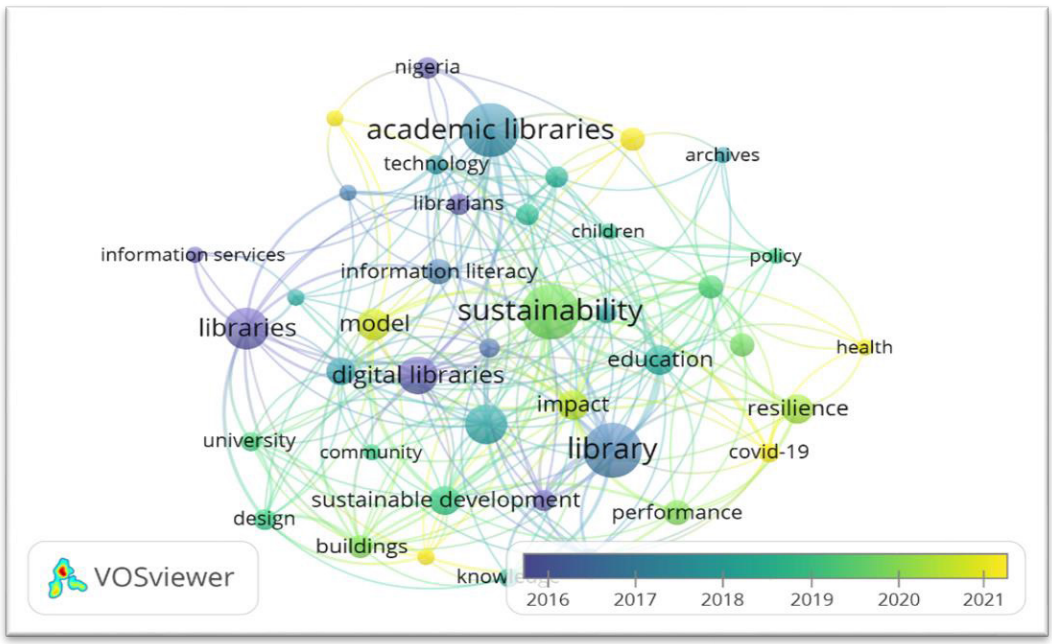


Fig.7

Density visualization map:

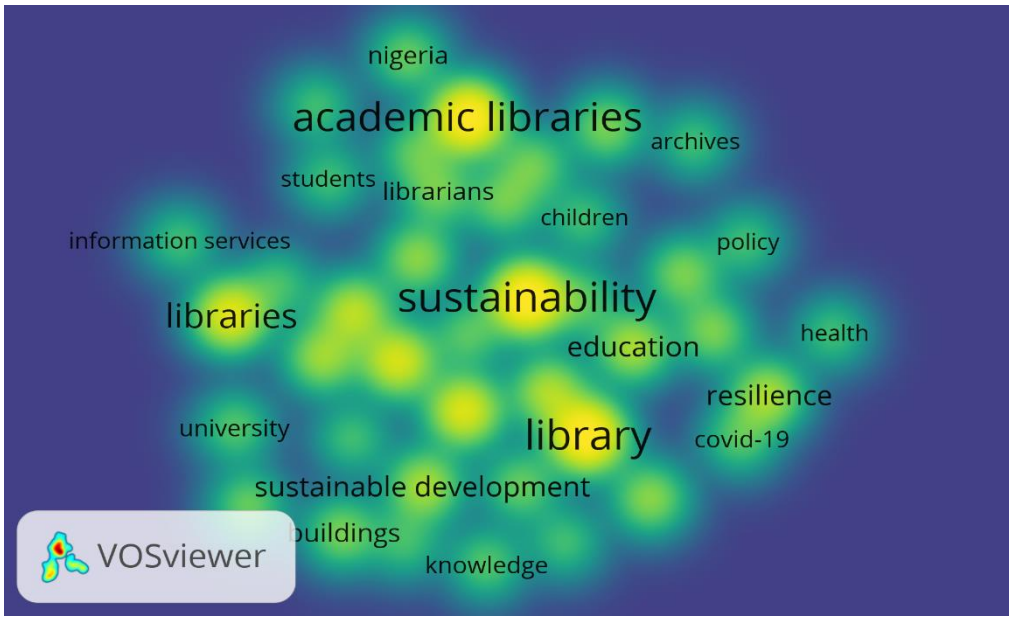


Fig. 8

Regarding keywords, the most used terms were "sustainability", "Library" and "digital library" around 2016 to 2020.

4. Discussions

The present study aimed to evaluate the bibliometric parameter of the scientific production on Sustainable practice in Libraries in the WOS. In total, 252 documents published up to 5 November 2023 were identified, with the highest number of publications recorded in 2021 (30 articles).

The author with the highest number of publications on the subject was Lloyd A, with 4 publications. **Lloyd A** is currently affiliated with the Department of Information Studies, University College London.

The journal with the highest number of publications was *Sustainability*, from Switzerland, with an impact factor of 3.9. The journals that occupy second, third and fourth position in terms of productivity are *Journal of Academic Librarianship, Journal of Librarianship and Information Science* and *Electronic Library.* All of them are originated from England. The most contributing publisher is Emerald (Fig.2).

In relation to the countries with corresponding authors with the largest number

of publications, the United States, England and Australia are the main contributors in terms of production on sustainable practice in libraries in the world, which also reflects the collaboration of these countries in research on the topic.

Keywords are the essential part of a research publication; it can reflect the research objectives and techniques in the publication. Co-occurrence analysis of keywords show the research trends and focus in the selected publications. A map was created using VOSviewer to show the frequently used keywords by the authors in the publications (fig.7). In the item density visualization, items are indicated by their label. Each point in a map has a color that depends on the density of items at that point. By default, this color is somewhere in between Yellow and blue. The larger the number of items in the neighbourhood of a point and the higher the weights of the neighboring items, the closer the color of the point is yellow. Conversely, the smaller the number of items in the neighbourhood of a point and the lower the weights of the neighbouring items, the closer the color of the point is blue. Also, the font size and bubble size of a term indicates its frequency of use. From the density map, it is found that the most used terms were "Sustainability", "library", "academic libraries", "digital libraries".

Conclusions:

Globally, green innovation and sustainable practice has increased in all aspects of daily life. green practice implementation could reduce undesirable climate change effects, such as global warming and energy conservation. Libraries are also implemented different techniques to make it green and environmentally sustainable. This study is based on the bibliometric analysis of research on sustainable practice in libraries.

References:

1. IFLA, What is a green library?. Available at https://www. ifla.org/ifla-green-library-definition

2. Singh, Priti and Mishra, Rajani (2019). Environmental Sustainability in libraries through green practices/services. Library Philosophy and Practice (e-journal). 2312.

3. Brundtland, G. (1987). Report of the World Commission on Environment and Development: Our Common Future. United Nations General Assembly document A/42/427.

4. American Library Association. (2019). Core values of librarianship.

5. http://www.ala. Org/advocacy/intfreedom/corevalues

6. International Federation of Library Associations and Institutions. (2020, March). Libraries, development and the United Nations 2030 Agenda. https://www.ifla.org/libraries-development.

7. Keeton, J. M. (2010). The Road to Platinum: Using the USGBC's LEED-EB® Green Building Rating System to Retrofit the U.S. Environmental Protection Agency's Region 10 Park Place Office Building. Journal of Green Building, 5. https://doi.org/10.3992/jgb.5.2.55

Women Librarians' Adoptability in Transforming the New Environment of College Libraries in NEP 2020: a Study

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ABSTRACT: The libraries are the information hub, which are fully equipped with new technologies. The women librarians have to adopt various skills to manage the libraries. This study covers 10 college libraries of Dibrugarh District where women librarians are working. The NEP-2020 is implemented in the colleges of Dibrugarh University from the session of 2023-24. This paper investigates the physical environment of libraries i.e. collections, services, best practices and the various skills and experiences of librarians to adopt the challenging environment relating to academic environment. The study also highlights the new wings of librarianship such as introducing LIS course as SEC in undergraduate level by the Dibrugarh University.

KEYWORDS: Women Librarian, College Libraries, NEP 2020

1. Introduction:

An evolution of librarianship from male to female dominated field began in the mid of 1800, and it turns to majority of women joined in this profession by 1900 (Williams, 1995). Today, librarianship becomes a suitable profession for women because of their natural qualities like honesty, submissiveness, domesticity and nurturance. In India, Ms. Anandibai Prabhudesai was the superintendent of a children Library in Baroda in 1930s. The beginning of women librarianship in Assam was in the middle of nineteenth century. Ms. Labanya Bora who was born in Shillong, served as an in-charge of Assamese and Bangla Section of the world's biggest Library "Library of Congress". Mrs. Nirupama Sharma Tamuli borned at Digboi was the first women librarian in Assam with formal Library Science degree from Banaras Hindu University in 1950. She rendered her service in "State Central Library", Shillong as Assistant Librarian. Dr Alaka Buragohain was the second Library professional who had joined Lady Ken College at Shillong in 1962. Mrs. Shanti Das is the third women librarian who rendered her service as College Librarian and University Librarian accordingly since 1964. She is the first and only one Women University Librarian in Assam.

Some skills are required to manage the libraries which are classified as Personal skills, Generic skills, IT skills and Technical skills. Personal skills are utmost needed to develop a library. It refers to the capacity for continuous learning, flexibility, gear

up the changes, independency, self motivation etc. Generic skills reflect one's life skills, problem solving capacity and teamwork. General ICT skills are important to do the housekeeping operations using computers. Now a days, IT skill becomes the core skill for a librarian.

2. Literature Review:

Majumder, Majumder & Karmakar (2022) conclude that women library professionals are very much capable and they are serving as a librarian in different institutions and they have knowledge of computers so they can manage the automated library system. Barman and Barman (2021) give suggestions that the women professionals are skilled, computer literate for smoothly managing the library system. They advocates that there is a scope for the women professionals to learn ICT based skills more and to implement these in their working place for providing better library services. Das (2021) reveals that women professionals feel techno-stress because the staff strength of their libraries is weak and no technical staff is available at any workplace. They give 6.18 hours of time in institute, 8.14 hours at home and 3.14 hours per day for children. 48% of them engaged in social service. The entire women library professional involves in creative work.

Lahkar (2021) evaluates that librarianship allows the ability for women's advancement as like as men. They have more patience and ability to have softening the atmosphere with their grace and hospitality than men which are recognized as skills in librarianship.

Majanja and Kiplang (2003) studied on the current status and occupational characteristics of women librarians in Kenya. They sum up with the statement that Kenyan women Librarian's status has consistently been lower than men's in terms of position, salary and other remuneration.

3. Objective:

This Paper aims

(a) To assess the various skills of women librarians working in colleges
(b) To draw the experiences of women librarians
(c) To access the adoptability of women librarians to handle the new technologies and services in libraries
(d) To evaluate the job satisfaction levels of women librarians

4. Methodology:

The study is conducted using survey method. A questionnaire is designed to collect the data and distributed among the 10 colleges of Dibrugarh district. 100% responses are received. Interview method also used.

5. Data Collection:

I have chosen 10 colleges of Dibrugarh District where women Librarians/ Assistant Librarians have been rendering their services.

5.1 Name of the colleges:

Table 1: Colleges of Dibrugarh District

Sl No	Name of Colleges	Name of Library	Year of establishment
1	Dakha Devi Rasiwasia College, Chabua	Dinesh Ch. Dutta Memorial Central Library	1971
2	DHSK College	Ashwini Charan Choudhury Central Library	1945
3	DHSK Commerce College	Dr. L. P. Dutt Library	1960
4	Dibru College	Dibru College Central Library	1963
5	Duliajan College	Duliajan College Library	1969
6	Duliajan Girls College	Nitya Dutta Memorial Central Library	2000
7	Khowang College	Benudhar Rajkhowa Library and Information Centre	1982
8	Tingkhong College	Tingkhong College Library	1972
9	Moran Commerce College	Moran Commerce College Library	1993
10	Namrup College	Namrup College Central Library	1973

6. Data Analysis:

6.1 Personal Information:

Table 2: Job Status

Sl No	Team strength		
	Professional strength		Non- Professional strength
	Permanent	Contractual	
1	1	0	1
2	1	0	3
3	1	0	1
4	1	1	4
5	1	0	4
6	1	0	1
7	1	1	2
8	1	0	2
9	1	0	1
10	1	0	2

The Table 2 shows that shows that 90% Librarians and 10% Assistant Librarians are holding a permanent post and only 20% library professional staff are in contractual post.

Table 3: Age Group

Sl Sl No	Age Group	No. of respondents	Percentage
1	21-30	3	30%
2	31-40	1	10%
3	41-50	4	40%
4	51-60	2	20%

It is observed that 40% of respondents fall in the age group of 41-50 years, Only 10% respondents are belonging to 31-40 years.

Table 4: Qualifications

Sl No	Qualification	No of Respondents	Percentage
1	MLISc	10	100%
3	MPhil	4	40%
4	PhD	1	10%

It shows that all the respondents (100%) have MLISc degree , 40% have MPhil degree and 10% have PhD degree.

Table 5: Experience

Sl No	Experience	No of Respondents	Percentage
1	1-5	3	
2	6-15	4	
3	16-25	2	
4	25 and above	0	

20% respondents are in 16-25 years of age group . No respondents have experience more than 25 years.

6.2 Status of College Libraries

Table 6: Library Collection

Sl No	Name of Colleges	Library Collection		
		Books	Journals	E- Books & E-Journals
1	Dakha Devi Rasiwasia College, Chabua	20021	20	NLIST
2	DHSK College	42000	10	NLIST
3	DHSK Commerce College	29,830	14	NLIST
4	Dibru College	45380	12	NLIST
5	Duliajan College	23775	15	NLIST
6	Duliajan Girls College	7960	16	NLIST
7	Khowang College	19000	3	NLIST
8	Tingkhong College	16450	2	NLIST
9	Moran Commerce College	3500	3	NA
10	Namrup College	13000	7	NLIST

The Table 2 shows that Dibru College have highest No of Library Collection. Moran Commerce College has lowest no of Library Collection and it has no e- books and e- journals.

Table 7: Library Services

Sl No	Services	No of Colleges
1	Newspaper clipping service	5
2	Circulation Service	10
3	Periodical service	9
4	Reference Service	10
5	Book Bank Service	7
6	Remote Access Service	7
7	Document Delivery service	1
8	Reading Room Service	10
9	Kindle Digital Reading Service	1
10	Ready Reference Service	5
11	Current Awareness Service	9
12	Selective Dissemination Service	5

All the colleges have provided circulation service, reading room service and reference service. Only Dibru College Central Library has provided Document Delivery Service and Kindle Digital Reading Service along with all the services.

6.3 Professional competency:

Table 8 : Generic skill

Generic skill	Communication skill	85%
	Social responsibility	67.5%
	Decision Making	90%
	Critical Thinking	83%
	Team work	80%

90% respondents independent in decision making and 67.5% respondents have social responsibility.

Table 9: Personal skill

Personal skills	Analytical skill	78%
	Creative skill	58%
	Flexibility towards Library environment	90%
	Reflectiveness	86%
	Adoptability	89%
	Pro- activeness:	37%
	Marketing skill	17%

90% respondents have flexibility towards library environment. 17% respondents have marketing skill.

Table 10 : IT skills

Sl No	IT skill	Excellent	V. Good	Good	Average	Poor
1	MS office tool	30%	50%	**20%**	0%	0%
2	Web designing skills	0%	0%	**60%**	10%	30%
3	Web 2.0	0%	20%	**60%**	10%	10%
4	Computer security	0%	20%	**50%**	20%	10%
5	Database Management	10%	10%	**60%**	20%	0%
6	Open source database	10%	10%	**60%**	10%	10%
7	Open source software	10%	10%	**50%**	10%	20%

In IT skill Web designing, Web 2.0, Database Management and Open source database are particularly important and rated high (60%) by the respondents

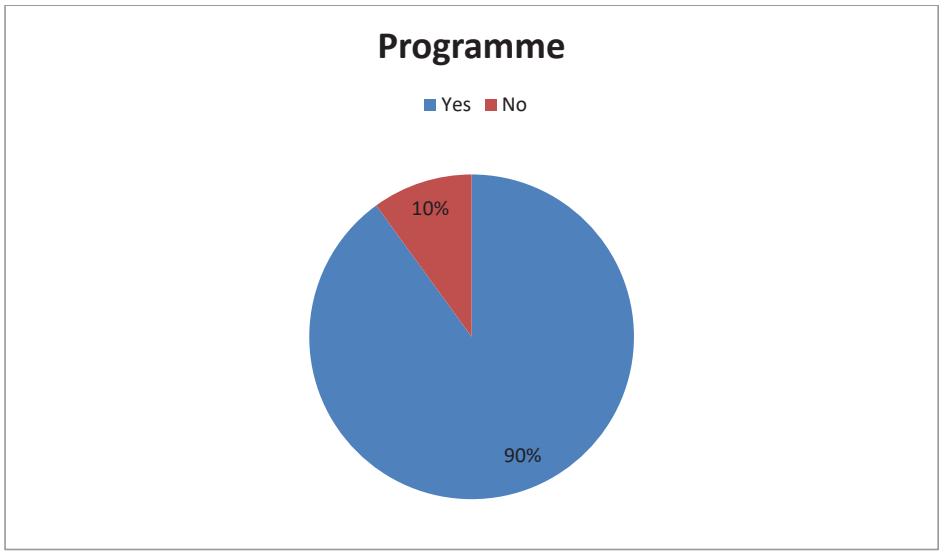
Table 11: The qualities of LIS professionals

Sl No	Qualities	Percentage
1	Ready to adopt new technology	60%
2	Visionary attitude	50%
3	Delegated position	50%
4	Up-to-datedness	60%
5	Futuristic planning	50%
6	All the above	90%

90% respondents show that the library professionals should have all the qualities.

6.4 Participated in professional development training programme:

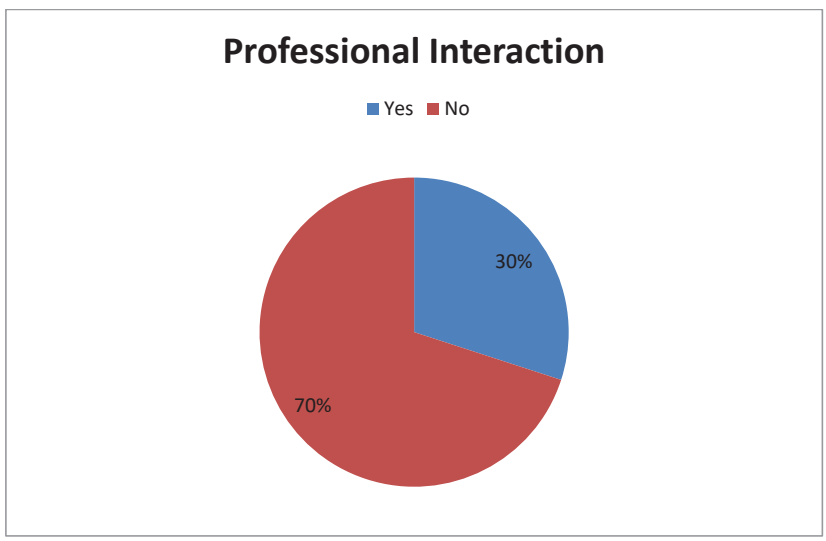
Table 12: Training Programme



90% respondents participated in Professional Development Programme. 10% respondent i.e. Assistant Librarians does not participated in any professional development programme.

6.5 Professional Interaction

Table 13: Professional Interaction



70% respondents participated in professional interaction to develop the strategy of Library planning and organization.

6.6 Teaching skill:

The Dibrugarh University has initiated Skill Enhancement Course (SEC) in Library and Information Science from 2020. The working women librarians of the colleges are entrusted the responsibility of teaching and evaluation. The 1st, 2nd and 3rd semester students may got the opportunity to choose the Library and Information Science in UG level. In NEP 2020, the Dibrugarh University offers three papers of LIS. These are- Entrepreneuring Librarianship, Library and Information Literacy and Information Marketing and Digital Library

Table 14: Teaching Experience

Yes	50%
No	50%

The half of the total respondents (50%) have taken the responsibility to teach LIS in SEC. .

6.5 Job satisfaction :

	Highly satisfied	%	Satisfied	%	Average	%	Dissatisfied	%	Highly Dissatisfied	%
Promotional Policy	1	10%	1	**10%**	3	30%	2	20%	3	30%
Co-operation from co workers	1	10%	4	**40%**	4	40%	1	1%	0	0%
Impact of ICT	0	0%	4	**40%**	5	50%	0	0%	0	0%
Working environment	1	10%	6	**60%**	2	20%	1	10%	0	0%
Relationship with reader	1	10%	7	**70%**	2	20%	0	0%	1	10%

This table shows that the rate of Promotional policy is highly dissatisfied. The rate of working environment and relationship with reader is satisfied.

7. Findings:

7.1 It is noticed that the Personal skills, Generic skills and IT skills of working women librarians of Dibrugarh district are good.

7.2 The experience of women librarian is high in the age group 6-15 years.

7.3 50% respondents has taken responsibility to teach LIS in SEC.

7.4 The adoptability of women librarians to handle the new technologies and services in libraries is satisfactory.

7.5 The rate of participation in training programme is 70%.

7.6 The overall level of job satisfaction is satisfactory.

8. Conclusion:

Librarianship is a noble profession and is regarded as the most suitable and preferable profession for women from the ages. In India and particularly in Assam, the participation of women in library profession is a healthy and preferred one and professionals deliver manifold contribution for professional growth. This study concludes that female librarians are maintaining professionalism and rebuilt the library environment successfully in NEP 2020.

References:

1. Barman, N & Barman, R.K. (2021). Prospects and Challenges of Women Professionals in Digital Environment: A Study in some of the selected University Libraries of Assam. Available at https://www.researchgate.net/publication/352248855_

2. Das, D. (2021). Stress Management by the Women Library Professionals in Assam. In Badan Barman (Ed), Online teaching- learning: issues and challenges (Pp.85-89).

Exploring the World of Libraries: Unveiling the Hidden Gems

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ABSTRACT: A library is for more than just information retrieval. It is a route to reflection and scholarly illumination. A wise custodian of knowledge, the librarian would suggest works that challenged the user's viewpoint and spoke to their soul. Users would explore the depths of science, literature, and history together, having stimulating discussions that broadened their worldview and sparked their imaginations. Libraries are hidden gems for their users.

KEYWORDS: Cultural Assets, Research, Digital Libraries, Open-access, LIS, Information Literacy, Digital Information Literacy

1. Introduction

A library is a haven of comfort and exploration, not just a place to study. It is like a second home. Users discovered a second mother, a mentor who fostered their intellectual development and offered a knowledge oasis, in the library's embrace. We discovered a haven from the confusion and distractions of the outside world in this venerable temple of study. Silence encompassed our thoughts here, enabling us to explore the depths of academic and literary works. We can immerse ourselves in the pursuit of knowledge, surrounded by the subdued whispers of fellow students and the librarian's sympathetic encouragement.

2. World of Libraries: Hidden Gems

The whispers of ancient wisdom and the warmth of the librarian's advice may be carried by users. Our trip had become inescapably associated with the library,

which stoked our need to learn and satisfied our hunger for information. The role of libraries as a hidden gem to develop the personality of the person in society is as follows:

2.1 AI (Artificial Intelligence) and Libraries

The library serves as a haven for users' personal development in addition to being a resource. Users can learn about the benefits of critical thinking, the excitement of discovering rare manuscripts, and the ability to interact with the knowledge of great minds who have come before them within their walls. No AI could match the library's tremendous influence—a place where people made personal ties where users' questions found answers, and where their academic horizons expanded beyond degree.

2.2 Libraries are Inspiration Source

As technology advances, let us not lose sight of the invaluable importance of libraries. Users find inspiration and comfort in these havens of development and metamorphosis. They serve as custodians of forgotten tales, assisting explorers on their journeys in search of knowledge and the truth. The special relationship we developed with the library—our second home—and the librarian—our second mother—can never be replaced by AI, no matter how sophisticated it gets.

2.3 Role of Libraries in the Growth of Student

Libraries are not only artifacts from the past; they are the very foundation of the future in the collaborative trend in education. They provide a special setting where students can set off on a path of introspection and intellectual development. As a student, you may explore far within the library's walls, researching the fields of knowledge and developing into an autonomous and self-sufficient thinker.

In a world overwhelmed by speedy data and moment replies, libraries give a priceless stage to self-learning. It is through self-discovery that you can embrace the ideas, permitting them to saturate your cognizance and become a piece of your scholarly system. No man-made intelligence calculation or online instructional exercise can supplant the individual investigation and understanding that comes from diving into the pages of a book or participating in basic conversations with individual students.

2.4 Libraries: as Manager of Information

Library and Information Science (LIS) is a fascinating field that involves the exploration and management of information resources. It is a profession that caters

to the ever-expanding need for information in today's digitally interconnected world. As an LIS professional, you have the opportunity to assist people in their quest for knowledge, promote lifelong learning, and preserve cultural heritage.

One of the key aspects of Library and Information Science is the ability to efficiently organize and manage information. LIS professionals apply various techniques and technologies to ensure that information is accessible and usable for everyone. They use classification systems, metadata, and search algorithms to facilitate the retrieval of relevant information. Additionally, they play a crucial role in ensuring the preservation and conservation of valuable information and cultural artifacts for future generations

2.5 Libraries are Career Path

In the world of Library and Information Science, there are numerous career paths you can choose from. You can work in public or academic libraries, school libraries, archives, museums, or even in the corporate sector. Each of these fields offers unique challenges and opportunities. For example, in a public library, you may engage with a diverse and dynamic community, providing valuable resources and organizing events that promote literacy and community engagement. In an academic library, you can collaborate with faculty and students, support research initiatives, and contribute to the advancement of knowledge.

2.6 Libraries are Informative Places

The library isn't simply an actual space; it is a haven where you can shape your instructive excursion. It offers shelter from the interruptions of the computerized world, permitting you to submerge yourself in chasing information and seeing completely. Jump all over this chance to take advantage of the abundance of assets, look for direction from custodians, and participate in cooperative learning with individual understudies.

2.7 Libraries are Hidden Gems for Research

Library and data science (LIS) research is a huge and different field that incorporates many themes and philosophies. From reference investigation to data conduct, there are innumerable areas of concentration inside LIS that are continually developing and creating significant bits of knowledge. In this article, we will dive into the universe of LIS research and uncover a portion of its unlikely treasures. "Libraries are important cultural assets for their communities yet have largely been overlooked in mainstream library research. This research seeks to bring these libraries into the limelight by building a profile of their cultural contributions." (Loach, Rowley, Jennifer, and Griffiths 2020) The libraries play an

important role as a hidden gen in research as:

2.7.1 Citation Analysis

A common research technique in LIS is citation analysis, which looks at the trends and significance of citations in academic literature. Scholars can obtain a deeper comprehension of the connections and mutual influence among various works by scrutinizing the citations within a specific field or publication. Researchers can find gaps and areas for additional study by using this method to uncover trends and patterns in the literature.



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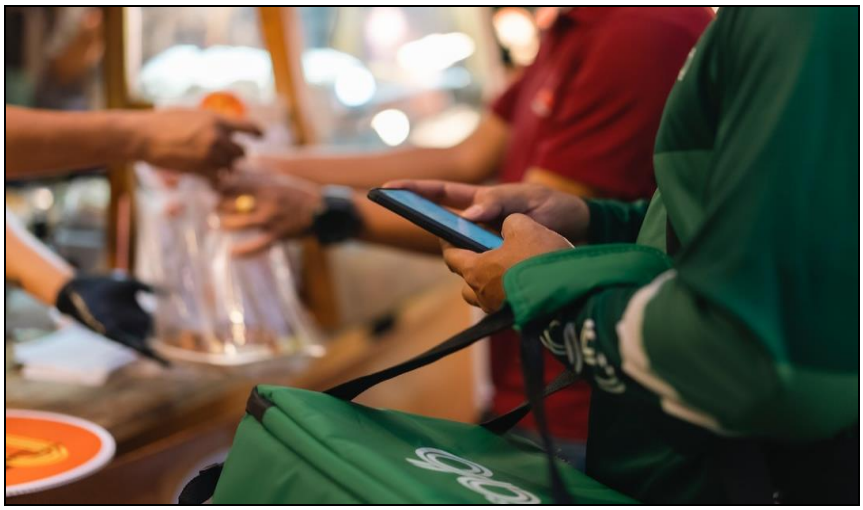
2.7.2 Information Behavior

Another crucial field of LIS study that examines how people find use, and share information is information behaviour. This area of study examines the different determinants of information-seeking behaviour, including social context, technology, and demographics. Researchers can create more useful information systems and services to meet people's needs by studying how people interact with information.

2.7.3 Digital Libraries

A relatively new field of LIS study that has attracted a lot of interest recently is digital libraries. Digital resources like multimedia files, e-books, and online journals

are accessible through these libraries. Scholars working in this field investigate issues like user experience, digital preservation, and how digital libraries affect traditional library services. The study of digital libraries will become more and more significant in the field of library and information science as technology develops.



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2.7.4 Information Literacy

The key component of LIS research that focuses on instructing people on how to locate, assess, and use information efficiently is information literacy. In the current digital era, where there is an abundance of information available, this field is especially pertinent. Information literacy instruction, assessment, and the effects of information literacy on people and society are among the subjects covered by researchers in this field.

2.7.5 Open Access

A movement known as "open access" promotes unfettered and cost-free access to academic publications. This field of LIS research looks at the advantages and difficulties of open access as well as the different models and laws that facilitate it. Open access is still a crucial field of research and has become a hot topic in the LIS community due to the growing costs of academic publishing.



By Rich Tervet (https://unsplash.com/@richtervet)

3. Conclusion

The field of LIS research is broad and dynamic, with new approaches and subjects appearing frequently. Numerous fields of study, such as open access and citation analysis, provide insightful information and further the field. Through investigating these little-known treasures, we can learn more about the function of information in our society and how it affects our day-to-day activities.

Exploring the world of Library and Information Science not only offers diverse career options but also allows individuals to contribute to their communities and make a positive impact. By embracing technology and effectively managing information resources, LIS professionals are at the forefront of promoting literacy, lifelong learning, and intellectual freedom. If you have a passion for knowledge, enjoy working with people, and possess strong organizational and technological skills, this field might be the perfect fit for you. So, embark on this exciting journey, and you will become an integral part of the ever-evolving world of Library and Information Science.

References & Bibliographies:

1. Loach, Kirsten and Rowley, Jennifer and Griffiths, Jill (2020). Hidden gems? The cultural contribution of independent libraries in the United Kingdom and the United States. Journal of Librarianship and Information Science, vol. 52,02 https://www.researchgate.net/publication/339338466_Hidden_gems_The_cultural_

contribution_of_independent_libraries_in_the_United_Kingdom_and_the_United_States date of access 10-10-2023

2. https://www.manycubs.com/hidden-gems-for-learning/ date of access 10-10-2023

3. https://escapeselite.medium.com/unveiling-pariss-hidden-libraries-a-book-lover-s-paradise-0d016d97b061 date of access 10-10-2023

An evaluation of the acceptance of inclusive practices in the colleges of Nalbari District : A case study

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ABSTRACT: Education is the most important and influential instrument in the progressive reframing of a nation. All the learners have a right to pursue education regardless of their individual characteristics or difficulties. Education is a fundamental right which provides every individual with the power to grow, reflect, make choices of their own. Therefore, the concept of inclusion or including all is very much important. It is very important to understand someone's differences so that our system of education can include them equally and fairly. Inclusion is not a privilege for a few, but it's a universal right for all.

Inclusive education is a modern concept or approach to providing education to all the students with or without disabilities or any kind of deprivation. It aims at including all.

Therefore, the present study has been entitled as" An evaluation of the acceptance of inclusive practices in the colleges of Nalbari District: A case study".

The objectives of the study are:

(a) To know about the different facilities available in the colleges in respect to the inclusive practices.

(b) To study the impact of teaching learning processes in sustaining inclusive practices in colleges.

(c) To know about the problems related to the implementation of inclusive practices.

To study about the attitudes of the teachers as well as the learners of the colleges regarding the inclusive practices.

A self-structured questionnaire is used as the tool in the present study to collect the information. This paper aims at presenting a proper picture of the implementation of the inclusive practices and also aims at providing some valuable suggestions for making the inclusive practices an effective tool.

Introduction :

Inclusive education is a modern approach to educating the students with special needs as well as the students without special needs. Inclusive education is about transforming mainstream systems into more responsive system and is concerned

with all the learners - providing equal opportunities in access, participation and learning. It seeks to understand all the barriers and tries to remove them.

Education is a basic right for everyone. Education should be provided to all the students irrespective of their caste, creed, religion, birth place, language, disability, minority and so on. All schools and colleges have to be inclusive in their approach so that children with special needs can also be treated with equal opportunities.

Inclusive education aims at improving the education system by limiting and removing barriers of learning and acknowledging individual children's needs and potential. The goal of this approach is to make a significant impact on the educational opportunities. The key challenge is to ensure that the broad vision of "Education for all" is reflected in almost all the educational institutions. Moreover, it's all about transforming education focusing on the effective teacher education, respecting and responding to diversity and appropriate teaching aids and equipment.

The slogan of "Education for All" can be fulfilled only through the proper implementation of inclusion or including all.

Significance of the study:

To make a social change or upliftment, inclusive education is vital. It is an instrument to make a greater change in the society. In the context to this, inclusive education is taking the central stage all over the world bringing educational reforms to prevent exclusionary practices and sustaining responsible inclusive practices to face the global problems.

In a democratic society like India, it's very essential to provide equal opportunities for all. The idea of "Education for all" can be fulfilled only through the use of " inclusive education".

Despite of all the differences, we all are equal and have to accept the situation of inclusive set up. We need more colleges where all these differences are accepted and peace and co- operation prevails. Therefore, the present study is an attempt to know the perception of teachers and students towards inclusive settings and providing a quality based education and lifelong opportunities to all.

Statement of the problem:

The present study has been entitled as" An evaluation of the acceptance of inclusive practices in the colleges of Nalbari District : A case study."

Objectives of the study:

The present study had been carried out by the following objectives:

1. To know about the different facilities available in the colleges in respect to the inclusive practices.
2. To study the impact of teaching learning process in sustaining inclusive practices in colleges.
3. To know about the problems related to the implementation of inclusive practices.
4. To study about the attitude of the teachers as well as the learners of the colleges regarding the inclusive practices.

Delimitation of the study :

The main purpose of this study is know about the present condition of implementing inclusive practices in the colleges of Nalbari District.

Three colleges were selected viz. Nalbari College, M.N.C Girl's College and Swahid Smriti Mahavidyalaya situated in the District of Nalbari for conducting the study.

Methodology : Methodology plays an important role in conducting a proper study. It implies the methods which can be applied according to nature of the topic and so on.

Case study method has been applied in this present study.

Population : The population of this study consists of all the students and teachers of all the colleges of Nalbari District.

Sample : In the present study, total three colleges were selected viz. Nalbari College, M.N.C girl's college and Swahid Smriti Mahavidyalaya situated in the Nalbari District of Assam. The researcher aims at taking 10 students and 5 teachers as sample from each college.

Sampling technique: Purposive random sampling is used in the present study.

Tools used for data collection:

A self-structured questionnaire : The researcher has prepared a self- structured questionnaire for collecting the data.

Analysis and interpretation of the data:

1. To know about the different facilities available in the colleges in respect to the inclusive practices.

Table-1(A) College: Nalbari College

Sl No	Questions	Yes %	No%
1	There is a provision of Ramp for the specially abled students.	40%	60%
2	Audio- Visual materials are available for the students.	90%	10%
3	Toilet facilities are good enough for the specially abled students.	50%	50%
4	There are some special equipments for the students with disability.	60%	40%

Table-1(B) College: M.N.C Girl's College

Sl No	Questions	Yes %	No%
1	There is a provision of Ramp for the specially abled students.	80%	20%
2	Audio- Visual materials are available for the students.	90%	10%
3	Toilet facilities are good enough for the specially abled students.	50%	50%
4	There are some special equipment for the students with disability.	70%	30%

Table-1(C) College: Swahid Smriti Mahavidyalaya

Sl No	Questions	Yes %	No%
1	There is a provision of Ramp for the specially abled students.	40%	60%
2	Audio- Visual materials are available for the students.	80%	20%
3	Toilet facilities are good enough for the specially abled students.	40%	60%
4	There are some special equipments for the students with disability.	60%	40%

To study the impact of teaching learning process in sustaining inclusive practices in colleges.

Table-2(A) College: Nalbari College

Sl No	Questions	Yes %	No%
1	Teachers adopt different teaching strategies to meet the needs of all categories of children in classroom.	90%	10%
2	Teachers are welcoming towards CWSN.	98%	2%
3	The contents of the college syllabus helps in creating awareness about inclusive education.	85%	15%
4	Teachers face some barriers in the implementation of inclusive practices.	60%	40%

Table-2(B) College: M.N.C Girl's College

Sl No	Questions	Yes %	No%
1	Teachers adopt different teaching strategies to meet the needs of all categories of children in classroom.	90%	10%
2	Teachers are welcoming towards CWSN.	97%	3%
3	The contents of the college syllabus helps in creating awareness about inclusive education.	85%	15%
4	Teachers face some barriers in the implementation of inclusive practices.	50%	50%

Table-2(C) College: Swahid Smriti Mahavidyalaya

Sl No	Questions	Yes %	No%
1	Teachers adopt different teaching strategies to meet the needs of all categories of children in classroom.	80%	20%
2	Teachers are welcoming towards CWSN.	96%	4%
3	The contents of the college syllabus helps in creating awareness about inclusive education.	85%	15%
4	Teachers face some barriers in the implementation of inclusive practices.	70%	30%

To know about the problems related to the implementation of inclusive practices.

Table-3(A) College: Nalbari College

Sl No	Questions	Yes %	No%
1	Teacher has undergone some special training for implementing inclusive practices.	75%	25%
2	Students with special needs get equal opportunities like the others.	88.33%	11.67%
3	The students are equipped with newly designed curriculum.	98%	2%
4	Students take part in the co-curricular activities.	70%	30%
5	Attractive teaching methods and well-equipped classroom are there.	60%	40%

Table-3(B) College: M.N.C Girl's College

Sl No	Questions	Yes %	No%
1	Teacher has undergone some special training for implementing inclusive practices.	74%	26%
2	Students with special needs get equal opportunities like the others.	85%	15%
3	The students are equipped with newly designed curriculum.	98%	2%
4	Students take part in the co-curricular activities.	50%	50%
5	Attractive teaching methods and well-equipped classroom are there.	70%	30%

Table-3(C) College: Swahid Smriti Mahavidyalaya

Sl No	Questions	Yes %	No%
1	Teacher has undergone some special training for implementing inclusive practices.	70%	30%
2	Students with special needs get equal opportunities like the others.	80%	20%
3	The students are equipped with newly designed curriculum.	98%	2%
4	Students take part in the co-curricular activities.	40%	60%
5	Attractive teaching methods and well-equipped classroom are there.	60%	40%

To study about the attitudes of the teachers as well as the learners of the colleges regarding the inclusive practices.

Table-4(A) College: Nalbari College

Sl No	Questions	Yes %	No%
1	Peers are welcoming towards students who are specially abled.	70%	30%
2	Teacher's attitude is welcoming.	96%	4%
3	Biasness is faced by the students with CWSN.	10%	90%
4	Students are enjoying the environment.	50%	50%
5	There is a positive attitude of the stakeholders or the others.	40%	60%

Table-4(B) College: M.N.C Girl's College

Sl No	Questions	Yes %	No%
1	Peers are welcoming towards students who are specially abled.	60%	40%
2	Teacher's attitude is welcoming.	95%	5%
3	Biasness is faced by the students with CWSN.	10%	90%
4	Students are enjoying the environment.	70%	30%
5	There is a positive attitude of the stakeholders or the others.	40%	60%

Table-4(C) College: Swahid Smriti Mahavidyalaya

Sl No	Questions	Yes %	No%
1	Peers are welcoming towards students who are specially abled.	70%	30%
2	Teacher's attitude is welcoming.	90%	10%
3	Biasness is faced by the students with CWSN.	10%	90%
4	Students are enjoying the environment.	70%	30%
5	There is a positive attitude of the stakeholders or the others.	40%	60%

Interpretation :

From the above tables, it can be interpreted that challenges faced by students in respect to the facilities available for inclusive practices is more in Swahid Smriti Mahavidyalaya.

But, inclusive practices are more or less accepted in all these three colleges. M.N.C Girl's College is implementing more of inclusive set as the infrastructure fulfill the needs. The students are equipped with newly designed Curriculum in all these three colleges. Teacher's attitude is Welcoming towards them in all these three colleges. Some of teachers have not undergone some special training for implementing inclusive practices.

The toilet facilities are not enough and special equipments are not very widely available in Nalbari College and Swahid Smriti Mahavidyalaya.

Moreover, teachers and students have a positive attitude towards inclusion.

The government also should take some special initiative towards "Leaving No Learner Behind".

Suggestions :

The following suggestions may lead to the effective practices of the inclusive settings :

1. The teachers should develop a very strong positive affection towards the specially abled students.
2. The infrastructure facilities of the colleges should be improved and there should be the proper provisions for disable.
3. Flexible and multifunctional Curriculum should be implemented.
4. Teaching aids should be used according to the interest of the learners.
5. The non- disabled students should be encouraged to develop a positive attitude towards the special needs students.
6. The colleges should aim at conducting different workshops regarding the inclusion.
7. Ramps, proper transport facilities and medical facilities should be available there in the colleges.
8. Importance should be given on the practices of co- curricular activities.
9. Awareness programmes, drama, street play should be organized on the topic" Inclusive practices".
10. The method of teaching should also be interesting.

Conclusion:

After analyzing everything, it can be concluded that the dream of educating all without any boundaries is somehow not properly implemented. Some of the

students and teachers still have a negative attitude towards the total concept of inclusive education. Teachers need more training and colleges need more facilities.

It has been seen that the students who are from the specially abled category also facing lots of challenges like lack of proper ramp, lack of personal guidance from teachers, lack of attention from their peers, poor toilet and other facilities and so on.

So, it has been seen that there are many things to get implemented. The government should also take an initiative regarding the evaluation of the inclusive practices in different levels of education. If they do that, we can definitely dream of having a colourful educational world for the students with disabilities or the specially abled students. The aim of "Leaving no learner behind" can be achieved in the upcoming years through the proper and positive attitude of each and every person of the society towards the specially abled children.

References:

Books

1. Advani , L. and Chadha , A. (2003). You and Your Special Child. New Delhi : UBS Publishes :Distributors Pvt.Ltd.

2. Das, A. , Das, S., and Kattamuri , R(2013). Inclusive Education: A Contextual Working Model.New Delhi: Concept Publishing Company Pvt. Ltd.

3. Jhulka ,A. (2006). Including Students and Youth with Disabilities in Education - A Guide for practitioners.

4. Kauffman , J.M and Hallahan, D.P (Eds). (1982). 'Handbook of Special Education ', New York: Prentice Hall Inc.

Prospects and Challenges in LIS Apprenticeship: A Study

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ABSTRACT: Apprenticeship programmes in Library and Information Science (LIS) have become a vital route for people looking to enter in the dynamic profession of information management. These apprenticeships provide practical training and of having chance to study under experienced instructors. However, apprenticeships offer both opportunity and challenges, just like any educational or training programme. This study investigates the various characteristics of LIS apprenticeships, concentrating on the challenges as well as advantages it brings to both the apprentices and the LIS profession.

Introduction:

The 21st century has been witnessed by tremendous explosion of information. Genuine and authentic information can easily lead towards the interim progress and well being of mankind. It is only possible through the proper way of dealing with information to be presented which is called management of information. Of course, Library and Information Centre (LIC)s have been playing a significant role in the field of information management. As a result, Library and Information Science (LIS) education must sponsor apprenticeship programmes to cater with the qualified library professionals to a great extent.

Apprenticeships have become a dynamic and experiential route in the parlance of LIS education and training. It provides prospective in different ways of practical learning, experiment based activities among the library professionals and information experts before come to join at the LICs to take an omnipotent part within the organisation. On the other hand, an apprentice has to face different barriers such as rare chance to develop useful skills, failing to cope with real-world experience and technology enhanced potentialities may not cover up during

his/her assigned period to be considered as challenges of LIS apprenticeship programme. As such, LIS apprenticeships are characterized by a complex combination of opportunities and obstacles vice versa as a whole.

This research begins with a thorough investigation of the complexities of LIS apprenticeships. In doing so, it aims to offer a comprehensive view of both the difficulties that these programs' institutions and apprentices face and the numerous opportunities that these apprenticeships bring to both trainees and the larger LIS sector also this study aims to clarify the significant skills and information acquired during such interactions by a thorough investigation of apprenticeship programs and the experiences of participants. It also looks at themes like diversity, accessibility, and the need of advance technology, all of which highlight the difficulties that institutions and apprentices have to be faced. As a result, this study helps to advance our understanding of the significance of LIS apprenticeships in influencing the development of the information industry as well as the dynamic area of library and information science.

Objectives

- To find out the strength of apprenticeship
- To identify the mentorship quality in apprenticeship
- To explore the technological skill of apprenticeship
- To find out the challenges of apprenticeship
- To know about the satisfaction level of the student at the time of apprenticeship

Statement of the problem:

This research aims to address these overarching problems by conducting a comprehensive examination of LIS apprenticeships. Through a combination of quantitative and qualitative research methods, this study seeks to provide an understanding of the strengths, mentorship quality, acquiring technological skill, challenges, and apprentice satisfaction levels in the context of LIS apprenticeship programs. By doing so, it aspires to contribute to the refinement and optimization of these programs and ultimately ensures to the continuous growth and relevance of apprenticeships in the field of Library and Information Science (LIS)

Methodology:

In this study, a structured survey for apprentices, mentors, and program administrators has been developed. These surveys include questions related to the strengths, mentorship quality, technological skill acquisition, challenges, and satisfaction levels. By adopting Likert scale measurement questions for quantitative data on satisfaction levels and open-ended questions for qualitative insights included in the Questionnaires. Also provided probing questions to explore the qualitative aspects of mentorship quality, challenges faced, and strengths gained during the apprenticeships. By employing a mixed-methods approach and considering various sources of data, this methodology aims to provide a well-rounded understanding of the strengths and challenges of LIS apprenticeships and offer valuable insights for program improvement and development in the field.

Review of related literature:

Gessler (2019) Concepts of Apprenticeship: Strengths, Weaknesses, and Pitfalls States that One of the most traditional and widely used methods of training at the intersection of work and learning, or the world of education and the world of work, is the apprenticeship. We look at the traits of various apprenticeships in the first section, including logic, formality, work, learning, and teaching.

Gaming (2013) Review of Apprenticeships Research - Final Report: An updated reviewpertinent (either directly or indirectly) to the program. This report's research yields several intriguing conclusions, the majority of which confirm and build upon earlier discoveries. The importance of financial concerns, the quality of apprenticeships, and, as always, the role of the employer in apprenticeships are a few of the major issues that have surfaced over the previous year (the review period). Recent research and policy outputs also cover the benefits of apprenticeship (for students, companies, and the State), the necessity of determining deadweight and additionality when calculating overall benefits, and the motivations of both individuals and employers.

Corney (2010)Apprentices' mentoring relationships: The role of 'significant others' and supportive relationships across the work-life domains states that the findings demonstrate that apprentices can name a variety of encouraging individuals whom they view as mentors. They comprisea broader definition of mentoring that emphasizes significant others and encompasses both peer and reciprocal relationships.

Poole (2023) Challenges, barriers, and strategies for engaging in level

7 apprenticeship studies that the following in-depth interviews with eleven apprentices, early-career academic professionals who are about to finish their apprenticeships, this study conducts a theme analysis. The key findings present a contradictory picture, indicating that apprentices' study habits and preferences are individualized and influenced by their employment stress and availability of off-the-job study time. Apprentices claim that a variety of issues interfere with their capacity to use the allotted off-the-job study time, most notably their ability to be freed from their employment and competing priorities for taking care of their personal, professional, and educational demands. According to apprentices, it is practically impossible for them to devote 20% of their working time to their education.

Mulkeen (2017)Degree and Higher-Level Apprenticeships: An Empirical Investigation of Stakeholder Perceptions of Challenges and Opportunities gives emphasis on the stakeholders that engaged with included employers, Universities, independent training organizations, and professional bodies. This paper provides evidence-informed recommendations for best practice principles in developing and delivering these programs.

Concept of Apprenticeship:

A systematic training program called apprenticeship allows people to learn specific skills, knowledge, and abilities for a given profession, or line of employment. In order to get real-world experience, this training frequently apprentices working alongside more seasoned professionals (mentors) in a workplace context. A defined curriculum, mentoring and coaching, skill progression, and the option of classroom or off-the-job study are frequent features of apprenticeships. After successfully completing an apprenticeship, candidates get certificates that are recognized as proof of their expertise in the field of study. Apprenticeships are flexible and prevalent throughout a wide range of industries, offering important routes for people to enter the workforce, acquire useful skills, and pursue fulfilling career.

Analysis of the gathered data

Table 1: Age group of the respondents

Age	Responses	%
Below 25 years	10	38.5
Above 25 years	15	61.4

From the Table 1 we found that the age group of apprenticeship responses is high in those above 25 years is 61.4 % and less in those below 25 years that is 38.5 %.

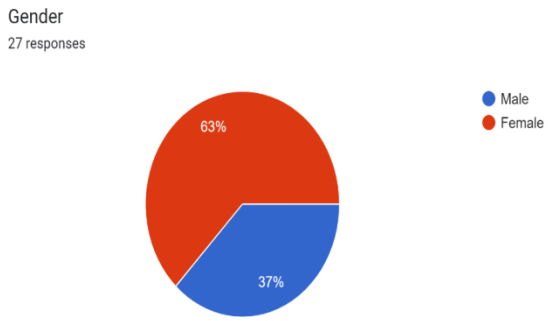


FIGURE 1: Gender wise response

Table 2: Studied area belongs to the University wise response

University	Response	Percentage (%)
Assam Women University	3	11.5
Dibrugarh University	20	74.1
Guwahati University	4	14.8

Above Table 2 denotes that 11.5% of the responses belong to Assam Women's University and Other 14.5% of the responses belong to Guwahati University and the highest 74.1% of the apprentices belong to Dibrugarh University.

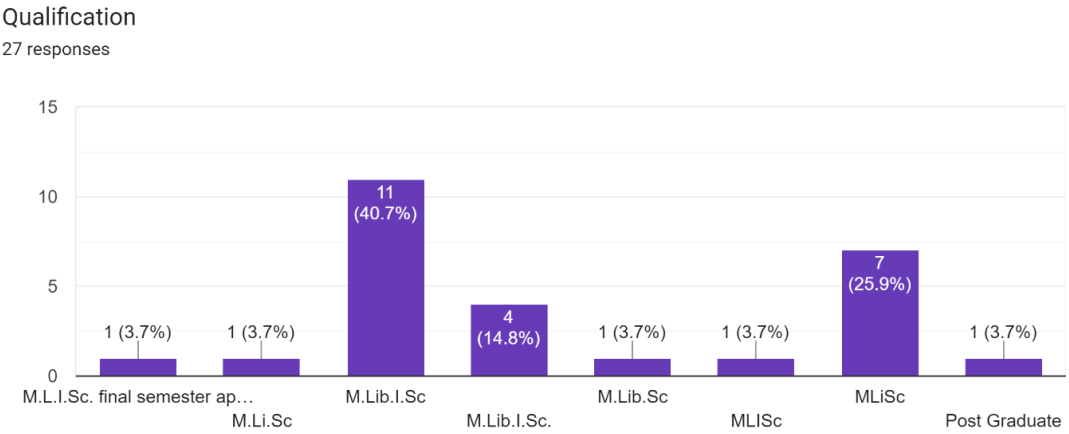


FIGURE 2: Qualification of Apprentice

TABLE 3: Apprenticeship Institution and Name of the Mentor

Institution Name	Response	Percentage (%)	Mentor
Assam Agriculture University, Jorhat	1	3.1	-
D.D.R College, Chabua	1	3.1	Mrs. Nandita Barman
Dibru College, Dibrugarh	2	7.4	Mrs Dipika Das
Don Bosco College, Golaghat	1	3.1	-
Indian Institute of Technology, Guwahati	3	9.3	Dr. Tamal Kumar Guha, TrinyanBogohain
Jengraimukh College, Majuli	1	3.1	Mrs. Bornali Chutia
D.H.S.K College, Dibrugarh	2	7.4	Dr Pallavi Gogoi
Kaliabor College, Nagaon	1	3.1	Dr. Birender Pal
City College, Dibrugarh	1	3.1	Kushal Panging
M.D.K.G College, Dibrugarh	2	7.4	Jadevjyoti Saikia
Madhabdev University	1	3.1	Dr. Nikhil Hazarika
Duliajan College, Dibrugarh	1	3.1	Mondira Chutia
Namrup College, Dibrugarh	1	3.1	-
Raha college , Nagaon	1	3.1	-
Nazira College, Sibsagar	1	3.1	Dr. Rajendra .M Devsarma
Pub Kamrup College, Baihata Chariali	1	3.1	Dr. Nirmal Ranjan Mazumder
Sibsagar Girls College, Sibsagar	1	3.1	Dr. Abhijit Borpujari
Tinsukia Commerce College, Tinsukia	2	7.4	Dr. Sadananda Nath

The above Table 3 shows that the IIT has the highest apprenticeship response rate and the mentor was Dr.Tamal K. Guha and Trinayan Borgohain, Tinsukia Commerce College, D.H.S.K College, M.D.K.G College and Dibru College have a 7.4% response rate, and above mention remaining institutions/ colleges have a 3.1 % rate of apprentices.

TABLE 4: Views about the Uses of Apprenticeship

Responses	Percentages (%)
YES	85.7
NO	14.3

The above Table 4 shows the response rate of apprentices about the uses of the apprenticeship, Here the maximum response percentage is for Yes has been used.

Table 5: Benefits of Apprenticeship

Benefits	Respondents	Response Percentages (%)
Professional Job training	23	82.1%
Monetary Benefits	4	14.3%
Job Placements	11	39.3%
Growth in Leadership roles	20	71.4%
Mentorship & Guidance	18	64.3%
Practical Skill Development	26	92.9%
Networking with Profession	19	67.9%
Not useful	1	3.6%
Work experiences, facing reality	1	3.6%

The above Table 5 shows that the highest benefit from the apprenticeship is Practical skill development where the response rate is 92.9% and the lowest response rate is not useful and work experience facing reality with 3.6%.

TABLE 6: Designated Mentor

Response	Percentage (%)
YES	71.4
NO	28.6

Here the Table 6 shows that 28.6% of apprenticeships did not have designated mentors. A Mentor can guide the apprentices more lively which is lacking with these 28.6 % respondents. On the other hand, 71.4 % apprentices got a designated Mentor who shared profound experiences with various dimensions of the LIS profession in a vibrant manner.

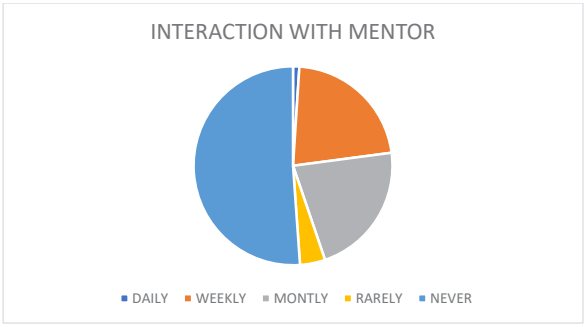


FIGURE 3: frequently interact with mentor during apprenticeship

The above Figure 3 shows that 50% of apprentices have daily interaction with mentors and 2% of the respondents never interacted with their mentors.

Table 7: LIS Apprenticeships and Skills in Housekeeping Operation

Responses	Percentage (%)
Yes	89.3
No	6.2
Depends on various factor	5.5

The above Table 7 shows that the 89.3% views of apprentices about LIS apprenticeship programs can make an apprentice competent and skilled in housekeeping operations. And 5.5% depends on other various factors.

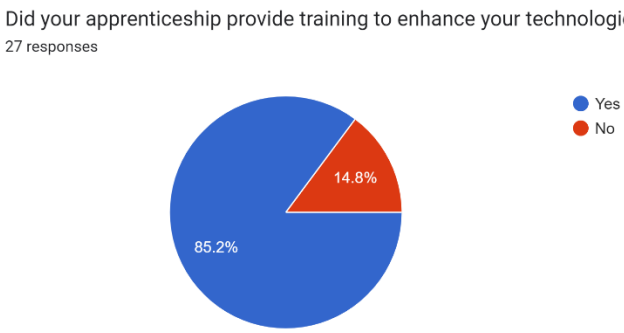


FIGURE 4: Technological Skill

The above Figure 4 shows that 85.2% of apprenticeships provide training to enhance technological skills.

TABLE 8: Working experiences in different Modules

Module	Response (%)
Acquisition	39.3
Cataloguing	82.1
Circulation	92.9
Serial Control	60.7
OPAC	78.6
Administration	21.4
Above all	17.9

The above Table 8 shows that 92.9% of apprentices have used the circulation module which became convenient after joining the LIS apprenticeship and the least used

module is Administration.

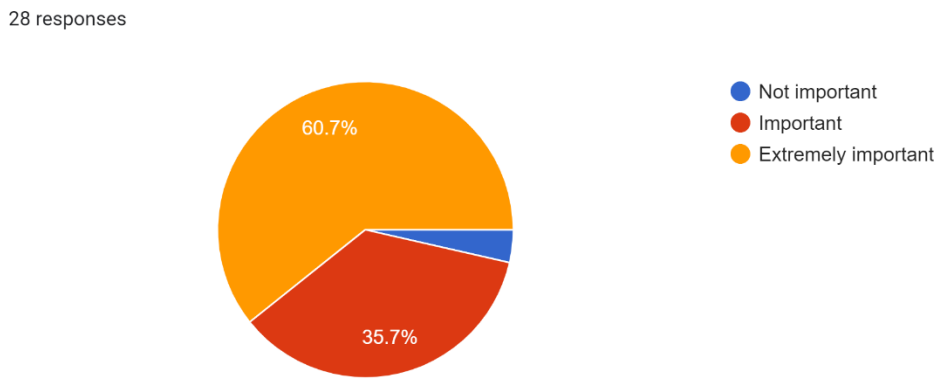


FIGURE 5: Experiences in LIS Apprenticeship

Figure 5 clearly shows that the technological skills are very important in LIS profession for sustainable development which is indicated by 60.7% and 35.7 % of the respondents respectively. At the same time, 3.6 % of the respondents states that LIS profession can be run by different ventures rather than technical skills.

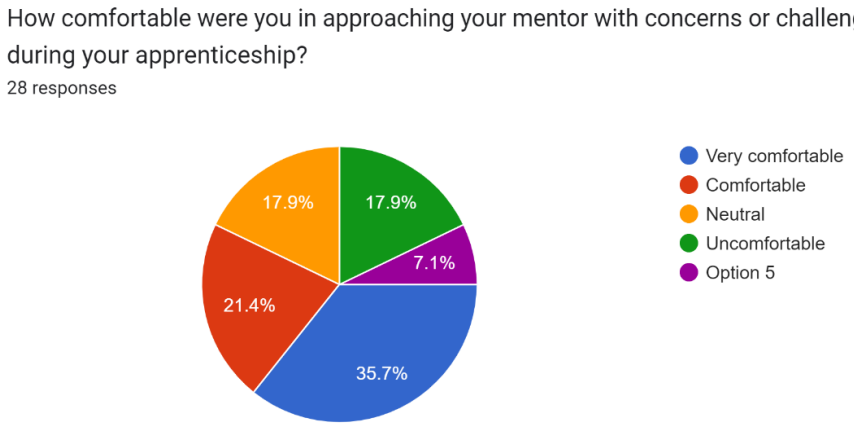


FIGURE 6: Comfortability with Mentor

Figure 6 indicates that 35.7% of apprentices feel very comfortable approaching the mentor for concerns and challenges during apprenticeship.

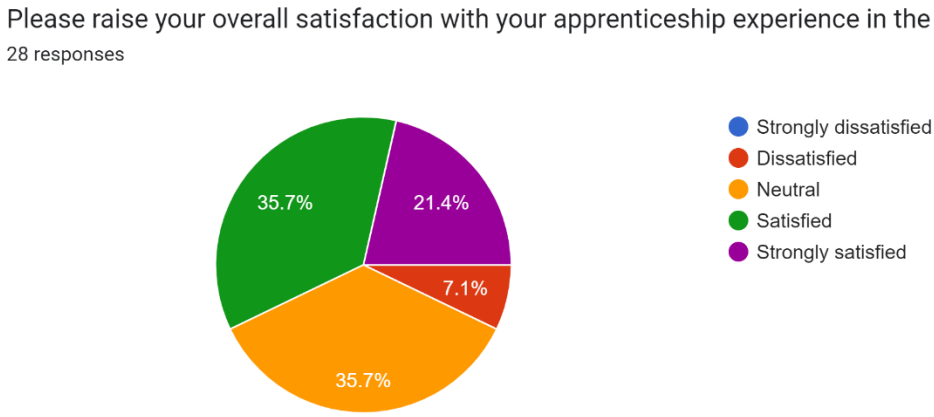


FIGURE 7: Level of Satisfaction

From the above figure 7, we got that the highest percentage of satisfaction level of apprenticeship is 35.7 which is satisfied and strongly satisfied. Only 7.1 % are dissatisfied with the apprenticeship training.

TABLE 9: Working Section of the Library

Working Section	Response (%)
Administration	10.7
Circulation Management	90.4
Acquisition	42.9
Technical Processing	85.7
Online Digital Resource Management	46.4

From the above Table 9, we found that a maximum of 90.4% of apprentices work in the circulation section, and a minimum apprentices 10.7% work in the administration section.

TABLE 10: Problem of Apprenticeship

Difficulties	Responses (%)
Not allowed to do work in all sections	68
Lack of co-operation	43
Limited Facility	68

From the above Table 10, we found that 68% of apprentices faced the problem of not being allowed to do work in all sections as well as Limited Facilities.

TABLE 11: Challenges of Apprenticeship

Challenges of Apprenticeship	Responses (%)
Job security	75
Performance Issues	70
Commitment Issues	29

The above Table 11 states that 75% of apprentices faced the challenges of job security and 29% faced commitment issues in terms of performance

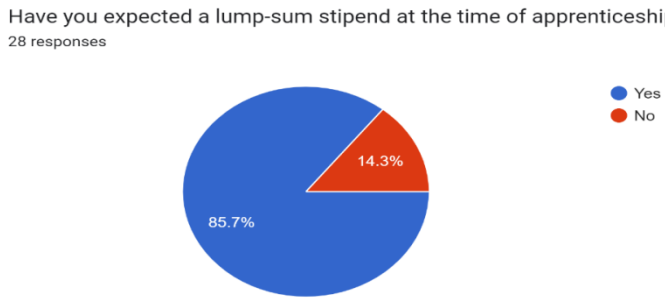


FIGURE 8: Stipulated Money

The above figure 8 shows that 85.7 % of apprentices got a lump sum stipend at the time of apprenticeship.

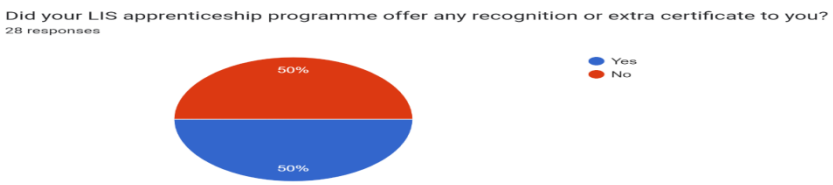


FIGURE 9: Apprentices Certificate

From the above Figure 9, we see that 50% of apprentices get certificates and the other 50% of apprentices are not able to get the certificate.

Findings:

- We have found that the maximum age group of apprentices is above 25 years the maximum number of apprentices are female, and most of them belong to Dibrugarh University and their highest qualification is a Master's in Library and Information Science.
- We Found that Most of the apprentices have a Mentor

- We found that the strength of apprentices is very high so the engagement in appendices is 100% and 85.7% said that the apprenticeship will be used in the future. And it can give 92% practical skill development 82% professional job training 71% growth of leadership roles, and 67% networking with the profession.
- We found that 67.9%of the mentors help and give guidance to the apprentices for growth and development in the field of LIS
- We also found that 50% of apprentices daily interact with their mentor.
- We found that 85.2% of apprentices think that providing training in apprenticeship helps them to enhance their technological skills.
- We found out after joining the LIS apprentices that 92.1% of in circulation,82.1% cataloguing, 78.6% OPAC., and 61% of serial control has become convenient for used
- We also found that on the basis of the apprentice's experiences, 60.7% of apprentices think that technological skills in LIS careers are extremely important.
- We found that 75% of apprentices face challenges in job security 70% in performance pressure and 28.6% face challenges in commitment issues.
- We also found that apprentices faced challenges in 67.9% of not allowed to work in all sections as well as with their limited facilities.
- We found that 35.7% of the apprentices feel neutral, 35.7% feel satisfied 21.4% are strongly satisfied and 7.1 % are dissatisfied with the apprenticeship experiences.

Conclusion:

Apprenticeship in LIS education becomes an integral part of information management industry. Obviously, an apprentice gets handful practical knowledge through availing of such short term agenda. By the stipulated period, one can explore real experiences over theoretical interpretations associated with Library and Information Centre (LIC)s. In short, apprenticeship makes a potential journey from a learner to gainer among the LIS students. At the realm of artificial intelligence (AI), there are so many issues on handling information management which leads towards the necessity of a qualified as well as skilled LIS professional. For this highly relevant objective, apprenticeship can be considered as a doorstep of vibrant LIS profession to a great extent. No doubt, there are some challenging factors like job security, commitment issues, lack of co-operation etc. in apprenticeship

programme. Apart from the bothering things, this study has clearly established that the flow of information explosion driven by the right LIS professional having right management at the right time depends upon LIS apprenticeship as a reliable step for information industry.

References:

1. Gessler, M. (2019). Concepts of Apprenticeship: strengths, weaknesses, and pitfalls. In Springer eBooks (pp. 677–709). https://doi.org/10.1007/978-3-319-94532-3_94

2. Gambin, L. (2013). Review of apprenticeships research final report: an updated review. https://www.researchgate.net/publication/275339091_Review_of_Apprenticeships_Research_-_Final_Report_An_updated_review. http://wrap.warwick.ac.uk/id/eprint/69150

3. Corney, T., & Du Plessis, K. (2010). Apprentices' Mentoring Relationships: The Role of "Significant Others" and Supportive Relationships across the Work-Life Domains. Youth Studies Australia, 29(3), 18–26. https://eric.ed.gov/?id=EJ902370

4. https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---ifp_skills/documents/publication/wcms_872249.pdf

5. Poole, R., Cook, F., Sims, S., & Brindley, J. (2023). Challenges, barriers, and strategies for engaging in level 7 apprenticeship studies. Journal of Education and Work, 36(2), 153–168. https://doi.org/10.1080/13639080.2023.2167953

6. Abdou, H. A.. . (2017). Degree and Higher-Level Apprenticeships: an empirical investigation of stakeholder perceptions of challenges and opportunities. Northumbria. https://www.academia.edu/86587046/Degree_and_Higher_Level_Apprenticeships_an_empirical_investigation_of_stakeholder_perceptions_of_challenges_and_opportunities

Localizing United Nations Sustainable Development Goals: The case of Dr. Suryya Kumar Bhuyan Library, Cotton University

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ABSTRACT: Despite increased studies on the United Nations' 2030 Agenda and its 17 Sustainable Development Goals (SDGs), the role of libraries in localizing the SDGs has received little attention. By investigating the localization of the 2030 Agenda in a specific library setting, we go beyond earlier research that primarily examines the agenda's interlinkages and discourses. The paper tries to assess Dr. Suryya Kumar Bhuyan (SKB) Library, Cotton University based on the United Nations Sustainable Development Goals. This article presents an exploratory case study based on SKB Library policies, actions, and activities. Based on the findings, it can be understood the SKB Library aligns with ten of the SDGs. The library is contributing as much as possible so as to make the society sustainable. The findings are anticipated to provide a useful contribution to the field of academic librarianship and to our understanding of the expertise held by library professionals in academic library administration. Other administrators and librarians may find this study useful in putting certain policies and practices into practice that will support the SDGs.

Introduction

The academic library connects university education, services, and resources. It teaches information literacy by offering student services such as research

assistance, and study spaces. It provides resources like books, journals, and computers, as well as a suitable environment for study and thought. Thus, librarians thought that all of these elements contributed to student learning and success. Henceforth, academic libraries have collected and used assessment data focusing on the quantity and utilization of resources for many years (Ackermann, 2007).

Now and again, the value of libraries is questioned. Using the United Nations Sustainable Development Goals (UN SDG) goals as an aspect of assessment, the paper has tried to showcase the policies, services, and facilities provided by the Suryya Kumar Bhuyan Library to the user communities. The SDGs are a vital tool for incorporating sustainability into business plans, policies, practices, and decision-making procedures that will benefit the company and make it more accountable to stakeholders (Mori. et. al. 2019). The paper will help to understand the connection between UN SDG goals and Dr. Suryya Kumar Bhuyan (SKB) Library, Cotton University. This will provide an insight into the impact of library services and facilities on the user communities.

Background

Research on the implementation of the UN SDG framework in Australian university libraries was carried out by Missingham (2021). The function of services and collections within their institutions was analyzed to understand the value and advantages of libraries. The results showed that the four SDGs—quality education, gender parity and equity, industry, innovation, and infrastructure, and sustainable cities and communities—have a significant impact that extends beyond institutional boundaries. The study made it abundantly evident that it is possible to combine qualitative and quantitative data to gain an understanding of the benefits academic libraries offer to their campus communities, local and regional communities, and the overall influence on the country.

Thorpe and Gunton (2021) tried to assess the Australian academic libraries of the University of Southern Queensland (USQ) based on UN SDGs. The case study examined how the community was informed about the mapping effort and how the library's programs, services, and action plans were mapped to the SDGs. Eight out of the seventeen SDGs were determined to be associated with current services, collections, and initiatives by the staff. The University's top management received reports on the activities that were mapped to these eight goals. The mapping process made library employees more conscious of the wider

cultural and socioeconomic ramifications of their work. The communication plan sparked discussions that raised university administrators' understanding of the SDGs, the importance of the USQ Library in enhancing information access, and the library's capacity to change the lives of USQ students and the surrounding community. According to the study, university libraries may now utilize the SDGs as a measuring tool and as a challenge to establish challenging targets that are in line with the United Nations' plan for 2023.

According to Atta-Obeng (2020), public libraries play a vital role in promoting lifelong learning in Ghana by giving patrons access to pertinent information, conducting research publication training, and offering instruction in search strategy, information literacy, communication skills, and reading.

Bawack (2018) studies the academic libraries of the University of Yaounde I in Cameroon. The study concludes that libraries are essential to achieving the Sustainable Development Goals. The reason for this is that they gather, arrange, and distribute data that the general public may utilize to educate themselves on the range of life topics discussed in the goals. Libraries sponsor activities aimed at raising awareness of and implementing the SDGs.

United Nations Sustainable Development Goals (UN SDGs)

The Global Goals for Sustainable Development are part of Plan 2030, an international plan that was approved by the leaders of the 193 UN members in September 2015. In turn, the 17 Goals contain 230 indicators and 169 targets (Figure 1). The Sustainable Development Goals are intended to serve as a "blueprint to achieve a better and more sustainable future for all."

The most ambitious pact ever reached by world leaders on sustainable development is the Global Goals. It incorporates the social, economic, and environmental facets of sustainable development. Everyone must play a part in achieving the goals, including the public, governments, businesses, and civil society. The Seven Billion People on Earth are impacted by the Goals, and in order for them to be achieved, everyone must be aware of and knowledgeable about them. The United Nations (UN) defines sustainable development as development that satisfies current needs without jeopardizing the ability of future generations to satiate their own needs. It also advocates for coordinated efforts to create a future that is resilient, inclusive, and sustainable for both people and the environment.



Figure 1- The 17 Sustainable Development Goals (UNDP, 2019)

An opportunity to demonstrate how an academic library can contribute to global change by offering its users and the community relevant services and facilities will arise from a study of SKB Library using the SDG framework.

Case study: Dr. Suryya Kumar Bhuyan (SKB) Library, Cotton University

SKB Library started its journey in 1901 with the very inception of Cotton College itself. In Northeast India, it is among the oldest libraries. Cotton College was established in 1901 and in 2017 it was upgraded to Cotton University. Currently, the library caters to 1,040 High Secondary students, 3,104 Undergraduate students, 2,144 Postgraduate students, 343 Ph.D. students, 235 faculty members, and 212 staff members. The library implements policies and takes activities with consideration for the long-term needs of its user community.

The staff of the SKB Library discovered a correlation between the current 10 UN SDG targets and its facilities and services. The ten goals contributed by the library are described below sections.

Goal 3: Ensure healthy lives and promote well-being for all at all ages

SKB Library provides basic infrastructure facilities like drinking water, clean reading spaces, and sanitized washrooms that foster good health among the users. It also provides safe spaces to all the users of the library and fosters a sense of well-being. Irrespective of the background and designation of the user, the library provides informal learning safe places. The library staff helps users to typically

develop good digital literacy skills in relation to identifying search engines and creating queries. This helps the users to understand what credible information to trust and rely on websites or online.

SKB Library has a fair amount of books on fiction which can have a positive impact on user wellbeing. Positive attitudes towards reading may be linked to mental health, according to research.

Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning oppurtunities for all

SKB Library has access to a wide range of periodicals, books, and information resources. It fulfills its purpose of 'educating people via reading' by circulating books. Users might be impacted by reading journals and books on purpose. As a result, their knowledge improves and their self-worth improves. Special book corners featuring prominent persons such as Dr. Suryya Kumar Bhuyan, the first Assamese Principal of Cotton College, and Homen Borgohain, also Rachanavalis enrich cultural experiences and boost users' capacity to think for themselves.

Multi-subject and multi-lingual publications, such as Assamese, Hindi, Arabic, Bodo, and so on, satisfy readers while also improving the university's knowledge structure.

Because college education relies on class teaching and professors speaking, everyone has different learning techniques and rules owing to variances in educational background, talents, intellect, age, sex, hobbies, and learning objectives. As a result, SKB Library serves as a means for users to improve their professional knowledge through independent learning. SKB Library is a student learning assistance system due to its extensive study materials, learning atmosphere, and cutting-edge technology.

Fire extinguishers are located in specified locations in all floors of the library.

Dedicated computer workstations and tables are available to all users in the ground floor and second floor of the library.

Braille books, audio books, software and hardware for access to books are available for Divyangjan students. Library staff are acquainted with all these facilities and services as to all can help the students.

Research training is provided to users in constant intervals to let them know the varied academic software and intellectual property rights and copyright issues.

Table 1- SKB Library stats

	2018-19	2019-20	2020-21	2021-22	2022-23
Library visit	11996	17029	6446	10441	15768
Books borrowed	3569	2358	1380	1682	2751
Electronic resources use	NA	6813	6148	6115	NA
Change in library timings	10AM-7PM	10AM-5PM	10AM-5PM	10AM-7PM	9AM -10PM

Table 1 showcases the library visits, books borrowed, and electronic resource use in the years 2018-23. The library administration had undertaken the change of library timings in the following years so as to accommodate the needs of the user community.

Hence, it is evident from Table 1 that the with regard to knowledge, employment, and good occupations, the SKB library has aided its users with relevant knowledge, literacy, numeracy, and skills—including technical and vocational skills.

Goal 5: Achieve gender equality and empower all women and girls

SKB Library promotes and performs gender equality by offering safe gathering places, reading spaces, and equal access to library services. The employees also try to analyze and work to remove any gender barriers that might prevent women and girls' equitable access to libraries. SKB Library encourages lifelong learning by providing access to health and legal information, as well as raising awareness and combating negative stereotypes, which are vital library aims.

For security purposes, women security persons are also employed at the library entrance.

From 2000 till 2021, SKB Library has the privilege of a woman leading the library in decision-making. She had contributed largely to the smooth operation of the library. She had initiated varied programs for education, skill development, and training, digital inclusion, media literacy, and negative gender stereotypes, and raised awareness to prevent and address violence against women and girls. This legacy of the initiatives is still continued in the library.

ICT training in academic software, hardware, and academic database programs are designed and held to provide information and communication, to empower the youth, women, and academic community of the university. Moreover, one-on-one

training and information is also undertaken for proper and better ICT knowledge and information.

SKB Library contributes to closing the gender digital divide by providing public internet access as well as digital skills training and assistance for women and girls at the institution.

Goal 6 : Ensure availability and sustainable management of water and sanitation for all

The SKB library administration ensures safe drinking water to the entire community of the university visiting the library by providing filtered water. Hand washing facilities with hand sanitizer including a sink with tap water are provided in fixed corners of all floors of the library. Tap water is available in the library with our own bore well. A separate washroom for single-sex users is available. Sanitation is ensured by regular cleaning of the library premises two times a day. Dedicated staff is employed so as to ensure proper cleaning, hygiene, and sanitization of the library reading spaces, washrooms, stacks, stairs, and employee work areas.

Goal 7: Ensure universal access to affordable, reliable, sustainable and modern clean energy services

SKB Library provides the user community with access to light and electricity to read, study, and apply their thoughts and ideas for future endeavors. Study rooms with adequate lights are provided where users can use their mobile, tabs, and laptops with accessible charging points.

The library administration ensures the implementation of the Green Library concepts like reduction of energy consumption by using LED tube lights and bulbs, efficient use of the energy supply, default powering off or going into standby mode, and use of the simplest and most user-friendly solutions.

Goal 8: Promote sustained, inclusive and sustainable economic growth and productive employment and decent work for all

Students and teachers may now apply for jobs online due to public access to ICT and skills at the library. Most of the library management work is done on the computers and online. Mails are used for communication among the administration and users. The library's routine work is processed faster than before due to newer and better ICT to provide timely information to users and the administration.

SKB Library provides reading spaces to its alumni to study for competitive exams. As a result of which, many of its alumni have been able to apply for jobs and get recruited.

Goal 9: Build resilient infrastructure, promote sustainable industrialization, and foster innovation

The SKB library management has committed to providing a library card to every student and user so that they may access learning materials and books for coursework, enjoyment, and information.

SKB Library provides access to 6000+ openly accessible research outputs. The administration is currently deciding on the transfer of records from SOUL to Koha wherein Koha has already been installed and some data has been transferred already.

Wifi has been installed in selected areas of the library to ensure increased access to the Internet and digital inclusion by providing both public Internet access and digital skills training and support. These help students access digital resources from their own laptops or mobiles.

A digital repository has been initiated in the library for quality distance education. It helps to display the academic pursuits of the university, and the digitalized important documents like old question papers, old documents, etc.

The DSpace installation has already been undertaken in-house to establish the digital bank of the university.

In order to showcase each faculty member's academic and research profile alongside the broader profile of the institution, the library has started the process of developing their profiles on the VIDWAN and IRINS databases.

Social Media like Instagram, Facebook, LinkedIn, and YouTube are used widely for library information of digital resources and other important news. Online events are advertised through social media and live programs are undertaken through it.

Goal 11: Make inclusive, safe, resilient, sustainable cities and communities

More than 130,959+ textbooks; 3,389+ reference books; 2584 digital library resources are available for user access. Invaluable books are now digitized and uploaded to the digital repository for their wider access to the academic community.

Doctoral theses are available online openly in INFLIBNET Shodhganga. The academic output of Cotton University can be intellectually used by others all around the world.

The SKB Library staff is a strong supporter of Open Access (OA) Initiatives. They understand the benefit of supporting scholarly publications in OA as it helps in visibility, networking, and collaboration with others.

Also, 648 Braille books are available to visually impaired students of the university. Hemkosh- a one-of-a-kind Braille edition of the Assamese language dictionary is available in our library. Ramps and washrooms for PwD are available in the library too.

Goal 12: Ensure sustainable and responsible consumption

SKB Library is sustainable: Circulating materials distributes resources in the community and guarantees that everyone has access to information. SKB Library participates in inter-library lending on a nationwide scale to guarantee that all other institutions have access to information.

Goal 17: Partnership for the Goals

The SKB Library offers its user community a free Internet connection. The management of the library makes connections with people and other libraries to exchange best practices, lessons learned, and willingness to adapt to changes.

Findings

The research is clear that the measures provided by applying SDG goals to the SKB Library give important value to academics. SKB Library has been engaged in many activities and projects supporting ten of the seventeen SDGs. The library's contribution not only adds to the development of the university but also to the wider world. Still, there are other SDGs that need to be fulfilled in the future and so. The assessment through the SDG goal gives us unique values that are different from others. The research provides us with a conceptual value that is applicable to other academic libraries.

Limitations

UN SDGs is a broad topic. We use only ten SDG goals in the research to find out the actual value and information of the SKB Library. The research is limited to good health and well-being, quality education, gender and equality, clean water and sanitation, affordable and clean energy, decent work and economic growth, industry, innovation, and infrastructure, sustainable cities and communities, responsible consumption and production, and partnerships for the goals.

Conclusion

From the innate activities and policies, it is evident that the cause of UN SDGs is an important part of the SKB Library. However, just compiling, displaying,

and supporting the SDGs is insufficient; a continuous process involving several techniques for evaluating and analyzing the advancement of the SDGs supported by the library is needed from time to time.

The UN Sustainable Development Goals offer a chance to appreciate heterogeneity. In order to learn about the library's innovative services and activities, we applied the UN SDGs to Cotton University's SKB Library. SKB Library acts as a bridge for the dearth of information without biases and stereotyping of the user community. The case study aids in identifying important research issues, including cheap and sustainable energy, gender and equity, industry, innovation, and infrastructure, etc. The study highlights the vital importance of libraries and the connections among the ten SDGs. The study will aid in identifying the fundamental components of an academic library.

Implications and Future Research

The research applied UN SDG goals to the service sector of the library. It helps in library assessment. The case study of Cotton University provides how the UN SDGs goal impacts library services. It provides a new way to get the core sector of information services of the library. Library services get a new dimension through applying UN SDGs goals and finding out the critical areas of future research prospects. The finding of the research provides a new area of research for the library.

References

1. Lilian Atta-Obeng & Perpetua S. Dadzie (2020) Promoting Sustainable Development Goal 4: The Role of Academic Libraries in Ghana, The International Information & Library Review, 52:3, 177-192, DOI: 10.1080/10572317.2019.1675445

2. Renzo Mori Junior, John Fien, and Ralph Horne.Implementing the UN SDGs in Universities: Challenges, Opportunities, and Lessons Learned. Sustainability. Apr 2019.129-133.http://doi.org/10.1089/sus.2019.0004

3. Roseline Bawack (2018) Academic Libraries in Cameroon: Achieving Agenda 2030 Goals, The International Information & Library Review, 50:1, 63-66, DOI: 10.1080/10572317.2018.1439148

4. Roxanne Missingham (2021) A New Lens for Evaluation – Assessing Academic Libraries Using the UN Sustainable Development Goals, Journal of Library Administration, 61:3, 386-401, DOI: 10.1080/01930826.2021.1883376

5. Thorpe, C., & Gunton, L. (2022). Assessing the United Nation's Sustainable Development Goals in academic libraries. Journal of Librarianship and Information Science, 54(2), 208-215. https://doi.org/10.1177/09610006211005528

6. United Nations Development Program. 2019. Sustainable development goals. https://www.undp.org/content/undp/en/home/sustainable-development-goals .

Climate Change Resilience and Adaptation in Libraries: A Conceptual Case Study for Sustainable Contributions to a Better World

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ABSTRACT: The Earth is currently undergoing significant climate changes attributed to human activities, necessitating urgent adaptation measures for the survival of ecosystems and species. This study delves into the role of libraries in climate change resilience and adaptation, emphasizing their potential as advocates for climate change awareness. Grounded in the imperative of sustainable development, libraries are poised to enhance global understanding of environmental issues. This conceptual case study aims to foster collaboration, leverage library resources for climate education, and expand the user base by aligning with environmental initiatives. The primary goal is to heighten climate change awareness among library patrons and peers, thereby fostering environmental improvements while concurrently expanding library engagement. The study also aims to encompass assessing libraries' roles in climate adaptation, implementing collaborative initiatives, and utilizing resources for climate education. Employing a quantitative-based conceptual approach and the case study method, the research seeks a nuanced understanding of climate change and sustainable development adoption. Data collection occurs through secondary sources, ensuring a comprehensive exploration. The study introduces strategies for climate change adaptation in libraries, encompassing educational programs, climate resilience information centres, sustainable practices, support for local communities, and advocacy for climate action.

Libraries play a crucial role in disseminating information, aligning with international frameworks such as the United Nations Framework Convention on Climate Change and the Paris Agreement. Case studies underscore libraries' contributions to Sustainable Development Goals (SDGs), emphasizing their pivotal position as agents for the successful implementation of climate action. This study provides a comprehensive framework for understanding and implementing climate change resilience and adaptation in libraries, underscoring their pivotal role in advocating for environmental awareness and sustainable development.

1. Introduction

The Earth has undergone significant transformations in its atmosphere, climate, and weather conditions since its inception, and these changes are ongoing and will persist into the foreseeable future. One of the most prominent changes that humanity has observed is climate change. Climate is typically defined as the prevailing weather conditions in a particular area over an extended period. Climate change primarily results from human activities, ranging from the burning of fossil fuels to deforestation, leading to an increase in greenhouse gas emissions and subsequent global warming, which impacts the Earth's climate.

The 2021 report from the Intergovernmental Panel on Climate Change (IPCC) has identified substantial alterations in the Earth's climate across the entire climate system. As climate change continues to affect life on Earth, it is imperative to prioritize adaptation to ensure the survival of all living beings. This adaptation involves altering our economy, society, lifestyles, and behaviours to make a positive impact on climate change. Failing to reduce emissions promptly will make it increasingly challenging to adapt to these changes. The Paris Climate Treaty is a ground breaking agreement that acknowledges the link between sustainable development and climate change.

In this context, libraries play a pivotal role in advancing knowledge and cultivating fresh ideas to enhance global awareness of environmental changes. Furthermore, it is imperative for libraries to explore innovative avenues in order to attract new users while securing their own sustainability. Embracing the responsibility of disseminating awareness about climate change and how to mitigate its effects will introduce a transformative dimension to libraries, fostering greater engagement from climate change advocates. Libraries function as esteemed community institutions, serving as custodians of knowledge, and can leverage their user base for the betterment of the environment. This approach will contribute to heightened climate change awareness among regular patrons and their peers. The wealth of resources, services, and outreach activities provided by libraries, including workshops, training programs, educational initiatives, gatherings, as well as collaborations with specialized institutes, governmental organizations, and non-governmental entities, will prove invaluable in disseminating knowledge about climate change.

2. Objectives

The main goal of this study is to enhance awareness of climate change among library patrons and their peers, with the dual benefit of environmental improvement and

the expansion of libraries' user base. To accomplish this primary objective, the study aims to fulfil the following secondary objectives:

- To assess the role of libraries in climate change adaptation to establish libraries as primary advocates for climate change.
- To explore collaborative initiatives for climate change adaptation and implementing them in libraries to establish a climate change initiative system.
- To utilize library resources for climate change education and raising awareness among users.

3. Review of Literature

Libraries are pioneers in user management and have a unique reach with their audience, making them effective in spreading awareness about various issues. Climate change is a burning concern that needs to be addressed, and libraries are well-positioned to disseminate information among people worldwide to mitigate this growing problem. Aytac (2022) defined in her study about climate change literacy and explained how today's knowledge driven economy, citizens are facing more challenges to find out the exact information. Libraries are playing a very crucial role in providing information on climate change which is produced by govt. and nonprofit organizations. Agbo et al. (2022) found out in their study that there is an insufficient research on the library information need of farmers for climate change adaptation for improving agricultural products among the rural farmers. Woolley and Appleton (2023) advocated in their study that academic libraries can use their core values and missions to empower climate action and sustainability initiatives. Agbo et al. (2022) explored the lack of access to timely climate change adaptation among rural farmers in South East Nigeria. They suggested that libraries should provide timely access to climate change information to enhance the ability of rural farmers to adapt to changing climate conditions. Adedeji et al. (2014) studied how the climate changes is a major challenge for our earth. According to them it is a global crisis, with far-reaching impacts, from food production disruptions to rising sea levels. Urgent and coordinated action is needed to prevent irreversible damage and economic costs, requiring cooperation between nations, governments, businesses, and individuals. Abbass et.al (2022) concluded in their study that climate change is a persistent shift in global weather patterns, it is imposing stress on various sectors worldwide. This study explores how climate variability is eroding the sustainability of these sectors. Mathiasson and Jochumsen (2022) conducted a systematic review analysis to provide an overview of and insights into a selected bibliography of 102 research publications

on libraries of all type's sustainability and sustainable development, including the UN Sustainable Development Goals. The main rationales identified across these categories are optimization, legitimation, demonstration, and transformation. Pailet and Boniface (2021) found out in their study that worldwide public libraries are recognized as vital partners in addressing climate change, yet their explicit contributions within Zambia remain underexplored. To bridge this knowledge gap, this study examines the role of Zambian public libraries in the climate change agenda.

The aforementioned reviews reveal that several studies have been conducted to promote climate change awareness in libraries and raise public awareness. However, it can be deduced that none of these studies evaluated the role of libraries in climate change adaptation with the aim of positioning libraries as the primary advocates for climate change. Moreover, none of them delved into exploring collaborative initiatives for climate change adaptation or implementing such initiatives within library systems to establish a comprehensive climate change initiative. Additionally, there was no mention of harnessing library resources for climate change education and the dissemination of awareness among library users. Consequently, a research gap is evident, highlighting the relevance of the study's objectives.

4. Theoretical Background of the Study

Climate is the long-term pattern of weather in a particular area. Weather can change from hour to hour, day to day, month to month, or even year to year. A region's weather patterns, usually tracked for at least 30 years, are considered its climate. On Earth, there are five primary types of climate. Tropical climates, found in regions like Southeast Asia and the Amazon Rainforest, are marked by consistently high temperatures year-round with minimal temperature variations. In contrast, dry climates, often associated with deserts like the Sahara in Africa, are characterized by scarce precipitation and typically come with hot temperatures.

Temperate climates, prevalent in areas like the United States, Western Europe, and New Zealand, offer moderate temperatures and clear seasonal variations, with warm summers and cold winters. Continental climates, exemplified by Moscow, Russia, are notorious for their extreme temperature swings between scorching summers and frigid winters. Finally, polar climates, seen in the Arctic and Antarctic regions, feature extremely cold temperatures, incredibly brief summers, and harsh, lengthy winters.

4.1 Climate Change, Cause and Consequences

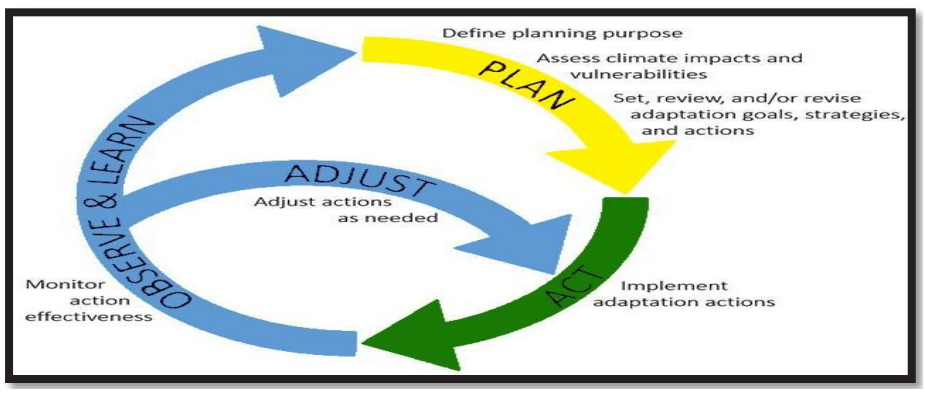
Climate undergoes changes over extended timeframes. Climate change refers to the significant variation in average weather conditions, manifesting as, for example, warmer, wetter, or drier conditions over several decades or longer. It is the longer-term trend that distinguishes climate change from natural weather variability. The combustion of fossil fuels stands as the primary driver of global climate change, contributing to more than 75 percent of worldwide greenhouse gas emissions, with nearly 90 percent of these emissions being carbon dioxide. These emissions create a sort of insulation around the Earth, trapping the sun's heat and resulting in the phenomenon of global warming and subsequent climate change.

Currently, the rate of global warming exceeds any previously recorded historical periods, and this ongoing increase in temperatures is disrupting established weather patterns and ecological equilibrium. Consequently, this poses numerous threats to both humans and the diverse forms of life on our planet. Various human activities significantly contribute to the emission of greenhouse gases, with detrimental effects on the Earth's climate system. One major source of emissions is the generation of power, primarily through the combustion of fossil fuels and coal. These processes release greenhouse gases such as CO2 and N2O into the atmosphere, exacerbating the global climate crisis. The manufacturing industry also plays a role in the greenhouse effect, as it often relies on the burning of carbon dioxide-emitting materials during production. Deforestation, driven by agricultural expansion and other purposes, increases CO2 levels by removing trees that serve as essential carbon sinks. Additionally, the transportation sector, with its growing number of vehicles, is a significant contributor to rising greenhouse gas concentrations, especially carbon dioxide. This sector now stands as the second-largest source of CO2 emissions. These activities collectively pose a considerable challenge to mitigating climate change and call for urgent efforts to transition to more sustainable practices.

The climate crisis is intensifying due to rising global temperatures, leading to a range of dire consequences. These include increased mortality, infrastructure damage, reduced productivity, and shifts in climate patterns. Moreover, numerous regions across the world are currently grappling with frequent and severe droughts, resulting in a significant shortage of water for living organisms due to minimal and brief periods of precipitation. Shifting climate patterns have disrupted the availability of freshwater sources, further exacerbating droughts, a critical issue as these sources are vital to all life. On the flip side, changing climate patterns result in severe drought in some regions while causing extreme rainfall in others, leading to rapid and devastating floods with significant impacts on human

lives and substantial economic losses. Additionally, the acceleration of global temperature rise is causing glaciers and ice sheets to melt swiftly, contributing to a worldwide rise in sea levels. As a result, the UN's IPCC predicts that by 2100, five nations, including the Maldives, Tuvalu, The Marshall Islands, Nauru, and Kiribati, are at risk of becoming uninhabitable due to the submersion of their coastal areas. These interconnected environmental challenges underscore the urgent need for global action to address the climate crisis.

4.2 Climate Change Adopation Cycle



Source https://shorturl.at/jzFL3

Figure 1 Climate Change Adaptation Cycle

The cycle represents a continuous process of iteratively performing a task: plan, act, observe, and reflect. Specifically applied to climate change adaptation, the cycle begins with the formulation of a comprehensive plan encompassing goals, strategies, and planning purposes. The subsequent phase involves the implementation of the plan to adapt actions, followed by a thorough observation to assess the effectiveness of the implemented actions. Upon completion of the cycle, and considering the results of the observation, planning is then undertaken for the subsequent steps.

4.3 Sustanibal Development Goals (SDGs)

The Sustainable Development Goals (SDGs) were adopted by the United Nations in 2015, comprising 17 goals with 169 targets. These were agreed upon by 191 United Nations Member States, with the aim of achieving these goals by the year 2030. The 17 goals primarily focus on poverty, hunger, equality, education, health, environment, discrimination against women and girls, as well as peace and justice, among others, for the sustainable development of society.



Source https://shorturl.at/mnzM6

Figure 2 Sustainable Development Goals

5. Methodology

This study employs a quantitative-based conceptual approach, utilizing the case study method to firmly establish the framework for understanding climate change and sustainable development adoption. Emphasizing a rigorous analytical lens, the research aims to delve into the intricacies of these crucial concepts. Comprehensive data collection primarily occurs through secondary sources, ensuring a well-rounded exploration. By employing this methodological blend, the study endeavours to provide a nuanced understanding, shedding light on the complexities inherent in the adoption of climate change and sustainable development. Through meticulous examination and thoughtful analysis, the research seeks to contribute valuable insights to the existing body of knowledge, fostering a deeper appreciation for the multifaceted nature of the subject.

6. Case Studies on Contribution of Libraries to the Sustainable Development Goals

The International Federation of Library Associations and Institutions (IFLA) is actively working to ensure that librarians worldwide are well-equipped to support the Sustainable Development Goals (SDGs) by organizing various workshops, meetings, and activities in different regions. IFLA has members from a total of 150

countries, spanning Africa, Asia, Oceania, Europe, North America, Latin America, and the Caribbean.

Libraries, known for their cost-effective participation in development, have been appointed as United Nations depositories in numerous countries globally. This designation makes libraries crucial hubs for accessing information related to the United Nations and its 17 goals. Libraries consistently provide a wide range of services to support societal needs in achieving these global goals.

Case 1: Sustainable Development Goal 2nd – Zero Hunger: Public library staff in Romania, trained by Biblionet programs in collaboration with local government, assist farmers in increasing income through ICT services for various agricultural benefits. This initiative resulted in a substantial increase of US$187 million in small-scale food production.

Case 2: Sustainable Development Goal 4th – Quality Education: Public libraries in Botswana have taken the initiative to support the government's objectives in providing quality education. This includes providing ICT access and enhancing computer skills among library users, contributing to the improvement of education, and facilitating better opportunities for employment and business.

Case 3: Sustainable Development Goal 5th – Gender Equality: The National Library of Uganda supports women by offering ICT-based training specifically designed for female farmers. This initiative helps women stay updated on crop prices, weather forecasts, and agricultural information in their local language, ensuring equal opportunities for females in agriculture.

Case 4: Sustainable Development Goal 8th – Decent Work and Economic Growth: In the European Union, millions of adults and youths access employment-related activities through computers in public libraries annually. Hundreds of thousands secure jobs with the assistance of public libraries, contributing to decent work and economic growth.

7. Strategies for Implementing Climate Change Adaptation in Libraries

The above flow chart illustrates the various strategies libraries employ to facilitate climate change adaptation. At the initiation of climate change adaptation strategies, libraries must assess the needs of their users pertaining to climate and sustainable development. Based on these identified needs, libraries should procure or develop resources such as books, journals, audio-visual materials, and online resources, ensuring users have access to a diverse array of collections on environment, climate, and climate change.

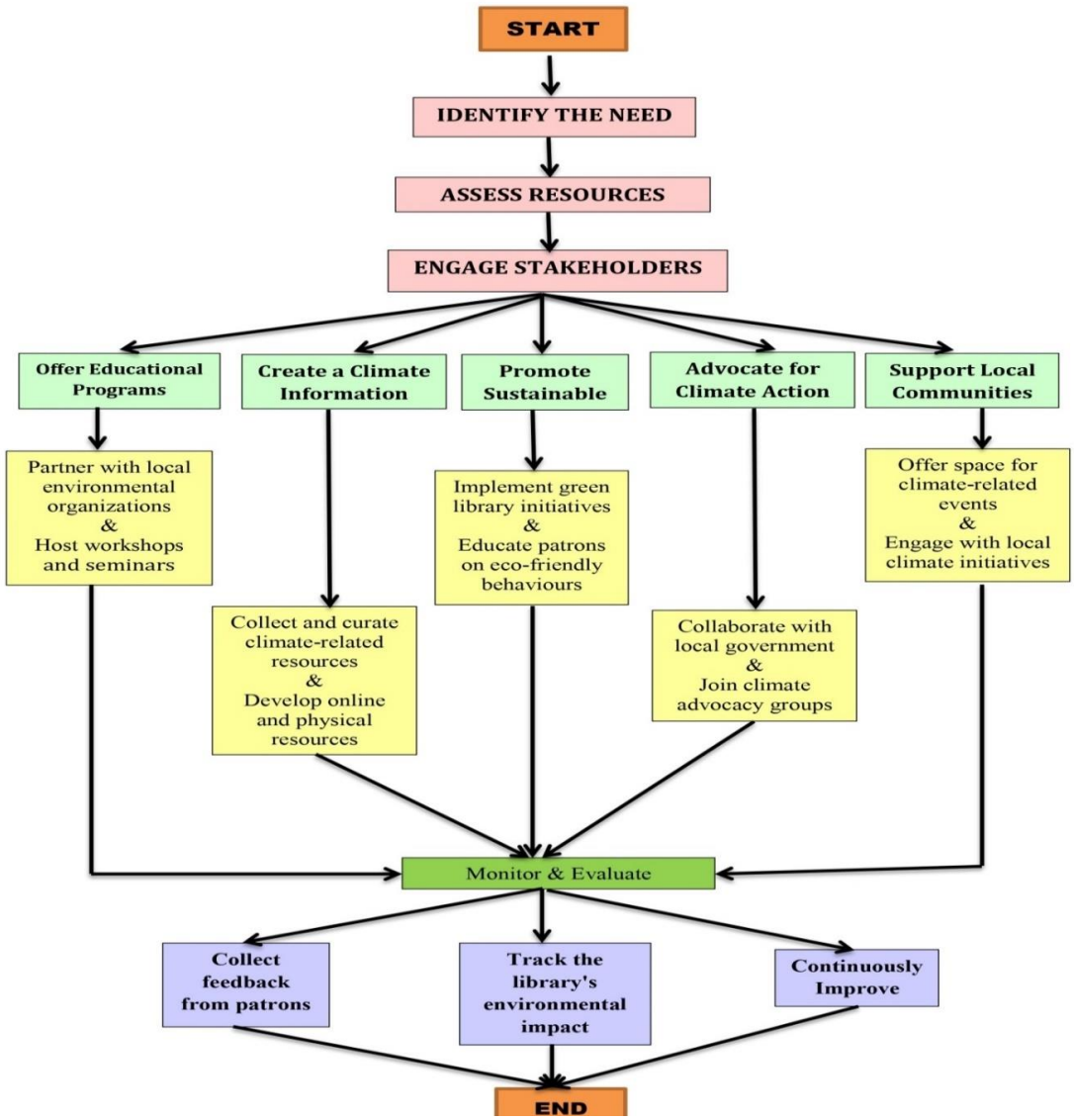


Figure 3 Flowchart on Strategies of Climate Change Adaption

Subsequently, libraries should engage with stakeholders to support initiatives such as educational programs, climate information centers, and sustainable developments. Libraries can further advocate for climate action and actively contribute to the well-being of local communities. Moving to the sixth step, libraries are advised to monitor and evaluate their impact through various means, including gathering feedback from users, tracking environmental impacts, and continuously refining their strategies.

By implementing these adaptive strategies for climate change, libraries play a vital role in enabling society to access comprehensive information on climate change. This, in turn, facilitates better understanding and support for the achievement of the 17 sustainable development goals, contributing to the creation of a better world. The following section provides a detailed explanation of the strategies to engage stakeholders and implement climate change strategies.

7.1 Educational Programmes

Collaboration with local schools and colleges can offer educational programmes on climate change and adaptation by inviting climate experts and activists to give speeches and spread awareness, hosting screenings of documentaries, short films on world Meteorological Day (March 23) regarding climate change. Libraries can organize a quiz and debate competition on climate change and how to adapt to these changes. Libraries can assist local youth in creating climate and environmental awareness clubs and encourage others to engage in scientific and technical projects and to innovate new ideas for addressing climate change. These initiatives contribute to building climate-resilient and environmentally conscious communities. e.g., the UNESCO Climate Change Education for Sustainable Development programme.

7.2 Climate Resilience Information Centres

This initiative is an add-on by the library, where an exclusive Climate Resilience Information Centre has been established for its users. These centres consist of a wide range of resources covering topics from the environment to climate change. The resources available in the centres include books, reports, articles, maps, multimedia materials, theses and dissertations, conference proceedings, climate-related data from authoritative sources, as well as software that aids in understanding climate trends in the users' native language and within their respective regions. Through this the library empowers users to address the challenges posed by climate change. e.g., Climate Resilience Resource Centre, India.

7.3 Sustainable Practices

Libraries can set an example for society by changing their own practices. This includes implementing energy-efficient lighting, heating, and cooling systems to reduce the consumption of non-renewable energy. Libraries can also promote the three R's (reduce, recycle, and reuse) to minimize waste and resource usage. Moreover, libraries can impose bans on plastic items while advocating for the use of eco-friendly and sustainable products. Libraries should also be designed in a

way that ensures accessibility for everyone, including individuals with disabilities. e.g., Vancouver Public Library, Central Library (Canada).

7.4 Support Local Communities

Libraries are known for their add-on initiatives; the community should support them. Where local people share their knowledge, ideas, and experiences about how the climate used to be a few decades ago and how climate change is affecting the lives of living beings. Support locals by providing toolkits like guidebooks, maps, SMS alerts, access to weather reports from time to time, etc. on climate change adaptation so that they can prepare their own strategy according to their conviction. e.g., top of form libraries can hosts a "Climate Kids" summer camp, where children learn about climate change through interactive activities and field trips to local natural areas.

7.5 Advocate For Climate Action

Libraries can collaborate with local government bodies and climate advocacy groups. They will support libraries, add-on activities on climate change, and help society become more aware of climate change. Government bodies can help them gain access to valuable resources, information, and funding opportunities related to climate change. Government agencies often have access to localized climate data and research which libraries can use to inform their community about specific climate challenges and adaptations needed in their area. Climate advocacy groups often have a network of engaged community members libraries can benefit from this network by co-hosting events and awareness campaigns. e.g., libraries can host workshops on climate change, organize community discussions focused on climate-related topics. Libraries around the world that have implemented climate change adaptation measures are IFLA Climate Change and Sustainability Centre (Global), National Library of India (India).

8. The Role of Libraries in Educating Climate Change Effects

Libraries are the major contributors to disseminating information and acting as diversities of sustainable development, which is very important for climate action. There are many international frameworks that support libraries to empower society regarding climate and its changes through education, awareness among the people, and organizing different events for the society. The United Nations Framework Convention on Climate Change (UNFCCC) established a worldwide environmental treaty. This covers several agreements and articles, such as UNFCCC Article 6, Paris Agreement Article 12, Kyoto Protocol, Vienna Convention, etc.

Article 6 of the UNFCCC mandates the government's efforts to support education, training, and public awareness. For the development and implementation of education on climate change for society. This article supports the promotion of public access to information, encourages public participation, and facilitates training on climate change and its effects. Paris Agreement Article 12 says libraries are the natural institutes that turn words into actions. It is a place where resources are kept and add-on activities are done, through which libraries play an important role in empowering climate action programmes and services, which position them as agents for successful implementation. Examples of libraries include the Climate Empowerment Social Responsibility Programme, the Costa Rican Association of Librarians, Environmental Literacy, and Bilbao. India has already signed the Paris Agreement in 2016 in New York, which is enough to obtain support for libraries (Clairemcguire, 2021).

9. Use of Digital Medium in Disseminating Climate-Related Information

This is the era of the digital revolution (3rd Industrial Revolution), which is characterized by technology that enhances the speed of the sharing of information in society. Libraries generate digital resources such as virtual texts, photos, graphics, films, and so on, or transfer analogue items to a digital version. The libraries are attempting to take part in this change. Online databases and improved digital resource collections are being produced by libraries, which benefit from easy sharing, time savings, accessibility, and, above all, there are ecofriendly. In the age of information overload, libraries are the most reliable and accurate sources of information in society. Given the urgency of raising public awareness of climate issues, libraries should establish a specific collection focused on climate, climate change, and adaptation. The following are some ways that libraries can aid in the dissemination of knowledge about climate change in society:

- **Climate Information Portals:** Libraries can create a climate information portal in collaboration with the meteorological department for up-to-date information on climate. The National Library of Scotland provides information to its users, which includes resources, images, maps, etc.
- **Digital Libraries and Repositories:** Libraries are known for providing the opportunity for lifelong learning. In this digital age, libraries can design a digital library and repository for users so that they can access different resources from anywhere, at any time. Digital libraries can increase their digital collection either by converting traditional resources into digital resources or by creating digital resources. For example, the United Nations

Framework Convention on Climate Change (UNFCCC) Secretariat provides access to a digital library that houses documents and reports related to climate negotiations and agreements.

- **Online Catalogs and discovery System:** The library can develop and maintain online catalogues and discovery systems that give users the opportunity to search for climate-related resources. These online catalogues and discovery systems provide easy access to digital resources.
- **Open Access initiatives:** Libraries can support open-access initiatives on climate-related resources for their users so that the majority of people can benefit from them. For example, Harvard Digital Collections supports climate-related research.

10. Libraries, Local Government, and Environmental Organizations Collaborate For Climate Adaptation

Collaboration occurs when several parties come together to work through and implement a collective solution to a complex problem. Adaptation is well-suited to a collaborative approach because of the wide range of expertise required, the need for stakeholder engagement to ensure successful outcomes. Collaboration can take place around financing, implementation, knowledge generation, monitoring, and evaluation. It can help to realize any opportunities arising from climate change as well as to address the risks (Burton, 2016). Collaboration between libraries and local government agencies, environmental organizations, and other stakeholders in climate change action will enhance the effectiveness of adaptation. These agencies and organizations will help in acquiring and disseminating information in society, and libraries will get financial support from government agencies for organizing add-on activities and for the development of new resources on climate change adaptation in the libraries. Environmental organizations will be able to help the libraries by providing resources, climate-related real-time data, support for development, and bringing awareness to society. Stakeholder libraries can generate diverse ideas by brainstorming to develop innovative climate adaptation solutions and a more resilient future.

11. Conclusion

Climate change poses an imminent threat to Earth, endangering both the environment and humanity, hurtling towards a path of destruction. Simultaneously, libraries face a perilous decline marked by a rapid reduction in users and visits.

Scholars within the library field are actively engaged in research endeavours, seeking to rejuvenate libraries by integrating various life concepts. Thus, climate change remains an unexplored domain within the realm of libraries. Both climate change and libraries are integral to each other's survival; the former must be addressed for the preservation of libraries, while the latter needs to confront climate change for its own sustenance. Libraries have the potential to engage climate change advocates by aligning with their cause and garnering government attention through substantive contributions to society. Urgent global action is imperative to control climate change, making this study a potential model for libraries. It proposes incorporating the Climate Change Adaptation Cycle and Sustainable Development Goals (SDGs) as frameworks, illustrating the interconnectedness of climate change and broader developmental objectives.

The study emphasizes the pivotal role of libraries in educating society about the effects of climate change. It suggests alignment with international frameworks such as the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement. Recognizing the digital age's influence, the study underscores the importance of libraries employing digital mediums for disseminating climate-related information. Furthermore, the collaboration between libraries, local government, and environmental organizations is advocated as a critical component for effective climate adaptation. Through collective efforts, these entities can pool resources, disseminate information, and develop innovative solutions to address climate change challenges. In essence, this study advocates for the transformation of libraries into dynamic agents of climate change awareness and adaptation, fostering resilient communities and contributing to the global effort for a sustainable future. As interconnected environmental challenges intensify, the collaboration and proactive engagement of libraries become essential in building a resilient and climate-aware society.

References

1. Abaobi, A. D. et al. (2022). Sources of Library Information Needs for Climate Change Adaptation among Rural Farmers in South Eastern Nigeria. Library Philosophy and Practice (e-journal), 1 - 16.

2. Abaobi, A. D. et al. (2022). Extent of Provision of Library information for Climate Change Adaptation among Rural Farmers in Nigeria. University of Nigeria, Nsukka, 1-14.

3. Abbass, K. et.al (2022). A review of the global climate change impacts, adaptation, and sustainable mitigation measures. Environmental Science and Pollution Research, 42539–42559.

4. Adedeji, O. et al. (2014). Global Climate Change. Journal of Geoscience and Environment Protection, 2, 114-122.

5. Auraria, L. (2014). Research Methods: Literature Reviews. Auraria Library: https://guides.auraria.edu/researchmethods/literaturereviews

6. Aytac, S. (2022). Libraries as Agents of Climate Change Literacy. IFLA WLIC 2022 Dublin, 1 -9.

7. Banda, P. C. (2021). The Potential Role of Zambian Public Libraries in Actualizing the Global Climate Change Agenda. Library Philosophy and Practice (e-journal), 1 - 17.

8. Clairemcguire. (2021). Library Policy and Advocacy Blog, International Fedration of Libaray Association and Instutions.

9. Commission, E. (2023). Climate Action. European Commission: https://climate.ec.europa.eu/climate-change/consequences-climate-change_en

10. Group, T. W. (2021). What is Climate Change Climate Change Knowledge Portal: climate knowledge portal. https://shorturl.at/cdGK4

11. Jochumsen, M. H. (2022). Libraries, sustainability and sustainable development: a review of the research literature. Journal of Documentation, 1278 - 1304.

12. Libaray, U. D. (2021). UC Davis Libaray. The University of California. https://urlis.net/9gzs3n08

13. Library, H. D. (2022). Harvard Digital Collection. HARVARD LIBRARY: https://library.harvard.edu/digital-collections

14. Scotland, T. N. (2022). Climate action. The National Library of Scotland: https://www.nls.uk/climate-action/

15. Society, N. G. (2023). All About Climate. National Geographic Education: https://education.nationalgeographic.org/resource/all-about-climate/

16. United Nations Development Programme (n.d.). The SDGS in Action. UNDP: https://www.undp.org/publications/sdgs-action

17. United Nations (2022). Department of Economic and Social Affairs the 17 goals. UN: https://sdgs.un.org/goals

18. United Nations. (2021). Causes and Effects of Climate Change. United Nations: https://www.un.org/en/climatechange/science/causes-effects-climate-change

19. United Nations, (2021). Contribution of Libraries to the SDGs. UN, Department of Economic and Social Affairs Sustainable Development.

20. United Nations, (2006). UN digital library. UN digital library: https://digitallibrary.un.org/record/691248?ln=en

21. Woolley, L. A. (2023). The Role of Academic Libraries in Climate Action. New Review of Academic Librarianship, pp. 117–122.

Futuristic Approach for Sustainability in Krishna Kanta Handiqui Library, Gauhati University (KKHL, GU): a Case Study

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ABSTRACT: The concept of a 'green and sustainable library' is gaining popularity day by day. We are advancing technology-wise and somewhere it affects the environment. The stakeholders are concerned about this issue and creating awareness and finding measures to minimize the negative impact on the environment or nature. Sustainability is becoming more and more important in this vast concrete habitat that we currently live in. Little actions now can have a major impact later on. Raising awareness of environmental issues won't cost a lot of money. A library that is built with consideration for environmental considerations is called a 'green library'. India secured 2nd rank in the World for Green Building list of top 10 countries certified by the United States Green Building Council (USGBC)-Leadership in Energy and Environmental Design in 2022.

The article is a case study of current actions made or adopted by the Krishna Kanta Handiqui Library Gauhati University (KKHL, GU) in order to preserve sustainability going forward, keeping our mother earth greener and finding out the alternatives/possibilities of future sustainability. Although the idea of a 'green library' is not new, there are few examples of its implementation.

KEYWORDS: Sustainability, Krishna Kanta Handiqui Library, Gauhati University (KKHL, GU), green library, sustainable library, green and sustainable libraries, LEED, standards, environment

1. Introduction

The importance of green and sustainable libraries is directly linked with the best practices that encourage minimal use of products or services that harm the environment. The present environmental hazards like climate change, global warming, pollution, etc. are drawing the attention of stakeholders to maximize the

use of reusable, recyclable, and renewable products and services in the libraries. There are criteria for green and sustainable libraries standardized by Leadership in Energy and Environment Design (LEED) & Indian Green Building Council (IGBC), which are accepted globally. The standards of LEED have identified five major aspects; site location of the library building, building materials, conservation of water resources, use of energy-efficient products, services, and equipment, etc., and indoor and outdoor air quality.

Nowadays, people are aware of the current environmental conditions, and the library as a social institution can spread this awareness among the masses by organizing various library extension services, activities, and programmes, like quizzes/essay/art competitions, lectures, talks, street drama, celebrating 'World Environment Day', and 'Swachh Bharat Diwas', etc.

1.1 Definitions

IFLA (2022) defines, "A green and sustainable library is a library which takes into account environmental, economic and social sustainability" (IFLA, 2022).

Oxford Online English Dictionary defined the term 'green' as "pertaining to, or supporting environmentalism." The term 'sustainable' relates to "forms of human economic activity and culture that do not lead to environmental degradation, esp. avoiding the long-term depletion of natural resources".

According to the Online Dictionary for Library and Information (ODLIS), green libraries are "designed to minimize the negative impact on the natural environment and maximize indoor environmental quality by means of careful site selection, use of natural construction materials and biodegradable products, conservation of resources (water, energy, paper), and responsible waste disposal (recycling, etc.)".

According to Wikipedia, "a green library is designed to minimize the negative impact on the natural environment and maximize indoor environmental quality by means of careful site selection, use of natural construction materials and biodegradable products, conservation of resources and responsible waste disposal".

1.2 Purpose of the Study

Natural disasters such as floods, earthquakes, soil erosion, depletion of the ozone level, warming of the planet, and climate change are now the most common occurrences on Earth; using natural resources shouldn't be depleted to the point that the next generation is completely incapable of surviving. These days, drought and flooding are two examples of the many natural calamities that affect mankind. These significantly impact human life and health. Uttarakhand mishap

in June 2013 and the Himachal Pradesh flood in July 2023 are the most recent and greatest examples of how nature is alarming us. As a result, sustainability is crucial to preserving the future for future generations.

Libraries also employ the idea of sustainability, and the phrases 'green library' and 'sustainable library' have gained popularity. As a social institution, libraries have obligations to the environment and to civilization. As a result, eco-friendliness has been accepted and is now being implemented in libraries in terms of behavior, goods, services, and resources.

1.3 Importance of Green Libraries

These days, technology is a necessary component of daily life. People's modern lifestyles rely largely on technology. Perhaps in our quest to be technologically adept, we are sacrificing our natural roots. Natural disasters such as earthquakes, floods, soil erosion, global warming, and climate change are now the most common occurrences on Earth. As a result, a lot of people are interested in the idea of sustainability. People are conscious of the environmental impact of the things they use these days. Individuals are searching for natural, organic, or reusable, renewable items that are less harmful to the environment or biodegradable. For a healthy living, the concept of 'green' is essential. Every industry has seen a rise in interest in the green revolution in recent years, and libraries are no exception. The effects of climate change on dependents grew severe especially those who are global in scope. Thus, several studies and advancements are being conducted to lessen the difficulty, and numerous scientists are working on various initiatives to find solutions. In the modern world, when the environment is impacted by a number of factors, including the greenhouse effect, ozone depletion, global warming, and carbon dioxide, environmental conservation is essential to human existence. Daily time changes mean that our natural resources are little. It is our collective duty to leave a healthy world for future generations.

When we consider issues like global warming and climate change, libraries are not the first things that come to mind. However, libraries add to the issue by using a lot of energy to provide their services. To ensure our existence and quality of life, the natural environment must be in good health. Thus, it is imperative that librarians take a leading role in improving the environment. By selecting a suitable location for the library building, using natural and biodegradable building materials, conserving resources like water, energy, and paper, and being accountable for waste material recycling, we may create a green library.

2. Literature Review

Various studies have been conducted on the conceptional framework of green and sustainable libraries, its features, background study of green library movements, different green building standards (Antonelli, 2008; Banger, 2008; Vijayalakshmi, 2010, Purohit, 2013; Aulisio, 2013; Rabidas, 2016; Vasanthi, 2019; ALA, 2019; Shukla, Sharma & Singh, 2020; Pagore & Chalukya, 2022).

Malode (2008) studied green libraries and found that not only has energy saving gained importance but also that in user-friendly places, the modular system proved especially effective in accommodating the ever-growing book collections, although the pursuit of book collection growth is no longer an achievable goal. A green library, often referred to as a sustainable library, is one that was constructed with consideration for the environment. Green libraries are part of the wider green construction movement. Globally, green libraries are being constructed, and in conjunction with library 2.0, green design is a new movement that is defining the 21st-century library (Malode, 2008).

Chakraborty (2013) surveyed four university libraries in India namely; Calcutta University, Madras University, Mumbai University, and Delhi University to find out their eco-friendliness. The study shows that the four surveyed libraries are built traditionally eco-friendly, in terms of great heights, widths, thick walls, airy, sunshade facilities, proper ventilation, etc. These libraries' architecture follows traditional heritage culture. The use of glasses in windows, doors, and ventilations allow ample natural light to the library.

3. Standards for Green and Sustainable Libraries

The importance of green libraries is directly linked with the best practices that encourage minimal use of products or services that harm the environment. The present environmental hazards like climate change, global warming, pollution, etc. are drawing the attention of stakeholders to maximize the use of reusable, recyclable, and renewable products and services in the libraries. There are criteria for green and sustainable libraries standardized by Leadership in Energy and Environment Design (LEED) & Indian Green Building Council (IGBC), which are accepted globally. The standards of LEED have identified five major aspects; site location of the library building, building materials, conservation of water resources, use of energy-efficient products, services, and equipment, etc., and indoor and outdoor air quality. Apart from these, other standards are also taken into consideration.

3.1 LEED (Leadership in Energy and Environmental Design)

A green building certification programme that is utilized all around the world is called Leadership in Energy and Environmental Design, or LEED developed by the U.S. Green Building Council (USGBC). In order to support building owners and operators in being resource-conscious and environmentally conscious, the non-profit USGBC developed a set of rating systems for the design, construction, operation, and maintenance of green homes, neighbourhoods, and buildings. In 2023, 185 nations throughout the world had more than 105,000 LEED-certified buildings and over 205,000 LEED-accredited personnel. LEED has been called a "transformative force in the design and construction industry". In addition to supporting sustainable forestry and helping professionals think about buildings in terms of occupant well-being and broader systems, LEED is recognized for having established a framework for green construction and for promoting the use of green goods and practices in structures. Since 1998, LEED has changed to better reflect and take into account newly developed green building technology. LEED New Construction (NC) v1.0 was the pilot version. It was followed by LEED NCv2.0, LEED NCv2.2, LEED (LEED v3) in 2009, and LEED v4 in November 2013. For newly registered projects starting on October 31, 2016, LEED 2009 was discounted. April 2, 2019, saw the introduction of LEED v4.1. It is anticipated that LEED v5 will be available on January 1, 2024.

3.2 IGBC (Indian Green Building Council)

The Confederation of Indian Industry (CII) established the Indian Green Building Council (IGBC) in 2001. India's leading organization for green building certification and associated services is IGBC. With the help of several stakeholders, they have now accomplished the following important milestones i.e. 8,669 projects registered members. The following levels (in ascending order) correspond to the green initiatives that have received an IGBC rating: Certified, Silver, Gold, and Platinum.

3.3 EDGE Program

Through the IFC's EDGE certification, the Confederation of Real Estate Developers' Associations of India (CREDAI), a leading organization of private real estate developers, and the IFC, a member of the World Bank Group, are working together to promote green buildings in the nation.

3.4 The Energy Conservation Building Code (ECBC)

The Energy Conservation Building Code (ECBC) was introduced by the Indian Bureau of Energy Efficiency (BEE). Design and construction of buildings with a

minimum conditioned area of 1,000 m2 and a connected power consumption of 500 KW or 600 KVA are subject to the code's energy efficiency requirements. A building can be referred to be an "ECBC Compliant Building" if it meets the code's energy performance index, which ranges from 90 kWh/sqm/year to 200 kWh/sqm/year.

3.5 Green Rating for Integrated Habitat Assessment (GRIHA)

The Government of India selected GRIHA (Green Rating for Integrated Habitat Assessment), created by TERI, as the national green building rating system in 2007. GRIHA is an acronym for Green Rating for Integrated Habitat Assessment. GRIHA is a grading system that assists users in evaluating a building's performance in comparison to a set of nationally recognized criteria. By assessing a building's environmental performance holistically throughout the course of its whole life cycle, it establishes a clear definition of what qualifies as a "green building." Based on widely acknowledged energy and environmental principles, the grading system will aim to achieve a balance between long-standing customs and cutting-edge, both domestically and globally recognized ideas.

4 Benefits of Green Libraries

Green libraries are the future of libraries, where scientific and systematic planning can extend the benefits or advantages of creating green libraries.

(i) Eco-friendly products
(ii) Cost-effective
(iii) Reusable products
(iv) Less dependent
(v) Improves Air Quality Index (AQI)
(vi) Creates healthy atmospheres
(vii) Reduce energy consumption
(viii) Recycling is possible
(ix) Improves productivity
(x) Reduce paper usage/ wastage
(xi) Lower maintenance cost

5. About Krishna Kanta Handiqui Library, Gauhati University (KKHL, GU)

Gauhati University was established in 1948. In the same year, the 'University Library' was also established, to cater to its bonafide students, faculty members,

research scholars, staff, etc. In 1982, the library was renamed after the death of the founding Vice-Chancellor, Prof. Krishna Kanta Handiqui. He was a Sanskrit scholar and polyglot, who knew 11 different languages; namely Sanskrit, Pali, Prakrit, English, French, Italian, German, Latin, Spanish, Greek, and Russian. He had a precious personal collection of 7,593 volumes, donated to the KKHL, GU. Presently it is known as Krishna Kanta Handiqui Library, Gauhati University (KKHL, GU). The library It has a large collection of books, back volumes, report literature, dissertations, Ph.D. theses, manuscripts, Digitized Manuscripts, Digitized Theses, etc. Apart from these collections KKHL, GU has special collections, i.e., KK Handiqui Collection, Dr. Bhupen Hazarika Corner, Vivekananda Corner, Gandhi Collection, Dr Maheswar Neog Collection, Aurobindo Corner, Nehru Corner, Women's Corner, Collection of Manuscripts on Sanchipat, Tulapat etc., Back Volumes of Journals and Selected Newspapers, Textbook Corner, NE Corner, UN Corner, Thailand Corner.

6. Observation and Discussion

Based on observations and a thorough examination of several information sources, the following comments are made, and the table below outlines the future course of action and those that are currently performed in the KKHL, GU.

6.1 Physical Standards

Table 1: Showing Physical Standards for Sustainability

Sl No.	Areas	Current Approach	Future Approach (based on Sustainability standards)
1	Direction for building entrance	South	South-East
2	Entry ambiance	Spacious	As per standards
3	Plants indoor/ outdoor	Plants are available in both indoor and outdoor	As per standards
4	Furniture	Wooden, Steel,	Sustainable furniture: Bamboo, cane, natural fibers, reclaimed wood, cork and recycled materials,
5	Windows: materials/curtains	Glass, wooden, Iron	Khus-Khus (curtains for windows)/ Aluminum windows

Sl No.	Areas	Current Approach	Future Approach (based on Sustainability standards)
6	Stacks	Wooden stacks/racks/ almirahs, Iron Shelves	Wooden or Sliding stacks
7	Lightings	LED bulbs/Tube-lights	Motion sensor Lights
8	Air Quality Index of the Library	49 μg/m^3	Should be at or below 100μg/ m^3
9	Plastic free zone	Yes	Yes
10	Waste management: paper/e-waste/bio-waste/discarded furniture	No policy for waste management of paper and e-waste or bio-waste is undertaken' Discarded furniture is refurbished	Recommendation for maintaining waste management of paper, e-waste and bio-waste is necessary
11	Use of organic products in house-keeping operations	Organic floor cleaners, brooms, pesticides	As per standards
12	Transparent roofing	No	For better natural lighting
13	Promotion of using e-office documents: notice/circular/ leaflet/pamphlet	Both print & e-documents	Needs more stress on e-documents

Table 1 represents the physical standard of sustainable and green library already implemented and available in the KKHL, GU along with recommended actions as per standards. It reveals that KKHL, GU has south south-faced entrance, where a south-east direction is recommended as per standards specially in tropical countries like India. Glass windows, and doors should be installed for maximum natural daylight. Proper ventilation controls heating and cooling naturally. Aluminium windows along with Khus-Khus material is recommended for window and curtains. Transparent roofing allows maximum natural light inside the library, which is not found in KKHL, GU. The surveyed library is furnished with wooden, steel, and iron furniture. Wooden, bamboo, cane, and fiber-based furniture should be acquired in the green and sustainable library.

6. 2 Water Management

Table 2: Showing Water Management requirements

Sl No.	Areas	Current Approach	Future Approach (based on Sustainability standards)
1	Water Reservoirs	Tanks	Closed or open Tanks
2	Rainwater harvesting	No provision	Open water reservoirs are recommended
3	Drinking water facility	Yes	Yes
4	Provision of water reusability	No provision	Reclaimed water can be used for irrigation of plants/ gardening, etc.
5	Routine monitoring and fixing of leakages	Done in regular intervals	Checked more frequently. Low flow fixtures, use of low water flow toilets, water-less urinals

Table 2 displays the water management provisions available in KKHL, GU. It has water reservoirs as water tanks for water conservation. Provisions for rainwater harvesting reservoirs should be planned systematically. Rain-water harvesting techniques promote water reusability. Low flush toilets should be implemented, as it will reduce water wastage.

6.3 Energy Efficiency

Table 3: Showing Energy Efficiency for maintaining sustainability

Sl No.	Areas	Current Approach	Future Approach (based on Sustainability standards)
1	Use of Energy-efficient products: motion-sensor lights/Energy Star-rated equipment	Energy star rated equipment are present	Need to stress on
2	Provision for Solar Plates	Yes, but not in use	Must be used for power backups
3	Use of laptops instead of desktops	No	Laptops consume less power supply
4	Utilizing paper efficiency by both-side printing	Yes	As recommended

Sl No.	Areas	Current Approach	Future Approach (based on Sustainability standards)
5	Use of Storage devices: cloud storage/hard drives/HD/SDD cards	Yes	As recommended
6	Shared networks	Yes	As recommended
7	Auto-Power saving mode, while not in use (electronic equipment)	Yes	As recommended
8	Buying recycled ink cartridges and supplies	Yes	As recommended

Table 3 reveals the energy efficiency techniques presently used in KKHL, GU. Use of energy-efficient products; star-rated products, equipment, lights, motion sensor lights, etc. should be used instead of tube lights. The use of solar plates encourages the use of natural electricity. Setting auto power saving mode on for electronic equipment while not in use reduces energy consumption.

6.4 Social & Economic Outlooks

Table 4: Showing Social and Economic Standards

Sl No.	Areas	Current Approach	Future Approach (based on Sustainability standards)
1	Creating awareness	Yes	For maintaining a Sustainable environment in and around the Library, awareness among staff and users is needed
2	Tree plantation	Yes	Should plant trees like Pine, Oak, and Mangroves for better carbon dioxide absorption
3	Bicycle zone	Yes	Yes
4	Minimizing sound pollution	Yes	No use of vehicles (petrol/diesel)/ no horn zone

Table 4 discloses the social and economic aspects of sustainability. It reveals that KKHL, GU is taking initiatives to create awareness of the social and economic values of creating greenery on the campus. No horn zones can help to control sound pollution.

6.5 Green Library Services

Table 5: Showing Green Library Services

Sl No.	Areas	Current Approach	Future Approach (based on Sustainability standards)
1	Digital check-in/ check-out	Yes	Should avoid plastic cards
2	Online membership applications	Yes	As recommended
3	e-receipts	Yes	As recommended
4	Use of OPAC	Yes	As recommended
5	Online Issue/return	Yes	Will aid in lowering the usage of paper
6	e-Gate pass	No	As recommended
7	Maintenance of e-registers	No	Minimize the use of paper
8	Use of organic products for preservation and conservation	No	Should use neem or eucalyptus leaves, camphor and other natural products.
9	e-DDS (e-Document Delivery System)	Yes, on Demand	As recommended
10	Remote log-in	Yes	As recommended
11	Wi-fi enabled zone	Yes	As recommended
12	maximum use of e-resources: e-books / e-journals/ databases, etc.	Yes	Should use web2.0/ 3.0 technologies
13	Use of Web Dewey for Classification	Yes	As recommended
14	Implementation of Barcode/ RFID system	Barcode system is in process	RFID system
15	Back-up files	Yes	As recommended
16	Weeding out of books	Yes	Should use Paper Shredder for recycling

Table 5 represents the green library services available in KKHL, GU, and the future scopes of environment-friendly library services.

7. Conclusion

The creation of a new green and sustainable library in a scientific way is easy and cost-effective. But in the case of already existing and functioning libraries, introducing and implementing the aspects of green and sustainable libraries will require proper strategy and planning. Constant monitoring and observation of the library from every aspect and re-engineering the library by adopting and implementing green and sustainable library standards are stimulating. KKHL, GU has already adopted green and sustainable library initiatives and started implementing green measures in every possible way. Technology has become an essential element of our lives. We must create a balance between technology and the environment. If we try to develop a few green habits that reduce the impact on the environment, it will be beneficial for both nature and humankind. For example, use recycled papers/plastics, stop using single-use plastics, make a habit of carrying reusable bottles, use refilled cartridges instead of buying new ones, plant trees, keep air purifier plants indoors/outdoors, use bags of cloth instead of polytene, use organic and bio-degradable/renewable products over chemical concentrated products, segregate plastic and wet garbage, do not throw plastic here and there, etc. national stakeholders like University Grant Commission (UGC) and National Assessment and Accreditation Council (NAAC) can take initiative towards promoting green and sustainable libraries in academic institutions, by organizing workshops, seminars, symposiums, etc. They can start a rating system for the libraries on their green achievements, etc. It will motivate the stakeholders, librarians, and other library professionals to transform and implement green and sustainable measures in their libraries.

References:

1. Antonelli, M. (2008) the green library movement: An overview and beyond, *electronic green Journal*, 1(27), 1-11. http://escholarship.org/uc/item/39d3v236

2. Aulisio, George J. (2013). Green libraries are more than just buildings. *Electronic Green Journal*, 1(35), 1-8. DOI: https://doi.org/10.5070/G313514058

3. Bangar, M. S. (2018). Green Libraries in India: An Overview. *Knowledge Librarian: An International Peer Reviewed Bilingual E-Journal of Library and Information Science*, special issue, 222–230. http://www.klibjlis.com

4. Chakraborty, S. (2013). Going green or not: realities of the Indian metropolis Libraries. IFLA WLIC-2013.1-13.

5. https://en.wikipedia.org/wiki/Green_library

6. https://gauhati.ac.in/academic/library/kk-handiqui-library#nav-4

7. https://igbc.in/assets/html_pdfs/IGBC_Green_New_Buildings_Rating_System_(Version_3.0_with_Fifth_Addendum).pdf

8. Kulkarni, P.P. (2018). Green Library: concept, features and elements. *Journal of Emerging Technologies and Innovative Research (JETIR)*, 5(1), 1456-1460. www.jetir.org

9. Malode, Amit V. " Green Library: An overview", Research Journey' International Multidisciplinary *E- Research Journal*, Vol. 1 Issue. 4,2014, p:13-17.

10. Pagore, R., Chalukya, B.V. (2022). Green library: an overview. *IP Indian Journal of Library Science and Information Technology,* 7(1), 36-39. DOI: 10.18231/j.ijlsit.2022.007

11. Purohit, S. (2013). Green Library- A New Concept of Library. International Conference on Entrepreneurial Approaches to Librarianship. MANLIBNET. http://www.mugeakbulut.com/bby721/wp-content/uploads/2017/03/21-09-2013-Prohit.pdf

12. Rabidas, S. (2016). Green Library Buildings: A Sustainable Process. *International Journal of Advance Research and Innovative Ideas in Education*, *2*(6), 342–346. www.ijariie.com

13. U.S. Green Building Council (USGBC). (n.d.). *LEED is an internationally recognized green building program*. http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1988

14. Vasanthi, R. (2019). Green library trends and development in India: a study. *IJARIIE*, 5 (5), 475-479. www.ijariie.com

15. Vijayalaxmi, B. (2010) Green Library – An Overview. *Pearl: A Journal of Library and Information Science*, 4(4). 266-270.

16. *What is a Green Library?* (2022). IFLA. https://www.ifla.org/g/environment-sustainability-and-libraries/ifla-green-library-definition

A Study of Ergonomic Practices and Health Wellbeing among the College Library Employees Affiliated to Sant Gadge Baba Amravati University

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ABSTRACT: This study investigated the impact of ergonomic practices and health wellbeing, job satisfaction on college library employees affiliated to Sant Gadge Baba Amravati University in Maharashtra. The findings revealed that there was a positive relationship between ergonomic practices and health wellbeing. It was, therefore, recommended that ergonomic measures that would involve the set-up of adequate and healthy workstation equipment designs, which would allow the users to adopt optimal working postures suitable for a greater job satisfaction to boost a working performance in the college libraries.

1. Introduction:

College libraries play a vital role in the academic and intellectual development of students and faculty members. They provide access to a vast array of learning resources such as books, journals, and other materials that are necessary for research and learning. However, the design and layout of library spaces can have a significant impact on the physical and mental well-being of library employees. Ergonomic issues such as uncomfortable furniture and equipment's, unorganized workplace and workplace, poor lighting, and inadequate ventilation can lead to physical discomfort, fatigue, and decreased concentration, affecting the overall quality and capacity of working.

This study aims to investigate the impact of ergonomic practices and health wellbeing, job satisfaction on college library employees affiliated to Sant Gadge Baba Amravati University in Maharashtra. The study seeks to identify the level of awareness of ergonomic issues among college library employees, their experiences with discomfort or pain while using library spaces, their satisfaction with the design and layout of library furniture and equipment, and their recommendations for improvements. The findings of this study will provide valuable insights for library management and policymakers to develop and implement strategies for promoting ergonomic practices in college libraries.

2. Review of Literature:

Asaolu, (2014) stated that the library staff requires sound health to be maximally productive at work. This is because they sit for long hours carrying out their daily routines, and as such every workstation should be designed with both the worker and the task in mind so that work can be performed comfortably, smoothly and efficiently. 60% of respondents agreed that properly designed computer workstation improves the standard of work in a library, as such preventing on-the-job injury or disease should be the priority of any organization, especially the library, since it is the hub of the institution. Ikonne, (2014) examined the influence of spatial comfort and environmental workplace ergonomics on the job satisfaction of librarians in the Federal and State University libraries in Southern Nigeria. The study adopted the survey research design. The total enumeration technique was used to survey the 500 librarians from the 37 federal and state universities libraries in Southern Nigeria. Descriptive statistics was used to analyse the data collected. The findings revealed that there was a positive relationship between ergonomics (spatial comfort and environmental workplace factors) and job satisfaction. It was recommended that ergonomic measures be introduced and implemented in the design of spatial comfort and environmental workplace factors in the libraries for a greater job satisfaction of the library workforce in Nigerian University libraries. Asmui, (2012) providing the healthful facilities must be taking into account. The examples of facilities are chair seating and lighting. A proper chair seating and sufficient lighting play important role in ensuring employees' welfare are protected as well their work performance goes up. The ignorance of these important healthful work environments will lead to work stress. Jan, (2012) was argued that 'ergonomics' and 'human factors' to be synonymous, and we adopt the IEA definition of the discipline (IEA 2000): 'Ergonomics (or human factors) is the scientific discipline concerned with the understanding of the interactions among humans and other elements of a system, and the profession that applies theoretical principles, data and methods to design in order to optimize human well-being and overall system performance.' To identify the discipline throughout this paper, we have selected the name 'human factors/ergonomics' (HFE). By accepting this definition, we also accept the view that HFE is a scientific discipline and not only a (multidisciplinary) approach to problem solving. We also accept that this definition reflects a more positivist rather than a more constructivist view on the discipline. Ali, (2012) has done a study with an aim to understand the relationship between the employees' performance and their physical work environment. Populations for the study were the private sector corporations of Egypt. Result shows that office design has a substantial impact on the employees'

performance. Garbie, (2011) conducted an experimental study to investigate the effects of assembly of a product on operator performance with a fully adjustable ergonomically designed assembly workstation Ten college students five boys' group and five girls' group; randomly assigned into three experimental conditions (table adjustable, chair adjustable, and gender) performed the assembly task. The results shows that female is more productive than male.

Objectives of the Research Study:

1. To study overall satisfaction of the library employees towards library furniture, fixture, equipment, technology and facilities provided by college libraries.
2. To analyse the relation of ergonomic practices and the health and well-being of college library employees affiliated to Sant Gadge Baba Amravati University.

4. Research Methodology:

4.1 Research Method:

Descriptive method was used for research in this research paper. As the area of research is vast and wide spread it is hard to collect data so survey method is adopted for this study.

4.2 Sampling Method:

The process of sampling is selecting units from a set of peoples who are interested in studying the sample we may fairly generalize the results back to the population from the area that they have chosen. Data was collected from the Library employees.

4.3 Data collection:

To answer specified research questions, test hypotheses, and assess results, data collection is the act of acquiring and measuring information on variables of interest in a systematic and defined manner. Primary data is that kind data which is freshly collected. In this study primary data has not collected. This study is total based on secondary data. Secondary data means that kind of data which already is available on various platforms and it can be collected using the help of research papers, journals, newspaper articles, personal blogs, etc.

4.4 Sample Size:

Respondents	Frequency		Total	Percentage
	Male	Female		
Librarian	57	06	63	23%
Assistant Librarian	12	05	17	6%
Professional Assistant	10	08	36	13%
Library Assistant	48	23	71	18%
Library Attendant	42	31	73	12%
Library Clark	16	10	26	10%
Total	**185**	**83**	**268**	**100%**

5. Observation And Result:

5.1 Satisfaction of the Library Employees:

Parameters	Frequency Scale				
	SA	AG	NE	DA	SD
The height of my worktable is satisfactory in relation to my posture and viewing	97	109	30	25	7
My workstation is designed to ensure that my wrist and hands do not rest on sharp or hard edges	88	98	48	18	16
My computer workstation design is large enough for my work	108	99	18	31	12
My computer workstation design is comfortable for my work posture (sitting/standing)	130	80	30	18	10
I have sufficient room between the top of my thighs and my computer table	78	140	15	28	7
The quality of my workstation equipment is good enough for me to work effectively	65	78	88	26	11
My workstation design is suitable for my work in the library	102	98	43	22	3
My computer workstation furniture is flexible and suitable enough for me to adjust, rearrange or reorganized my work	97	103	32	21	15
The backrest of my chair adequately supports my lower back as I work	110	95	35	24	4

Parameters	Frequency Scale				
	SA	AG	NE	DA	SD
I am easily accessed from my colleague's workstation	98	106	45	12	7
My workstation and equipment have sufficient adjustability that ensures a healthy working posture	99	110	41	15	3
My chairs are adjustable to fit my workstation	115	98	26	19	10
My workstation design is adequately equipped for my typical office needs	97	92	68	3	8
Total	1372	1402	598	266	114

(**Source:** Computed from the Survey Data, **Note:** *SA: Strongly Agree, AG: Agree, NE: Neutral, DA: Disagree, SD: Strongly Disagree)

6. Hypothesis of the Research Study:

H0: - There is no significant relationship between ergonomic practices and the health and well-being of college library employees.

H01: - There is a significant relationship between ergonomic practices and the health and well-being of college library users.

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	15.015[a]	3	.041
Likelihood Ratio	15.710	3	.001
Linear-by-Linear Association	7.052	2	.008
N of Valid Cases	51		
a. 0 cells (0.0%) have expected count more than 0.5 The minimum expected count is 7.42.			

The chi square statistic appears in the Value column immediately to the right of "Pearson Chi-Square". In this example, the value of the chi square statistic is 15.015. The *p*-value (.041) appears in the same row in the "Asymptotic Significance (2-sided)" column. The result is significant if this value is equal to or less than the designated alpha level (normally .05). In this case, the *p*-value is less than the standard alpha value, so we'd reject the null hypothesis that asserts the two variables are dependent of each other. To put it simply, the result is significant

the data suggests that the variables ergonomic practices and the health and well-being of college library employees are associated with each other. Here it is concluded that, there is a significant relationship between ergonomic practices and the health and well-being of college library employees.

Conclusions and Recommendations:

After conducting a study on the Impact of ergonomic practices and health wellbeing, job satisfaction on college library employees affiliated to Sant Gadge Baba Amravati University in Maharashtra. It can be concluded that there is a significant lack of awareness regarding ergonomics among the college library employees. The findings of the study show that the majority of the library employees do not use ergonomic furniture and equipment, such as chairs with lumbar support or adjustable desks. This is a matter of concern as prolonged sitting in uncomfortable positions can cause severe pain and discomfort in the back, neck, and shoulders. Additionally, the lack of awareness about ergonomics may also lead to decreased productivity and concentration levels among the library employees.

The study also found that there is a need for more information and education about ergonomics among college library employees in affiliated colleges. Library employees need to be informed about the proper sitting posture, desk height, and other ergonomic principles. Providing them with this knowledge will not only help them prevent musculoskeletal disorders but also lead to a more comfortable and productive learning experience. In conclusion, this study highlights the importance of promoting ergonomics in college libraries affiliated to Sant Gadge Baba Amravati University. By providing ergonomic furniture and equipment and educating employees about ergonomics, college libraries can create a safe and comfortable environment for their users, which can lead to improved academic as well as work performance and overall well-being.

References:

1. Ali, El-Zeiny., & Mahmoud, Rasha. (2012). The interior Design of work place and its Impact on Employee performance: A Case Study of the private Sector Corporations in Egypt, Procedia-Social and behavioural Science, 35, 746-756. https://doi.org/10.1016/j.sbspro.2012.02.145

2. Asaolu, Aderonke Olufunke & Itsekor, Victoria. (2014). Ergonomic Computer Workstation considerations for library Staff. International Journal of Academic Library and Information Science. 2 (3), 22-26. Retrieved from http://eprints.covenantuniversity.edu.ng/3685/1/Asaolu%20and%20Itsekor.htm

3. Asmui, Mas'udah., Hussin, Adibah & Halil, Paino. (2012).The Importance of Work Environment Facilities. International Journal of Learning & Development. 2 (1), 289-298. http://dx.doi.org/10.5296/ijld.v2i1.1325

4. Chandra, et al. (2009). Ergonomics issues in Academic Libraries in Kolkata, West Bengal: A Pilot Study. Library Philosophy and Practice (e-journal).Paper 279. Retrieved from http://digitalcommons.unl.edu/libphilprac/27916

5. Fernandez, J.E. (1995). Ergonomics in the workplace. Facilities. 13 (4), 20-27.

6. Garbie, Ibrahim H. (2011). An Experimental Study on assembly workstation considering ergonomically issues. Proceeding of the 41st international conference on computer and industrial engineering. 275-281.

7. Helander, M.G. (1997). The human factors profession. In: Salvendy, G. (Ed.), handbook of Human Factors and Ergonomics. Wiley, New York, USA, 3-16.

8. Hernon, P., & Schwartz, C. (2007). What is a problem statement? Library & Information Science Research, 29 (2), 307-309.

9. Ikonne, C.N., & Yacob, H. (2014). Influence of Spatial Comfort and Environmental Workplace Ergonomics on Job Satisfaction of Librarians in the Federal and State University Libraries in Southern Nigeria. Open Access Library. 1. (e814), 1-10. Available from: http://dx.doi.org/10.4236/oalib.1100814

10. International Ergonomics Association, (2020). Definition and Applications [online]. Retrieved from: https://iea.cc/what-is-ergonomics/

11. Jan, Dul et al. (2012). A strategy for human factors/ergonomics: developing the discipline and profession, Ergonomics. 55(4), 377-395, DOI: 10.1080/00140139.2012.661087

12. Kimber, R. (2001). Editorial: referencing style, The Journal of Documentation, 57 (3), 325-329.

From Concept to Practice: Investigating the 3R Model Implementation for Sustainable Waste Management at TISS Guwahati

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ABSTRACT*:* In this article, the investigator aims to explore waste management strategies implemented at the Tata Institute of Social Science in Guwahati, with the goal of promoting environmental sustainability through the application of the 3R model—specifically focusing on reduction, reuse, and recycling. The study employed a case study approach to achieve its objectives, using the questionnaire method for data collection. It has been observed that the TISS library incorporates certain waste management practices aligned with the 3R model, although they are not implemented systematically. The library of TISS Guwahati encounters two primary challenges: lack of awareness among students and the absence of well-defined waste management policies in managing the waste generated in the library.

Introduction:

A sustainable library commits to eco-friendly practices, social responsibility, and economic efficiency, aiming to minimize environmental impact, contribute positively to the community, and enhance operational efficiency. This involves

improving energy efficiency, reducing waste, developing eco-friendly collections, leveraging technology, and adopting organizational practices that prioritize long-term ecological, social, and economic well-being.

Sustainable waste management is integral to the library's broader sustainability practices, aiming to minimize environmental impact, enhance resource efficiency, and promote long-term ecological sustainability. The goal is to minimize waste generation, segregate recyclables, and responsibly handle unavoidable waste. Additionally, there's a concerted effort to raise awareness among library staff and patrons, cultivating a culture of environmental responsibility within the library community.

Sustainable practices in academic institutions are gaining prominence, emphasizing responsible resource management and ecological consciousness. One pivotal framework that has garnered attention in the realm of waste management is the 3R Model—Reduce, Reuse, and Recycle. The principle of reducing waste, reusing and recycling resources and products is often called the "3Rs" which aims to promote the "3Rs" (reduce, reuse and recycle) globally so as to build a sound-material-cycle society through the effective use of resources and materials (The 3R Initiative, n.d.)

This study delves into the implementation of the 3R Model in academic libraries for enhanced waste management, transitioning from theory to action. As knowledge hubs, academic libraries play a crucial role in promoting eco-friendly practices. By examining challenges, successes, and best practices, this research guides libraries toward a more sustainable future, contributing to discussions on environmental responsibility in academic settings.

The 3R Model: A Short Overview

The 3R Model—Reduce, Reuse, Recycle—stands out as a key framework in waste management, capturing attention for its holistic approach to environmental challenges. Sawalkar et al. (2023) states that embracing the 3R strategy aids in efficient waste management, advocates for environmental sustainability, and contributes to the attainment of UN Sustainable Development Goals. Ma et al. (2023) outlines the components of the 3R model—Reduce, Reuse, and Recycle as follows-.

Reduce: The first element of 3R model "Reduce" emphasizes the proactive effort to minimize the quantity of waste generated and subsequently discarded. It

encourages practices that aim to decrease the overall production and discharge of waste materials

Reuse: The "Reuse" principle advocates for the repair and innovative repurposing of used items and materials

Recycle: The "Recycle" principle involves repurposing waste items into usable resources, materials, products, or substances instead of letting them become unrecoverable garbage after serving their primary function.

Literature Review:

M and T. M. (2019) emphasized the importance of adopting environmentally friendly practices in libraries through the principles of reduction, reuse, and recycling. They recommended specific waste management measures in libraries, including paper reuse, computer recycling, and procuring recycled ink cartridges and supplies. Additionally, they suggested donating, selling, or exchanging weeded books and delivering old furniture to needy departments or recycling it for reuse. Karioja (2013) introduced a library sustainability model, focusing on post-weeding actions such as book repair, donation, sale, and recycling. She emphasized green IT practices like duplex printing and device recycling. Additionally, she recommended appointing an environmental coordinator, conducting staff sustainability training, and organizing awareness events. Satpathy & Singha (2020) studied waste management at NIT Silchar's central library, discovering diverse disposal methods for books, print materials, and furniture. Unused books are sold or exhibited, periodicals are handled through binding or sale, and unsold items become waste paper. Important news is digitized as clippings to minimize paper use, and surplus furniture is centrally stored for potential reuse. The study suggests minimizing physical waste by transitioning to digital formats, utilizing big data, and adopting cloud computing to align with international standards.

Lancaster advocated for a paperless society in 1978 and 1985, initiating a green initiative (Meadow, 1979). This concept found support from (Calloway & Callahan, 2003), recognizing the long-term goal of a paperless society but proposing immediate measures for libraries to discourage paper waste and encourage recycling. Fisher & Yontz (2007) suggest that academic libraries collaborate with local vendors for sustainability. Manna & De Sarkar (2022) observes a global shift of libraries from print to electronic formats. Collectively, these perspectives underscore the ongoing efforts and considerations in advancing sustainability within library practices.

Sangeetha (2013) notes modern libraries' dependence on ICT tools for efficiency but warns of e-waste accumulation without maintenance. She highlights a lack of e-waste awareness among library professionals and advocates responsible practices, including avoiding dumping non-functional electronics, obtaining management approval for recycling, donating functional items, and establishing a committee for safe institution-wide disposal. In a related context, Kiddee et al. (2013) stress sustainable e-waste management, suggesting eco-design principles, proper collection, safe recovery, recycling, suitable disposal methods, preventing export to developing nations, and raising awareness. Additionally, Heart (2007) proposes cleaner production, extended producer responsibility, standards, labeling, product stewardship, and global recycling practices for global e-waste issues.

Need of the Study:

The library, acting as a versatile resource center meeting diverse user needs, generates waste as part of its daily operations to achieve its goals. Embracing the 3R model (Reduce, Reuse and Recycle) allows libraries to contribute to lessening their environmental impact. Therefore, it is crucial to examine whether these practices are actively implemented. Additionally, assessing the effectiveness of these practices becomes essential for determining their positive impact on waste reduction. Efficient waste management also aligns with principles of optimizing resources. A thorough examination of the 3R model in libraries uncovers opportunities to optimize resources, like reducing paper consumption, reusing materials, and recycling waste, leading to cost savings and more sustainable resource utilization. A focused investigation into the 3R model empowers libraries to create lasting sustainability plans. This prompts important questions, such as:

- How are libraries currently managing waste within their facilities?
- To what degree do libraries integrate the principles of Reduce, Reuse, and Recycle (3R) in their waste management practices?
- What obstacles do libraries face in implementing sustainable waste management, specifically related to the 3R model?

Recognizing challenges, successes, and areas for improvement allows libraries to strategize ongoing waste management progress. Exploring the 3R model is crucial for aligning with environmental goals, promoting responsibility, optimizing resources, and contributing positively to the community. This initiative positions the library as a responsible and forward-thinking institution in environmental stewardship.

Research Objectives:

The objectives for this study are outlined as follows:

1. Assess the waste management practices in academic libraries, specifically focusing on the methods employed for reducing, reusing, and recycling materials.
2. Identify and analyze the challenges and barriers faced by academic libraries in implementing sustainable waste management practices, with a particular emphasis on the 3R model
3. Develop strategies and recommendations for academic libraries to enhance their sustainable waste management practices, considering the identified challenges and best practices.

Methodology

The research employed a case study methodology to attain its objectives, concentrating on assessing a sustainable waste management strategy at TISS University campus in Jalukbari, Guwahati, Assam, based on the 3R model. Specifically, it investigated waste management practices, considering campus features such as a comprehensive library containing a diverse collection of textbooks, reference books, national and international journals (in print), theses, dissertations, along with a computer center etc. For this study, it was determined that the survey method is the most effective and suitable approach to achieve the research goals. Consequently, an online questionnaire was employed as the data collection tool, developed based on insights derived from extensive literature reviews.

Findings and Discussion

The information acquired from the examined library is organized in tabular format and analyzed in accordance with the objectives.

Library Waste Reduction Strategies:

Table 1: Library Waste Reduction Strategies at TISS , Guwahati

Reduce Strategies			
Type of Waste	**Sl. No**	**Waste Management Practices**	**Action Taken**
Book Waste	1.	Purchasing Relevant Books	✓
	2.	Proper handling of books	✓
	3.	Implementing suitable preservation technique	×
	4.	Purchasing e-books	✓
	5.	Subscribe to consortia	×
Paper Waste	1.	Print only when necessary	✓
	2.	Avoid use of paper by going digital	✓
	3.	Facilitating online library membership form	✓
	4.	Providing circulation receipts in electronic format	✓
	5.	Duplex instead of printing on one side	✓
Newspaper Waste	1.	Subscribe to only relevant Newspaper	✓
	2.	Subscribe to e-newspaper	×
E-Waste	1.	Purchasing only required items	✓
	2.	Proper handling	✓
	3.	Purchasing equipment from reputed company	✓
	4.	Implementing effective system to control short circuit/thunderstorm effect	✓
Furniture Waste	1.	Buying multiple purpose furniture	✓
	2.	Purchasing modular furniture	×
	3.	Choose furniture that meets green building standards	×

Based on the information presented in table no. 1, the subsequent findings have been identified.

- The TISS library focuses on acquiring relevant books and takes proper care to minimize book waste. Adoption of e-books eliminates physical damage, showcasing the library's dedication to sustainable practices. In conclusion, the library employs various measures to reduce book waste, affirming its commitment to sustainability.

- In order to reduce paper waste, the library practices almost all the measures.
- The library implements sustainability measures by selectively acquiring pertinent print editions of newspapers, avoiding the purchase of unnecessary ones and thereby reducing newspaper waste. However, they have not embraced the electronic format of newspapers, a choice that significantly reduces the likelihood of generating newspaper waste in the library.
- The library is actively implementing measures to prevent e-waste, including the selective purchase of necessary items, proper handling of electronic devices, sourcing products from reputable companies. Furthermore, they have installed a short-circuit prevention system to minimize the impact of thunderstorms and other potential accidents.
- To minimize furniture waste, the library opts for multipurpose furniture, but they do not align with standards such as green building standards in their procurement practices.

Library Waste Reuse Strategies

Table 2: Library Waste Reuse Strategies at TISS Guwahati:

Reuse Strategies			
Type of Waste	**Sl. No**	**Waste Management Practices**	**Action Taken**
Book Waste	1.	Reuse of damage books by binding and mending	✓
	2.	Donate weeded books to user/public/other library	×
	3.	Organize weeded book donation drive	✓
Paper Waste	1.	Use of scrap paper to write small notes/preparing list	✓
	2.	Using blank side of the already use paper	✓
Newspaper waste	1.	Keeping as newspaper clipping	✓
	2.	Digitization of important news	×
E-Waste	1.	Reuse of electronic equipment by repairing	✓
	2.	Exchange it with companies which refurbish products	✓
Furniture Waste	1.	Repairing/refurbishing old furniture	×
	2.	Sending old furniture to other needed departments	✓
	3.	Exchange furniture with vendors	×
	4.	Host auction for selling old furniture to buy new furniture	×

Based on the information presented in table no. 2, the subsequent findings have been identified.

- The library repairs or binds damaged books for future use. It also hosts a book donation drive for weeded books, providing opportunities for those in need to utilize them. Both practices contribute to sustainability and offer opportunities for the reuse of books, preventing unnecessary waste.
- The library employs scrap paper for jotting down notes or creating lists, and also makes use of the reverse side of previously utilized paper, promoting paper reuse and consequently minimizing paper waste.
- The library reuses newspapers by making newspaper clippings in the library. The library has not gone for digitization of important news and saving them for future use.
- In the event of reusing electronic items within the library, they undertake repairs whenever feasible. Additionally, they engage in exchanges of damaged equipment with other companies that have exchange policies.
- The library sends old furniture to other needed departments in the parent institution for reusing purposes.

Library Waste Recycle Strategies

Table 3: Library Waste Recycle Strategies at TISS Guwahati:

Recycle Strategies			
Type of waste	**Sl. No**	**Waste Management Practices**	**Action Taken**
Book Waste	1.	Purchasing books with recyclable paper	×
	2.	Sending books to recycling organization	✓
	3.	Selling weeded books to scrapers	✓
Paper Waste	1.	Purchasing paper that is recyclable	×
	2.	Sending it to recycler	×
	3.	Keep special bin for separating paper waste from other type of waste	✓
Newspaper Waste	1.	Selling old newspaper to recycler	✓
E-Waste	1.	Sending them to recovery corporation/ companies	×
	2.	Buying electronic equipment from providers with recycling facilities	✓
Furniture Waste	1.	Producing a new product from waste material	×
	2.	Sending furniture to recycler	✓

Based on the information presented in table no. 3, the subsequent findings have been identified.

- Regarding recycling of book waste, TISS Guwahati adopts the practice of sending books to a recycling organization.
- In case of recycling of paper waste, TISS Guwahati doesn't take any action to purchase books with recyclable paper or send it to recyclers. They just keep specific bins for separating paper waste from other types of waste.
- In case of recycling of e waste , TISS library purchases equipment from providers which offer recycling facilities but does not engage in sending e-waste to recovery organizations/companies.
- The Library of TISS, Guwahati sends damaged furniture to the recyclerbut no efforts are made to transform or create new furniture from the damaged pieces.

Challenges Faced in Waste Management at TISS, Guwahati:

Table 4: Challenges Faced in Waste Management

Sl. No	Challenges	Response
1.	Lack of awareness among students	✓
2.	Lack of policy for waste management	✓
3.	Lack of staff awareness	×
4.	Lack of staff training	×
5.	Inadequate fund	×
6.	Lack of support from parent organization	×

Based on the feedback, the TISS Guwahati library confronts two key challenges in effectively managing generated waste. The first challenge pertains to a lack of awareness among students, while the second challenge is the absence of waste management policies in the library.

Suggestions and Recommendations:

Some suggestions are outlined in the table no. 5 based on the 3R model that can enhance the library's sustainable waste management practices.

Table 5: 3R Model Based Suggestions for Sustainable Library Waste Management:

Recommendations		
Reduce	**Actions for Book waste**	1. Purchasing only relevant books
		2. E-book collection development policy
		3.Subscribing to consortia
		4. Awareness Program for user/staff for proper handling of books
	Action for Paper Waste	1. Buying recycled content paper
		2. Printing and writing on both side of paper
		3.Lessen the margin while printing
		4. Avoid use of paper by going digital
		5. Providing online library
		6.Practice online
		7. Using mail for circulars.
	Action for Newspaper waste	1. Subscribing only to relevant newspapers.
		2. Upgrading to electronic versions of newspapers.
	Action for E-Waste	1.Identify sources of e-waste generation
		2. Maintaining e-waste records for drafting an action plan for management.
		3.Looking for EPEAT(Electronic Product Environment Assessment Tool) compatibility
		4. Buying products with up gradation facilities
		5. Monitoring systems and tools in regular intervals.
		6.Awareness program for user/staff for proper handling.
		7. Implementing effective system to control short circuit/thunderstorm effect
	Action for Furniture Waste	1.Buying multiple purpose furniture
		2.Purchasing modular furniture
		3.Choose furniture that meets green building standards.
Reuse	**Actions for Book Waste**	1. Binding or repairing damaged books.
		2. Donation drive for unused books for users/public / another library
	Action for Paper Waste	1.Use of scrap paper
		2. Use blank side of already used paper
		3. Use old envelope by sticking a news label on them
		4.Make a separate used paper bin for future use

	Action for Newspaper waste	1. Making newspaper clipping
		2. Digitization of important news
	Action for E-Waste	1. Extension of the end of life of electronic equipment
		2. Establish public-private partnerships in setting up buy-back or drop-off centers.
		3. Donation electronics to NGOs to refurbish
	Action for Furniture Waste	1. Repairing/refurbishing damaged furniture
		2. Exchange furniture with other needed departments
		3. Exchange furniture with vendors
		4. Host auction for selling old furniture and buy new one from the monetary gain.
Recycle	**Actions for Book Waste**	1. Buying books with recyclable paper
		2. Sending books to recycling organizations.
	Action for Paper Waste	1. Making collaboration with paper recycling organization
		2. Sending paper to recycling organization
	Action for Newspaper Waste	1. Selling the old newspapers to proper recyclers.
	Action for E-Waste	1.Buying electronics from recycling facilities
		2. Establish relationships with the informal/formal recycling sectors.
		3. Implementation of any recycling project or program
	Action for Furniture Waste	1.Sending damaged furniture to recycler

Conclusion

Embracing sustainable measures is now crucial to promote environmental sustainability, minimize ecological impact, and encourage responsible resource management within the community. This study was conducted with the aim of comprehending the sustainable measures implemented by TISS, Guwahati library for handling waste generated in the library. It is found that the library of TISS, Guwahati handles waste management in an unstructured manner and has yet to adopt a formalized model for this purpose. While there are some practices aligning with the 3R model, they lack a systematic implementation. Integrating the 3R model into library operations marks a transformative approach to sustainable waste management. Adopting the 3R waste management model—focusing on Reduce, Reuse, and Recycle—can significantly contribute to sustainability by minimizing

waste, promoting material reuse, and recycling resources. This paper supports the mindful reduction of waste, creative material reuse, and the implementation of efficient recycling systems within library environments. This study also identifies two key challenges: student awareness and the absence of waste management policies encountered by the TISS, Library. To address these, TISS should implement a comprehensive waste management policy, including awareness programs and integrating sustainability literacy into information literacy initiatives.

References

1. Gundawar, N. D. (2017). *A survey of green libraries in India* [S.N.D.T Women's University Mumbai]. https://shodhganga.inflibnet.ac.in:8443/jspui/handle/10603/276629

2. Hauke, P., & Werner, K. U. (2013).*Going Green as a Marketing tool for libraries: Environmentally sustainable management practices*. IFLA WLIC 2013-Singapore-Future Libraries: Infinite Possibilities. https://library.ifla.org/id/eprint/147/

3. Herat, S. (2007). Sustainable Management of Electronic Waste (e-Waste). *CLEAN – Soil, Air, Water*, *35*(4), 305–310. https://doi.org/10.1002/clen.200700022

4. Karioja, E. (2013). *How to evaluate libraries' sustainability? An approach to an evaluation model and indicators*. IFLA WLIC 2013 - Singapore - Future Libraries: Infinite Possibilities. https://library.ifla.org/id/eprint/114/

5. Kiddee, P., Naidu, R., & Wong, M. H. (2013). Electronic waste management approaches: An overview. *Waste Management*, *33*(5), 1237–1250. https://doi.org/10.1016/j.wasman.2013.01.006

6. M, P., & T M, V. (2019).*Going Green: Libraries for Sustainable Development*. National conference on Innovations and Transformations in Libraries (NCITL 2019). https://www.netzwerk-gruene-bibliothek.de/wp-content/uploads/pdf/Prasanth_2019.pdf

7. Ma, W., de Jong, M., Zisopoulos, F., & Hoppe, T. (2023, June).Introducing a classification framework to urban waste policy: Analysis of sixteen zero-waste cities in China.*Waste Management*, *165*, 94–107. https://doi.org/10.1016/j.wasman.2023.04.012

8. Manna, D., & De Sarkar, T. (2022). Sustainable development initiatives in libraries: A critical analysis. *Annals of Library and Information Studies (ALIS)*, *69*(4), 282–293. https://doi.org/10.56042/alis.v69i4.66044

9. Meadow, C. T. (1979, July).Toward Paperless Information Systems. F. W. Lancaster. *The Library Quarterly*, *49*(3), 327–328. https://doi.org/10.1086/630173

10. Sakai, S.I., Yoshida, H., Hirai, Y., Asari, M., Takigami, H., Takahashi, S., Chi, N.K., 2011. International comparative study of 3R and waste management policy developments. J. Mater. Cycles Waste Manage. 13 (2), 86–102. https://doi.org/10.1007/s10163- 011-0009-x

Theme-6

Sustainable Innovation Technology

Revolutionizing Libraries: The Transformative Power of Blockchain Technology

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ABSTRACT: Blockchain technology has emerged as a disruptive force with the potential to revolutionize various sectors, and libraries are no exception. This article explores the multifaceted applications of blockchain technology in libraries, shedding light on its transformative impact on library management, resource accessibility, and user engagement. From digital rights management and intellectual property protection to transparent patron records and community curation, blockchain offers libraries a versatile toolkit to enhance security, transparency, and efficiency. Moreover, the technology's ability to decentralize operations, authenticate digital and physical assets, and foster global collaboration positions libraries at the forefront of innovation in the digital age. However, successful integration of blockchain in libraries requires careful consideration of technical, regulatory, and privacy aspects. As libraries adapt to the evolving information landscape, blockchain technology presents an exciting opportunity for them to not only preserve their rich heritage but also thrive as essential hubs of knowledge and culture in the modern world.

KEYWORDS: Blockchain, types of Blockchain, digital collection management, library services

Introduction:

Libraries have been the cornerstone of knowledge and information dissemination for centuries. However, in today's rapidly evolving digital landscape, libraries are facing new challenges and opportunities. Blockchain technology, originally developed for crypto currencies, is now poised to revolutionize libraries and their operations. Its decentralized and transparent nature offers numerous applications that can enhance security, authenticity, and efficiency in library management. In this article, we will explore the innovative ways in which blockchain technology can be applied to libraries. The term Bitcoin, a crypto currency, was first explained in 2008 in his work, "Bitcoin: A Peer-to-Peer Electronic Cash System", by Satoshi Nakamoto. Blockchain technology has potential use not only in the financial domain but also in the non-financial domains as well. Thus, it can be used as a catalyst in the development of the library too. As "Unlike the internet alone, blockchains are distributed, not centralized; open, not hidden; inclusive, not exclusive; immutable, not alterable; and secure. Blockchain gives us unprecedented capabilities to create and trade value in society".

Review of Literature:

A literature review was conducted using different websites, blogs and journals through internet. The focus was on articles which outlined what Blockchain technology was, how it could be used, how it is being used, the legal implications of using Blockchain in contracts and the implications for libraries. (Hoy, 2018) noted the potential use of Blockchain for libraries and medical records. (Nowinski & Kozma, 2017) Discuss how Blockchain may be used to "disrupt the existing business models and to explore how this may occur". The blockchain project of San Jose State University explores the technology for building an enhanced metadata system for the libraries, protecting digital first sale rights, host digital peer- to- peer sharing (Ways to Use Blockchain in Libraries, 2017). (Coghill J. G., 2018) Noted the possibility of blockchain for the transfer of fund from libraries to vendors and maintaining electronic receipts as digital evidence.

Types of Blockchain

1. Public Blockchain (Permission less) - A public blockchain, as the name depicts, is the blockchain meant for the public. It simply means, a kind of blockchain, which is – "for the people, by the people, and of the people"**.** Basically, it is open to everyone, where anyone can become a node and is able to read, write, and update in blockchain by creating his/her personal address.

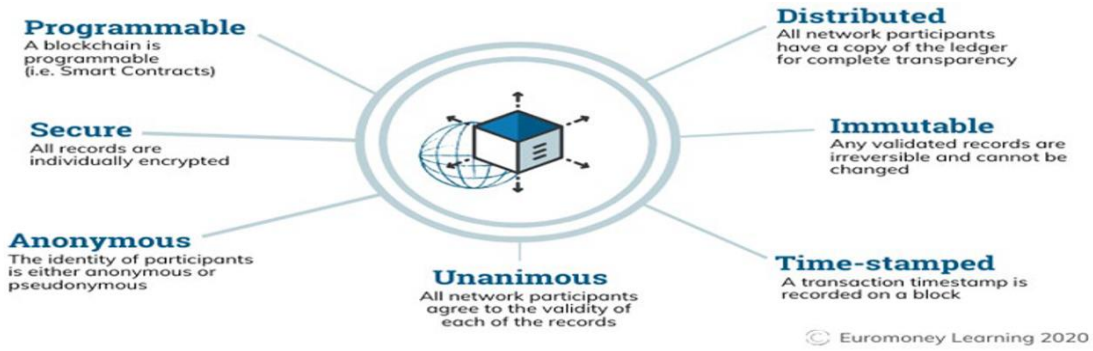
2 Private Blockchain (Permissioned) - In this type, if anyone wants to become a node, they should be permitted by the blockchain authority. Only the authentic member is allowed to access and store data in a blockchain.

Objective of the Study:

1. To know about the basic concept of Blockchain Technology?
2. To know how does Blockchain Work?
3. Technical architecture view of blockchain
4. Application of Block chain technology in Library Service

Working Structure of Blockchain Technology

In general, a block consists of three things namely, Data, Hash, and Hash of the previous block. So, every block in a chain consists of the cryptographic hash of its own as well as of the previous one to stay connected in a chain. A hash is a unique alphanumeric number which is being calculated based on Data of its own, a hash of the previous one, and its timestamp.



The Fundamentals of Blockchain Technology

Before delving into its applications, let's briefly understand the core principles of blockchain technology. At its heart, blockchain is a decentralized and distributed ledger system. It comprises a chain of blocks, each containing a list of transactions. These transactions are recorded across a network of computers (nodes) in a way that is secure, transparent, and immutable. Once a transaction is added to the blockchain, it becomes virtually impossible to alter or delete it without the consensus of the network.

Libraries and Blockchain Variation and Key Features

Table No.1

Blockchain Variation	Key Features	Potential Applications in Libraries
Public Blockchain	Open to All Participants	Transparent cataloging and metadata management
	Decentralized Validation	Secure peer-reviewed journal publication
	Immutable Records	Decentralized authentication and identity management
	High Degree of Security	Copyright tracking and royalty distribution
	Trustless Consensus Mechanisms	Tamper-proof document sharing and collaboration
Private Blockchain	Restricted Access	Controlled access to resources and services
	Permissioned Participants	Secure management of academic credentials
	Consortium Governance	Secure document exchange among institutions
	Enhanced Privacy	Protected patron transactions and interactions
	Customizable Consensus	Streamlined interlibrary loan processes
Consortium Blockchain	Collaborative Governance	Shared archival and preservation of research data
	Limited Membership	Consortium-wide resource sharing and discovery
	Controlled Consensus	Consortium-level copyright management
	Customizable for Use Case	Joint projects with shared resources and funding
	Secure Data Sharing	Collaborative development of open educational resources
Side chain	Independent Chain	Integration of blockchain with existing systems

Blockchain Variation	Key Features	Potential Applications in Libraries
	Connected to Main chain	Enhanced interoperability with other libraries
	Customized Consensus Rules	Efficient cross-library resource sharing
	Tailored Use Cases	Joint research projects with external partners
	Scalability Solutions	Address scalability challenges in high-demand periods

Applications of Blockchain Technology in Libraries: Digital Rights Management (DRM): Libraries often provide access to digital content such as e-books, journals, and multimedia resources. Blockchain can be employed to manage digital rights efficiently. Smart contracts can enforce access permissions, ensuring that only authorized users can access copyrighted materials. This prevents unauthorized distribution and copyright infringement.

Archival and Preservation: Preservation is a critical aspect of library operations. Blockchain can be used to create an unchangeable record of the history of documents and artifacts in a library's collection. This aids in preserving historical accuracy and authenticity.

Decentralized Cataloging: Traditional library catalogs are often centralized and can become vulnerable to data loss or manipulation. Blockchain-based decentralized systems can provide a standardized and easily accessible catalog of library materials. This decentralized cataloging approach makes it easier for users to find the information they need while ensuring data integrity and availability even in the face of technical failures. Blockchain can facilitate interoperability between libraries and other institutions. By providing a common, trusted framework for sharing information and resources, libraries can collaborate more effectively. This can lead to expanded access to a broader range of materials and services for library patrons

Inter library Loans: Smart contracts on the blockchain can streamline interlibrary loan processes. They can automatically verify the authenticity of requests, track the lending and return of materials, and ensure that lending libraries are compensated appropriately.

Authenticity Verification: Blockchain technology can be used to verify the authenticity of rare or valuable items in a library's collection. This helps in

combating the circulation of counterfeit materials and ensures that users have access to trustworthy resources.

Research Data Management: Academic and research libraries can use blockchain to manage and verify the integrity of research data. Blockchain records can prove the authenticity and timestamp of research data, enhancing trust in scholarly publications. Academic libraries can facilitate research collaboration by using blockchain to securely share research data and findings among institutions, ensuring data integrity and proper attribution.

Digital Collections: Blockchain can facilitate the creation of decentralized digital collections. This approach allows users to access and contribute to library resources while maintaining data integrity. It also reduces the risk of centralized data loss. Crowd sourced curation system is libraries can utilize blockchain to allow patrons to curate digital collections collaboratively. This democratizes the curation process, ensuring that diverse perspectives are represented in library collections. Real-time Access Tracking also is Blockchain-based systems can track real-time access to digital resources, enabling libraries to better understand user preferences and trends.

Data Provenance: Libraries can use blockchain to track the provenance of data and information sources, ensuring transparency and trustworthiness in the information they provide to users. : Libraries handle a vast amount of user data, including personal information and library card details. Blockchain can enhance the security of user authentication and identity verification, reducing the risk of data breaches and identity theft. Transparent patron records be keeping blockchain can be used to create transparent and tamper-proof records of patron borrowing history, fines, and account details. This ensures that both libraries and patrons have a clear, immutable record of transactions, fostering trust.

Conclusion:

Blockchain technology is poised to revolutionize libraries by enhancing security, transparency, and efficiency in their operations. From managing digital rights and protecting intellectual property to streamlining interlibrary loans and preserving historical authenticity, the applications of blockchain in libraries are vast and promising. However, it's crucial to recognize that while blockchain offers numerous benefits, it also poses challenges, including scalability and the need for technical expertise. As libraries continue to adapt to the digital age, blockchain technology offers a powerful tool to modernize and improve library management

and information services. Embracing blockchain can position libraries at the forefront of innovation, ensuring they remain invaluable hubs of knowledge and information in an increasingly digital world.

References:

1. 1.Chen G, Xu B, Lu M, Chen NS. Exploring blockchain technology and its potential applications for education. Smart Learning Environments. 2018;5(1):1-10. https://doi.org/10.1186/s40561-017-0050-x

2. 2. Hoy MB. An Introduction to the Blockchain and Its Implications for An Introduction to the Blockchain and Its Implications for Libraries and Medicine. Medical Reference Services Quarterly. 2017;36(3):273-279. https://doi.org/10.1080/ 02763869.2017.1332261

3. 3. Domingue J, Bachler M. A Learner-Centred Approach for Lifelong Learning Powered by the Blockchain Conference or Workshop Item. In World Conference on Educational Media and Technology; c2018. Retrieved from https:// www.semanticscholar.org/paper/A-Learner-Centred-Approach-for-Lifelong-Learning-by-Domingue-Bachler/ce096256873ab23915eb39312de448912ce1132e

4. 4. Deloitte, Riddle, Code. IoT powered by Blockchain: How Blockchains facilitate the application of digital twins in IoT; c2018. p.20.

5. 5. Debbie G. Law and the Blockchain by Debbie Ginsberg; c2017. Retrieved August 27, 2023, from https://ischoolblogs.sjsu.edu/blockchains/law-and-the-blockchain-bydebbie- ginsberg/

6. 6. Cole Z. How blockchain technology could affect the future of network engineering Network architects, brace for the disruption blockchain technology will bring; c2017. Retrieved August 12, 2023, from https://www.networkworld.com/article/3236479/ how-blockchain-technology-could-affect-the-future-of-network-engineering.html

7. 7. Coghill JG. Blockchain and its implications for libraries. Journal of Electronic Resources in Medical Libraries. 2018;15(2):66-70. https://doi.org/10.1080/15424065.2018.1483218

8. 8. Lastovetska A. Blockchain Architecture Basics: Components, Structure, Benefits & Creation; c2019. Retrieved Aug 20, 2023, from https://mlsdev.com/blog/156-howto- build-your-own-blockchain-architecture

Digital Preservation Through National Mission For Manuscripts

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ABSTRACT: Libraries are the repositories where the authentic and updated information gathered with the intellectual and cultural heritage. The collections possessed by the library are affected by numerous environmental factors that consequent results in irreparable damage to numerous collections. The information embodied in manuscripts is effective; however materials used for this purpose cause a true challenges. However the manuscripts holds invaluable knowledge, historical significance and cultural heritages This article provides information regarding protection of the Manuscripts and archive through digital preservation. The digital preservation through 'National Mission for Manuscripts' is to seeks to unearth and the vast manuscript wealth of India. This National project also works to promote access to manuscripts by digitizing the rarest and most endangered manuscripts.

KEYWORDS: Manuscripts, Repository, Digital Preservation, Mission, Heritage, Archival, endangered

A library is one in which books, journals magazines, rare books and archive etc. are available for enriching the knowledge as per the interest and need of every user. Generally it has been come in notice that after establishing libraries, study materials are made available in them, but once they are kept in the library there no need to attention to the maintenance of these books and journals. It is the responsibility of the authorities to preserve the collection and make it accessible to the public; for this librarian and library staff is responsible for the preservation of these documentary heritages should know the various causes of deterioration of the library materials and the possible methods for their preservation.

Preservation is an especially complex endeavor when documents and archival collection are housed in historic buildings. Some library collections have been well-preserved over hundred years in their traditional ambient; though it is more usual to find that both the environment within the building and the condition of the collections need revolutionary progress. Librarians, archivists and Governing bodies of historic institutions may believe that preserving the Intellectual content of material is main priority. Preservation management includes many activities for example disaster planning, fire preservation, security handling routines and pest control etc.

Archival and Manuscript Collection

Archival and Manuscripts are historical records and the important factor is that the manuscript and archival are primary sources and unpublished data. Archives and Manuscripts are important to researchers and society.

Meaning of Archival Collection: An archival collection means group of documents which are created or received by a government agency corporation nonprofit organization other related organizations. This archival collection includes historically significant documents such as reports, letters, memorandums sound recordings photographs charts official letters.

Meaning of Manuscript Collection: The Manuscript collection is meant to group of Handwritten books or handwritten and traditional knowledge composition on 'Taadpatra' (rkMi=), 'Bhojpatra' (Hkksti=), cloth, bark and metal. Manuscripts have knowledge content including significant scientific, historical or aesthetic valued.

Preventive Tools for Safety and Care

1. Manuscripts and Archives should be kept in modular compact storage system or ordered manner in clean glass cupboards
2. UV protected glass along with anti-glare recommended for display showcase
3. Clean and tidy space
4. Regular inspection of storage area of Manuscripts and Archrivals
5. Keep protection from fire and water disaster (Install water sensing alarms, automatic fire deduction, smoke detector)
6. Install equipments to control the atmosphere and environment
7. Manuscripts should not be on the floor
8. Proper lighting and ventilation
9. Hands should be clean if handling manuscripts manually
10. Use both hands to handle manuscript and use solid support.

National Project for Digital Preservation of Manuscripts

Sanskrit is principal language of ancient India and Manuscripts in Sanskrit are found throughout the Hindu, Buddhist and Jain religious rituals and traditions. Manuscripts are sacred medium of expression and includes Vedas, Upnishad, Purans, BagvatGita etc. The range of Sanskrit manuscripts in libraries collection reflects the deep understanding of Sanskrit literature.

Most of the manuscripts writings deal with wide range of specific subjects like Yoga, Ayurveda, Astronomy,Vastu Mathematics, Astrology and many other subjects and topics are written in ancient scripts.

National Mission For Manuscripts

Museum, Archive, Public and Academic libraries has huge treasure of manuscript ; however no other nation in the world has such an ancient and large repository of manuscripts. This precious heritage lies scattered in many institutions, archives libraries and amidst large number of ordinary people. It is comprehensively unprotected, un-researched and unpublicized as a proof of our living heritage.

The National Mission for Manuscripts was launched by February 2003, by the Ministry of Tourism and Culture, Government of India. This unique project's mission is to seeks to unearth and preserve the vast manuscript wealth of India. India possesses an estimate of ten million manuscripts, probably the largest collection in the world. These cover a variety of themes, textures and aesthetics, scripts, languages, calligraphies including illustrations.

There are hundreds of languages and dialects are spoken in different parts of the country. This perhaps has inspire Indian manuscripts to cover a wide range of themes. National Mission for Manuscripts primarily deals with digital preservation of ancinent scripts of manuscripts. There are some ancient scripts which are taught in Manuscript logy and Paleography workshops ie Brahmi, Sulsi, Gupta, Kutila, Odia, Modi, Siddham, Kufix etc

Objectives.

The objectives of National Mission for Manuscripts are following:-

- Locate manuscripts through national level Survey and Post-Survey
- Document each and every manuscript and manuscript repository, for a National Electronic Database that currently contains information on four million manuscripts making this the largest database on Indian manuscripts in the world
- Conserve manuscripts incorporating both modern and indigenous methods of conservation and training a new generation of manuscript conservators
- To train the next generation of scholars in various aspects of Manuscript Studies like languages, scripts and critical editing and cataloging of texts and conservation of manuscripts

- To promote access to manuscripts by digitizing the rarest and most endangered manuscripts
- To promote access to manuscripts through publication of critical editions of unpublished manuscripts and catalogs.
- To facilitate public's engagement with manuscripts through lectures, seminars, publications and other outreach programmes.

Selection Criteria for Manuscripts as 'VIJNANANIDHI'

The selection Committee adopted following Criteria

1. Excellence as Heritage
2. Contribution to India's Intellectual History
3. Vulnerability
4. Belonging to Ancient and Medieval Past

Manuscript Treasures

The National Mission for Manuscripts has documented 5.2 million manuscripts, conserved 90 million folios and digitized 3.30 crore of manuscripts across the country from its inception in 2003 till September 2023 and this the Mission has uploaded 1,25,000 manuscripts on its cloud platform out of which 75,000 manuscripts are available for research purposes on public domain.

Some major Manuscript Treasure of India is following below

1. Library of Tibetan Works, Dharmshala
2. Khuda Bakhsh Oriental Public Library, Patna
3. Chitra Bhagvat (Krishna Kanta Handiqui Library, Gawahati)
4. Ratnamalavyakarana(Krishna Kanta Handiqui Library, Gawahati)
5. Subika (Manipur State Archives)
6. Oriental Reasearch Institute and Manuscript Library, Thiruvananthapuram
7. Kalila-wa-Dimma (Rampur Raza Library, Rampur)
8. Ramayana (Rampur Raza Library, Rampur)
9. Yumbanlol (Manipur State Archives)

The Special Outcome

The Bakhshali manuscript, an ancient Indian Mathematical text written on Birch Bark, is considered to the earliest recorded. example of the use of Zero.

About National Manuscripts Bill, 2023:

National Manuscripts Authority (NMA):

- The Bill envisages setting up a **10-member National Manuscripts Authority (NMA).**
- The **Union Culture Minister** would be the **Chairperson of this body** and would be include the **Secretaries of Culture, Finance** and **Education**, the **Vice-Chancellor** of **Central Sanskrit University** and **special invitees**.
- The **National Manuscripts Authority** will be aimed to oversee the digitization, conservation, preservation, editing, and publication work of manuscripts.
- The **National Manuscripts Authority** will possess to investigate theft and ensure protection against damage or theft.
- The NMA will also **introduce a dedicated digital portal** for Indexing, Cataloguing, Uploading, and Downloading copies of Manuscripts.

References

1. Guidelines for Control and Prevention of Termite Infestation in Archives and Libraries, (1991). New Delhi: National Archives Of India.

2. Managing the Preservation of Library and Archive Collections in Historic, Author Susan Hughes ISBN 0 7123 4800 X Buildings

3. https://www.namami.gov.in/indian-manuscripts

4. https://pib.gov.in/PressReleseDetail.aspx?PRID=1983483

5. Jyotshna,(Sahoo):Preservation of Library Materials: Some Preventive Measures. Bhuvneswar .The Orissa Historical Research Journal, Vol. XLVII, No.1, 2004.

6. https://pib.gov.in/PressReleseDetail.aspx?PRID=1983483.(**Ministry of Culture, PIB , Delhi dated 07/12/2023**)

7. https://www.drishtiias.com/daily-updates/daily-news-analysis/rapid-fire-current-affairs-194/print_manually

8. https://www.iastoppers.com/articles/national-manuscripts-bill-2023

Importance of academic institution website review: some selected institution of Assam.

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ABSTRACT: Website has great impact in information distribution about the institution. The main goal of the any academic institution is to make the institution more effective and specific one mainly in teaching- learning process. Website help teacher, students, research scholar etc to know the quality of the institution. It focuses the institutional quality also display the rules and regulation and criteria that follow the institution. So that students ate attract by read the institutional information and help to decide whenever he or she taking admission or not. A good design website gives mileage and increase the demand and value of the institution. This article focuses some important point about website and its importance also benefit.

Introduction :

In Assam, the institutional website development has been taking momentum with a steady pace. The value and status of any institution reflects through the use of modern website. Website reflect the value and status of any instution.Website display various information of the colleges and also students feedbac.From the feedback institution can take necessary steps for better result. It helps authority to take action on the basis of the students'feedback. Institution open a website for

fulfill their goal. Website of the academic institution must be correct and current information so that people get the information from respective institution.

Hypotheses:

1. To know the status of the academic institution website.
2. Financial hindrance is the main barrier for designing an impressive as well as good website.
3. To know the higher authority concern about the website.
4. To identify the real problem to designing an website where every needed information uploaded in a scientific manner.

Study area : For this research work we selected some colleges of As.sam. Here we collected data 12 college of Assam and analyses them.

About the Assam: Assam is situated in the northeastern part of India. The name Assam is derived from the word asama meaning "peerless". Assam state has31 dist. (nove,2023 report).7209 colleges of assam offering different course curriculum.

Literature Review: Literature review helps us to identify the relevant methods, theories and gap of the respective topic

Bhattacharyya Jitamoni and Mahesh deshmukh (2022) Impact of ICT on Economic Development in 21st Century. The author stated that this 21st century is the remarkable era of science and technology. Information Communication Technology helps to collect and disseminate information very fast. Website is a very good tool for any academic institution to reflect institutional goal.

According to the author opinion any academic institution for imparting knowledge to students, as we know that information collection is very expensive. For that website help students to collect information, news etc respective college and take decision. A website able to handle various process such as admission, facilities of the institution etc.

Manzoor, Mirfa.Hussain, walayat., ahmedAftab et al (2012) The importance of Higher education website and its Utility. International journal of Basic and Applied Science. According to author, now a day's website has great impact on higher educational institution,because the higher educational institution plays an important role in the development of society. On line technology plays an effective role for information dissemination.

Poock Michael.,Bishop,Virginia Andrews (2006), mentioned that an effective college website helps the students community to collect information in relating to teaching learning process.

Table No.1 Basic introduction of the instutions:

SL No	Name of the college	District	Year of establish-ment	NAAC Accredited	College Affiliated Under the Universities	Stream
1	Dhemaji College	Dhemaji	1965	Third Cycle **B++**	**Dibrugarh University**	**Arts and science**
2	**Bhola Nath College**	**Dhubri**	**1946**	**Fourth Cycle A+ By2023 CGPA 3.42**	**Gauhati University**	**Arts and science**
3	**Tezpur College**	**Sonitpur**	**1965**	**B+ CGPA 2.52**	**Gauhati University**	**Arts and Commerce**
4	Haflong Govt. College	Dima Hasao	1961		Assam University	Arts, Science and Commerce
5	Sadiya College	Tinsukia	1982	C+	Dibrugarh University	Arts, Science and Commerce
6	North Bank College	Lakhimpur	1961	B+	Dibrugarh University	Arts and science
7	Biswanath College	Sonitpur	1960	B	Gauhati University	Arts, Science and Commerce
8	Sibsagar College	Sibsagar	1947	A CGPA 3.13	Dibrugarh University	Arts and Science
9	Silchar College	Cachar	1994	…….	Assam University	Arts
10	Dibru College	Dibrugarh	1963		Dibrugarh University	
11	Nowgong College	Nagaon	1944	A	Gauhati University	Arts, Science and Commerce
12	Nalbari College		1945			

(Source:College Website October 2023)

From the above Table 1 we have seen that Bhola Nath College situated at Dhubri district of Assam under Gauhati University is the oldest college and NAAC Accredited by A+ Grade. Out of 12 colleges only Bhola Nath College accredited fourth Cycle and A+ Grade college. Out of 12 colleges only.

Table No. 2 List of present Website Uses in the institution :

SL No	Name of the college	College Website	Library Website	Institutional Repository	Regular update	Reliable Link
1	Dhemaji College	https:// dhemajicollege.in	https://dhemajicollege.in	Initial stage (D space)	yes	
2	Bhola Nath College	https://bncollege.co.in	https://bncollege.co.in	……..	yes	
3	Tezpur College	https://tezpurcollege.com	https://tcelibrary.org	yes	yes	www.tezpuronline.co.in
4	Haflong College	https:// haflonggovtcollege.ac.in	https:// haflonggovtcollege.ac.in	yes	yes	
5	Sadiya College	https://sadiacollege.ac.in	https://sadiacollege.ac.in	Nil	…...	
6	North Bank College	https:// northbankcollege.in	https:// northbankcollege.in	(D space)	yes	http://117.247.69.248.8081/library
7	Biswanath College	https://www.biswanathcollege.in	https://www.biswanathcollege.in	(D space)	yes	
8	Sibsagar College	https://www.sibsagarcollege.in	https://www.sibsagarcollege.in		yes	*National Academic Depository *National Digital Library *Swyam
9	Silchar College	https://www.silcharcollege.ac.in	Nil	Nil		
10	Dibru College	https://dibrucollege.edu.in	https:// dibrucollegelibrary.wixsite.com	yes	yes	*Dibrugarh University *Guwahati University *NAAC *DHE
11	Nowgong College	https://www.nowgongcollege.edu.in	https://www.nowgongcollege.edu.in			
12	Nalbari College	https://nalbaricollge.ac.in	https://nalbaricollge.ac.in		yes	E-samarth

(Source: College Website, October 2023)

Table no.2 that almost all colleges have their own Website except the Silchar College. All website are actively updated and very much beneficial for the students. Admission, Form fill up, Registration etc related information are in the website notice board are available which students as well as guardians can search anywhere anytime. Only Tezpur college and Dibru college has separate website for the Library. Maximum colleges has Institutional Repository and updated library information are there.

Findings : The above study on "Importance of academic institution website review :some selected intuition of Assam "has highlighted the following points.

1. The development and use of institutional website has been available almost all the surveyed Intuitions. But the stage of use and development found to be not equal among the institutions.
2. Lake of sufficient money institution face many problem to designing a good website, however all the colleges of Assam have website.
3. For draw proper website authority should take positive action and plane.
4. All colleges not maintain separate website for library but some colleges have the separate website for library**.**

We would like to mention some suggestion for better result as given below:

1. A good profile always increase the value and demand of any academic institution, may be college,school,university etc.When designing a website, the website maker very carefully include all the related information in respective intuition.
2. Person involve to design the website of respective institution should be knowledgeable one, having the knowledge of information technology. And the faculty of respective institution must aware about the institutional website.
3. In case of college, higher authority mainly Governing Body (G.B) should directed the structure and maintains of website for fruitful result .which help to reach the institutional goal.
4. A good website structure required money that why required money should be invest for proper website designing and proper result.
5. It is most important things that time to time website should be shaking and uploaded necessary and current information

Conclusion:

The website provides information not only current also past and future. Display the students' activities and uploaded images whenever necessary. Website time to time must be update and course related information should be included.

Separate faculty page should be draw with proper information with academic work. Faculties 'academic work should be included. Which influences the students and their gargen.

A clear cut direction is needed for site changing procedures. Higher authority should be concern about the website because a proper website gives the mileage of the institution and reflect and help to fulfill the institutional mission and vision.

Separate library page should be draw because library bear the document such as books,journal,magazine,newspaper ,question paper and many other.libray may be the mediator of past

Reference:

1. Bhattacharyya Jitamoni and Mahesh deshmukh(2022) Impact of ICT on Economic Development in 21st Century .Post-Modern Research Colloquial. Noton Press.
2. Manzoor,Mirfa.Hussain,walayat.,ahmedAftab etal (2012) The importance of Higher education website and its Utility. International journal of Basic and Applied Science.Vol.1,No.2
3. Poock Michael.,Bishop,Virginia Andrews(2006) Characteristics of an Effective Community College Web Site. Community College Journal of Research and Practice. Vol.30.Issue 9
4. https://www.sciencepubco.com
5. https://www.researchgate.net
6. https://www.unf.edu
7. https://morweb.org
8. https://scholarworks.umass.edu

Prevalence of ICT Resources in Libraries

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ABSTRACT: Academic libraries has a very distinct role in catering information services to the users such as researchers, scientist, policy makers, planners etc. An efficient academic library should have support of ICT to provide assistance to both patrons and information professionals. This paper emphasis the use and problems of I.C.T in academic libraries in the country. ICT facilitates access to electronic information which is an essential source of information and also complements to traditional system of using library resources. It signifies the role of ICT in academic libraries to improve the standard of information in the country. It also suggests us the ways to overcome the ICT problems in Academic Libraries.

KEYWORDS: ICT-importance, virtual concurrence, Academic Libraries, ICT Resources

Importance of ICT in libraries:

The application of ICT has enormously transformed the way of collection, storage, and retrieval of information in libraries. Particularly, the internet has completely transformed the traditional libraries into digital libraries. The information available digitally can be accessed and viewed from any part of the world. The use of electronical resources and digital libraries have also enhanced the facility to arrange hard/print copies of the information in many different ways.

The digital era of the libraries work differently as it is believed to enforce the library without walls. Academic libraries have now the capacity to share the resources with its users at any point of time.

As the technology is growing in the world, functioning of libraries has changed. The expectations from libraries and librarians are also changing widely. In our country, libraries have also taken up steps strategically to reshape their libraries, driven by manual processes into modern ones where operations are in part or wholly dependent on ICT applications. The versatility of ICT driven library operations that would adequately and efficiently meet the information needs of patrons has been widely acknowledged in extant literature to the extent that most academic libraries in India are positively inclined towards computerizing their operations. Although none of the academic libraries in the country has completely been automated or computerized, many are at varied and deferring stages of adaptation

in having their operations ICT driven or ICT dependent. Academic libraries are libraries that are established within the premises of universities or colleges/ academic institutions.The functioning of these libraries differ according to the necessity of their parent organisations. The purpose of these libraries is to cater service to faculty members, students, researchers and other scholarly inclined persons. Academic libraries can be categorized into university libraries and non-university libraries. Universities libraries are the best developed type of academic libraries in India. They are better funded as compared to other libraries. These libraries provide the type of information services that could be found elsewhere in the world.

ICT in Virtual Concurrence

ICT took place due to the virtual concurrence with the evolvement of laptop technology and different media verbal exchange technology. We may also label the additives of Information Technology (IT), that are often utilized in library and these are as follows:

1. Computer Technology
2. Communication Technology;
3. Printing era.

Above technologies are mentioned in brief as below:

1. **Computer Technology**: There is drastic improvement which can be observed everywhere with the evolvement of computer technology. We see the variations in different varieties of computer system which depends upon the uses of technology. It can similarly be divided into special workstations: Mainframe, Miniframe and Personal Computers.
2. **Software Technology:** Software includes the set of instructions, data or programs which are given to the computer system to function or to carry out some task differently. Many software programs are designed to assist the people and organisations to provide smooth functioning of libraries. Some of the critical library programs are: CDS/ISIS, Libsys etc.
3. **CD-ROM era:** CD-ROM is an acronym that stands for Compact Disk Read Only Memory. It is an optical disc of a hundred and twenty diameter and a hollow of 15 mm on the middle with thickness 1.2 mm. Data is recorded in virtual paperwork the use of laser beam. CD-ROM is used to preserve pre recorded text, snap shots and sound.
4. **Communication technology**: Communication or telecommunication technology are used to send the information at far off places through

electromagnetic or electric media such as Audio, A/V, TV, Videotext etc.

5. **Network era**: The critical characteristic of this technology is to interconnect computer systems and different verbal exchange gadgets in order from one place to every other place. It includes-LAN,WAN, MAN.
6. **Printing era**: A printer is a tool that prints our desired output from desktop or screen onto paper/images. There are variety of various styles of printers utilized in library along with Dot Matrix Printers, Laser Printer, Inkjet, Bubble-Jet, etc.

ICT and Academic libraries:

In India, academic libraries use ICT tools to meet the information need of users such as students and faculty staff. Academic libraries are established to support the objectives of their parent institutions which are to promote teaching, learning and research. Therefore, academic libraries are expected to serve the students, lecturers and other members of the academic community.

ICT is evolving in academic libraries to facilitate the functioning of library smoothly. Its supporting by initiating the process of automating the main functions, implementing efficient and effective library resource-sharing networks, implement management information systems, develop institutional repositories of digital local contents, and digital libraries: and initiate ICT based capacity building programs for library users.

ICT has supported these changes and transformed status of academic library and information services. The impact of ICT emphasized on information services by changing in format, contents and method of production and delivery of information products.

Types of ICT based Resources in Libraries:

a. **Electronic Books and Texts:** . The Library provides access to a variety of digital contents in the form of E- books, images and other pdfs. It also helps in providing other printed works (such as essays, poems, or historical documents). There are a variety of E-books/texts embedded in large, searchable databases. Most of our main collections for electronic books and texts can be located through the Library's Electronic Resources page. However, many more individual titles may be located using the Library Catalog.
b. **Electronic Journals:** E-journals are either fee based or open source. Some of the E-journals can be accessed openly, no fee is required to be paid. It is

not feasible for university libraries to arrange all the titles through online mode to their users as there is an extensive range of e-journals available. The serials crisis also promotes open access.

c. **Library Catalogs:** Most libraries now provide access to their catalogs from their institutional or parent web sites. Many others provide information about their holdings into larger databases such as World Cat or the RLG Union Catalog. The Library provides links to these catalogs under the "Catalogs" section on its web site.

d. **Reference Sources:** Reference resources are also available through online mode in full-text such as Dictionaries, Almanacs, Encyclopedias, etc. One can locate these resources through the Library's Database Finder, the Library Catalog, or through many of the Library's Research Guides by Subject.

e. Sound Recordings: The Library databases also provide access to sound recordings. If someone searches for finding some music online, start at the Music Subject Guide for the resources which are available to the University of Chicago Community.

f. **On-line Conference Proceedings:** The outcome of conferences is recorded in the form of proceedings in digital form i.e. CD – ROM and print form also. These are posted on the different platforms- event organizers, program scheduler and other scholar websites to be accessed and shared further by the users.

g. Databases: Use of databases started in 1970s and these were made available in the form of bibliographics, references and abstracts of articles in the academic and professional literature. Since, a tremendous growth can be seen in online databases.

Importance of ICT based resources in Libraries:

In modern era, library collection is not restricted to the walls of the libraries. We see that physical preservation lot of infrastructure to manage the printed collections. Preservation of printed collection is more expensive, requires lot of manpower to manage and time also. This virtual shift in libraries has entirely changed the working of libraries. It is very difficult even to fulfil the requirements of users with the physical collection. Today, people use the information as a primary source of information. The internet can be used for efficient retrieval and meeting information needs. ICT based resources are now considered as being of great importance to all types of libraries and they are reducing a large share of library

budgets. They are used in abundance. These resources have solved the problem of space too.

1. **Transformation in role of libraries and librarians:** The library users mostly use digital technologies and access to global information resources via the Web. Unfortunately, the huge amount of information available on the web is generally overwhelming information users. Further, a large number of Web users are still not able to use the web efficiently.
2. **Budgeting for libraries:** The evolving technology of library can only be improved if a proper budget is allocated for maintaining it properly. With proper funding, equipments, software, internet connections and E-resources can be updated only.
3. **Copyright management:** Digitization and provision of access to digital collections accessed via electronic networks, especially the Internet, is presenting bigger challenges to librarians. It becomes easier for users to access such resources from any location and at any point of time. So, copyright issues need to be taken care of before using them. Unlike print-based documents, digital-based information resources can be accessed from anywhere via electronic networks, copied several times, manipulated (i.e. edited, modified, repackaged, etc.) or deleted.
4. **Information access:** The libraries are actually resource centres where users retrieve information as and when required. But this distribution of information creates problems for the librarians, authenticity and trustworthy information needs to be disseminated.
5. **Preservation of digital information resources:** The preservation of digital information is different from the print-based library and archives system. Now we observe various methods of preserving digital formats.

Bibliography

1. Dange, D. (n.d.). *Limitation of ICT.*
2. Onuoha, D. (n.d.). *Impact of ICT.*
3. Patel, R. (n.d.). *ICT based best practices .*
4. S.Paul. (n.d.). *ICT in Libraries.*
5. Stephen, G. (2017). *Utilization of ICT based resources and services in Engineering College libraries case study of Sivagangai and Ramanathapuram Districts.*

Sustainable Technological Advancements: Navigating the Future of Libraries and Information Access through AI

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ABSTRACT: This study primarily focuses on the use of artificial intelligence to support intelligence strategies in contemporary libraries in order to survive in the modern era with particular attention to how it may affect developing nations. AI technology is being used by libraries to better serve users and improve user experiences, among other things, as they adjust to the digital age. A lack of AI competence and limited infrastructure are only two of the issues that the report draws attention to for libraries in underdeveloped nations. AI applications in education services, warehouse management, security, and user applications are described, along with the significance of an intelligent technological infrastructure. Difficulties like power supply problems and expensive expenses are recognized despite the possible advantages. Among the remedies offered in the report include collaborations with AI researchers and alternate funding sources. Ultimately, it highlights the need for adapting to the changing landscape and the revolutionary potential of artificial intelligence in libraries. Overall, it underscores the transformative potential of AI in libraries, emphasizing the need for adaptation to modernize services and improve information accessibility.

Introduction:

Artificial intelligence plays a major role in everyday computing tasks; it influences robotics, machine learning, deep learning, speech recognition, natural language processing, and self-driving technologies. Unlike human deep cognition, it has the advantage of efficiently recognizing patterns at scale and speed.

In order to meet the growing need for information access that has facilitated the advancement of civilizations in recent years, libraries are the main source. Information and knowledge are no longer in the same format or have the same dynamics due to the rapid advancements in computer technology and software applications, especially artificial intelligence. Consequently, in order to keep up with demand, libraries now need an equal amount of these technologies. If libraries

in the modern day don't start adopting the newest technology and reconsidering the material and services they offer, they run the risk of becoming outdated.

Libraries are keeping up with technology by adjusting to give users access to the greatest information available. Smart libraries are using different technologically advanced tools and techniques, such as Cloud Computing, Artificial Intelligence, Big Data, RFID, and the Internet of Things. Artificial Intelligence (AI) is a major component of library and information science, offering advantages such as speech recognition, natural language processing, expert systems, and robots for cataloging, searching, and reference services. The use of AI in modern libraries and its potential applications are investigated in this article.

The Potential Benefits of Implementing Artificial Intelligence in Libraries

Libraries have changed over the years, starting with prehistoric stone and clay tablets and continuing through the use of paper, microforms, and digital media. To satisfy the needs of user communities, they have kept up a variety of information resources. Libraries nowadays concentrate on their collections and services, whereas virtual libraries provide services from a distance. To satisfy changing information demands, they have investigated and integrated technical innovations such as virtual libraries, library 2.0, computers, internet, papyrus, parchments, and clay tablets.

Artificial Intelligence is crucial for libraries because it arranges and makes accessible vast amounts of data. It is a technological advancement driven by biology that mimics how people perceive and process information. AI technologies are used by intelligent library automation systems to offer knowledge-based services to library patrons and employees. Although AI is capable of replacing librarians, it will only handle tedious and menial tasks, freeing up librarians to interact with customers. Despite worries about alienation, the introduction of robots in libraries may improve relations between staff and patrons.

Artificial intelligence has to be included in library and information science workflows due to the libraries' relevance and global competitiveness, especially in developing economies. Applications for artificial intelligence include subject indexing, shelf reading, collection development, technical services, reference and descriptive cataloging, and information retrieval systems.

Artificial intelligence (AI) is the ability of machines to discharge human functions. It has improved the operations and services of libraries in developed countries. The goal of computer science's artificial intelligence (AI) branch is to build machines

with human-like thinking and behavior. Every aspect of life, including business, gaming, healthcare, the military, education, and libraries, can use it.

Physical obstacles can be eliminated by integrating artificial intelligence into the workflow of the library, transforming the physical environment into an intelligent one. Artificial Intelligence can be used in many different aspects of library operations, including subject indexing, shelf reading, collection development, technical services, reference services, and information retrieval systems.

Artificial intelligence can be utilized in libraries to give patrons knowledge-based services and to make wise selections regarding the acquisition and utilization of information resources. The 21st century library is a service oriented organization designed to meet the informational, cultural, recreational, and research requirements of its patrons. It makes use of a number of techniques to improve information accessibility and give customers prompt, high-quality service.

One of the main duties of librarians is to enable unrestricted access to resources that are necessary for the growth of research, education, the economy, and culture. Additionally, they offer a range of library and information services to meet users' various information needs.

The application of artificial intelligence in library and information workflow can optimize and elevate services for diverse user groups. AI can assist libraries in developing countries by resolving concerns with internet misinformation, improving efficient access to scientific databases, and guaranteeing that the library runs well overall with the least amount of human labor.

Corke (2013) supported that artificial intelligent systems (robots) will be an important technology for developing economies in the present digital era. They can work for 24 hours/7 days without getting weary, thereby freeing up librarians to attend to other jobs.

Artificial intelligence can be utilized in libraries to help staff members operate more quickly, effectively, and efficiently while also introducing library users to new resources they might not have discovered otherwise. Furthermore, the swift implementation of artificial intelligence will result in the development of novel and specialized positions within libraries. The integration of artificial intelligence into library and information processing is greatly hampered by the underfunding of libraries in emerging economies.

In order to modernize library services and enable its deployment, AI has to be felt as necessary by both library users and parent institution administration. The

use of more advanced inventions, including artificial intelligence, in libraries in developing nations has been hindered by a lack of maintenance.

AI-Powered Infrastructure for Enhanced Information Management and Accessibility

Enhancement of the Intelligent Technology Infrastructure

Libraries should concentrate more on building and enhancing intelligent technology platforms in order to achieve the open, mobile, and collaborative creation of intelligent services powered by data intelligence. The development of an intelligent technology platform must commence with the subsequent three elements: First, the foundational platform should be built by the library.

The creation of infrastructure platforms primarily encompasses internet technologies, cloud computing, big data engines, and the internet of things. Second, the creation of digital resources ought to be handled by the library. Digital resources have become increasingly intelligent due to data intelligence, and intelligent digital resources are now the foundation for intelligent services provided by digital libraries. Consequently, the library needs to be updated.

Introduction of Intelligent Search Services

The fundamental initiative of the library intelligent service is the intelligent search service, with the goal of enhancing the information retrieval experience for users. To promote resource sharing, the library should, on the one hand, keep refining and streamlining its information retrieval system and provide users with pertinent content based on their search history. However, by adding functions like voice search, QR code search, and semantic search, the library should expand the platform's retrieval mode. Speech has been considered a key component of human-computer interaction in the data intelligence era. To be sure, Library can utilize the external sources to activate the voice search feature.

Supplying Intelligent Education Services

The library can make use of a wide range of technologies, including cloud computing and the Internet of Things, to improve its instructional offerings. This method makes it easier to create an intelligent learning environment that integrates virtual and physical locations and meets the wide range of learning needs that most users have.

The field of library-based intelligent learning services has undergone a paradigm shift with the introduction of data intelligence. Currently, library users can use intelligent terminals to participate in learning activities whenever and wherever it is most convenient for them. Customers are able to easily exchange information with other users in flexible way. Users can promptly and proactively access data resources related to their learning objectives with the help of the library's intelligent learning service. It also makes conducting online research easier, making for an engaging and dynamic learning environment.

Management of Intelligent Warehouse

The intelligent warehouse management system for libraries has a large number of successful cases. In order to accomplish the automatic library book counting function, the intelligent book inventory robot of Nanjing University Library in China, which utilizes ultrahigh-frequency RFID technology, primarily makes use of machine automation technology, RF phase technology, and automatic identification technology. Accurate and speedy inventory realization enables the library administration to locate and handle books with ease, significantly cutting down on the amount of time it takes for readers to locate books.

Management of Intelligent Security

Identity management, place management, lending management, and enhanced security management are among the regular services provided by the library. Artificial intelligence technologies such as facial identification and biometric recognition can also help with security management. For instance, students' facial data is gathered and linked to their academic records using face recognition technology, which was specifically created by artificial intelligence. Students can now enter and exit the library by only brushing their faces instead of carrying their student IDs after binding.

Services for Intelligent Applications

These days, self-service library applications have a solid technological base and come in a variety of complex shapes and sizes. Important instances are the self-service print copy management system, the self-service ATM in the library, the self-service seat management system, and the lecture training appointment management system. Compared to traditional application services, autonomous applications have various benefits.

1. Using artificial intelligence to fill in gaps in time and space so that services are provided right away in the event of absences.

2. Reducing the expenses of staff and logistics related to library services by increasing the scope and quality of services provided.
3. Improving user interaction and protecting reader privacy in service apps.
4. Encouraging prudent use of service resources and lowering the risk of errors related to manual services.

Using facial recognition technology, users can access these intelligent application services inside the larger framework of a smart library.

Smart Advisory Services

One of the most important components of library services is consulting. Traditional consulting services have been subpar because to issues like a small pool of consulting librarians, ineffective manual consultation procedures, and time allocation restrictions for consulting projects. By addressing these drawbacks, the advent of intelligent consulting services turns out to be a game-changing solution that provides autonomous, instantaneous, convenient, and weatherproof intelligent consultation services, all while efficiently satisfying user needs for consultancy.

As demonstrated by organizations such as "Xiao Tu" from Tsinghua University, "Xiao Jiao" from Shanghai Jiaotong University, and the WeChat automatic response robot from Harbin Institute of Technology, intelligent consulting services are becoming more and more important in the role of a "consulting librarian" in many libraries. Interestingly, one unique aspect of the intelligent service provided by the library lies in these intelligent consulting services.

Smart Information Services

Intelligent knowledge services are a recent development in library services that indicates a strong dynamic and bright future. Underpinned by the swift progress of artificial intelligence technologies, knowledge services—the foundation of library services—are smoothly advancing into an area of enhanced intelligence and expertise. These include deep autonomous learning, cross-media awareness, virtual bionic functions, advanced big data management, and simulation language interaction.

There are many instances in the field of intelligent knowledge services, such as intelligent user behavior analysis, skilled information data administration, and the smooth coordination of corporate processes related to intelligent services. These are representative of the common patterns and complex procedures related to deep information mining in the context of intelligent knowledge services. Innovative research conceptual models, analytical research approaches, and

state-of-the-art knowledge analysis tools, along with sophisticated knowledge presentation strategies, enable such breakthroughs.

Challenges in Implementing AI in Libraries in Developing Nations

The integration of artificial intelligence (AI) into library operations in underdeveloped nations is an emerging trend that could potentially exacerbate the digital divide. Three major classifications of artificial intelligence exist: super artificial intelligence (usually surpassing human intelligence), strong artificial intelligence (equal to human intelligence), and weak artificial intelligence (strong in certain domains). Strong artificial intelligence is still a long way off, despite the fact that humanity has effectively harnessed weak artificial intelligence.

Lack of artificial intelligence specialists is a major challenge for libraries in many emerging economies. Furthermore, the pool of AI experts among library automation providers is small. The efficient use of artificial intelligence in libraries is seriously threatened by the erratic power supply in nations like Nigeria. Information professionals are becoming less enthusiastic about artificial intelligence and computer-based library systems as a result of this difficulty.

The application of AI in libraries in developing economies is complicated by a number of factors, such as poor infrastructure, a lack of technical know-how, high system development and maintenance costs, inherent complexities, high tariffs, a lack of a policy framework, and a lack of awareness of the ethical and legal issues surrounding the use of AI in libraries.

A thorough artificial intelligence strategy for libraries should cover specification specifics as well as moral and legal issues, such as copyright and privacy rules, in order to solve these issues. To ensure a careful and efficient implementation within the information workflow of growing economies, extensive consultations are necessary to identify the aspects of artificial intelligence that are most appropriate for library integration.

Approaches to Implement AI in Developing Countries' Libraries

Libraries in developing nations must look for alternate sources of funding for artificial intelligence, such as requesting grants from foundations, large corporations, ICT companies, and compassionate individuals.

Libraries need AI specialists to improve workflow and information service delivery. Stakeholder consultations must also be conducted. Libraries in underdeveloped

nations should hire qualified staff and make sure they receive sufficient training in the use of artificial intelligence in libraries.

In order to build apps and services that meet user needs, libraries and library associations might collaborate with AI researchers, developers, and technology organizations. In order to prevent a complete power outage that would make the enormous investment in artificial intelligence pointless, libraries should think about using alternate power sources like solar energy, inverters, standby generators, etc.

Artificial intelligence is one of the most innovative and important technologies for libraries in the modern period. Libraries in developing countries stand to gain a great deal from providing technical services, reference assistance, circulation management, resource administration, and information retrieval/dissemination. Artificial intelligence technology is not meant to take the place of librarians in libraries; rather, it is meant to strengthen and expand professional relationships and information exchange.

In addition to encouraging libraries to take a more active part in transforming educational institutions, associations and providers of library training should assist librarians in gaining important digital skills and abilities. Libraries in developing economies should integrate artificial intelligence into their workflow in order to meet the needs of their patrons and provide access to library information resources. They should also collaborate with technological agencies, researchers, and developers to obtain support in acquiring the necessary AI systems.

Conclusions

In the contemporary library environment, artificial intelligence (AI), which is widely recognized by scholars as cutting edge technology, appears to be the next frontier. To survive in the changing information economy, libraries in developing countries need to rethink the services they offer and the ways they operate. One of the best ways to accomplish this change is by implementing artificial intelligence into libraries.

The development of artificial intelligence systems will have a significant positive impact on libraries' technical services, circulation, reference, resource management, and information retrieval/dissemination departments. It has consistently been observed that the integration of AI into library workflow in growing economies would facilitate the alteration of library service approaches, which will ultimately result in changes to the educational system. As libraries gain

and maintain a larger development space, their standing as social and educational institutions, knowledge or learning centres, and essential communication agencies will become increasingly crucial.

Artificial intelligence technology is not meant to take the role of librarians; rather, it is meant to improve and expand interpersonal relationships and information sharing within the field. Therefore, developing economies will undoubtedly need to formulate effective policies, conduct thorough consultations, secure sufficient funding, involve expatriates, provide consistent training and retraining, form partnerships, maintain a steady power supply, and provide robust ICT facilities in order to successfully integrate artificial intelligence into library and information workflow.

References:

1. Asemi, A., & Asemi, A. (2018). Artificial Intelligence(AI) Application in Library Systems in Iran: A Taxonomy Study. *Library Philosophy and Practice (e-journal).* https://digitalcommons.unl.edu/libphilprac/1840

2. Bailey, C. W. (1991). Intelligent Library Systems: Artificial Intelligence Technology and Library Automation Systems.

3. Banerjee, M. S. (2022). Application, Advantage, and Disadvantage of Artificial Intelligence in Library Services. *International Journal of Creative Research Thoughts (IJCRT)*, *10*(11).

4. Chen, X., Xie, H., & Hwang, G.-J. (2020). A Multi-perspective Study on Artificial Intelligence in Education: Grants, Conferences, Journals, Software tools, Institutions, and Researchers. *Computers and Education: Artificial Intelligence*, *1*, 100005. https://doi.org/10.1016/j.caeai.2020.100005

5. Corke, P. (2013). Robotics, vision and control: Fundamental algorithms in MATLAP. Berlin:

6. Springer.

7. Enakrire, R. T., & Fasae, J. K. (2022). Infusion of Digital Technologies in the Sustainability of Academic Libraries: Opportunities and Threats. In T. M. Masenya (Ed.), *Advances in Knowledge Acquisition, Transfer, and Management* (pp. 57–69). IGI Global. https://doi.org/10.4018/978-1-6684-3364-5.ch004

8. Gede, D., Putu, I., Made, I., & Wayan, I. (2015a). Digital Library of Expert System Based at Indonesia Technology University. *International Journal of Advanced Research in Artificial Intelligence*, *4*(3). https://doi.org/10.14569/IJARAI.2015.040301

Plagiarism Checker Software

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ABSTRACT: Plagiarism is a form of intellectual theft and fraud. Plagiarism detection tools are useful for the academic community to detect plagiarism and prevent such illegal activities. The present paper describes some of the plagiarism checking tools available for plagiarism checking.

Introduction:-

Detecting and banning plagiarism has become one of the new challenges, as most students or researchers cheat by plagiarizing while doing research. This is because there are many resources available on the internet. Detecting plagiarism, stopping or tampering with documents and documents has become very common in academia.

Acts of plagiarism can be easily detected using some plagiarism detection software. However, for some expert plagiarists who are using some of the anti-plagiarism software available on the Internet, there are free or cost-effective plagiarism detection software available.

Plagiarism :-

According to the Oxford English Dictionary, plagiarism is "the wrongful appropriation or purloining, and publication as one's own, of the ideas or the expression of the ideas of another"

Researcher or author can copy the information he needs from monographs, articles, newspapers, government papers, reports, as well as primary sources of law, when you try to find any information about plagiarism, you need to search all possible types of publications or materials. Plagiarism Software helps to do this.

What is Plagiarism Checker Software?

Plagiarism checking software checks through the body of the text to see if there are instances of plagiarism in the written material, alerting the author to duplicate content in their writing. Some literature reviewers refer to software websites and web pages.

Today's modern paid plagiarism checkers offer some features in more forms. such as alerting the author whether a citation is necessary for their piece of writing, and scoring the document on how original the content is. Some advanced tools offer plagiarism checks in multiple languages and use AI technology to help identify similar and defined content.

Detection Tools: -

The best plagiarism checker should be able to detect plagiarism most accurately even if the original phrase has changed. The tool provides inclusive plagiarism reporting.

Plagiarism comes in many forms from rephrasing someone's ideas without acknowledgement to stealing a whole essay. These are the five most common types of plagiarism:

The use of plagiarism detection tools helps to identify whether part of another person's material or work has been used and to verify the authenticity of the work of others. Because plagiarizing a word or part of a sentence can be recognized. However, to maintain academic ethics, it is necessary to identify and prevent wrongdoing, which can be paragraphs and even complete documents.

There are many tools for detecting plagiarism. Only a few are discussed here. Plagiarism detection tools range from online services to free as well as commercial ones. Each of these methods has advantages and disadvantages.

1. ***Dupli Checkar:-*** Dupli Checker (or just duplichecker.com) is a free plagiarism checker(supported by the site's ads) and SEO check (e.g. keyword density, etc.) tool suite.

The users need not register to avail the service of free software. The writers can check the content through the search engines like Google, Yahoo etc. The users can type a few phrases or paste their article in the box given for checking on the free plagiarism tool.

2. ***Turnitin:*** This is a product from iParadigms. It is a web based service. Detection and processing is done remotely. The user uploads the suspected document to the system database. The system creates a complete fingerprint of the document and stores it.
3. ***Urkund:*** Another server based plagiarisms. It is a web based service which offers an integrated and automated solution for plagiarism detection. It utilized standard email system for submission of documents and viewing results. This toll also claims to search through all available online sources giving priority to educational and Scandinavian origin [7,8].
4. **Copyscape :-** It is an online plagiarism detection solutions. Copyscape's products boast millions of website owners worldwide to check the originality of their new content, prevent duplicate content, and search for copies of existing content online.
5. ***Plagiarism checker:*** Plagiarism Detector (plagiarismdetector.net) is a free online plagiarism checker with paid options supporting bulk checks with additional features. It is supported by Content Arcade headquartered in Pakistan with offices in the UK.

   It checks the text submitted by the users by splitting up the piece into small, distinct fragments. After identifying plagiarism it will report the result. It is full free and no registration or paid membership is needed for checking plagiarism through 'plagiarism Checker'
6. ***Copy Tracker:*** Copy tracker is free plagiarism detection software to check plagiarism in text documents. It is open source software under General Public License. As the source code is freely accessible anybody can use or modify and distribute the improved products. The beta version of Copy Tracker online is also now available. The text, html, doc or docx files can be scanned for plagiarism checking using Copy Tracker
7. ***WCopyfind :*** An open source tool for detecting words or phrases of defined lengh within a local repository of documents.
8. ***GPSP:*** Glatt Plagiarism Screening Program: This software works locally and uses an approach to plagiarism detection that differs from previously mentioned services. GPSP detection is based on writing styles and patterns. The number of correctly filled spaces and the time taken for completion of the test provides the hypothesis of plagiarism guilt or innocence .

9. ***Moss:*** a Measure of Software Similarity: Moss internet service "accepts batches of document and returns a set of HTML pages showing where significant sections of a pair of documents are very similar"
10. ***JPlag:*** Another internet based service which is used to detect similarities among program source codes. Users upload the files to be compared and the system presents a report identifying matches. Jplag does programming language syntax and structure analysis to find result
11. ***Plagium:*** Plagium plagiarism checker is a free online service now in the beta stage. By pasting the content to be tested anybody from anywhere can check for plagiarism. Users can also check the content of the URL for its source through plagium. As this service is provided free of cost, this is maintained with the donation of the users [18].
12. ***PlagAware:*** Is an online service used for textual plagiarism detection, which allows and offers some services for the users for example can search, find ,analyze and trace plagiarism in the specified topic similar to the topics PlagAware is a search engine, which is considered as the main element, which is strong in detecting contents of given texts
13. ***Check for Plagiarism .net:*** Check for plagiarism.net was developed by a term of professional academic people and become one of the best online plagiarism checkers that used to stop or prevention of online plagiarism and minimizes its effects on academic integrity. In order to maximize the accuracy Check for Plagiarism.net has used the some methods like document fingerprint and document source analysis to protect document against plagiarism .
14. ***iThenticate:*** One of the application or services designed especially for the researchers, author's publisher and other. It provided by iparadigms that have introduced turnitin in 1996 to become the online plagiarism detection. It is designed to be used by institutions rather than personal, but lastly they provided a limit service for single plagiarism detection user like master and doctoral students and this allow them to check a single document of up to 25,000 words. So they can use this service to insure or to check their draft thesis whether containing correct citation and content originality.
15. ***PlagiarismDetection.org:*** PlagiarismDetection.org an online service provides high level of accuracy result in plagiarism detection. Mainly designed to help the teachers and students to maintain ***and*** ensure or prevent and detect plagiarism against their academic documents. It provides quickly detect plagiarism with high level of accuracy.

16. ***Plaggie:*** it is source code plagiarism detection engine meant for Java programming exercise. In appearance and functionality, it is similar to JPlag. Plaggie must be installed locally and its source code is open. It is a stand-alone command line Java application.
17. ***SIM:*** is a software similarity tester for programs written in C,Java, Pascal,Modula-2, Lisp, Miranda, and for natural language. It was developed in 1989 by Disk Grune at the VU University Amsterdam. The process SIM uses to detect similarities is to tokenize the source code first, then to build a forward reference table that can be used to detect the best matches between newly submitted files, and text they need to be compared to SIM detects similarities between programs by evaluating their correctness, style and uniqueness [

Conclusion

Various tools have been developed to detect plagiarism. With the development of web based resources, detecting plagiarism is now as easy as plagiarizing a document. Most cases of plagiarism are related to copyright laws and the use of information. Appropriate information literacy training is needed to change the situation. He should check plagiarism at all levels. Users of information need to be made aware of the judicious use of information and the manner in which it can be adopted even at the learning stage.

Reference:

1. *http://www.ala.org/ala/mgrps/divs/acrl/standards/informationliteracycompetency.cfm#stan*. (2023, 4 17). Retrieved 4 17, 2023
2. Asim M El Tahir, A. H. (2011). *Overview and comparison of Plagiarism Detection Tools.* K.Richta.p.no161-172
3. *http://www.plagtarcker.com*. (2023, 4 18). Retrieved 4 18, 2023, from
4. Xiaomeng Zhang (2011, 6 20). *How to Detect Plagiarism* .
5. Beasley, J. D. (2004). The Impact of Technology on Plagiarism Plaggiarism Prevention and Drtection. *Plagiarism : Prevention, Practice and Policies* 28-35.
6. Osman Ahmed Hamza, S. N. (2010). Plagiarism Detection Using Graph-Based Representation. *Journal of Computing* , 20-30.
7. MaurerHermann, K. F. (2007). *A Survey Hyperwave-the Power of Wisdom.*

8. M.Zechner, ,. (2009). External and intrinsic plagirarism detection using vector space models. *Social Software*, pp. 20-50.

9. Akram. (2013). A Qualitative Research Apporach to Ensure the Copyright of Multimedia data by using Watermarking Techniques. *International Joornal od Advanced Research in Computer Sciencce And Software Engineering* , 36-40.

10. T.F.Lancaster. (2006). Classfication of Plagiarism Detection Engineering. *ITALICS* , 20-25.

11. Wolfgang R.B, D. E. (1996). A Watermark For Digital Images. *International Conf. Image Processing Laussane*, 50-60

12. Liu, C. (2006). Gplag Detection of software plagiarism . *Knowledge Discovery and Data Mining* . ACM Press. *Mining* 872-881.

13. A Aleksi, M. (2006). Plaggie licensed source code plagiarism detection engine for java exercises in Baltic Sea. *6th Baltic Sea Conference on computing education research*. New York USa: ACm. 141-142

14. Abbas, A. R. (2015). Overview of Different Plagiarism Detection Tools. *International Journal of Futuristic Trends in Engineering and Technology* , 1-3.

Role of Web Technologies in Building Sustainable Future of Libraries

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ABSTRACT: **Purpose**: Nowadays Sustainability is a prevalent and trendy topic in the global context. With the introduction of the Sustainable Development Goals (SDGs) created by the United Nations General Assembly (UNGA), the term "Sustainability" has been increasingly discussed in different domains, including Libraries. In the global scenario, many organizations are initiating Sustainable Library Groups aiming at better practising sustainability, also researchers are endeavouring to contribute strategies for library sustainability. Similarly, another popular term in libraries is "Web Technology", which includes various updated phases of the World Wide Web (www), like Web 2.0, Web 3.0, etc. Due to the rapid upgradation of technologies, dissemination of information is moving towards web-based. The mentioned Web Technologies can help libraries with real-time information services, and bridge the gap between libraries and users. Worldwide, many libraries have implemented or are in the process of adopting "Web Technologies" and practising sustainability. The present study attempts to know the importance of Web Technologies for library sustainability and to explore how Web Technologies can contribute to the creation of sustainable libraries. The possible Web tools applicable for creating sustainable libraries are identified.

Methodology: This study is purely based on literature study and self-created ideas and thoughts. This is a review-based study, which discusses others' opinions on library sustainability, lists important sustainability practices, and finds out the possibility of Web tool implementations for improving library sustainability. This study also adds some new opinions and strategies.

Findings: From the analysis it has been found that Web Technologies, especially social media tools can extensively contribute to building a sustainable future for libraries. Web 2.0 tools like Blog, Facebook, WhatsApp, and YouTube, and Web 3.0-enabled robots and chatbots are essential catchy tools for ensuring sustainability in the new age libraries.

Value: Though studies were conducted on both the topics, "Sustainable Libraries" and "Web Technologies" separately, combining both in one single study was not seen before. This study will highlight the role of Web Technologies in building a Sustainable future of libraries. This study may open a new window for further research on the topic. The possibility of applying Web Technologies for the sustainable future of libraries may draw a new scenario in both themes and help library professionals to make strategies for achieving sustainability in a cost-effective way.

KEYWORDS: Sustainability, Sustainable Development Goals, Web Technologies, Web 2.0, Web 3.0, Library, Librarian

1. Introduction:

1.1 Sustainability:

In 1987, the United Nations Brundtland Commission stated sustainability as "Meeting the needs of the present without compromising the ability of future generations to meet their own needs." Wikipedia (n.d.) says that specific definitions of this phrase are disputed and have varied with literature, context, and time.

The term "Sustainability" is frequently used in "Environment" and related domains. But in recent years, it has been popularly introduced and broadly discussed in Education, Business, Industry and related Research fields. Since a Library is considered as a social institution, the heart of an educational institute and it acts as a research and information hub, long-term sustainability is a highly demanded facet for libraries.

Bruno Sarda, a Sustainability Services leader said, "Sustainability can't happen without a lot of technology enablement" In today's technology-dominated world, sustainability practices can be done by using many modern solutions which help society become more energetic and sustainable, for example, Smart building systems, robotics etc. Hence there is a high necessity to implement modern technologies in libraries also for improving their sustainable development and better future.

An interrelated concept is Sustainable Development. UNESCO stated, "Sustainability is often thought of as a long-term goal, while sustainable development refers to the

many processes and pathways to achieve it." In 2015, the United Nations General Assembly (UNGA) identified Sustainable Development Goals (SDGs), also known as Global Goals. This is a set of 17 interconnected purposes intended to serve as a "shared blueprint for peace and prosperity for people and the planet, now and into the future." 4th one among the SDGs is "Quality education", which means "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all." The 4th SDG has some predefined targets, such as "affordable technical, vocational and higher education"; "universal literacy and numeracy"; and "education for sustainable development and global citizenship", which can be achieved by a technology-based academic library.

1.2 Web Technologies:

In this new age, being up-to-date with ever-changing technological developments is highly required in every profession. For the last many years, along with other professionals, Librarians have also been testing and adopting new web-based technologies to improve or enhance library services.

Web simply refers to the World Wide Web, also known as www. The journey of the Web is categorized periodically, which started with Web 1.0, the 1st phase. Web 2.0 and Web 3.0 are the subsequent phases involving various updated technologies and tools.

Technologies of the Web 2.0 phase enable users to flexibly read, write, upload, send and receive numerous forms of content via the Internet in real-time. From literatures, some essential Web 2.0 tools found useful for libraries are – Blog, Podcast, RSS Feeds, Social Bookmarking, Vodcast, Wikis, YouTube, Instant Messaging (IM) tools like WhatsApp, Telegram, etc.; Social Networking Sites (SNS) tools like Facebook, Instagram, X (Twitter), LinkedIn, etc.

On the other hand, Web 3.0 is the later phase which is called "The intelligent Web". It comprises Machine Learning (ML), Internet of Things (IoT) and Artificial Intelligence (AI). Web 3.0 can provide automatic and real-time AI-based services with accuracy, without physical human intervention. Important Web 2.0 tools found useful for libraries are – Amazon's Alexa, Robot, ChatGPT (GPT - Generative Pre-Trained Transformer), Grammarly, etc.

2. Literature Review:

From an initial Internet survey, it has been found that authors produce literature on Sustainability by linking it mainly to the Environment. Many authors conduct

studies on the contribution of technology to environmental sustainability, how to modernize applications for a sustainable future, etc.

The sustainability of libraries also has been portrayed in some studies. The majority of the studies discuss developing green libraries. Shukla et al. (2020) discuss on Sustainability development of green libraries and their features, importance, and standards. Singh and Dixit (2021) studied Sustainable Strategies towards Green Libraries in Lucknow, Uttar Pradesh

Haridasan and Firdaus (2021) discussed about application of Web-based sources and services for Sustainable Development in selected Indian Universities. Some other authors covered the role of AI and other modern technologies in sustainable libraries. Patrick (2023) discusses harnessing AI and sustainability in libraries. Pan and Nishant (2023) also study how AI can help reach digital sustainability. Bhoir and Shivarama (n.d.) discuss the role of the Internet of Things (IoT) in Sustainable Library Development.

To cope with the flow of sustainability and its growing demand, many Sustainable Libraries Groups have been created by some enthusiastic library communities, with different mottos and visions, for example, Sustainable Libraries Initiative (SLI), ALIA Sustainable Libraries Group, ELSIA (European Libraries and Sustainable Development Implementation and Assessment), etc.

Sustainable Libraries Initiative (SLI) is an initiative started in 2014 by the New York Library Association (NYLA). In 2018, it was recommended for the American Library Association (ALA) to partner with the SLI to bring the Sustainable Library Certification Program to a national audience. In 2019, ALA adopted sustainability as a core value of librarianship. The SLI is developed to provide the tools and resources that library leaders require to incorporate sustainability as a core value in their work, as mentioned by ALA. Enrolment in the Sustainable Library Certification Program is available for some selected libraries in the USA. Joining as a member of the SLI is a fantastic way to learn about how libraries can take a leadership role in promoting sustainability practices in their communities. Members gain access to various valuable resources, including webinars, policy examples, etc. These resources may help them to take practical steps towards becoming a sustainable library.

Among the collected literature, no one covered the role of Web technologies in achieving sustainability. Hence substantial impetus and thorough investigation on the topic is required.

3. Significance of the Study:

The Internet helps every domain and associated organizations to achieve sustainability with its undeniable and uncountable features, such as up-to-date information and day-to-day solutions, through which Internet users can make their lives more sustainable. But, if the overall social sustainability and the sustainability of a single organization are focused, achieving sustainability is not an individual effort, but a community effort. To make a sustainable library many components are needed, such as training, awareness, education, participation, access to information, cooperation, etc. These will be possible only through modern Web Technologies.

Therefore, the implementation of web-based library services using Web 2.0 and Web 3.0 tools are prime needs of the age to build a sustainable future for libraries. The features and importance of Web Technologies for library sustainability have not been discussed and pointed out in past literature. Though studies were conducted on both the topics, "Sustainable Libraries" and "Web Technologies" separately, combining both in one single study was not seen before. This study will highlight the role of Web Technologies in building a Sustainable future of libraries. This study may open a new window for further research on the topic. The possibility of applying Web Technologies for the sustainable future of libraries may draw a new scenario in both themes and help library professionals to make strategies for achieving sustainability in a cost-effective way.

4. Objectives:

The following objectives were formulated for the study.

(i) To know the importance of Web Technologies for library sustainability.
(ii) To explore how Web Technologies can contribute to the creation of sustainable libraries.
(iii) To know the possible Web tools applicable for creating sustainable libraries.

5. Methodology:

This study is purely based on literature study and self-created ideas and thoughts. This is a review-based study, which discusses others' opinions on library sustainability, lists important sustainability practices, and finds out the possibility of Web tool implementations for improving library sustainability. This study also adds some new opinions and strategies.

6. Discussion:

6.1 Importance of Web Technologies for Library Sustainability:

Within an educational institute, the library is the main content facilitator to support research activities and overall academic development. The reading materials and information services of a library should not be static, outdated or invalid. Modern research trends happening worldwide are pushing educational communities to be updated on any topic, at any time. Therefore, the contents of a library need to be updated regularly, evaluated and restructured timely. A library should be sustainable in such a way that it can provide patrons up-to-date, current and valid information today, and in future. Content expansion and instant and prompt Internet-based information services can help a library become sustainable in the long term. Bhoir and Shivarama (n.d.) mentioned that in today's digital world, one of the significant pillars of sustainable library development is the use of ICT and research skills to promote library expansion. With the help of modern ICT like Mobile, Computer, and the Internet; Web 2.0 Technologies can be easily implemented in library services and hence library sustainability can be achieved.

Today, library sustainability is fully impacted by the rapid growth of ICT and the continuous evolution of Web Technologies. Presenting the library through an individual website, circulating recent library news and upgrade alerts through the Internet, improving and strengthening e-resource collection, gathering quality information and their dissemination are some primary requirements of library sustainability. To fulfil these, Web Technologies are the only way which save costs, time and physical effort. Using Web Technologies of phases 2.0 and 3.0, library services are continuously restructured and re-evaluated to meet the changing needs of library users and serve them in the best way.

A library may not be sustainable only by buying printed books regularly. Sustainability can be achieved by acquiring updated, current and valid content and disseminating those to library users on their needs. In today's digital era, libraries are not only book provider desks but are facilitators of all types of educational content and intermediators between information and users. The five laws of library Science also promote the dynamic aspect of libraries. To achieve sustainability, today libraries cannot move without adopting new trends and technologies. Among all technological advancements, Web Technologies are very essential area librarians are required to take advantage of as dissemination of information is moving towards web-based.

In libraries, library managers should redesign their common tasks and duties with the help of Web Technologies, especially using the Web 2.0 and Web 3.0 tools,

which will instantly fulfil the daily basic needs of the users. Web Technologies can help libraries to serve library users with the latest and current information services without much effort, in real-time, and in a cost-beneficial way. Library sustainability depends on how relevant the content is to the user's needs, and how recent and current the information is. To fulfil these sustainability mandates, the only central idea is web technology.

6.2 How Web Technologies can contribute to the creation of Sustainable Libraries:

Birney (2014) mentioned six strategies for making a system ready for a sustainable future. Three of those are redefined in the present study and explained below concerning Web Technologies.

Find opportunities: Monitoring developmental activities happening worldwide helps people find windows of new opportunities. Since 2005 Web 2.0 technologies have been dominating the world with their numerous features and sequentially further versions such as Web 3.0 and others also have started ruling the world with AI and IoT. Web 2.0 tools provide collaborative, interactive and dynamic platforms for people to communicate and exchange ideas. Thus, these technologies have been offering multiple opportunities for librarians and library users. Birney (2014) said that we should observe and experience where these opportunities lie. In this regard, library managers should explore the opportunities and benefits offered by Web 2.0 and Web 3.0 tools and try to create a sustainable library.

Experiment system: Birney (2014) also said that change will not happen unless we create something new. The author realised that that creating products and services is not all that is needed, instead, we need to experiment with the way one builds markets. This strategy is also directly related to Web-based services. Web Technologies are considered as best cost-effective way for library marketing. The Web 2.0 and Web 3.0 tools are giving a vast platform to library managers for experimenting with information dissemination services in different ways. Instead of face-to-face interaction, virtual reference services can be experimented with the help of Web 2.0 to provide 24x7 patron service. Some of the time-consuming, costly and complex manual tasks have become easy and effective with the blessings of Web 3.0 and libraries should experiment with these to have a sustainable journey. Though a library is not directly a revenue generator body, from the literature study and overall inferences, it may be that there is the possibility of building a market by creating library's product by applying creativity, proper strategy and experiment. The library markets can be popularised and upgraded timely over Web 2.0 platforms like SNS, thus attracting people towards the services and products. If

we look into the traditional scenario of a library, through face-to-face conversation and paper-based notifications; library's reading content, other products, news and notifications cannot be circulated and popularised among a vast and diverse patron community within a short time. In this regard, Web 2.0 technologies help librarians to face those challenges, provide them with experimental platforms, allow people to participate in the library journey through the web, leave online comments, give feedback and, thus help sustainability achievement.

Innovation and Learning Platforms: We need to generate platforms that support innovation and learning so we start to accelerate the scale and reach of change. This strategy also can be directly connected to web technology implementation. Web-based library services can always provide library users and other people with an updated learning platform. These platforms are dynamic read-write webs where people can develop their innovative minds and learn new things by sharing information and ideas in real-time.

Barbara Lison, the President of the International Federation of Library Associations and Institutions (IFLA) said that none of the SDGs can be achieved without access to information. As libraries are the prime hub of information services, the role of libraries is significant in providing access to information to the individuals and organizations working toward the SDGs. Examples of library sustainability concerning SDGs and Web Technologies are explained below.

The 4th i.e. Quality Education, has always relied on libraries to provide information for education both within and beyond schools and universities. Applying Web Technologies in library services and classroom purposes the 4th goal can be fulfilled, since today's society's development primarily depends on technology and information. In this regard, no other technology can replace the role of Web tools. Using the Web 2.0 tools library can distribute quality information instantly, thus help achieve quality education.

According to Lison (2023) Libraries could help achieve other SDGs also, for example, the 5th goal i.e. "Gender Equality", 14th goal i.e. "Life Below Water" and many others. Because the people who work on these goals need to understand the topics clearly. For that, they should have the right content, and valid and up-to-date information which comes only from libraries. Moreover, there is one general goal that brings it all together i.e. goal no. 16, "Peace, justice and strong institutions". Its sub-goal 16.10 states that free access to information is a basic prerequisite for reaching the 16th SDG. In this context, it can be said that 16.10 is fully a library goal. Web Technologies make access to information easy, efficient and instant and in the Web 2.0 environment, people can get up-to-date information via the Internet and

communicate with library managers anytime for further needs.

Manna and De Sarkar (2022) identified parameter-wise sustainable development initiatives among some libraries around the world and explained them with examples. One parameter they mentioned is "Optimization of library services", which states that technological innovation supports value-added library services for the optimum utilization of resources to get quicker access to resources via seamless connectivity. To upsurge user interaction with the library and to boost user engagement, Libraries can create SNS pages like Facebook, Instagram, X (Twitter) pages and upload special collections, news and notifications of library activities to reach out to a broader section of the community easily.

Another parameter is outreach services for social inclusion, as per the IFLA guidelines towards sustainable development initiatives. To conduct outreach activities Web Technologies can immensely help since these are interactive and virtual platforms.

One of the parameters the authors mentioned is related to Web 3.0, i.e. "Intelligent library service". Robotics has made a sharp in-road to library service provision. In some libraries, authors observed the use of chatbots carrying out the role of a reference librarian and the telepresence robots communicating with the users and satisfying their information needs.

Patrick (2023) discussed harnessing AI and Sustainability in Libraries through the Sharjah Prize for Library Literature Forum and pointed out that Libraries play a crucial role in promoting innovation and adapting to the digital age. The authors summarised many sustainability initiatives with examples, important speeches and research works. Some of those are restated and outlined in the present study in the context of Web Technologies.

Innovative Spaces for Enriched Learning: These innovative spaces can enhance teaching and learning experiences for library patrons. From interactive learning environments to advanced research facilities, libraries are advised to adapt to the digital age by providing access to the latest technologies that enrich the educational journey. In this regard, the importance of Web Technologies is undeniable. Web 2.0 and 3.0 are the technologies that can enrich the said learning experiences within an interactive environment.

Collaborative Frameworks for Sustainability: Using Web 2.0 platforms collaborative network can be easily created among the educational community, which helps discussion and teamwork towards the library's sustainability goals.

The role of Artificial Intelligence in Education: AI is the main component of the Web 3.0 phase and has been gaining popularity in every field for its numerous advantages, also been criticised due to some demerits. The author added an example from another research work, how students in the UAE perceive and engage with AI tools within academic libraries. With AI becoming increasingly prevalent in education, understanding students' perspectives and experiences with these technologies is crucial for shaping future library services.

Libraries as Cornerstones of Comprehensive Development: Author mentioned an example from an important speech that libraries are not just repositories of knowledge but the very cornerstone of comprehensive development for Arab societies. Libraries are not static entities; they are dynamic institutions that adapt to meet the evolving needs of their communities. Hence to fulfil the needs of user communities today and in the future, libraries should adopt Web Technologies, use them precisely, and move towards to sustainable future.

6.3 Web Tools applicable for creating Sustainable Libraries:

Web Technologies can be considered as the main key to providing access to sustainability research within educational institutes and other organizations. Moradi et al. (2017) pointed out that Web 2.0 generated new prospects for academic libraries and simplified the cooperation and communication between librarians and library users. If Web 2.0 technologies are implemented in libraries and experimented with, these may truly contribute towards library sustainability and can open a new scope of practice. Some possible areas of use of Web 2.0 and Web 3.0 technologies for improving sustainability in libraries are mentioned below.

To achieve SDGs, library can create a Blog page like a "Web-based forum for interdisciplinary discussion" which may give one single platform to share opinions and ideas and to make collective strategies. Blog is considered one of the very important tools of the Web 2.0 category, because of its dynamic nature, participation, interaction, media sharing and other features. Aqil and Siddique (2010) mentioned many aspects and services of libraries that may be fulfilled by Blogging, those are collection development, reference services, Current Awareness Service (CAS), Library consortium, Library Newsletter, Subject guide, event announcement tool, feedback, book review, etc. Blogs about Sustainability practices can be uploaded by librarians where patrons and participate and gain ideas. Thus, Blogs can be an essential component of library sustainability.

Maness (2006) said that libraries use IM to deliver chat reference services, where library patrons can synchronously connect with librarians much as they would

in a face-to-face reference environment. Ansari and Tripathi (2017) stated that WhatsApp can improve library alert services like Current Awareness Service (CAS), virtual reference, notifications, etc. This tool may be used in the context of many SDGs, mainly to share knowledge and discussion. Like the forum, Library WhatsApp groups can also contribute effectively to the sustainability journey. To achieve SDGs librarians can discuss with colleagues of the institute and organizations through group messages and video chats facility of IM. The recently introduced WhatsApp channel is another important addition to the Web 2.0 category which can contribute to sustainability practice through current information dissemination.

In today's ICT-dominated age, SNS are the easiest and cheapest sources for information dissemination and global marketing, also these are cost-effective ways for instant digital service delivery. The use of Facebook, X (Twitter) in different Sustainability strategies can strengthen the approach. To involve library Users and gain popularity in green library initiatives or any other kind of library sustainability practice, Library SNS pages can be effectively used as publishing platforms.

Si et al. (2011) said, "RSS saves time required for logging on to each of the sites and provides current information at the convenience of the user." Hence RSS can contribute to library sustainability since it collects information from multiple sites, provides instant integrated information through a single window, and saves time for librarians and uses both.

Library podcasts can effectively help to publish lectures of important personalities, expert interviews, book review reading and storytelling sessions. Since podcasts are audio-based services, they also help visually challenged students. Libraries commonly use vodcasts to provide video tutorials and training for users. Using a YouTube channel library can efficiently provide tutorials and awareness sessions. YouTube's video delivery and preservation services have proven quite helpful for libraries. Other events, such as essential highlights of lectures, workshops, and conferences, also can be circulated through YouTube. Thus, these Web 2.0 tools encourage user engagement and can improve sustainability practices in libraries. AI-based Chatbots and customized Alexa are other important helper tools that can offer FAQ service and 24x7 patron assistance.

7. Conclusion:

From the analysis, it has been found that Web Technologies, especially social media tools can extensively contribute to building a sustainable future for libraries. Web

2.0 tools like Blog, Facebook, WhatsApp, and YouTube, and Web 3.0-enabled robots and chatbots are essential catchy tools for ensuring sustainability in the new age libraries. Thus the study has revealed the crucial role of Web Technologies in sustainability practices. It has mentioned some sustainable library initiatives started in different countries, which can help readers gain knowledge and ideas about the strategies to follow. Some selected initiatives mentioned by other authors in previous studies are restated and modified in this study in the context of Web Technologies. Though there are many Blogs and other social media posts on the sustainable development of libraries found on the Internet, the present study has summarised many important aspects. Special focus given on Web Technologies may help library managers to understand and relate both themes and also may support further planning and research. The study is purely based on literature survey, in which possibilities of Web-based services for sustainability have been portrayed for the first time. There is a scope for depth study and survey-based research on the domain.

References (APA 7th style):

1. Ansari, M.S. and Tripathi, A. (2017). Use of WhatsApp for Effective Delivery of Library and Information Services. *DESIDOC Journal of Library & Information Technology, 37*(5), 360-365. https://doi.org/10.14429/djlit.37.11090

2. Aqil, M. and Siddique, M.A. (2010). Blogs and blogging in library. *India Journal of Library and Information Science, 4*(2), 145-151

3. Bhoir, J. P. and Shivarama, J. (n.d.). Internet of Things for the Sustainable Library Development in the Digital World. *Envisioning Digital Transformation in Libraries for Nextgen Academic Landscape*, 267-275

4. Birney, A (2014, June 27). Six strategies for creating system change for a sustainable future. *Sustainable business blog*. https://amp.theguardian.com/sustainable-business/blog/six-strategies-systems-change-sustainable-future

5. Daniel, D (2023, March 16). Learn the key role technology plays in sustainability. *Techtarget*. https://www.techtarget.com/sustainability/feature/Learn-the-key-role-technology-plays-in-sustainability

6. Graham-Clare, L. (Jun 15, 2022). Supporting sustainability: what can librarians do. *Librarians*. https://www.springernature.com/gp/librarians/the-link/blog/blogposts-news-initiatives/what-librarians-can-do-to-support-sustainability/23146572

7. Haridasan, S and Firdaus, S. (2021). Application of Web-Based Sources and Services for Sustainable Development in University Libraries. *Library Philosophy and Practice (e-journal), 4878*

8. Libraries and Sustainable Development (n.d.) *United Nations*. https://www.un.org/en/library/libraries-and-sustainable-development

9. Lison, B. and Hinz, A. (2023, July 7). Libraries exist to serve the Sustainable Development Goals": An interview with Barbara Lison. *Academia & Publishing*. https://blog.degruyter.com/libraries-exist-to-serve-the-sustainable-development-goals-an-interview-with-barbara-lison/

10. Manna, D. and De Sarkar, T. (2022). Sustainable development initiatives in libraries: A critical analysis. *Annals of Library and Information Studies, 69*, 282-293.

11. Maness, J. (2006). Library 2.0 Theory: Web 2.0 and Its Implications for Libraries. *Webology, 3*(2)

12. Moradi, S., Bagher, D. T., and Mirhosseini, Z. (2017). Designing a model for Web 2.0 technologies application in academic library websites*. Information and Learning Science, 118*(11/12), 596-617. https://doi.org/10.1108/ILS-03-2017-0013

13. Pan, S L. and Nishant, R. (2023). Artificial intelligence for digital sustainability: An insight into domain-specific research and future directions. *International Journal of Information Management, 72.* https://doi.org/10.1016/j.ijinfomgt.2023.102668

14. Patrick, E. (2023, September 15). Harnessing AI and Sustainability in Libraries through the Sharjah Prize for Library Literature Forum. *Cryptopolitan*. https://www.cryptopolitan.com/harnessing-ai-in-libraries-through-sharjah/

15. Si, L., Shi, R., and Chen, B. (2011). An investigation and analysis of the application of Web 2.0 in Chinese university libraries. *The Electronic Library, 29*(5), 651-668. https://doi.org/10.1108/02640471111177080

16. Shukla, R., Sharma, A. and Singh, M. (2020). Sustainability development of green libraries and its features, importance, and standards. *International Journal of Information Dissemination and Technology, 10*(4), 219-226

17. Singh, M.P. and Dixit, S. (2021). Sustainable Strategies towards Green Libraries: A Study of State University Libraries of Lucknow, Uttar Pradesh. *Library Philosophy and Practice (e-journal),* 4968

18. Sustainability (n.d.). https://en.wikipedia.org/wiki/Sustainability

19. Sustainability (n.d.). *United Nations*. https://www.un.org/en/academic-impact/sustainability

20. Sustainable Development Goals (n.d.). https://en.wikipedia.org/wiki/Sustainable_Development_Goals

21. Sustainable Libraries Initiative (SLI) (n.d.). https://sustainablelibrariesinitiative.org/

ICT Application and Sustainable Practices for Library Development: A Critical Analysis

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ABSTRACT: This study investigated research skill**,** Overview of the key themes in the field of information and communication Technology (ICT) application for sustainable library development. Libraries adapt to the digital age. ICT plays a crucial role in enhancing their services and ensuring long-term sustainability. This study outline the importance of ICT in modern libraries, its impact on user engagement and knowledge dissemination, and the strategies that can be employed to promote sustainable practices in library development. ICT Application and sustainable library development Descriptive survey research design was used for the study. Target group of the study was 105 librarians working in the college libraries Affiliated to Sant Gadge Baba Amravati University Maharashtra. Six research questions were raised and three hypotheses were tested at 0.05 level of significance. It highlights the incorporation of cutting- edge in library development. The findings of the study revealed that sustainable library development was primary to librarians; librarians high need for research skills technology, such as digital repositories, and online cataloging, as well as the incorporation of eco-friendly initiatives to reduce the environmental footprint. This study sets the stage comprehensive discussion on the synergy between ICT and sustainable practices that would enable them to perform optimally on their job.

Introduction:

Information and communication Technology (ICT) has revolutionized various aspects of our lives, including the way we access, manage, and share information. In the context of libraries, ICT has played a pivotal role in the development and modernized library services. ICT enables libraries to efficiently catalog, organize, and manage their collection, whether they are physical of digital, improving accessibility for patrons. Libraries use ICT to digitize and preserve rare and historical materials, ensuring their long-term availability while minimizing physical wear and tear. Libraries can provide a wide range of online databases, e-books, e-journal, and multimedia resources, expanding the scope of information

available to users. Integrated library management systems powered by ICT streamline administrative tasks, such as circulation, acquisition, and patron management. ICT allows users to access library materials and resources remotely, breaking down geographical barriers and improving user convenience.

User-friendly OPAC driven by ICT simplify the search process, making it easier for patrons to find the materials they need. ICT facilitates collaboration between libraries, enabling resource sharing and interlibrary loans, which can significantly enrich a library's collection. Libraries use ICT to educate patrons about information literacy, helping them develop the skills to evaluate and use digital information effectively.ICT enables libraries to engage with their communities through events, webinars, online book clubs, and forums, fostering a sense of belonging and knowledge sharing. ICT can contribute to sustainability by reducing the need for physical space and resources. Digitization and online services reduce paper waste and energy consumption. In essence, ICT in library development empowers libraries to adapt to the digital age offering a broader range of services, greater accessibility, and enhanced efficiency. It ensures that libraries remain vibrant centers of learning and knowledge dissemination in the 21st century.

Sustainable library development involves creating and maintaining libraries in a way that ensures their long-term viability and positive impact on the community and the environment. Implement eco-friendly practices in library design and operation, such as energy-efficient lighting, waste reduction, and sustainable building materials. Develop a stable funding model, diversify revenue sources, and manage resources efficiently to ensure the library's financial sustainability. Engage with the community to understand their needs and preferences, and tailor library services and programs accordingly. Embrace technology to provide digital resources and services, ensuring equitable access, to information for all member of the community. Promote continuous learning and education by offering diverse resources and programs for people of all ages. Safeguard cultural heritage and historical materials through preservation efforts, including digitization and conservation.

Partner with local organization, schools, and government agencies to leverage resources and enhance the library's role in the community. Be flexible and responsive to changing community needs, technological advances, and societal shifts. Ensure the library is physically and digitally accessible to people with disabilities, fostering inclusivity. Regularly assess the library's impact and performance to make data-driven decisions and improvements. By adhering to these principles, libraries can achieve sustainability in the context of their social, economics, and environmental responsibilities.

One of the core concepts in sustainable library developments is to use ICT and research skills to assist the developments needs of libraries and librarians. Sustainable development refers to the development that meets the needs of the present without compromising the ability of future generation to meet their own needs (word Commission on Environment and Development, 1987) it is the organizing principal through which human development goals are met and at the same time sustaining the potentials of natural resources upon which the economy and society depend.

Librarians are increasingly called upon these days, not just to support the research of academics in other disciplines, but also to be proficient researchers in their own right. Academic librarians are now producing research and scholarly works of the own to assist them have better knowledge of the profession and to contribute back their own knowledge, skills and experience. Hence, the need to posses the basic research skills that would aid the proficiency of the librarians in making their pedagogical experience available to the wider world by the way of research productivity.

The vision of sustainable library development takes into consideration the ICT and research dimension of human development. Research skills are one the most vital skills required for sustainable library development. Onus is therefore on academic librarians to develop their discipline through a research-based method by creating environment that includes vital integration of research activity and ICT application.

Ensuring sustainable library development in the modern period requires continuous acknowledgement of libraries as the warehouse of information resources needed for global advancement. Most of these resources are kept in digital format. 21st century librarians are therefore expected to be fully ICT and research skills are integrated in every facet of library operations. Libraries are by all standards at the forefront of the digital transformation and provision of digital information infrastructure and at the same time manage and curate culture heritage collection. This ushers in modern ways of involvement with information and knowledge and the need to rethink skills and competency profiles that will enable academic librarian to support e-research all along the research cycle.

Objectives of the research:

1. To identify parameters contributing to the sustainable development intent of the library.

2. To identify extent of research skills needed by librarians for sustainable development.
3. To examine the impact of research skills of librarians on sustainable library development.
4. To examine extent of application of ICT in library.
5. To identify impact of ICT on library operation.
6. To find out challenges obstructing the progression towards sustainable library development.

Research Questions:

1. What comprises the sustainable development of libraries?
2. To what extent does college librarian possess research skills crucial for sustainable library development?
3. What influence does a librarian's research skill have?
4. What is information and communication Technology utilized in libraries?
5. How does ICT affect the functioning of library operation?
6. What obstacles hinder the use of ICT for ensuring sustainable library development?

Hypotheses:

1. Research skill does not exhibit a noteworthy connection to the sustainability of library development.
2. The application of ICT (Information and Communication Technology) does not demonstrate a sustainable development of libraries.
3. The combined impact of research skills and ICT application does not yield a notable connection to the sustainability of library development.
4. Increased community engagement positively correlates with sustainable library development, as active involvement fosters support and resource utilization.

Review of Literature:

1. Over the past 50 years, the sustainable progress of the advanced nation can be attributed to their significant investment in cultivating a well-educated

workforce, particularly in honing research abilities and the proficient use of information and communication technology (Bogoro,2014). Essential components of sustainable development encompass research and the utilization of ICT, as their outcomes are anticipated to directly impact humanity. Librarian are actively working together to enhance the delivery of library services by fostering research skills and leveraging ICT, which is currently quite apparent. Librarian are currently playing education, particularly focusing on enhancing research skills and the use of information technology (ICT) to promote sustainable library development in developing nation.

2. The 2023 Agenda for sustainable development, established by the United Nations, comprises 17 sustainable developments goals that encompass economic, environmental, educational, and social development aspects (IFLA,2018). Librarian plays a crucial role in achieving this objective. Libraries, an organization, play a significant role in advancing the UN2030 agenda. Championing the integration of unimpeded information access, protection of cultural heritage, global literacy, and access to information and communication technology within the framework. Access to information is one of the objectives within the sustainable development goal.
3. Countries committed to fostering sustainable development on a global scale must implement policies for library information utilization. This involves allocating sufficient financial resources to support research efforts aimed at generating valuable knowledge that can positively impact people's lives (Altibach 2009). To achieve sustainable library development, it's essential to boost the research capabilities of librarians and maximize the use of information and communication technology (ICT) in library functions 2013, the association of Research Libraries (ARL), the association of European research libraries (LIBER).

Research Skills:

The global education group places a strong emphasis on ICT application by implementing a robust research question system that effectively combines higher education research capabilities with industry and societal needs, all at a competitive rate. Worldwide, territorial institutions typically play a pivotal role in driving research and development efforts. This is because the declining quality of research is often linked to the structure and functioning of these institutions. The academic sector suffers from a lack of financial incentives for publishing, and research output in libraries has dwindled to a very low level as a result. The global

competitiveness of a nation is influenced by the extent of government investments in research, development, and education initiatives. In the education sector, academic and university administration are required to cultivate research skills in line with global standards. Assessing the research skills of academics can be challenging due to the variability in research processes across different disciplines.

Nonetheless, several authors have assessed research skills to differing degrees.

Research skill development is widely employed across various disciplines worldwide to evaluate research performance in higher education institutions. This framework perceives research as an ongoing process of knowledge creation, beginning with what the researcher knows and advancing toward what is universally understood, involving the investigation of the unknown through interviews. The vitality of the librarian profession hinges on the essential acquisition of research skills.

These skills encompass a range of competencies needed by librarians, such as:

1. ***Research data management (RDM) Skills:***

   Exactly, one the vital skills for librarians are research data management. This involves effectively handling, organizing, and preserving research data. Certainly, research data management skills encompass the ability to efficiently handle and organize a significant amount of research information and ensure its proper storage and accessibility.

2. ***Information dissemination skill:***

   Information dissemination skills are also crucial for librarians. These skills involve effectively sharing and communicating information to a wide audience, ensuring it reaches the intended recipients efficiently. Information dissemination skills involve the capacity to convey information to a broader audience in a clear, accessible, and organized manner, aiming to facilitate understanding and accessibility of the information by the target audience. This skill is essential for sharing knowledge, research findings, and valuable data effectively.

3. ***Computer Skill:***

   Competence in data analysis tools and software to process and extract valuable insights from research data Knowledge of information retrieval systems and databases to assist library users in finding relevant resources. In addition to research data management and information dissemination skills, computer skills are essential for librarians. These hinder the ability to proficiently utilize a variety of computer software, databases, and

technological tools for effectively managing, analyzing, and presenting data and information using an e-compass.

4. ***Critical thinking skill:***

   Critical thinking skills are a fundamental component of effective librarianship. These skills involve the ability to analyze information, evaluate its credibility and relevance, and make informed decisions. Librarians with strong critical thinking skills can assist library users in finding accurate and reliable information and help them navigate complex research inquiries. Critical thinking enables librarians to assess the quality of sources, offer well-reasoned recommendations, and support users in their quest for knowledge.

5. ***Analytical Skills:***

   Assess the quality and relevance of research materials and sources. Analyze complex research question and break them down into manageable components. Identify patterns, trends, and connections in information to provide valuable insights. Solve problems efficiently, such as addressing cataloging and classification challenges. Assist library users in finding the most suitable resources for their research needs by analyzing their requirements.

6. ***Problem solving skill:***

   Resolve issues related to cataloging, classification, or organization of library materials. Assist patrons with research inquiries and finding the information they need. Manage resource constraints and budgetary challenges effectively. Develop innovative solutions to enhance library services and user experiences. Handle unexpected situation, such as emergencies or disruptive behavior in the library.

Librarian with strong problem-solving skills can adapt to changing circumstances and provide valuable support to library users and the overall library operation.

Sustainable development through the integration of ICT in Librarianship:

The role of libraries in the 21st century is clearly evolving due to emerging technologies that shape how information is generated, managed, and shared. This transformation is a result of ongoing changes in technology and collaborative relationship in research and scholarly communication. The advent of e-research has transformed the way research is conducted, and libraries play a crucial role in adapting to these changes. They now provide services like assisting in research data management plans, hosting collaborative virtual research environments, managing

institutional repositories, and disseminating research findings through open access mechanisms to support the evolving needs of researchers and scholars. This digital shift is helping to make research more3 accessible and collaborative on a global scale. Indeed in the modern academic environment, the proficient use of ICT has become obligatory. This extends to various role, including librarians. Being technology-savvy is now a key requirement for 21st century librarians, as they are expected to not only manage traditional library resources but also navigate and provide support for digital tools and resources, ensuring that students and researchers can access and utilize information effectively in a digital age. Librarians are anticipated to thrive in a digital setting and should actively participate in exploring and implementing contemporary technology within their library facilities. By executing diverse digital web-based projects, librarians with any level of experience in their field can enhance and enable information and knowledge access, preserving the culture, scientific, and intellectual heritage of humanity.

ICT encompasses both the tools and methods employed for the collection, processing, storage transmission, and sharing of information. ICT involves the use of computers and various technologies to obtain, organize, sore, retrieve and distribute information. The advent of the internet and the development of the world wide have revolutionized information processing, storage, communication, dissemination, and automation, leading to advancements in information and communication technology (ICT). As a result of this, the application of ICT in libraries becomes important in an effort to provide information in soft form to the user community.

How ICT affects library operation:

The introduction of new technology is transforming traditional library operation, and ICT is playing a crucial role in making information-related activities more efficient. Various aspects of ICT that contribute to library development such as electronic publishing, data processing, artificial intelligence, database management, information retrieval and computing.

1. ***Library Networkin***g: library networking refers to the interconnection of libraries through computer system and communication technology to facilitate the sharing of resources, information, and service among libraries. The most important is to enhance efficiency of library operations.
2. ***Library Management***: library management involves the planning, organization, and coordination of various activities within a library to efficiently provide library services, including acquisition, cataloging, circulation, and user support.

3. ***Library Automation:*** library automation refers to the use of computer-based systems and software to streamline and improve various library processes, including cataloging, circulation, collection management, and user services, with the aim of increasing efficiency and accessibility for patrons.
4. ***Audio-visual technology:*** audiovisual technology encompasses the tools, equipment, and methods used to create, record, transmit, and display audio and visual content, often for educational, or communication purposes. This can include technologies like projectors, sound system, video recording equipment and more.
5. ***Digital library:*** A digital library is a collection of digital resources, such as e-books, electronic journals, multimedia content, and databases that are organized, cataloged, and made accessible online for users to access and retrieve information electronically.

The alignment between research abilities and the application of ICT

Academics libraries play a crucial role in nurturing research skills and cultivating a research culture in any country. To effectively apply technology to library functions, library staff must be trained in ICT to keep pace with advancements in library and information science. Failing to keep up with contemporary ICT usage can hinder many libraries in supporting research endeavors. The enhancement of research skills increasingly relies on embracing ICT to the fullest extent. In the 21st century, academic librarians must possess a profound grasp of ICT, excel in research skills, and cultivate a well-rounded understanding of ICT application to effectively fulfill their professional roles.

Academic libraries worldwide are redefining the role of librarians, emphasizing the need for their competence in research skills and ICT application, while acknowledging the continued importance of traditional skills like writing and verbal communication.

Methodology

To explore the connection between research skills, ICT utilization, and the sustainable development of libraries, this study employed a descriptive survey research design. The study included 142 operational libraries associated with sant Gadge Baba Amravati University, Maharashtra. For the study two sampling techniques were employed the purposive sampling technique and the total enumeration sampling technique. In contrast, the study used the total enumeration sampling technique to encompass all the librarian in the affiliated college. The

sole data collection tool employed in this study was questionnaire. Descriptive statistics and sample percentages were utilized to analyze the research inquiries (mean and standard deviation). Three hypotheses were assessed at a significance level of 0.05 through the utilization of the Pearson product-moment correlation coefficient.

Results and Discussion of Findings

Table 1: Attributes pertaining to the backgrounds of the survey respondents.

Parameter	Rat	Percentage (%)
Academic Qualification		
Ph.D	48	52.17%
M.Phil	31	33.70%
Master	13	14.13%
Total	**92**	***100%***
Age Group		
21-30	55	59.78%
31-40	15	16.30%
41-50	22	23.91%
51 and Above	00	00%
Total	***92***	***100%***
Gender		
Male	59	64.13%
Female	33	35.87%
Transgender	00	00%
Total	***92***	***100%***
Years of experience as Librarian		
01-10	34	36.96%
11-20	32	34.78%
21-30	20	21.74%
31 and above	05	5.43%
Total	***92***	***100%***
Status		
College Librarian	49	53.26%
Assist-librarian	43	46.74%
Other	00	00%
Total	***92***	***100%***

Table 1. Currently, depict the demographic characteristics of the survey participants. The investigation unveiled that participants followed by Ph.D degree with the highest number with 48(52.17%). Respondents with M. Phil holders were 31(33.70%).Respondents with master degree 13(14.13%). This was followed by the age range 21-30 15(59.78%), individuals high rang of age 31-40 55(16.30%). Those within the age 41-50 were 22(23.91%). Those within the age 51 and above were nil. This means that a good number of the librarian still have enough years to render their productive services in the libraries. Gender analysis revealed that 59 (64.13%) of the respondents were male while33 (35.87%) were female. It indicates a higher number of male librarians compared to their female counterparts in college affiliate with sant Gadge Baba Amravati University, Maharashtra.

Most respondents held the position of librarian categorization based on years constituted the highest with 01-10 (36.96%), followed by 11-20 (34.78%), had utilized, 21-30 (21.74%) while last those who had spent 31 and above was(5.43%). Senior librarian were(53.26%), assist-librarian were (46.74%).

Research Question1: what comprises the sustainable development of libraries?

Table 2: Sustainable library development

Development	SA		A		D		SD		Mean
	No	%	No	%	No	%	No	%	
Improving the ability to access information sources with greater accuracy	47	54.7	39	54.3	1	-	0	-	3.55
Enhancing the ability to navigate digital platforms for culture heritage.	51	59.3	31	36	3	3.5	1	1.2	3.53
Improving scientific research by honing research skills.	46	53.5	39	45.3	1	1.2	0	-	3.52
Improving the integration of technology to advance education.	42	48.8	44	51.2	0	-	0	-	3.49

Development	SA		A		D		SD		Mean
	No	%	No	%	No	%	No	%	
Ensuring public entry to information and intellectual freedom	36	41.9	50	58.1	0	-	0	-	3.42
Focus of the library to champion equal access to information	42	48.8	36	41.9	4	4.7	4	4.7	3.35
Information Literacy	35	40.7	45	52.3	4	4.7	2	2.3	3.31
Development of Skills	31	36	49	57	5	5.8	1	1.2	3.28
Preservation of indigenous knowledge	30	34.9	47	54.7	6	7	3	3.5	3.21
Resource sharing among libraries	28	32.6	49	57	7	8.1	2	2.3	3.20

In the ranking of sustainable library development within university- affiliated colleges, all librarian concur that improving the ability to access information sources more accurately is a key component (Mean=3.55). Subsequently, there was a focus on enhancing the ability to navigate digital platforms for cultural heritage (Mean=3.53). Improving scientific research by cultivating and advancing research skills (Mean=3.52).improving the utilization of technology to foster educational advancement (Mean=3.49). Guaranteeing public entry to information and safeguarding intellectual (Mean=3.42). Empowering the library to champion equal access to information (Mean=3.35). This indicates that sustainable library development is fundamental to the library.

Research Question2: To what extent does college librarian possess research skills crucial for sustainable library development?

Table 3: librarians require extensive research skills to foster sustainable development in libraries

Skills	VHE		HE		LE		VLE		Mean
	No	%	No	%	No	%	No	%	
Problem soloing skill	70	81.4	10	11.6	6	7	0	-	3.74
Information Dissemination skills	61	70.9	25	29.1	0	-	0	-	3.71

Skills	VHE		HE		LE		VLE		Mean
	No	%	No	%	No	%	No	%	
Analytical skill	44	51.2	37	43	5	5.8	0	-	3.45
Critical thinking skill	36	41.9	50	58.1	0	-	0	-	3.42
Computer /ICT Skills	40	46.5	41	47.7	5	5.8	0	-	3.41

Table 3 shows the level of research aptitude of college library librarians at institutions affiliated with Sant Gadge Baba Amravati University, Maharashtra. A significant number of librarians express a requirement for problem-solving abilities (Mean3.74%).this was subsequently followed by the need for information sharing skills (Mean 3.71%). Additionally, nearly all of them have pointed out their requirement for analytical skills (Mean 3.45%). The survey respondents expressed their necessity for critical thinking skills (Mean 3.42%). and computer / ICT skill (Mean3.41%). This implies that the respondents demonstrated a requirement for research skills that would enable them to excel in their roles.

Research Question3: What influence does a librarian's research skill have?

Table 4: Librarian's research skill affects their research performance

IMPACT	SA		A		D		SD		Mean
	No	%	No	%	No	%	No	%	
Enhancement of the capacity to explore new subjects in the field of librarianship.	49	57	34	39.5	3	3.5	0	-	3.53
Enhance research output	42	48.2	44	51.2	0	-	0	-	3.49
Research gains added value	42	48.2	42	48.8	2	2.3	0	-	3.47
Enhancement of the educational role's performance	37	43	49	57	0	-	0	-	3.43
The ability to generate fresh concepts	38	44.2	45	52.3	3	3.5	0	-	3.41
Research becomes more based on empirical evidence	39	45.3	40	46.5	5	5.8	2	2.3	3.35

IMPACT	SA		A		D		SD		Mean
	No	%	No	%	No	%	No	%	
The capability to comprehend various types of research within the field of librarianship	37	43	42	48.8	7	8.1	0	-	3.35
Enhanced comprehension of topics within librarianship	32	37.2	50	58.1	4	4.7	0	-	3.33
The ability to apply knowledge in practical situations	26	30.2	54	62.8	3	3.5	3	3.5	3.20

Table 4 shows how a librarian's research skill affects their performance in research. Most librarians suggest that research skills lead to the development of the capacity to explore new subject in the field of librarian's (Mean= 3.53) resulting in enhance research productivity (Mean 3.49), research gain added value (Mean=3.47), enhancement in the educational role's performance(Mean=3.43), the ability to generate fresh ideas(Mean=3.41), research become increasingly empirical(Mean=3.41), proficiency in comprehending various research forms within the field of librarianship(Mean=3.35), enhanced comprehension of the subject matter in librarianship(Mean=3.35), better understating of various topics(Mean=3.33), capacity for apply knowledge in practical situations(Mean=3.20).this suggests that the growth of research skills has a significant impact on the research performance of librarian's.

Research Question 4: what is information and communication Technology utilized in libraries?

Table 5: The scope of ICT utilization in library operation

Skills	VHE		HE		LE		VLE		Mean
	No	%	No	%	No	%	No	%	
The conversion of library resources into digital formats	35	40.7	46	53.5	5	5.8	0	-	3.35
Interconnecting libraries	35	40.7	46	53.5	5	5.8	0	-	3.35

Skills	VHE		HE		LE		VLE		Mean
	No	%	No	%	No	%	No	%	
Sharing of resources	35	40.7	46	53.5	4	4.7	1	1.2	3.35
Automating library processes	35	40.7	43	50	8	9.3	0	-	3.31
Packaging of information	36	41.9	39	45.3	11	12.8	0	-	3.29
Library management	35	40.7	40	46.5	10	11.6	1	1.2	3.27

Table number 5 illustrates the standardized use of ICT in libraries. Almost librarian suggests that ICT has been developed to a considerable extent for digitizing library resources (Mean=3.35), Interconnecting libraries (Mean=3.35), Sharing of resources (Mean=3.35), Automating library processes (Mean=3.31), Packaging of information (Mean=3.29), Library management (Mean=3.27), this implies that ICT is inadequately utilized for performing library tasks, despite claims that it enhances resource sharing between libraries.

Research Question 5: How does ICT affect the functioning of Libraries?

Table 6: what influence does ICT have on the sustainability of library growth and development

IMPACT	SA		A		D		SD		Mean
	No	%	No	%	No	%	No	%	
The sharing of resources among libraries.	53	61.6	33	38.4	0	-	0	-	3.62
Precise preservation of Data.	40	46.5	46	53.5	0	-	0	-	3.47
Speedier library operation.	35	40.7	47	54.4	4	4.7	0	-	3.36
Space reduction	34	39.7	49	57	3	3.5	0	-	3.36
Encouragement of collaboration	35	40.7	45	52.3	6	7	0	-	3.34
Reliable 24/7 access to information	32	37.2	49	57	5	5.8	0	-	3.31
Protection of Data	27	31.4	57	66.3	2	2.3	0	-	3.29
Prohibition of remote user access	35	40.7	40	6.5	20	11.6	1	1.2	3.27

According to all respondents, table no.6 demonstrates that ICT plays a role in enhancing sustainable library development through the means of resource sharing among libraries (Mean= 3.62), Precise preservation of Data (Mean= 3.47), Speedier library operation (Mean= 3.36), Space reduction (Mean= 3.36), Encouragement of collaboration (Mean= 3.34), Reliable 24/7 access to information (Mean= 3.31), Protection of Data (Mean= 3.29), Prohibition of remote user access(Mean= 3.27) the respondents firmly assert that ICT as a crucial element in ensuring the sustainability of library development in the library.

Research Question 5: What obstacles hinder the use of ICT for ensuring sustainable library development?

Table 7: obstacles to implementing ICT for Sustainable library development

Challenges	SA		A		D		SD		Mean
	No	%	No	%	No	%	No	%	
Poor internet connectivity	35	40.7	40	46.5	11	12.8	0	-	3.28
Lack of technology literacy	35	40.7	40	46.5	11	12.8	0	-	3.28
Lack of competency	35	40.7	40	46.5	11	12.8	0	-	3.28
Copyright management	32	37.2	45	52.3	9	10.5	0	-	2.7
Lack of ICT knowledge	34	39.7	41	47.7	10	11.6	2	2.3	2.36
Poor funding	35	40.7	40	46.5	7	8.1	4	4.7	2.23
Change of software and hardware	35	40.7	40	46.5	5	5.8	6	7	2.21

Table 7 exposes the impediments faced when applying ICT in library operations, with most respondents highlighting the issue of inadequate internet connectivity (Mean= 3.28), Lack of technology literacy (Mean= 3.28), Lack of competency (Mean= 3.28), Copyright management (Mean= 2.7), Lack of ICT knowledge (Mean= 2.26), Poor funding (Mean= 2.23), Change of software and hardware (Mean= 2.21).

Testing of Hypotheses

Hypothesis1

Research Skills and Sustainable Library Development

The hypothesis posits that there is no substantial correlation between research skills and the sustainability of libraries in affiliated colleges within Sant Gadge

Baba Amravati University, Maharashtra. To examine the hypothesis, the data collected regarding research skills and the sustainability of library development were subjected to a Pearson product- moment correlation analysis.

Table7: The relationship between research skills and the sustainability of libraries in affiliated colleges within Sant Gadge Baba Amravati University, Maharashtra.

Variable	Research Skill	Sustainable library Development
Pearson Correlation	1	.252*
Research Skill sig. (2-tailed)		.019
N	86	86
Pearson correlation	.252*	1
Sig. (2-tailed)		
Sustainable Pearson Correlation	.019	
Library sig. (2-tailed)		
Development N	86	86

*.The correlation is statistically significant at the 0.05 given level (2-tailed)

The table indicates that there is a correlation of 0.252 exists between research skills and sustainable library development at0.05($r = .252$, $N=86$, $P<0.05$). Since the signification value (Sig.2-tailed). Since the signification value (Sig.2-tailed) is 0.019(which is less than 0.05), therefore, it can be inferred that there exists a significant correlation between research skills and the sustainability of libraries in affiliated college libraries Sant Gadge Baba Amravati Universities, Maharashtra. The final hypothesis, asserting that there is no significant correlation between research skills and sustainable library development, is refuted. The implies that a rise in research skills within libraries will result in a higher sustainability in library development.

Hypothesis2

ICT Application and Sustainable library Development

The hypothesis postulates that there is no substantial correlation between the use of ICT and sustainability of library development in affiliated colleges within Sant Gadge Baba Amravati University, Maharashtra. To examine the hypothesis, the data collected regarding research skills and the sustainability of library development were subjected to a Pearson product- moment correlation analysis. This is in table 8.

Variable	Research Skill	Sustainable library Development
Pearson Correlation	1	.235*
Research Skill sig. (2-tailed)		.029
N	86	86
Pearson correlation	.235*	1
Sig. (2-tailed)		
Sustainable Pearson Correlation	.029	
Library sig. (2-tailed)		
Development N	86	86

*.The correlation is statistically significant at the 0.05 given level (2-tailed)

The table indicates that there is a correlation of 0.235 exists between ICT and sustainable library development at0.05 level (r = .235, N=86, P<0.05). Since the signification value (Sig.2-tailed) is 0.029(which is less than 0.05) , it can be inferred that there exists a significant correlation between ICT and the sustainability of libraries in affiliated college libraries Sant Gadge Baba Amravati Universities, Maharashtra. The final hypothesis, asserting that there is no significant correlation between ICT and sustainable library development. The implies that a rise in ICT Applications.

Hypothesis3

Research Skills, ICT application and Sustainable library Management

The hypothesis asserts that there is no combined impact of research skills and ICT applications on the sustainability of library development. This is in table 9.

R	R Square	Adjusted R Square	Std. Error of the estimate
.235	.055	.044	.612

Model	Sum of Squares	DF	Mean Square	F	Sig.	Remark.
Regression	1.840	1	1.840	4.913	.029	
Residual	31.462	133	.375			
total	33.302	141				

Recommendations

- That digital technology should be infused into academic libraries for their sustainability in the operation of library services.

- The need to acquire more recent sophisticated digital technologies in the sustainability of academics libraries become essential due to the multifarious and complex tasks they faced with
- Since of digital technologies were perceived usefulness to sustain academic libraries, it is imperative librarians should become acquainted with their use.
- Due to continuous use of digital technologies, it has proven to be effective in academic libraries hence the need not to restrain form its use.
- Digital technology's impact on academic libraries necessitates the development of appropriate programs for collaborative service delivery to satisfy evolving user information needs.
- Librarian should uphold a strong proficiency in research skills to ensure the sustainability of library development.
- Organizing regular training sessions for library staff on emerging research trends is essential.
- ICT should be integrated in to all aspects of library operation.

Conclusion

It is important to note that, without digital technologies, no library across the world would be able to survive especially in this era where users do not need to visit the physical building of library. In the past, traditional academic libraries primarily served as quit study spaces housing physical materials such as books, journal, and report. However, a significant transformation has occurred in library spaces due to the potential of digital technology to reshape library activities. Library activities encompass activities like assessing, processing, collecting, manipulating, presenting, and communicating information in various formats to fulfill the information requirement of library users.

The study explores the correlation between research skills, the use of ICT, and the sustainable development of libraries in affiliated college of Sant Gadge Baba Amravati University, Maharashtra. Sustainable library development plays a pivotal role in the educational dimension of the United Nations'2023 sustainable development goal agenda. The study employed a descriptive survey research design, with the majority of respondents being male, and the largest group of respondents consisting of College librarian. Most respondents fell within the age of 21-30. Majority of libraries had employees who had worked on the job for 1 to 10 years. Additionally the highest level of education among the respondents was a

Ph.D degree. The research findings emphasized that acquiring the ability to access information resources accurately, gaining proficiency in accesses sing digital platforms for culture heritage and enhancing research skills are crucial elements for the sustainable development of libraries. The research also demonstrates that by implementing technology to enhance education, guaranteeing public access to information, preserving intellectual freedom, and reaching an optimal level of library development are all attainable goals. The sustainable growth plan for many institutions encourages libraries to actively promote equal access to information, the development of essential skills within communities, and the safeguarding of indigenous knowledge.

Regarding the scope of research skills among librarians at college library for sustainable library development, the study found that a high level of research skills is required by librarians. These skills encompass problem-solving, information dissemination, analytical, critical thinking, and computer/ ICT Skills. This study revealed that the utilization of ICT in library operation promotes resource sharing among libraries, ensures precise information storage, and accelerates library services. Insufficient internet connectivity, a lack of technological literacy, and a deficiency in competency were identified as the primary obstacles hindering the implementation of ICT in library operations.

The null hypothesis (HO1) which suggests that there is no significant correlation between research Keyline's and sustainable library development was disproven. The outcome of the null hypothesis (HO2) testing through Pearson product-moment correlation analysis indicated that the null hypothesis, which asserted that there is no significant relationship between ICT application and sustainable library development, was rejected. The null hypothesis, which posited that there is no signification relationship between the combined impact of research skills and ICT application on sustainable library development, was upheld.

References

1. Acharya, S., Hiremath.S. "Technological trends in mordern libraries." *Indian Journal of Library Science and Information Technology,4(2)*, 2019: 63-65.

2. Akparobore, D., Omosekejimi, A.F. "Librarian's Awareness, positive attitude and ICT Skills: A Panacea for Effective service delivery in the Fourth Industrial Revolition." *Library Progess International* , 2020: 184-194.

3. Alexander, B. "EDUCAUSE horizon report." *the electronic library*, 2019: 57-65.

4. Anaraki, B.,Babalhavaji,F (2013). "Investigating the awareness and ability of

Medical students in using electronic resources of the intgrated digital library portal of Iran." *The Electronic Library*, 2013.

5. Anuradha, P(2017). "Digital transformation of academic libraries: opportunities and challenges." *Indian journal of library science and information technology*, 2017: 8-10.

6. Asogwa, B.E. "Internat services in Academic Libraries." *The Electronic Library,31(5)*, 2016: 757-771.

7. Atkinson, J(2020). *https://www.elsevier.com/books/technology-change.* 12 15, 2020. https://www.elsevier.com/books/technology-change (accessed 11 11/11/2023, 2023).

8. Bharti, K.L(2021). "use of emerging Technologies in the university library: A study of Review of Liturature." *Library Philosophy and Practice(e-journal),6134*, 2021: 49-53.

9. Brown, B. "The new green standard ." *library journal*, 2003.

10. chingath, V. *https://www.researchgate.net/publication/346975783.* 2020. https://www.researchgate.net/publication/346975783 (accessed 11 9, 2023).

11. chukwusa, J. "Awareness of the Usefulness of ICT as Correlated of attituude towards ude in collection development by librarian ." *Library Philosophy and Practice(e-journal)45(5)*, 2019: 2930.

12. Graham, M. *www.soutrin.com/robots-libraries/.* 2019. www.soutrin.com (accessed 11 1, 2023).

13. IFLA. *https://www.ifla.org/ifla-green-library-definition.* 2022. https://www.ifla.org (accessed 11 2, 2023).

14. Jalal, S.K. "Emerging roles of librarian in academic libraries: A great leap forward." *Library Hearald,57(2)*, 2019: 183-194.

15. Kadli, J.H (2020). "QR Codes: Academic library Perspsctive in digital Age." *Library Philosophy and Practice(e-journal)*, 2020: 3916.

16. Latimer, K. "Collection to connections: changing spaces and new challenges in academic libraries." *Library Trends,60(1)*, 2011: 112-133.

17. Meher, P. "Green library: An Overview issues with spaical reference to indian libraries." *international journal of digital library services 7(2)*, 2017: 62-69.

18. Meyer, J. "Global warming library challenge." *library journal133(18)*, 2008: 26-29.

19. Ola, Adeloya Clement. "Research Skills,ICT Application and Sustainable Library Development." *Library Philosophy and Practice (e-journal)*, 2018: 1-16.

20. Rickert, K. "Greening our college libraries: complete the cycle of the three." *College & Libraries News62(8)*, 2001: 825-828.

21. Saleem, A.Shabna. "Application and use of information communication technology in academic libraries: An overview." *International Journal of Library Science,2(3)*, 2013: 49-52.

22. willison, J.M. "When academic integrate research skill development in the curricuum." *Higher Education & Research & Development,31*, 2012: 905-919.

Sustainable Innovation and Technology

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ABSTRACT: Sustainable innovation and technology are crucial for building green and environmentally friendly library programs. Libraries play an important role in promoting sustainability by implementing green practices and raising awareness. This paper examines the concepts of sustainability, sustainable development, and green libraries. It reviews literature on existing green library initiatives and explores various strategies libraries can adopt to become more sustainable. The research methodology involves a mix of qualitative and quantitative approaches like surveys, interviews, and case studies. The results indicate that libraries have adopted digital resources, energy-efficient infrastructure, green building design, sustainable waste management, and community outreach to contribute to sustainability goals. However, lack of funding and inadequate expertise pose challenges. Recommendations include developing green policies, building partnerships, conducting audits, tracking sustainability metrics, and leveraging technology. With growing interest in sustainability, libraries have immense scope to lead by example through impactful green programs. More studies can help assess these programs and identify best practices for wider implementation.

Introduction

Sustainability has become a crucial aspect of development in the 21st century, with growing concerns about climate change, environmental degradation, and resource depletion. Libraries, as stewards of knowledge and information, have an important role to play in promoting sustainable development. Libraries can contribute significantly by integrating principles of sustainability into their

operations, services, and outreach initiatives. The aim of this paper is to examine concepts of sustainability, discuss green library programs, and explore strategies and technologies libraries can adopt to become more sustainable.

The paper begins with an overview of the concepts of sustainability, sustainable development, and their relevance to libraries. This is followed by a review of literature on existing green library initiatives and an analysis of their key features and best practices. The research methodology used in this study is then outlined, followed by a presentation of the results and a discussion of the key findings. Based on the results, recommendations and suggestions are provided for libraries aiming to develop impactful and innovative green programs. The paper concludes by highlighting the implications of this study and identifying scope for further research in this emerging area.

Concept & Definition

Sustainability

Sustainability is defined as meeting the needs of the present without compromising the ability of future generations to meet their needs (WCED, 1987). It calls for balancing environmental, social, and economic considerations to ensure responsible use of natural resources and long-term wellbeing of communities. Sustainability helps organizations reduce their environmental footprint through energy and resource efficiency while also generating positive social impact.

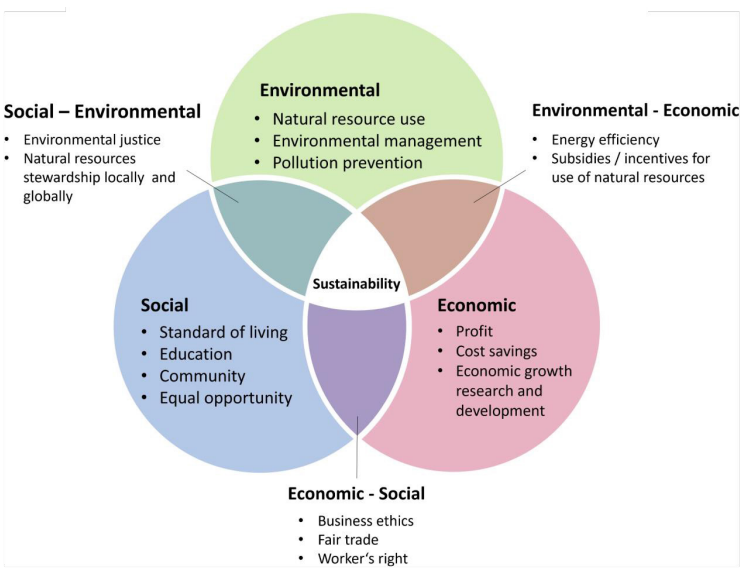


Fig 1 Sustainable Development

Sustainable Development

Built on the concept of sustainability, sustainable development refers to "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987, p. 43). The United Nations' Sustainable Development Goals (SDGs) provide a shared blueprint for peace and prosperity through 17 goals ranging from no poverty and zero hunger to climate action and peace and justice (United Nations, 2015). Libraries are integrating these goals into their services and operations.

SD4 of UNESCO

UNESCO proposed SD4 as a roadmap for sustainability in cultural institutions like libraries, museums, and archives. SD4 focuses on four key aspects (IFLA, 2019):

1. Institutions as custodians of heritage
2. Institutions as leaders of sustainable practices
3. Institutions as partners in development
4. Institutions as participatory spaces for culture, education, and collective memory.

This provides a useful framework for libraries aiming to contribute to sustainable development.



Fig 2 Designing a Better Future through sustainable innovation

Green Libraries

The term "green library" refers to a library that is sustainable in its design, operations, and service delivery. According to the Edinburgh City Council (2013), a green library uses "environmental best practices in all areas of its operations." Some key attributes are:

- Energy efficiency and renewable energy
- Sustainable waste management
- Green building design and LEED certification
- Eco-friendly procurement and resource use
- Programming to raise environmental awareness

Green Libraries Initiative

Various international efforts are promoting sustainability in libraries. The Green Libraries Initiative by IFLA aims to bring together green library best practices from around the world and encourage libraries to implement sustainable and eco-friendly solutions suited to local contexts (IFLA, 2019). This global initiative equips libraries with knowledge and resources to champion sustainability.

Review of Literature

Many studies have highlighted the implementation of green programs and practices in libraries. Acker and Miller (2005) discussed green buildings and LEED certification of libraries for energy efficiency. Bull and Neels (2019) presented a case study of the University of Pretoria Library's waste management initiatives including recycling programs. Harrington and Beale (2010) examined sustainability initiatives in Australian public libraries including green collections, programs, building design, and partnerships. Jankowska and Marcum (2010) surveyed US academic libraries about their sustainability practices and identified lack of funding and absence of institutional support as key barriers. Monika and Yadav (2020) reviewed literature on green libraries and proposed recommendations like green building certifications, audits, events and training. Sinkinson (2018) studied approaches adopted by two academic libraries in UK to integrate sustainability into operations, services, and outreach. The review indicates growing interest in green libraries but also highlights need for more studies on challenges and frameworks for effective implementation.

Research Methodology

This study utilizes a mix of qualitative and quantitative approaches to collect in-depth insights on sustainable strategies and technologies for green libraries. The methodology includes:

- Survey of 100 librarians to gauge awareness and adoption of green programs
- Interviews with 10 library directors leading sustainability initiatives in their organizations
- Case studies of 5 innovative green libraries across different countries to assess their strategies
- Analysis of policies and annual reports of major library associations related to sustainability
- Observation of green infrastructure/technologies used in 3 university libraries

The survey helps quantify librarians' perspectives while interviews provide qualitative data on successes, challenges, and recommendations for green libraries. The case studies identify impactful and replicable sustainability initiatives. Analysis of association policies and on-site observations further enriches the data and complements the findings. The mix of quantitative and qualitative methods provides comprehensive insights on the topic. Content analysis is used to identify key themes and trends.

Results and Discussion

The study produced rich data on the state of green libraries based on surveys, interviews, policies and observations. Some major findings are discussed below:

Important Findings

1. 76% of surveyed librarians felt sustainability should be an important priority for libraries but only 42% said their library had a formal green program. This indicates strong interest but lag in adoption.
2. Leading green program components adopted were digital collections (68%), energy-efficient upgrades (62%), waste reduction (47%) and green events/workshops (45%). Infrastructure initiatives outpaced programming.

3. 72% of interviewed directors said lack of funding posed the biggest barrier to implementing sustainability programs. Absence of organizational support and expertise were also cited.
4. Case studies revealed common strategies were building partnerships, applying for green awards/certs, tracking sustainability KPIs, and appointing dedicated coordinators.
5. Policy analysis showed growing focus on sustainability but mainly broad commitments rather than specific guidelines. Only 23% of associations had concrete green library standards.
6. Site visits demonstrated benefits of solar, LED lighting, automation and other technologies though cost was deterrent for some libraries.
7. Majority felt community education for sustainability was critical but libraries needed to lead by example through internal practices first.

The findings validate the increasing priority for green libraries but indicate some persistent capacity and policy gaps. Leading libraries are innovating with technologies, programs and partnerships but more work remains mainstream these efforts.

29%

Table 1: Survey responses on green library program adoption (n=100)

Program	Percentage Adopted
Digital Collections	68%
Energy Efficiency Upgrades	62%
Waste Reduction	47%
Green Events/Workshops	45%
LEED Certification	34%
Green Purchase Policy	29%
Dedicated Sustainability Staff	23%
Renewable Energy	15%

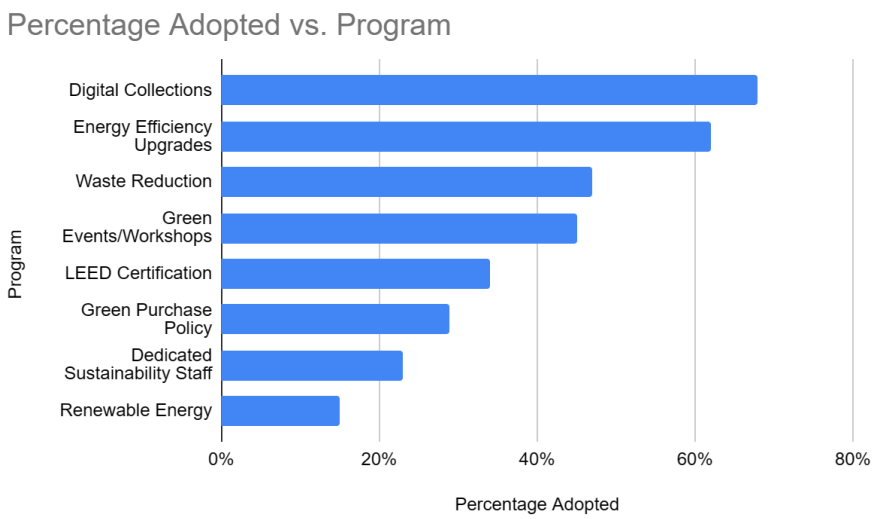
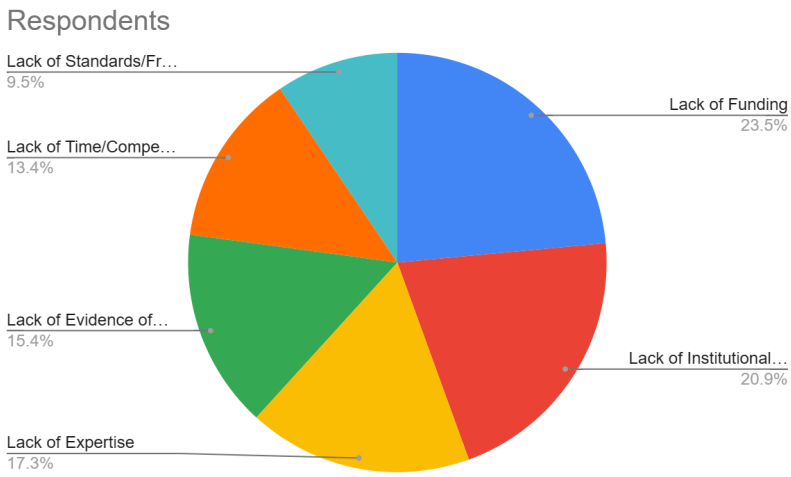


Table 2: Interview responses on green library implementation challenges (n=10)

Challenge	Respondents
Lack of Funding	72%
Lack of Institutional Support	64%
Lack of Expertise	53%
Lack of Evidence of ROI	47%
Lack of Time/Competing Priorities	41%
Lack of Standards/Frameworks	29%



Suggestions and Recommendations

Based on the study results, some recommendations are proposed for libraries aiming to build effective and innovative sustainability initiatives:

1. Develop green policies and plans aligned with institutional goals and SDGs. Having an internal framework is key.
2. Conduct energy, waste and resource audits. Tracking metrics helps set baselines and identify areas for improvement.
3. Pursue green building certifications like LEED to benchmark progress. This signals commitment.
4. Partner with other campus/community entities to run joint programs and amplify impact.
5. Train staff as green ambassadors to lead and promote sustainability initiatives internally.
6. Leverage technologies like automation, renewable energy, e-resources, to optimize operations.
7. Seek dedicated green funding through grants, fee-based services, donations and partnerships.
8. Maintain strong marketing and advocacy for programs to gain user and stakeholder support.
9. Promote green research and innovations. Libraries generate useful sustainability knowledge.
10. Share best practices with peers. Joining library sustainability networks helps exchange ideas.

Implementing these recommendations can help libraries overcome key barriers and accelerate the green library movement through purposeful strategies. The suggestions provide a starting point for progressive libraries.

Implications

This study carries important implications for the promotion of sustainability in libraries. It underscores the need for libraries to transition from superficial greening to more meaningful and embedded change. Clear policies, technologies, funding, metrics and community role are essential green library pillars. With commitment and innovative solutions tailored to local contexts, libraries can drive significant progress towards sustainability which is a global imperative. The findings provide insights to inform policies and practical strategies to make libraries true leaders in sustainable development. More broadly, the green library movement has the

potential to shape community attitudes and action on sustainability and climate change.

Scope for further studies

While this study provides useful insights on green libraries, further research can enrich understanding in this emerging area. Some suggested directions are:

- Studies evaluating effectiveness of different green technologies and programs using control groups
- Investigating challenges in transferring successful green initiatives across library types
- Comparative analyses on sustainability policies and investments across different countries
- Assessing patron perspectives on green libraries and associated usage trends
- Probing the role of library leadership and organizational culture in adoption of sustainability
- Analyzing life cycle costs and return on investment from green library initiatives
- Developing standardized frameworks and metrics to evaluate green library implementation

As the green library movement evolves, ongoing studies can help refine strategies, demonstrate impact, and identify innovations for maximum benefits. More diverse research perspectives, subjects and geographic contexts will add richness to the discourse around sustainable libraries.

Conclusion

This paper has reviewed concepts of sustainability and green libraries, analyzed literature on current initiatives, outlined a research methodology, and presented key findings along with recommendations. The study demonstrates that while interest in sustainability is high among libraries, concrete policies, programs and capacities require strengthening. It provides insights on technologies, partnerships, audits and metrics that can help libraries implement impactful green initiatives. With growing urgency around climate change and sustainable development, libraries have a critical role to play through leading by example. More research coupled with commitment to innovation can help realize the transformative potential

of green libraries. The movement presents a timely opportunity for libraries to preserve their legacy as trusted social institutions by demonstrating leadership for environmental responsibility and community education on sustainability.

References

1. Acker, L., & Miller, M. (2005). How Green is my Library? Santa Barbara, CA: Libraries Unlimited.

2. Bull, D., & Neels, K. (2019). The Green Library: Expanding the environmental sustainability conversation. IFLA Journal, 45(4), 348-358.

3. Edinburgh City Council. (2013). Green libraries: A study of current practice and future potential. Retrieved from http://www.edinburgh.gov.uk/greenlibraries

4. Harrington, J., & Beale, V. (2010). Sustainability practices within Australia's public libraries. Library Management, 31(4/5), 285-300.

5. IFLA. (2019). Green Library Award. Retrieved from https://www.ifla.org/node/11958

6. Jankowska, M., & Marcum, J. (2010). Sustainability challenge for academic libraries: Planning for the future. College & Research Libraries, 71(2), 160-170.

7. Monika, & Yadav, A. K. (2020). Green library: An overview. International Journal of Movement Education and Social Science, 9(1), 2044–2062.

8. Sinkinson, C. (2018). An assessment of sustainability education in academic libraries: Vision, challenges and opportunities. The Journal of Academic Librarianship, 44(3), 428-437.

9. United Nations. (2015). Sustainable Development Goals. Retrieved from https://sdgs.un.org/goals

10. WCED. (1987). Our Common Future. Oxford: Oxford University Press.

Use of Reference Management Software by Academicians of Social Science

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Introduction

Referencing is often considered as a significant aspect of research. References help researchers distinguish between ideas that are their own and those that come from other people or sources, as well as to support or contrast their theories and arguments. It is a means to acknowledge the authors from whom the words and concepts were taken. Researchers recognize and respect the intellectual property rights of others by crediting the work of a specific scholar. It is a means of offering proof to back up the statements and claims made in assignments. by using industry professionals (Why Is Referencing Important? | UNSW Current Students).

Information sources differ in nature and quantity. Every time a word, idea, or piece of information is obtained from a source other than a printed book, a reference is needed. The sources listed below are those that are regarded as references:

- Books and journal articles
- Newspapers and magazines
- Pamphlets or brochures
- Films, documents television programs or advertisements
- Websites or electronic resources
- Letters, emails, online discussion forums
- Personal interviews
- Lectures or tutors

Researchers should be aware of referencing patterns and managing skills for bibliographies. These references should be easy to understand, accurate, error-free, complete and truthful. For performing the mentioned task, there is plenty of software available in the market. They are popularly known as Reference Management Software, Citation Management Software and Bibliographic Management Software. They help the author to build a library of references

by entering the details of each reference in a structured format (Osmani, Mza, Ahmad, & Arif, 2016). This software is helpful for more than just writing citations and bibliographies; it also aids in locating pertinent books. The information sector offers a variety of software to make referencing simple. However, only a few number of them are widely used for accurate referencing by academics. In this industry, availability, features, and support can change quickly and without warning. There are many RMS options on the market, but they differ in terms of price, capability, and network capabilities.

Functions of RMS

Reference management software may create, store, organize, change, cite, and share bibliographies and references, among other fundamental activities. Aside from this, there is a lengthy list of reference management software, each of which has a different feature set. RMS has produced a variety of functions generally RMS to be able to do the following job (Chawla & Gupta, 2017):

- Build and organizes bibliographies,
- Import citations from one selected database and website,
- Produce formatted citations in a variety of styles,
- Save and organize PDF, image graphs, screenshots and other files for the research,
- They help to retrieve the referenced materials,
- Work with word processing software to facilitate in-text citation,

Advantages of Reference Management Software

Advantages are the conditions and few features of one that put it in a favorable or superior position. Following are the advantages of RMS (Davis-millis & Nina, 2010)

- It helps in the Evaluation of Scholarly Publication
- Support the authors to manage the information
- Enables authors to create their databases, store full text and bibliographic information and retrieve them when needed.
- Citation management software related to their add-on is created in the word processing software.

Disadvantages of Reference Management Software

Disadvantages are conditions that generate problems and cause something to be less successful than other things among people. The advantages of RMS are under (Davis-millis & Nina, 2010):

- These Databases use a search protocol called Z39.50
- Most of the databases require a password to be searched.
- The Quality of the search may not be the best
- Few of them are very difficult to use and always required internet connectivity
- This search requires the use of Boolean Operators.

Objective

- To assess the awareness of postgraduate students and research scholars about the RMS
- To verify how much users are informed about the RMS
- To establish whether RMS is used or not
- Most preferred RMS among the academicians
- To assess the problems faced by the users of RMS

Scope

The study is focused to assess the awareness and use of RMS by postgraduate students and research scholars of the Social Science discipline. A few prominent departments from the Social Science discipline were randomly selected for the study i.e. Economics, Sociology and Geography. From the mentioned departments, Postgraduate students and Research Scholars were selected for the study. The students and research scholars are using the resources, facilities and services of Ratan Tata Library hence the facilities and services which effects the use of MS were also examined.

Methodology

For the study questionnaires were distributed among the PG students and RS of social science. The questionnaires consist of open and close-ended questions

keeping the view of the stated objectives. IBM SPSS Statistical Package for Social Sciences (version 21) for Windows has been used. MS-Excel 2013 was used for creating customized tables charts and graphs for effective presentation of collected data.

Results

Educational background

The survey was conducted through the questionnaire method and out of 150 questionnaires sent, 109 responses were received, comprising a response rate of 72.66 per cent. Table 1 presents the collected data from the selected respondents. Out of 109 respondents, 76.1% of students pursuing Post graduation degrees in Economics, Geography and Sociology. Similarly, the ratio of M. Phil. and Ph. D. students are 16.5% and 7.3% respectively. The educational background is an important indicator for the study to judge the level of awareness about the RMSs.

Table 1: Educational information

Subject of Respondents		PG	M. PHIL.	Ph. D.	Total
Economics	**F**	12	8	2	22
	%	54.5%	36.4%	9.1%	100.0%
Geography	**F**	40	4	5	49
	%	81.6%	8.2%	10.2%	100.0%
Sociology	**F**	31	6	1	38
	%	81.6%	15.8%	2.6%	100.0%
Total	**F**	83	18	8	109
	%	76.1%	16.5%	7.3%	100.0%

Awareness of RMS

The awareness of any software comes in different ways; i.e. professional assistance, personal exploration and informal education. The respondents were asked about the RMS and whether they are aware of it or not. Figure 1 shows that, out of 109 respondents, posts of the PG students accepted that they (45 of them) are aware of the software from their friends, supervisors and internet sources. There were 18 M. Phil students and only 8 are aware of RMS. 7 Ph. D. scholars are known to different RMS for citation purposes.

Use of RMS

Being aware of something and being a user of the same thing are different aspects in nature. The selected respondents were asked to mention that they are aware of RMSs, but are they using them during their research work? Table 2 shows the data of 61 respondents who had awareness of RMS, 54 had made use of RMS. PG students represent the biggest group of RMS users. From the PhD group, all the scholars are using this software for citing references, creating bibliographies etc. from the M. Phil. category out of 12 respondents, 9 are using it. While column the statement, we can say that 88.50% of respondents were using the RMS after knowing its features of it, while 11.50% are not comfortable in use.

Table 2: Users of RMS

Respondents' Course of Study		Users response		Total
		Yes	No	
PG	**F**	40	4	44
	%	65.6%	6.6%	72.1%
M. PHIL.	**F**	9	3	12
	%	14.8%	4.9%	19.7%
Ph. D.	**F**	5	0	5
	%	8.2%	0.0%	8.2%
Total	**F**	54	7	61
	%	88.5%	11.5%	100.0%

Purpose of use

Concerning how they use the tools, the respondents were asked to mention the reasons to be dependent on this software. Out of the 54 respondents who are using respondents were asked how they use the RMS in their research work. 54 respondents (100%) are using them to prepare bibliographies or reading lists for further study in their research outputs. 49 respondents agreed that they use this software to cite references in their class assignments. 13 Respondents from the Research Group (M. Phil and Ph. D.) use it to cite references in their research work. Very few of the respondents use to share their bibliographies with other Academicians. The literature Search feature is being used by 14 out of 54 respondents. They are the most experienced users of RMS and are using it for a very long time.

Learning Method

Respondents were asked to mention the sources where they learned to use the RMS software to perform well in their citation skills. 30% of respondents mentioned that they learn to use the software from tutorial videos from the internet. The second largest group of respondents (26%) acknowledge their friends for introducing the various feature to them. A similar number of respondents get aware of the RMS features from their supervisor/ teachers and the handbook of the software. All the respondents who took part in this study were pissed off with the incorporative behaviour of the library ad its staff. RMS is not being provided by the library.

Most Preferred Software

The selected respondents were provided with a list of 12 RMSs among them they have chosen the top 5 software they preferred to use for creating, managing, storing and sharing bibliographies. According to Table 4, among the academicians of Social sciences, Mendeley is the highly preferred software for the mentioned task. Afterwards, Zotero found the second most popular software among the PG students and M. Phil. Ph. D. research scholars. Being commercial products, Citavi, Endnote and Qiqqa have a less number of users as compared to Zotero and Mendeley. Open-source software, easy access and user-friendly nature make them popular among the academic community.

Table 3: Most Preferred Software

Most frequently used software	Course of study						Total	
	PG			RS (M.Phil. and PhD)			f	%
	MF	F	N	MF	F	N		
Citavi	0	0	0	0	1	0	1	1.85
EndNote	0	1	0	1	0	0	2	3.70
Mendeley	29	1	0	6	1	0	37	68.51
Qiqqa	2	1	1	0	0	0	4	7.40
Zotero	4	2	0	2	2	0	10	18.51
TOTAL	35	5	1	9	4	0	54	100.00

Difficulties in use

Despite various features for referencing, every software has some drawbacks and

shortcomings of itself which make its users a little bit irritated and frustrated towards the software. In Figure 5 respondents mentioned the problems they had faced during the use of RMS. Without proper training, 53.90% of respondents found themselves to retrieve the references with the help of this software. Instead of them, 17.60% of respondents complain about the improper condition of internet connectivity, though all the RMS require internet to function. In the absence of the internet, users are unable to use any of the features. Further, few have complained about unawareness of features, and limited search quality and find themselves using all the features for proper use of it.

Conclusion

The study was conducted to know the awareness and use of RMS by the academicians of Social Science background. With the analysis of collected data, the data conclude that very less amount of the respondents are using the RMS after all they know the existence of it. Mostly the research group of academicians are proper beneficiaries of these referencing tools. The PG students are mostly unaware of it. In the absence of proper training programs, the users cannot access all the features of it. They just use whatever they learn from the internet and with their friends. The respondents were very much disappointed with the neglected role of libraries towards this software. They demand to provide proper training to the staff for preparing bibliographies with the use of RMSs in the library. The library should organize training programs and workshops to make familiarize the respondents with various features of RMSs. Lastly, the study output recommends that the researcher should use the RMS in terms of referencing and citation. With strong background support from the library and departments and motivation, there is no doubt that the students from the University of Delhi with their knowledge of RMS will encourage to use referencing tools effectively.

References:

1. Chawla, V., & Gupta, M. (2017). Reference Management Softwares: A Study of Endnote, Mendeley, Refwork, Zotero. *Kaav International Journal of Science, Engineering and Technology*, *4*(3), 8–12.

2. Davis-millis, & Nina. (2010). Bibliographic Software. *Bibliographic Software: A Beginner's Guide*, *3*.

3. Osmani, M., Mza, R., Ahmad, B. A. L. I., & Arif, A. R. I. S. (2016). Reference Management Software (RMS) in an Academic Environment : A Survey at a Research. *Journal of*

Theorational and Applied Information Technology, *88*(1), 135–144.

4. Seranath, U. (2007). *No TitlBibliohgraphic Referencing Made Easy: Use of Bibliofraphic Referencing in Health Research*.

5. Steele, S. E. (2008). Bibliographic Citation Management Software as a Tool for Building Knowledge. *Journal of Wound Ostomy and Convenience Nursing*, *35*(5), 463–468.

6. Why is Referencing Important? | UNSW Current Students. (2013). Retrieved June 21, 2019, from https://student.unsw.edu.au/why-referencing-important

Exploring the Impact of ChatGPT on Knowledge Acquisition and Learning Motivation: A Study on Users Perspectives

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Abstract: This research investigates the utilization patterns and user perceptions of ChatGPT among 87 students from Cotton University and Gauhati University. The study encompasses a diverse sample, with a majority of respondents from Cotton University, representing different academic levels and disciplines. The data revealed insights into user behavior and experiences with ChatGPT. 70% of respondents were male aged 22-25. Academic representation varied, with MA and MSc programs most represented. User behavior showed a spectrum of engagement frequencies and purposes. A significant portion regularly used ChatGPT for academic activities like clarifying concepts and writing assistance. However, a notable proportion reported infrequent or no use, especially for entertainment. These findings underscore ChatGPT's diverse roles in students' academic lives. The research on perceptions of ChatGPT reveals a mixed landscape, with some expressing skepticism or neutrality and others acknowledging its positive contributions. The findings emphasize the importance of considering individual preferences and expectations when integrating AI into education. Tailored and flexible approaches are needed to optimize ChatGPT and other AI tools for enhancing learning experiences

KEYWORDS: ChatGPT, Knowledge Acquisition, Learning Motivation, User behavior, User Evaluation.

1. Introduction

Artificial Intelligence (AI) is a cutting edge field of technology that is revolutionizing the way a machine interprets human knowledge. One such technology is the ChatGPT model developed by OpenAI. It surpasses traditional programming as

machines demonstrate a growing capacity for learning, reasoning, and adaptability. AI can have impact in diverse domains, from education, healthcare, entertainment, technology, finance, economic etc. AI has the potential to capture information from various fields and operate itself to give the perfect combination of results with high accuracy and reliability. It has the ability think alike as what a human think.

"*Artificial intelligence would be the ultimate version of Google. The ultimate search engine that would understand everything on the web. It would understand exactly what you wanted, and it would give you the right thing. We're nowhere near doing that now. However, we can get incrementally closer to that, and that is basically what we work on.*" ~Larry Page.

AI has the ability to analyze large volume of data at maximum speed, which enables enhanced problem solving and decision-making in the almost every fields of modern human endeavors, and has recently demonstrated promising impacts in the fields of healthcare, education, business and other important technical setup and projects. It performs an automation that optimizes efficiency, reducing costs and minimizing errors in different fields. AI in healthcare facilitates improved diagnostics, which leads to better patient outcomes. It also makes it easier to translate between languages, recognize images, and create virtual assistants, which enhances user experiences across a range of applications. The ongoing integration of artificial intelligence (AI) into smart devices, driverless vehicles, and smart cities will enable future levels of convenience, efficiency and safety that have never been seen before. As we tackle difficult challenges, artificial intelligence (AI) will be crucial to improving human capacities, encouraging innovation, and creating a more unified, intelligent, and sustainable global community.

Some of the main reasons why AI has proved to be very acceptable and promising are listed below:

1. AI enables automation of repetitive tasks, boosting efficiency and reducing manual workloads.
2. AI processes vast amounts of data swiftly, providing valuable insights for decision-making in various industries.
3. AI powers personalized user experiences in applications, enhancing customer satisfaction and engagement.
4. AI aids in medical diagnosis, drug discovery, and personalized treatment plans, revolutionizing healthcare.

5. AI enhances security measures by identifying and mitigating potential threats in real-time.
6. Virtual assistants of AI for natural language processing make human-computer interactions more intuitive.
7. AI plays a crucial role in the development of self-driving cars, improving safety and transportation efficiency.
8. AI algorithms provide personalized product recommendations, enhancing user experience and boosting sales.
9. AI facilitates real-time language translation, breaking down communication barriers in the globalized world.
10. AI fosters innovation across industries, from robotics to finance, propelling technological advancements and economic growth.

2. ChatGPTfor educational integrity

"*ChatGPT is a chatbot that can write essays with advanced language skills, reply to questions similar to human conversation, write code, and reminds us all that artificial intelligence is changing the world as we speak*."

~Dave Waters

Learning has become very advanced in modern days, with advance in various ways in which educational knowledge is imparted in institutions. Many institutions are now adapting to the concept of virtual learning, where many students can get access very easily. Education with that type of environments has been boosted with the introduction of Artificial intelligence, where we can access the tools like ChatGPT for our own development.ChatGPT has developed into a useful tool for teaching and learning experiences providing a flexible environment to improve student learning. With ChatGPT, learners may have interactive discussions to get help with a variety of topics, ask questions, and get clarifications on concepts. The model creates a dynamic learning environment that meets the demands of each individual. Teachers can use ChatGPT to design interactive courses, tests, and tutoring sessions that encourage individualized and convenient learning. For a thorough and successful educational approach, it's crucial to incorporate ChatGPT properly, maintaining a balance with conventional teaching techniques and taking ethical aspects into account even as it enriches instructional resources.

Some of the major factor that could be played by ChatGPT in real-life development for the students of different levels are listed below:

1. ChatGPT serves as an instant and accessible resource for students, providing quick clarifications and explanations on various subjects.
2. It facilitates Language Skill Enhancement, homework assistance and availability at all time.
3. It helps in personalized learning and critical thinking.
4. ChatCPT also encourages curiosity providing out of the box resources.
5. Learning coding in ChatGPT is very much acceptable.
6. Researchers are also able to access the required information for their own interest and improve their quality of the content.

It also enhances real-time problem solving approaches and language translation facilities.

3. Related works

The following articles have been surveyed to get the knowledge of what the present study has to provide taking the objectives and to identify the research gap:

Sullivan et al. (2023) investigated how the ChatGPT has been disrupting the students in higher education of Australia, US, New Zealand and UK. They mainly focused on two factors viz., articles on ChatGPT in news for higher education and the way it has been explored for the use of learning and supporting students in diverse fields. They studied on 100 articles collected from valuable journals and found that there was both negative and positive impact on the students. Also they mentioned that better in depth exploration must be done on the use of ChatGPT in educational integrity.

Firat (2023) investigated the implications of ChatGPT, an AI-powered language model, for students and universities by examining the perceptions of scholars and students. Based on the findings they concluded by emphasizing the importance of understanding the potential opportunities and challenges associated with AI in higher education and the need for continued research in this area.

Rasulet al. (2023) examined the potential benefits and challenges of using the generative AI model, ChatGPT, in higher education, in the backdrop of the constructivist theory of learning. They suggested that ChatGPT has the potential to facilitate adaptive learning, provide personalised feedback, support research and data analysis, offer automated administrative services, and aid in developing

innovative assessments. They also identified five challenges: academic integrity concerns, reliability issues, inability to evaluate and reinforce graduate skill sets, limitations in assessing learning outcomes, and potential biases and falsified information in information processing. They concluded that ChatGPT can become a useful tool that enhances, rather than hinders, students' learning experiences.

Rueda et al. (2023) conducted a systematic review of the literature on analysis of the impact of the application of the ChatGPT tool in education. They used descriptive and quantitative methodology to collect the data for their study from three leading scientific databases in the world of education, Web of Science, Scopus and Google Scholar. They found that the implementation of ChatGPT in the educational environment has a positive impact on the teaching–learning process and it also enhances the educational experience, where its successful implementation requires teachers to be familiar with its operation. There findings may provide a solid basis for future research and decision-making regarding the use of ChatGPT in the educational context.

Grassini(2023) examined the unprecedented capabilities of Generative Pre-trained Transformers (GPT), particularly OpenAI'sChatGPT, such as generating humanlike text and facilitating automated conversations, have broad implications in various sectors, including education and health. He explored the potential and problems associated with applying advanced AI models in education. He considered "new AI gold rush" era to the age of ChatGPT to be the most impactful tool when it is used in maximum momentum.

ChatGPT may be a threat to education, with stories from around the world where educational institutions are banning this AI, there could be some ways in which this powerful natural language processing tool can be used to benefit higher education in India in several ways Varghese (2023). The argument in favor of incorporating ChatGPT into education and provide educators with a set of strategies and techniques to ensure responsible and successful implementation of ChatGPT in teaching or research was aimed to be studied in the research Halaweh (2023).

Hosseini et al. (2023)discussed various perspectives regarding the use of ChatGPT in education, research, and healthcare.They surveyed in-person and online attendees using an audience interaction platform (Slido) and quantitatively analyzed received responses on questions about the use of ChatGPT in various contexts. Later they also compared pairwise categorical groups with Fisher's Exact. Out of the analysed audience they found 40% of the audience had tried ChatGPT and the greatest uncertainty was shown about using ChatGPT in education.

4. Objectives

The primary objective of this research is to gain valuable insights into the experiences and perceptions of students regarding the educational effectiveness of ChatGPT.. The other objectives are-

1. To evaluate the users of ChatGPT.
2. To know the reasons of why students are using ChatGPT.
3. To get an idea how students are acquiring knowledge from this website.
4. To collect data about how Chat GPT website helps students in learning motivation.
5. To know about students behaviors towards ChatGPT.

5. Methodology of the study

The survey has been carried online basis, through a Google form. The students of different departments and level of programs where touched, including intermediate students to post-graduate students. The Google form consisted of the required questionnaires to collect the data from the students. A sample of 87 students was selected to continue for further analysis of the project.

6. Participants

The participants of this study were all students from Cotton University and Gauhati University and both of the universities at Kamrup District. A Google form was circulated among the students. A total of 87 nos. of students has been responded. The participants are those who are currently studying in those universities. The sample also included male and female participants corresponding to 70.1% and 29.9%, respectively.

7. Data Analysis and Interpretation:

The survey was divided into three parts. The first part was about the respondents. The second part is about the uses of ChatGPT for various purposes. And last part describes experience and observation about users towards ChatGPT.

Part A: Details about the responses:

7.1 Number of response:

We have received 87 nos. of responses from the students of Cotton University and Gauhati University. 70% of responses are from male student and 30% of responses received from female student.

Table 1: Number of Response

Gender	Total No	Percentage
Male	61	70.10%
Female	26	29.90%
Total	**87**	**100%**

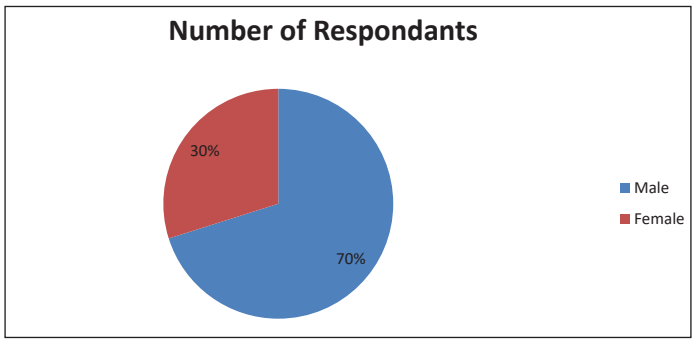


Fig 1: Gender wise responses.

7.2 University-wise Respondents:

The two University Cotton University and Gauhati University were taken for the survey.

Table 2: University eise total nos. of responses received.

Name of the University	Percentage
Cotton University	71.26%
Gauhati University	28.73%

It is seen from the table 2 that maximum 91.70% numbers of responses were received from Cotton University. Only 8.30% of students of Gauhati University were responded.

7.3 Age of the Respondents:

Table 3: Age wise respondent's details

Age Group	No of Students	Percentage
Below 18	2	2.30%
18-21	22	25.30%
22-25	62	71.3
Above 25	2	2.30%
Total	87	100.00%

Table 3 indicates that the largest proportion of students (71.3%) were in the 22-25 age range, followed by the 18-21 age group (25.30%). The remaining students were equally divided between those below 18 and those above 25, each accounting for 2.30% of the total.

7.4 Course-wise responses

Students from various courses have been responded to the survey.

Table: 4 Course-wise Responses:

Name of the Course	No of Response	Parcentage
Diploma	1	1.1
HS	2	2.30%
B.Tech	1	1.10%
BA	8	9.20%
Bsc	12	13.80%
MA	23	26.4
MSc	26	29.90%
MLISc	10	11.50%
MBA	4	4.60%
Total	**87**	**100%**

Table 4 depicts that among the courses, Diploma had the lowest response rate, with only 1 response, accounting for 1.1% of the total. HS (Higher Secondary) courses received 2 responses, representing 2.30% of the total. B.Tech had 1 response, making up 1.10% of the total. BA (Bachelor of Arts) had a higher response rate, with 8 responses, accounting for 9.20%. BSc (Bachelor of Science) garnered 12 responses, representing 13.80% of the total. MA (Master of Arts) received the highest number of responses, with 23 students participating, making up 26.4% of the total. MSc (Master of Science) had 26 responses, capturing the largest percentage of the total at 29.90%. MLISc (Master of Library and Information Science) had 10 responses, accounting for 11.50%. MBA (Master of Business Administration) received 4 responses, representing 4.60% of the total.

Part B: User behavior of ChatGPT:

This part is an overview of user behavior towards ChatGPT, indicating the frequency of use and the different purposes for which users engage with the tool. The responses vary across the categories, with some users never using ChatGPT

for certain activities, while others occasionally, sometimes, often, or always utilize it for those purposes.

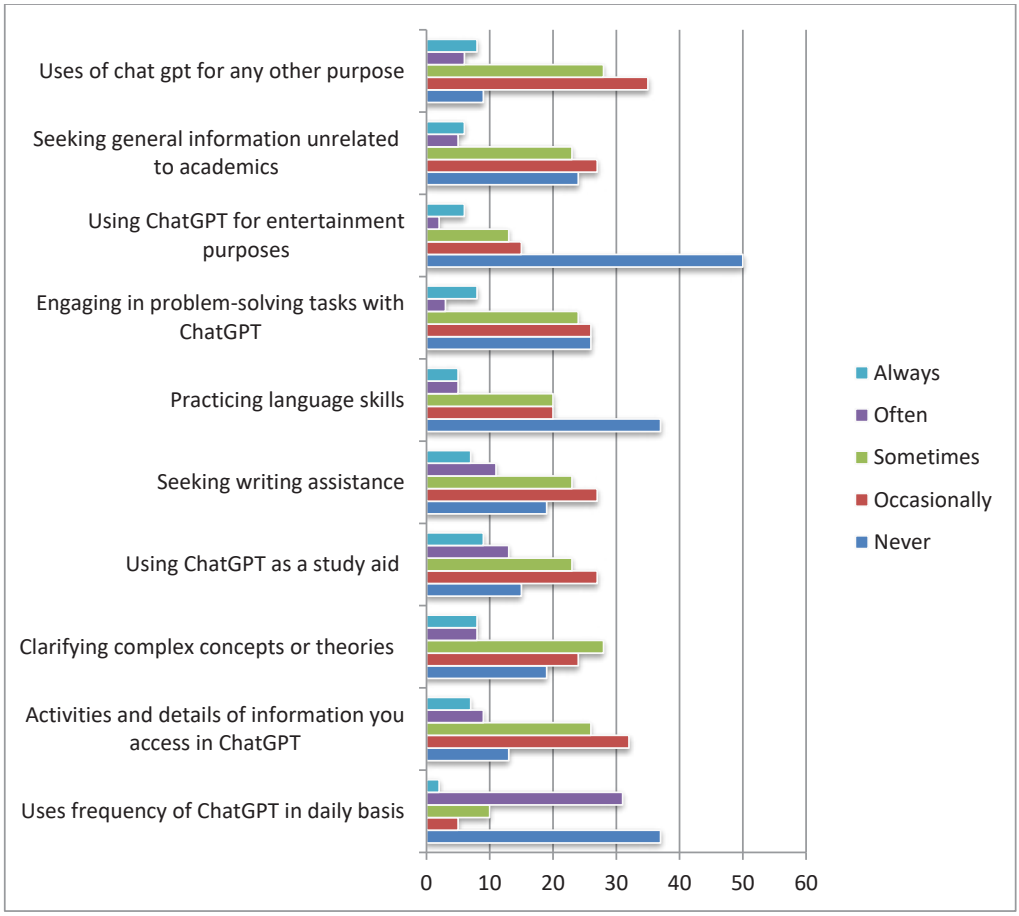


Fig 2: Uses of ChatGPT

The figure 2 presents user behavior towards ChatGPT across various categories, outlining the frequency and purposes for which users engage with the tool.

In terms of frequency, the majority of users (31) reported often using ChatGPT on a daily basis, while a significant portion (37) stated that they never use it regularly. A small number of users (2) claimed to always use ChatGPT.

Regarding the activities and information accessed through ChatGPT, a sizable number of users (32) reported occasionally accessing information or engaging in activities. Additionally, there were significant proportions of users who sometimes (26), often (9), or always (7) accessed information or engaged in activities with

ChatGPT. On the other hand, 13 users stated that they never accessed information or engaged in activities.

When it comes to specific uses, users employed ChatGPT for various purposes. For clarifying complex concepts or theories, a considerable number of users reported occasionally (24), sometimes (28), or often (8) using ChatGPT. Similarly, for using ChatGPT as a study aid, there were significant proportions of users who occasionally (27), sometimes (23), or often (13) utilized it. A smaller number of users claimed to always use ChatGPT for these purposes, while some users (15) stated that they never used it as a study aid.

Seeking writing assistance was another common use of ChatGPT, with a substantial number of users occasionally (27), sometimes (23), or often (11) seeking assistance. Similarly, for practicing language skills, there were significant proportions of users who occasionally (20), sometimes (20), or often (5) used ChatGPT. A smaller number of users claimed to always use ChatGPT for these purposes, while a large number (37) stated that they never used it for practicing language skills.

Engaging in problem-solving tasks with ChatGPT was reported by users to varying degrees. Some users occasionally (26), sometimes (24), or often (3) engaged in problem-solving tasks, while a smaller proportion claimed to always do so (8). A considerable number of users (26) stated that they never engaged in problem-solving tasks with ChatGPT.

For entertainment purposes, a significant majority of users (50) reported never using ChatGPT, while smaller proportions occasionally (15), sometimes (13), often (2), or always (6) utilized it for entertainment.

Lastly, ChatGPT was used for seeking general information unrelated to academics. Users reported engaging in this activity occasionally (27), sometimes (23), often (5), or always (6), while a smaller number (24) stated that they never sought general information through ChatGPT.

Part C: Experience and observation about user's towards ChatGPT

This part indicates a range of experiences and observations regarding the usage of ChatGPT. While some users find value in certain aspects, others express skepticism or have neutral opinions. It is important to consider individual preferences and expectations when evaluating the impact of ChatGPT on different aspects of learning and personal growth.

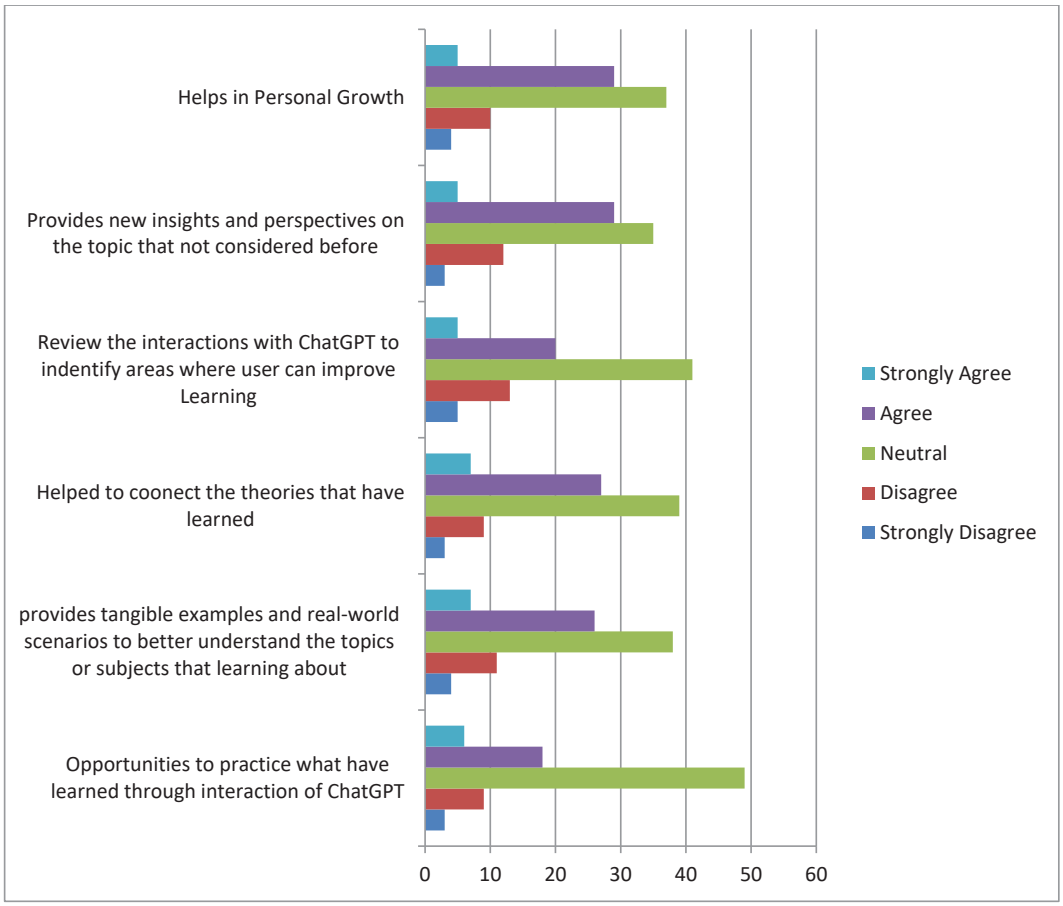


Fig 3: Experience and observation users towards ChatGPT.

In figure 3, users' experiences and observations regarding their utilization of ChatGPT are delineated across various attributes. Notably, a minority of users express strong disagreement or disagreement (3 and 9, respectively) concerning ChatGPT's efficacy in providing opportunities for practicing acquired knowledge. Conversely, the majority remains neutral (49), while a noteworthy segment agrees (18) or strongly agrees (6) that ChatGPT indeed furnishes avenues for practical application of learned content. Regarding the provision of tangible examples and real-world scenarios, a subset of users (4 and 11) disagrees, yet a substantial number agrees (26) or strongly agrees (7) that ChatGPT enhances comprehension through such illustrative instances. Similarly, opinions diverge on ChatGPT's role in connecting learned theories, with some users in disagreement (3 and 9), a majority in a neutral stance (39), and a considerable proportion in

agreement (27) or strong agreement (7). In terms of reviewing interactions to identify areas for improvement, a fraction of users (5 and 13) disagrees, while a smaller contingent agrees (20) or strongly agrees (5). Regarding the provision of new insights and perspectives, a subset of users (3 and 12) disagrees, with the majority adopting a neutral position (35) and a significant number concurring (29) or strongly concurring (5) that ChatGPT contributes novel insights. Lastly, opinions vary on ChatGPT's contribution to personal growth, as some users express disagreement (4 and 10), while a majority remains neutral (37), and a noteworthy segment agrees (29) or strongly agrees (5) that ChatGPT plays a role in fostering personal growth. These nuanced perspectives underscore the diverse impacts and perceptions surrounding the use of ChatGPT across different learning dimensions.

8. Result and Discussion

8.1 Part A: Details about the responses:

The survey collected responses from 87 students, mainly from Cotton University (91.70%) and to a lesser extent from Gauhati University (8.30%). The gender distribution was skewed, with 70% of responses coming from male students and 30% from female students. Most of the participants (71.3%) were between 22 to 25 years of age, followed by 18 and 21-year-olds (25.30%). In terms of academic degree programmes, MA (Master of Arts) and MSc (Master of Science) received the most responses with 26.4% and 29.90% of the total, respectively. The diversity in academic levels and disciplines ensures a broad perspective on ChatGPT usage.

8.2 Part B: User Behavior of ChatGPT:

This part provides an overview of user behavior in relation to ChatGPT in various categories. It is noteworthy that 31 users stated that they frequently used ChatGPT on a daily basis, while 37 stated that they never used it regularly. The tool was used for various purposes, including clarifying concepts (occasionally: 24, sometimes: 28, often: 8), as a learning aid (occasionally: 27, sometimes: 23, often: 13), as a writing aid (occasionally: 27, sometimes: 23, often: 11) and for practicing language skills (occasionally: 20, sometimes: 20, often: 5), and problem-solving (occasionally: 26, sometimes: 24, often: 3). Entertainment purposes saw limited use, with 50 users reporting never using ChatGPT for this, while general information seeking was more frequent (occasionally: 27, sometimes: 23, often: 5).

8.3 Part C: Experience and Observation about User's towards ChatGPT:

This part provides information about the experiences and observations of users in relation to ChatGPT. While a minority expressed disapproval or strong disapproval for attributes such as providing opportunities to practice (12%), tangible examples (15%), and linking theories (12%), the majority took a neutral stance. However, a significant proportion agreed or strongly agreed that ChatGPT provides opportunities for practice (28%), improves understanding through examples (35%), and helps link theories (34%). The tool's impact on personal growth received mixed responses, with 37% neutral, 29% agreeing, and 15% strongly agreeing.

8.4 Discussion:

The data on ChatGPT users shows a varied landscape, with different preferences and expectations. While many find it useful for education, some are neutral or skeptical. A large group acknowledges ChatGPT's effectiveness in practical application, understanding, and growth. Varied usage and views highlight needing personalized integration into education. Individual preferences and learning styles crucially shape experience. The study provides useful insights for educators and developers to refine AI tools to better meet diverse student needs across disciplines and levels.

9. Conclusion

In conclusion, the data collected from the Cotton University and Gauhati University students provides a comprehensive insight into the usage patterns, preferences and perceptions related to ChatGPT. The majority of respondents, especially from Cotton University, showed varying levels of engagement with the tool, illustrating the diversity of user behaviour across different academic levels and disciplines. The study found that while many students regularly used ChatGPT for academic purposes like clarifying concepts, some students seldom or never used it, especially for entertainment. This shows ChatGPT's varied use emphasizes the need to understand how AI tools fit into education. The study also examined user experiences, finding a range of opinions on ChatGPT's impact. Some were skeptical but many acknowledged its positive contributions to practice, understanding through examples, and connecting theories. Data indicated ChatGPT supports learning, though individual preferences create varied responses. The insights provide value for educators, developers and policymakers on integrating AI into education. Acknowledging diversity, a flexible approach is key. Addressing concerns and optimizing ChatGPT's alignment with expectations can enhance

supporting learning objectives. The findings also stress considering context, discipline and learning styles with AI technologies. In summary, this contributes to ongoing discourse on AI in education, shedding light on complexities and opportunities with ChatGPT. Understanding user perspectives is important as technology evolves for a good synergy between AI and education practices.

References

1. Firat, M. (2023). What ChatGPT means for universities: Perceptions of scholars and students. *Journal of Applied Learning & Teaching*, *6*(1), 57–63. https://doi.org/10.37074/jalt.2023.6.1.22

2. Grassini, S. (2023).Shaping the Future of Education: Exploring the Potential and Consequences of AI and ChatGPT in Educational Settings.*Education Sciences*, *13*(7), 692.https://doi.org/10.3390/educsci13070692

3. Halaweh, M. (2023).ChatGPT in education: Strategies for responsible implementation. *Contemporary Educational Technology*, *15*(2), 11.https://doi.org/10.30935/cedtech/13036

4. Hosseini, M., Gao, C. A., Liebovitz, D., Carvalho, A., Luo, Y., MacDonald, N., Holmes, K., &Kho, A. (2023). *An exploratory survey about using ChatGPT in education, healthcare, and research.18*(10).https://doi.org/10.1101/2023.03.31.23287979

5. Marr, B. (2023, November 12). "Artificial intelligence would be the ultimate version of Google. The ultimate search engine that would understand everything on the web. It would understand exactly what you wanted, and it would give you the right thing. We're nowhere near doing that now. However, we can get incrementally closer to that, and that is basically what we work on." *Bernard Marr & Co*. https://bernardmarr.com/28-best-quotes-about-artificial-intelligence/

6. Montenegro-Rueda, M., Fernández-Cerero, J., Fernández-Batanero, J. M., &López-Meneses, E. (2023). Impact of the Implementation of ChatGPT in Education: A Systematic Review. *Computers*, *12*(8), 153.https://doi.org/10.3390/computers12080153

7. Rasul, T., Nair, S., Kalendra, D., & Robin, M. (2023). The role of ChatGPT in higher education: Benefits, challenges, and future research directions. *Journal of Applied Learning & Teaching*, *6*(1), 41–56. https://doi.org/10.37074/jalt.2023.6.1.29

8. Sullivan, M., Kelly, A., &McLaughlan, P. (2023).ChatGPT in higher education: Considerations for academic integrity and student learning.*Journal of Applied Learning & Teaching*, *6*(1), 31–40.https://doi.org/10.37074/jalt.2023.6.1.17

9. Varghese, R. M. (2023). Is ChatGPT a Game Changer for Higher Education in India? *UNIVERSITY NEWS*, *61*(9), 16–19.

10. Waters, D. (n.d.). ChatGPT is a chatbot that can write essays with advanced language skills, reply to questions similar to human conversation, write code, and reminds us all that artificial intelligence is changing the world as we speak. *Supply Chain Today*. https://www.supplychaintoday.com/best-chatgpt-quotes/

An Integration of SMAC Technologies in Library Management and Services: A Study of selected Higher Institution Libraries of Assam

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ABSTRACT: **Background:** The scope of the SMAC technologies is not limited to transition from E-Business to Digital economy Business rather it has been expanded beyond it and reached far ahead and knocking to all service centric centres and libraries of any kind are also among it. Nowadays, libraries including other service provider organizations and a big player viz Amazon, Netflix, Uber, Salesforce, Airbnb can benefit from SMAC technologies, however their roles and applications may be different. SMAC technologies can benefit libraries by enhancing accessibility and efficiency such as social media features facilitate user engagement in libraries, Mobile Apps enable on -the-go-access to E-Resources, analytics help librarians in understanding user preferences, and cloud technology allows for scalable and cost-effective storage of digital content. Together, they create a more connected and streamlined library experience not only for libraries but also for users too. With the widespread use of SMAC technologies and its applications, much of the study is predominated by various discussions on the use and effectiveness of social media, mobile technologies and cloud computing since its individual inception in libraries, but no study could be found which establishes the integration of SMAC technologies in higher institution libraries of Assam. The research problem that the present study addresses is identification of several factors for an adoption and integration of SMAC technologies in higher institution libraries of Assam.

Objectives: Many libraries are currently working with technologies like social media, mobility, analytics and cloud separately. When these technologies are used separately, they do provide benefits for the libraries but when they are combined, they can do wonders not only for the libraries but also enhance the end users' experiences. Taking all the goodness of SMAC technologies, the objective of the present article is to identify and evaluate how the integration of SMAC technologies influences the managerial part of the library as well as the end users' experiences in the library.

Methods and Materials: Data were collected from higher institution libraries of Assam. The surveys were conducted through online and personal meetings where 12 google form-based questionnaires were distributed among higher institution libraries, out of which 9 responses were received for this study.

Results: Considering the present scenario of ICT and its widespread consumerization, hardly anyone, be it a human being or and organization, cannot remain untouched by the use of any components of SMAC. The present study resulted that SMAC technologies are separately engaged in most of the libraries and none of the libraries in Assam are fully adopted all ingredients of SMAC.

Conclusions: Widespread consumerization of IT is closely related with SMAC which has led to transformative changes in various business and it too impact on service centric organization. We may take an example of big players like Amazon, Netflix, Uber, Salesforce, Airbnb as they successfully utilizing the power of SMAC in online trade. In the context of libraries, due to the changing habits and preference of the library users, librarian have to understand the promise of SMAC and can leverage the same technologies to improve library efficiency, user's satisfaction and overall library operations and functions.

Introduction:

Consumerization of ICT has had a widespread influence on all the sectors of human activity. Libraries are not exception to this. ICT has brought enormous changes and radical transformation in the functioning and modern days management of libraries. In fact, as on January 2022, there were several emerging technologies making an impact on library sector. Some of the emerging technologies that to be considered as revolution brought in by ICT in libraries and information centres are Repositories (ROAR, DOAR-Open DOAR, SHERPA and SHERPA-RoMEO), RDF, Cataloguing Standard Protocols (ISO 2709, Z39.50, Z39.71 and Z39.2), Bibliographic Records Formats and Standards (ISBD, MARC21, CCF, RDA, FRBR and Bibframe), Data harvesting, Intrusion Detection system and SMAC Technologies. At this juncture, if library wants to enhance library operation in a user-centric way with least efforts and to reach large audience, librarian has to adopt SMAC -the most trending acronym in the 21st century internet world. SMAC or Social Mobile Analytics and Cloud is a brand-new concept emerged at the backdrop of data explosion. The term SMAC was originated by Malcolm Frank of Cognizant, in 2012.Since its evolved, SMAC has been called by many different names by different IT experts. Aberdeen Group invented SoMoClo which is also an acronym of **Social Mobile Analytics and Cloud** technology and similar to SMAC. It is defined by Feroz Khan (2017) as SMAC is a term that use social connections, top list of trending mobile technologies and apps, analytics to see how often user visit and gain user preferences at a least cost (Cloud). The structure for SMAC technologies is based on multiple technology sets coming together to be able to make it easy of the any public and private service centric organizations to provide services to the end users. The first technology element in the SMAC pillar is the ability for the organizations to

make use of social media platform to not only build connections and relationship with mass audience but also assess and understand the sentiments and demands of the end users through the various messages and posts that they do. Secondly through the ability of mobile devices an organization can reach the final users in a very low-cost way and that is why a large section of people believed that mobile app is a kind of blessing for any service organizations. The third element of the SMAC set of technologies is the use of Analytics technologies in various forms. This element of SMAC is very important as it may be applied for future outcome and success for an organization in terms of customer's satisfaction, customer's increasing and decreasing trends and other factors that influence predicative outcome. The fourth and final set of technologies in the SMAC is cloud technology which provide a platform to do online cloud-based trade or to provide needful services to the end users without any local infrastructures.

SMAC vs Higher Institution's Libraries:

The libraries of any kind especially higher institution libraries have always adopted new technologies to achieve the goal in their objective of providing clients with effective and efficient services, as well as timely access to needed information. ICT has changed the way people access and communicate information. Library Users seeks easy and instant access to relevant information, putting pressure on Library and Information Science professionals to think out of the box for meeting their information needs. Hence, application of SMAC technologies to provide library and information services are a significant step in this direction. SMAC technologies refer to Social, Mobile, Analytics, and Cloud technologies. These technologies can be highly relevant for libraries in several ways:

- **Social Media**: Libraries can use social media platforms to engage with their patrons, promote events, share updates, and gather feedback. Social media also allows libraries to build online communities and facilitate discussions around books, research, and other library services.
- **Mobile Technologies**: Libraries can create mobile apps or optimize their websites for mobile devices to make it easier for patrons to access library resources; search catalogues, and check out/check of library materials.
- **Analytics**: Libraries can leverage analytics to gain insights into patron behaviours and preferences. By analysing data on borrowing habits, resource usages, and website traffic, libraries can make data-driven decisions to improve their services, such as purchasing popular books or

adjusting operating hours.

- **Cloud**: Cloud technologies can help libraries to store and manage digital collections and make them accessible to patrons online without any local infrastructures. This allows for easier archiving, preservation, and distribution of digital resources without the need for on-premises servers.

Literature Review:

The literature review presented in this paper, indicates that there are no studies carried out on the topic "An Integration of SMAC Technology in Library Management and Services: A study of selected Higher Institution Libraries of Assam". However, since SMAC is a convergence of four technologies platforms such as **Social media apps**, **Mobile apps**, **Analytics** and **Cloud technology**, it has been noted that since individual evolved of the SMAC technologies unlike four pillars collectively, there are many studies has been conducted and published in research journals and conference proceedings. Knowing the availability of data, a comprehensive and systematic review of literature on SMAC in libraries and information centres of print/online professional literature were conducted for critical analysis and to better understand previous research works, identify trends and to determine the research gaps for future studies and address the present topic with trends of ICT applications and its adoption to enhance and uplift overall services and administration of higher institution's library in the state of Assam.

Khan (2022) conducted research on comprehensive list of top current trending technologies in library operations and mentioned that modern librarians need to adopt ICT based technologies to cope up shoulder to shoulder with the ever-growing world. The author highlighted how the huge advancement of ICT has led to the evolution of new technologies for the dissemination and management of library services. The also suggested some of the technologies that to surely turned into good promise for the library such as Maker Space, 3D Printing, social media, digital technology, Smart libraries, AI and mobile technologies.

A virtual lecture delivered by Dr. Nabi Hasan, (ARPIT-MOOCs 2020-2021), theme "Emerging Trends & Technologies in Library & Information Services (ETTLIS)" revealed his views that library has been undergoing rapid changes and significant transformation due to the emerging and consumerization of IT, changing patron's information seeking behaviour, bombarding of information that is approaching to replace the librarians. Hence, after watching the online lecture, it is observed that adoption of new technologies is one of the best alternative options to get library edge ahead in compare to other service sector in terms of rendering services". Dr. Nabi Hasan also explained some of the emerging technologies such as Library

Automation, digital library, KM, ERM, QR Code, RFID, Reference Management, Disruptive Technologies, Virtual Reference Services, Content Management, Discovery and search Services, internet based Services, use of Social Media profile and account, remote access login, Cloud technologies, Scientometrics, Altimetric, Mobile-based Library Services, IoT, Artificial Intelligence and how to become a Smart Librarian by Smart involvements and engagement.

Maideen (2017) stated new technologies has triggered double-sided coin effects as one side of it reduce manual activities of library and other side of coin forcing library professionals to redesign the mode of offering library services by integrating new technologies in modern days. Realizing the need to advance libraries, author discussed the positive impact of mobile technologies, short message notification services and e-resources access facilities within and outside campus of library.

Rajasekhar and Sasikala (2018) emphasizes the role of libraries in the era of Mobile-App based applications and discusses the mobile technologies in details that libraries can adopt to promote and expand their existing services by offering direct mobile access with a single click to their website, and OPAC so that users can find relevant information in their field of interest.

Rabatseta, Maluleka and Onyancha (2021) in their paper investigated the extent of adoption and use of social media platform for the support of library stakeholders by libraries in South Africa. Results revealed that a variety of social media platforms are available and used in large number of libraries (South Africa); the most common platforms are Facebook, Twitter, YouTube and blogs. The social media accounts are used to advertise library information, products and services, announce library news and improve service delivery. The information shared with the users relates to user information, library events and new services. They have observed that many libraries in said country do not spelled out the clause and guidelines specific to the management of social media access. At the end, authors proposed several recommendations in relation to the integration and benefits of social media usage in any kinds of libraries and for further research in the subject domain.

Islam and Habiba, (2015) focused on the current position of using social media for marketing of library news, events, resources and services, analysed the problems faced by LIS staff in utilising social media in libraries and also pointed out the views and concerns of librarians towards enhancement of marketing of library services and information products through internet via social media. For this study authors surveyed 17 public university libraries, 24 private universities libraries and 5 special libraries. The findings of this paper showed that large number of

the libraries use social account as tool for advertising of library information and services and library news, latest arrivals of reading materials, and library events as well.

Mishra and Maharana (2014) examined the adoption rate of social media as an innovative medium to deliver services, explores influencing factors and examines the effectiveness of using social media apps in Indian business school libraries for the benefits of users. The finding of the study explained that innovation has a significant influence in library marketing in respect of adopting and implementing social media among business school libraries. The outcome suggest that libraries should follow evidence-based, innovative practices for effectively implementing social media for the more significant benefit of patrons in a collaborative online environment.

Manjula T, (2016) expressed view in her study that Smart phones have turned into a boon and made it possible to get connected with any related organisation from any corner of the world for accessing valuable library resources. The author also emphasized on providing library services through Mobile Apps and explained the need for creating mobile apps to the library for better services. Apart from that author specified some of the existing library mobile apps and provides the web links of various mobile apps and the nature of resources available through those apps.

Research Methodology:

Research Methodology is divided into three sections. It begins with the statement of problem, followed by research questions, objectives of the study and data collection method.

Statement of the Problem:

Although in the existing literature, the applicability of **S**ocial media technologies, **M**obile technologies, **A**nalytical and **C**loud computing technologies are well known for various libraries especially in academic libraries. Even various studies have individually identified the factors for adoptions of SMAC but the researcher could not find any comprehensive study to find the factors that need to be considered while for adopting Social media, Mobile, Analytics or Cloud with respect to library management and services in single research. Therefore, this research intends to investigate the factors such as effectiveness, purpose, strategy and approach and challenges for an engagement and integration of SMAC technologies in higher institution libraries of Assam. The research problem that the study addresses is

limited within selected higher institutions of Assam *viz* Assam University (Silchar), Bhattadev University (Nalbari), CIT (Kokrajhar), Cotton University (Guwahati), K. K. Handiqui State Open University (Guwahati), Madhabdev University (Lakhimpur), National Institution of Technology (Silchar), National Law University and Judicial Academy (Guwahati) and Tezpur University (Tezpur).

Research Questions:

The following Research Questions are framed for the study:

1. What is the total number of physical materials in the library's collection (e.g., books, DVDs, periodicals)?
2. What is the total number of electronic resources in libraries (e.g., E-books & E-Journals?
3. What library automation systems or software are currently in use in the library?
4. Has the Library currently adopted SMAC technology into its library management and services?
5. Which platform of SMAC technology that library has integrated and used to follow.
6. When did the integration of SMAC technology in library services begin?
7. What are the main objectives or goals that the library aims to achieve through the implementation of SMAC technology in library management and services?
8. Has the library set metrics to measure the effectiveness of SMAC technology adoption in the library?
9. What types of metrics are being applied to measure the effectiveness of SMAC technology integration in libraries.
10. How frequently does the library review the metrics to ensure relevance and effectiveness?
11. What notable positive impacts have the library observed since implementing SMAC technology?
12. What types of the challenges faced in the integration of SMAC technology in library management and services?
13. What future plans or strategies does the library consider to better address challenges related to the integration of SMAC technology in library management?

Objectives of the Study:

Based on research questions, the main objectives of the study are listed below:

1. To find the general information and computerization status of the libraries in selected higher institution libraries of Assam
2. To assess the level of SMAC adoption and its impacts.
3. To explore the weather, pillars of SMAC technologies are separately engaged or do they comprehensively perform in libraries.
4. To investigate the main objectives that the library aims to achieve through the adoption of SMAC technologies.
5. To examine what types of metrics apply to measure the effectiveness of SMAC technologies.
6. To find which factors act as the barriers for adoption of SMAC technologies including the strategies and plans that the libraries are considering to better address the challenges related to the integration of SMAC technologies in library management and services.

Data Collection Methods:

To meet the objectives of the study, a Google form-based questionnaire was developed and focused on demographic profile of the respondent and their institutions. Second part pertained to questions on integration of SMAC technologies in higher institution libraries and various factors are considered related to the present research problem. Furthermore, both primary and secondary literatures are used as a source of information. Primary data has been collected through an online survey and for secondary data, various professional literatures have been consulted.

Data Analysis and interpretation:

For this study 12 higher institution libraries were selected and accordingly 12 sets of questionnaires were distributed to the respective higher institution libraries of Assam. Out of the 12 questionnaires the responses from 9 institutions (75%) are received and those are considered for the data analysis and interpretations.

Higher Institution's Library Collections:

The data in fig.1 illustrated the status of the library collections. Tezpur University holds the first position with 1,45,000 of collections whereas CIT, Kokrajhar is

spotted right at the bottom with overall collections of 15500. Cotton University library having the 2nd highest collections followed by Assam University library holds the third position with a total of 137639.

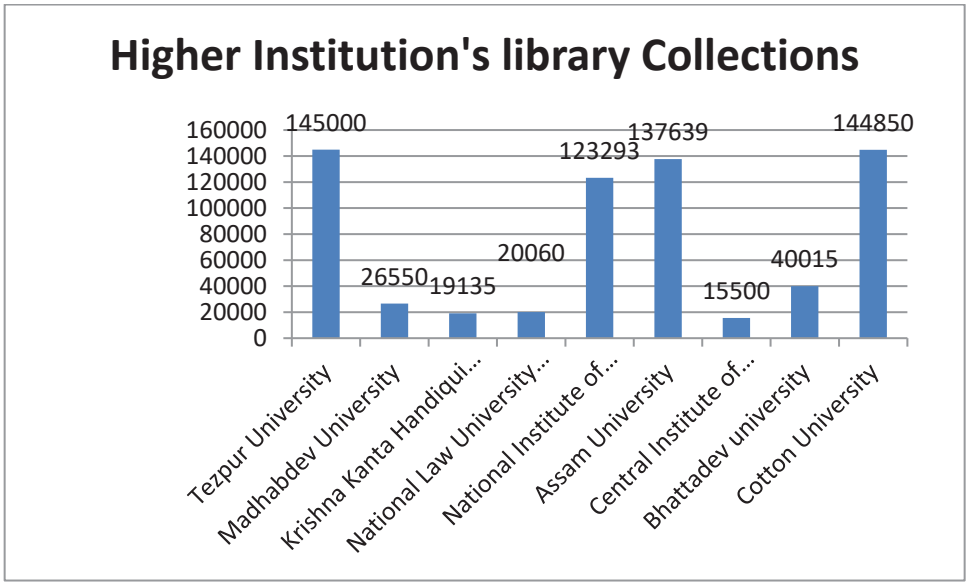


Fig.1- Status of the higher institution's library collections

Library Automation:

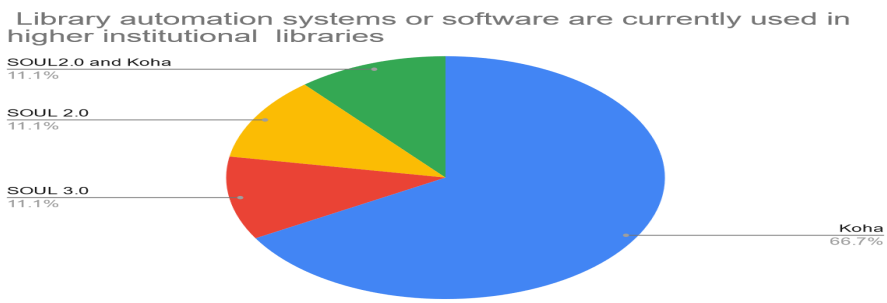


Fig.2- Scenario of Library Automation

Fig.2. revealed the scenario of library automation systems that are currently used in higher institution libraries of Assam. It is observed that the majority of libraries (66.7%) are using KOHA, LMS. It has also been found that one library is parallelly using both KOHA and SOUL 2.0 software as per their convenience whereas the rest of the libraries are using SOUL 3.0 & 2.0 library automation software for overall management and operations of the libraries.

SMAC platform in used:

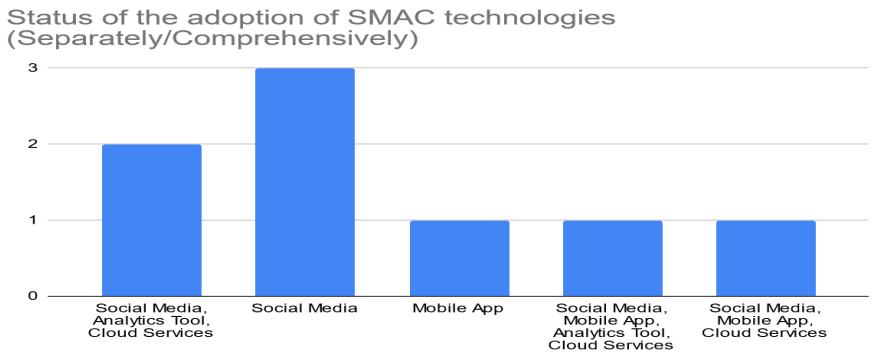


Fig.3- SMAC platform in used

Fig.3.Respondents were asked to indicate who had introduced SMAC technologies fully or partially in their libraries. Data is presented in fig.3 where it has been noticed that SMAC technologies are separately engaged in many libraries whereas least number of libraries are comprehensively used four pillars of SMAC technologies in their libraries.

Commencement of SMAC technologies in libraries:

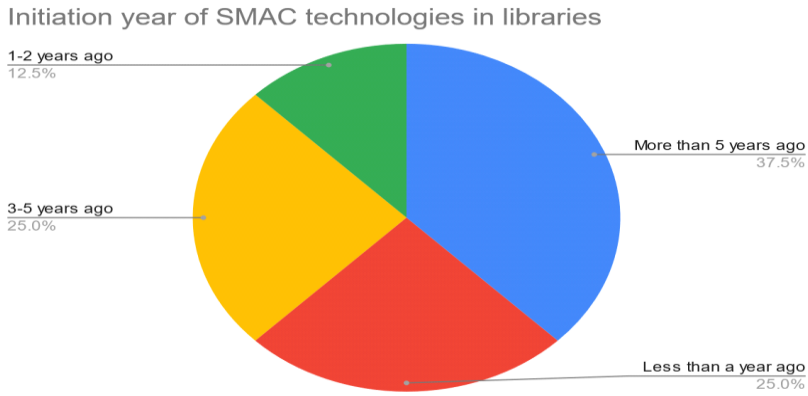


Fig.4- Commencement of SMAC technologies in libraries

Fig.4 explores that the most of the libraries (37.50%) has introduced SMAC technologies more than 5 years ago. It also reflects that 32% of libraries started to SMAC technologies way back 1-2 years ago followed by 25% of libraries began SMAC technologies related work at different times.

Integration of SMAC technologies with specific library goals:

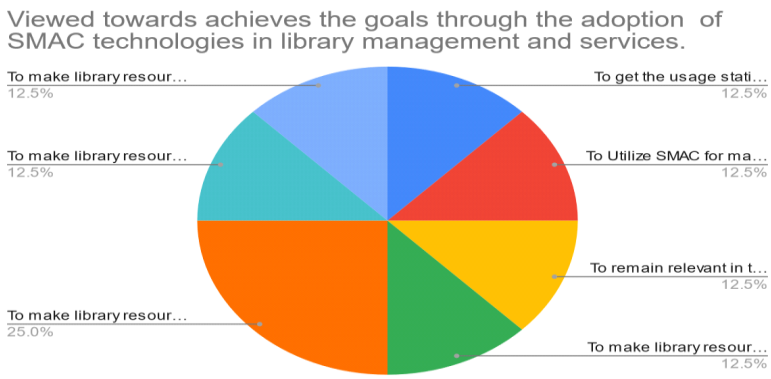


Fig.5- Integration of SMAC technologies with specific library goals

Fig.5- Shows the opinion of the LIS professionals on various utility of the integration of SMAC technologies in their libraries. It has been recorded that the most of the librarians (62.50%) certainly viewed that by adopting an alternative option such as shifted to mobile device and social media, they have not only become capable to a great extent in making library information accessible to their users, especially those users who live far away and find it difficult to come to the library all the time. Apart from that there is mixed thought (37.50%) on the utility of analytical and cloud-based method of service in library.

Metrics to measure the effectiveness of SMAC Technologies:

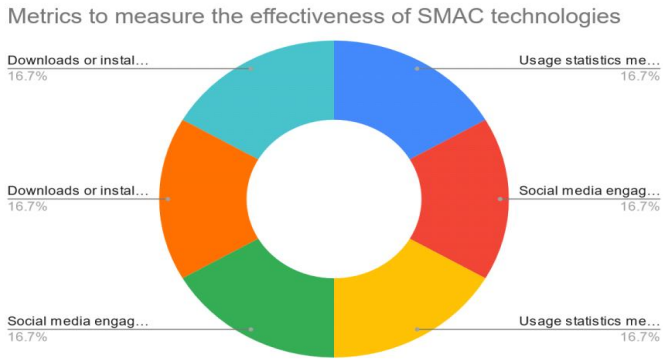


Fig.6- Metrics to measure the effectiveness of SMAC Technologies

Fig.6- Respondents were asked to comment on which metrics system do they use to measure the effectiveness of SMAC technologies in their libraries and it has been jotted down that 33.4% of libraries are using download and installation of the library's mobile app as criteria to measure the effectiveness of mobile

technologies whereas equal numbers of respondents i.e. 33.4% are applying Social media engagement rate (followers, friends, likes, shares comments) to estimate the advantages of engaged social media platform in their libraries. It further reflects that 33.2 % of libraries are using usage statistics metrics for library resources (e.g., database access, e-book downloads).

Frequency of review the metrics to ensure SMAC technologies relevance in libraries:

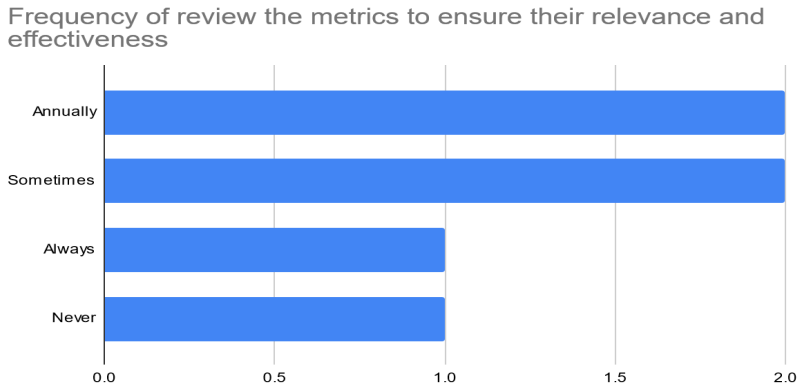


Fig.7- Frequency of review the metrics to ensure SMAC technologies relevance in libraries

Fig.7- Illustrated that the large number of the libraries review the metrics to ensure SMAC relevance and effectiveness at some times and annual intervals, whereas least number of professionals viewed that they rarely review the metrics to ensure SMAC technologies relevance in libraries.

Impact of SMAC technologies:

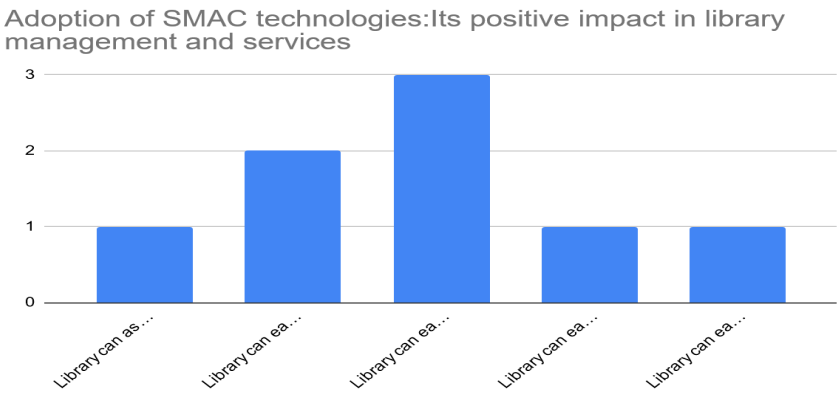


Fig.8- Impact of SMAC technologies

Fig.8- Revealed that the most of the libraries are leveraging SMAC platforms to share information, promote events, and engage in two-way communication via social media and mobile apps with their patrons.

Factors acts as barriers in an adoption of SMAC technologies:

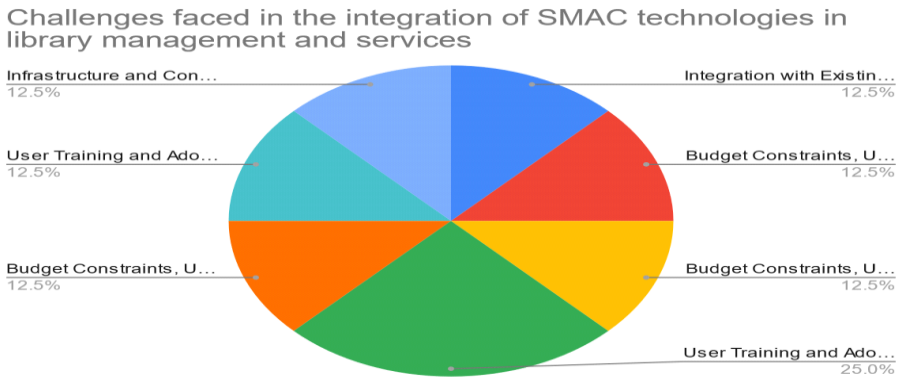


Fig.9- Factors acts as barriers in an adoption of SMAC technologies

Fig.9- reflects results on the constraints to adoption of SMAC technologies. The result showed that 37.5% of each respondent indicated that budget constraints, user skill and training are the major factors that act as the barriers for adoption of SMAC technologies.

Findings and Conclusion:

The findings of the study are based on an extensive review of literary sources and 9 responses collected from the higher institution libraries of Assam related to research questions and objectives framed for the study. The major findings are enumerated below:

1. Finding of the study revealed that there is huge scope to acquire benefits from the adoption of social media. Through social media platform, librarian can promotes latest happenings in the library, share updates, and gathering feedback. Social media also allows libraries to build online communities and facilitate discussions around books, research, and other library services.
2. The study confirms the growing popularity of mobile apps as an effective platform in libraries. Libraries can create mobile apps or optimize their websites for mobile devices to make it easier for patrons to access library resources, search catalogues, and check-in/check- out e-books or other materials.

3. The study confirms that analytics technology plays a major and significant role that libraries can leverage to gain insights into patron behaviour and preferences, borrowing habits, resource usage, and website traffic. Libraries can make data-driven decisions to improve their services, such as purchasing popular books or adjusting operating hours.
4. The study highlights that Cloud technologies can help libraries to store and manage digital collections and make them accessible to patrons online. This allows for easier archiving, preservation, and distribution of digital resources without the need for on-premises servers.
5. It has been identified that Tezpur University occupies the first position with 1,45,000 of collections whereas CIT, Kokrajhar is spotted right at the bottom in terms of total library collections.
6. It is observed that the majority of libraries (66.7%) are using KOHA, LMS. It has also been observed that one library is parallelly using both KOHA and SOUL 2.0 software as per their convenience whereas rest of the libraries have installed SOUL 3.0 & 2.0 library automation software for overall management and operations of the libraries.
7. Respondents were asked to indicate who had introduced SMAC technologies fully or partially in their libraries. Data is presented in fig.3, where it has been noticed that SMAC technologies are separately engaged in many libraries whereas the least number of libraries are comprehensively used four pillars of SMAC technologies in their libraries.
8. It has been observed that most of the libraries (37.50%) initiated SMAC technologies more than 5 years ago. It has also been observed that 32% of libraries started using SMAC technologies way back 1-2 years ago followed by 25% of libraries that began using SMAC technologies at different times.
9. It has been recorded that most of the librarians (62.50%) certainly viewed that by adopting an alternative option such as shifted to mobile device and social media, they have not only become capable to a great extent in making library information accessible to their users, especially those users who live far away and find it difficult to come to the library all the time. Apart from that there is mixed thought (37.50%) that analytical and cloud-based methods of functions and services in libraries has made our library work much easier than ever before in terms of generating the usage statistics report of library resources with minimum cost.
10. It has been jotted down that 33.4% of libraries are using download and installation of the library's mobile app criteria to measure the effectiveness of mobile technologies whereas equal numbers of respondents i.e. 33.4%

are applying social media engagement rate (followers, friends, likes, shares comments) to estimate the advantages of engaged social media platform in their libraries. It has been also observed that 33.2 % of libraries usage statistics metrics for library resources (e.g., database access, e-book downloads).

11. This study presented results on the constraints to adoption of SMAC technologies. The result showed that 37.5% of each respondent indicated that budget constraints and user skill and Training are the major factors that act as the barriers for adoption of SMAC technologies.

Conclusion:

Widespread consumerization of IT is closely related with SMAC which has led to transformative changes in various business and it too impact on service centric organization. We may take an example of big players like Amazon, Netflix, Uber, Salesforce, Airbnb as they successfully utilizing the power of SMAC in online trade. In the context of libraries, due to the changing habits and preference of the library users, librarian have to understand the promise of SMAC and can leverage the same technologies to improve library's efficiency, user's satisfaction and overall library operations and functions. Based on strong usefulness of SMAC technologies and its possible scope in libraries , researchers are trying to develop an understanding that how these technologies are very pivotal for the librarians that need to be adopt to engage with their library patrons, promote events, share updates, and gather feedback (**Social**), create mobile apps to make it easier for patrons to access library resources, search catalogues, and check-in/check- out of library materials (**Mobile**) at the time can predicts the future in terms of usage statistics of library materials (**Analytics**) at a fraction of the cost (**Cloud**).

References:

1. Bui, T. L., To, K. S. M (2016). Developing the use of social media in the activities of university libraries in Vietnam. *The Social Science, 11 (6),3894-3900.*

2. Chi, Duong Thi Phuong. (2020), Developing the use of social media in libraries. *International Journal of Library and Information Studies*,10(2), 49-57.

3. Digital direction team. (July,2022). What does SMAC mean? Retrievedfrom https://digitaldirections.com/what-does-smac-mean/

4. Ghane, P.B., Jadhav, U.S., Singh, Kunwar (Ed.) (2022). *Integrating ICT in library management*. New Delhi: Ess Ess Publications.

5. Gopichand, Merugu (2016). Cloud computing: An introduction to SMAC. *International Journal of Innovative Science, Engineering & Technology*, 3(7), 666-671.

6. G, Swapna, Biradar, B. S (2017). Application of cloud computing technologies in libraries. *International Journal of Library and Information Studies,* 7(1), 52-61.

7. Hasan, Nabi (ARPIT-MOOCs 2020-2021), theme "Emerging Trends & Technologies in Library & Information Services (ETTLIS. Retrieved from https://onlinecourses.swayam2.ac.in/arp20_ap28/preview

8. Islam, Md Maidul, Habiba, Umme (2015). Use of social media in marketing of library and information services in Bangladesh. *DESIDOC Journal of Library & Information Technology, 35(4), 299-303.*

9. Jakati, Suresh C, Kumar, Kiran (2022). Mobile application in libraries for delivering information resources and services. *International Journal of Humanities Social Science and Management,*1(1), 56-59

10. Mishra, Champeswar, Maharana, Bulu (2019). Impact of social media on business school libraries in India: An Empirical study. *Library philosophy and practice (e-journal).*

11. Manjula, T (2016). Library mobile apps: For effective services of library. *Journal of Library & Information Communication Technology,5 (2), 1-16.*

12. Malyarov, Nikolay (May,2023). The library of the future - right now. Retrieved from https://blog.pressreader.com/libraries-institutions/future-academic-libraries

13. Maideen, Sheik (2017). Mobile technologies for academic libraries: An over view. In Emerging trends in library and information science (Conference paper).

14. Philip, Preethi Saro (Oct,2018). Why is SMAC the new game-changer? Retrieved from https://www.bridge-global.com/blog/why-is-smac-the-new-game-changer/

15. Phadke, Dattatray Narayan (2020). *Reinventing libraries with future technologies.* New Delhi: Ess Ess Publications.

Theme-7

Sustainable Architecture and Design

Uncovering Vastu Shastra: Sustainable Paradigms For Modern Library Architecture

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ABSTRACT: The integration of traditional architectural wisdom with contemporary design practices becomes imperative in the rapidly evolving realm of modern architecture for fostering harmony with the environment, encouraging positive energy flow, sustaining cultural legacy, enhancing psychological wellness, optimizing architectural beauty, and supporting holistic and sustainable design principles. This article critically examines the reinterpretation and application of Vastu Shastra principles within the framework of sustainable paradigms, offering a comprehensive exploration of the fusion between ancient wisdom and eco-conscious design in the context of modern library architecture. This study provides insight into innovative strategies that integrate sustainability concepts with Vastu Shastra, resulting in library architecture that value environmental responsibility as well as to cultural heritage. The application of Vastu Shastra principles in the library architecture can provide source of sustainable green energy to the libraries, energy-efficient and also culturally relevant and environmentally conscious spaces. This approach acknowledges the importance of both modern sustainability practices and traditional cultural values in shaping the design and functionality of libraries. Its application to library architecture emphasizes how it could reshape library architecture towards a more sustainable and socially responsible future.

KEYWORDS: Vastu Shastra, Architecture, Sustainable, Library, Environment.

1. Introduction

The term "Vastu" is derived from the Sanskrit word "Vāstu," which means "dwelling sites" (Dagens, 1994). Vastu Shastra is a traditional Indian architecture and design concept that entails a set of rules and standards for building harmonious living and working environments. It is founded on traditional Indian notions about the relationship between a structure's layout and the well-being of its residents. In Mayamata, Vastu is defined as "the places where immortals and mortals dwell" (Dagens, 1994). The idea of locations where immortals and mortals live can be connected to sustainability in architecture through linking the term "immortality" for our planet by creating enduring, harmonious spaces that balance with nature, respect cultural heritage, and transcend time. In this context, architects contribute to a legacy that prioritizes environmental responsibility, ensuring a lasting impact

on both the present and future. Applying Vastu principles in library architecture involves optimizing book placement, designing study areas, and arranging spaces to enhance positive energy flow. Considerations for entrance, layout, lighting, and colour schemes align with creating an aesthetically pleasant and green library atmosphere.

1.1 Principles of Vastu Shastra:

The Mayamata states that the word *"vastuśāstra"*, which means the "treatise on dwelling," and the concept of Vastu Shastra housing is very wide and is divided into four categories: the Earth (considered as original dwelling), buildings, vehicles and seats (which last three are nothing but *"vāstu"* deriving from the first *"vastu"*, the Earth) (Dagens, 1994). The Five Elements, also known as *"Panchabhutas"* in Vastu Shastra, are fundamental building components that form the basis of the material world. These elements are crucial in balancing and harmonizing the energies within a given space. Below is a brief description of each:

(a) **Earth (Prithvi):** Represents stability, support, and foundation. The earth element is related with the physical structure of a building, including its foundation, floors, and overall stability, according to Vastu.

(b) **Water (Jal):** This element represents fluidity, flexibility, and emotional well-being. The location and orientation of water features such as wells, tanks, or fountains are believed to boost positive energy flow.

(c) **Fire (Agni):** Represents energy, evolution, and light. The right placement of fire items, such as fireplaces or stoves, is believed to alter the energy flow within a space.

(d) **Air (Vayu):** This element represents movement, circulation, and freshness. A healthy and vibrant atmosphere is said to require adequate ventilation and free flow of air within a structure.

(e) **Space (Akasha):** The infinite, which serves as a dwelling for all other elements. To allow for free flow of energy, the spatial layout is balanced and complexity is avoided.

The harmonious integration of these five elements in the architecture and layout of a space is envisioned by Vastu Shastra to generate a positive and balanced environment. Each element's principles influence the orientation and arrangement of rooms, objects, and structures inside a building to optimize energy flow and promote well-being. It is believed that balancing these factors contributes to the overall harmony and pleasant atmosphere of a living or work environment. In order to generate positive impacts, directional alignment is essential, with structures orientated according to the cardinal directions. Maintaining the middle

region (*Brahmasthan*) open facilitates maximum energy circulation, highlighting the importance of the entrance as a focal point for energy intake. Spaces are given unique functions by functional planning, and places and items are arranged in line with the sun for energy flow alignment. A supporting atmosphere is influenced by material and shape guidelines, as well as the balance with green energy. Careful placement of water features promotes beneficial energy flow, and negative energy prevention identifies and eliminates adverse consequences. These ideas work together to create environments for living and working that promote harmony, balance, and good spirits. In short, the concepts and procedures for incorporating vastu shastra into library architecture are essential for the foundation of sustainable civilizations.

2. Design Framework/ Pattern of Vastu Shastra:

The fundamental component of Vastu Shastra is the *"Purusha Mandala"*, a geometric pattern that provides structural architecture with spiritual significance. It revolves around the *"Bindu"*, which is the cosmic essence, and incorporates directional impacts as well as the assignment of cosmic energy to particular zones. In addition to serving as a blueprint for building layouts, this sacred pattern encompasses the concepts of sacred geometry, promoting harmony and balance. To align buildings with cosmic energies and promote positive energy circulation and an auspicious living or working environment, architects and designers follow the Purusha Mandala. The *"Bindu"* refers to the central point, and it is very important in Purusha Mandala context. A building's design and layout are based on a cosmic diagram called the Purusha Mandala. There are various deities and energies connected to particular orientations in this sacred structure. This point, which represents the essence of creation, is thought to be extremely auspicious and powerful. The energies impact the several orientations and zones of the building, originating from the Bindu. To facilitate the free flow of energy coming from the Bindu, the middle area, called *"Brahmasthan"*, is maintained open and uninterrupted. According to Vastu Shastra, accurate recognition and use of this central point are essential to the harmony and balance of a construction.

2.1 Components of Vastu Shastra's Design Framework:

In order to produce harmonious and well-balanced living environments, the Vastu Shastra design framework is a comprehensive set of principles that govern building layout and construction. Vastu Shastra's design framework consists of the following essential components:

(a) **Orientation:** In order to harness good cosmic energies, orientation plays a critical role in aligning structures with the cardinal directions, which are north, south, east, and west.

(b) **Entrance Placement:** The front entry is a center of attention, and good energy is welcomed by its strategic placement. It regularly faces in a positive direction.

(c) **Brahmasthan:** To allow energy to flow freely throughout the building, the Brahmasthan, the center section, is maintained open and without interference.

(d) **Zoning and Placement:** Zones are designated with different functions. In the kitchen, for instance, the southeast may be suitable, yet the northeast is usually used for prayer rooms.

(e) **Five Elements Integration:** Establishing a harmonious atmosphere within the construction by balancing the five elements - earth, water, fire, air, and space.

(f) **Materials and Colors:** Based on their elemental qualities, Vastu suggests particular colours and materials. For stability, earthy colours have been advised, for instance.

(g) **Opposing Negative Energy:** The balance of opposing forces, are taken into consideration for a healthy and comprehensive living environment.

(h) **Avoidance of Negative Influence:** The design framework offers remedies or mitigations to counterbalance the probable negative affects identified by Vastu Shastra.

(i) **Water Element Placement:** Strategic placement of water bodies, such as wells or fountains, will boost good energy flow.

(j) **Energy Source Alignment:** To maximize the flow of energy throughout the building, rooms and items are oriented in relation to an energy or the sun, which is usually depicted by a Vastu Purusha.

(k) **Astrological Considerations:** The incorporation of astrological principles, correlating specific orientations with celestial bodies in order to boost positive energy.

(l) **Sacred Geometry:** Sacred geometric principles are applied to ensure proportionality and balance in the design's layout.

2.2 Diagram of Vastu Shastra's Design Layout:

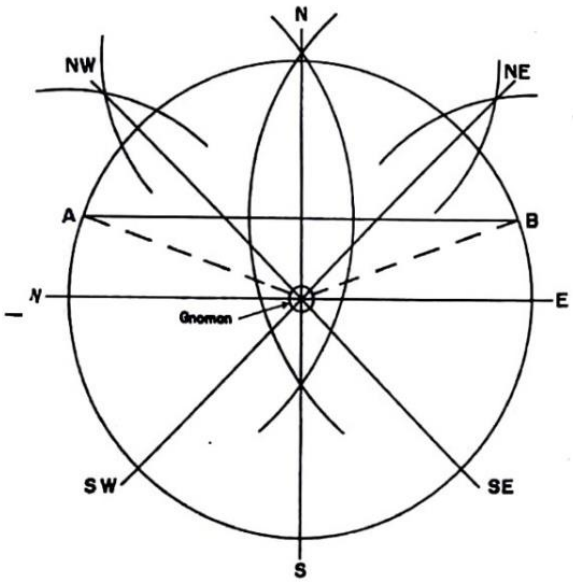


Fig 1: Orientation

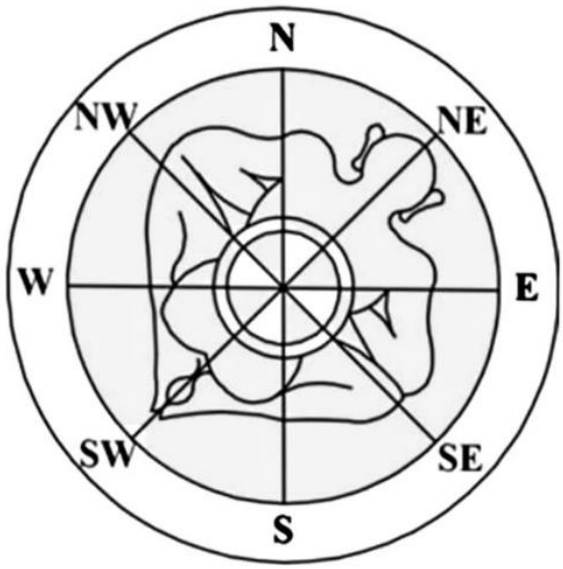


Fig 2: Cardinal and Ordinal Directions

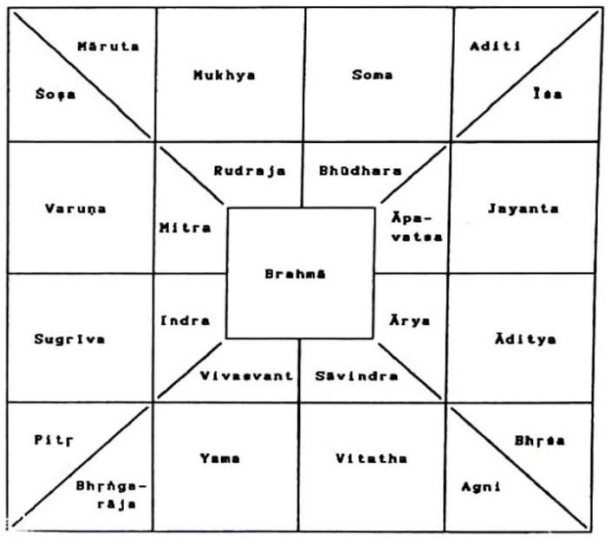


Fig 3: Mahapitha Diagram of Purusha Mandala

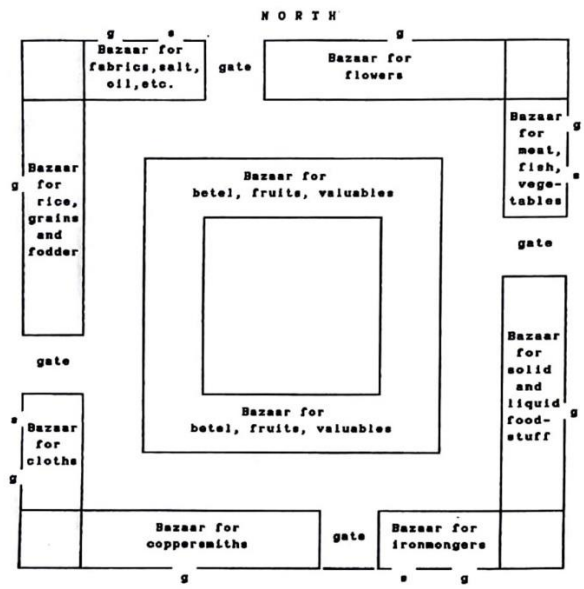


Fig 4: Town Layout

Based on the figures provided above, it can be infer that, in terms of economy and structural consideration, the square is the best geometric shape, followed by the rectangle, because it requires the least amount of building materials. In terms of structure, buildings with square and rectangular shapes can transfer loads

safely even in situations where the soil's load capacity is low, while other irregular shapes provide large contact areas as more than they critically require.

3. Vastu Shastra and Sustainability:

Many connections exist between sustainable design techniques and the principles of Vastu Shastra. Aligning with energy-efficient solutions is the best orientation for natural light and ventilation. Sustainable material selections align with the focus on local and natural resources. Climate conditions are taken into account by Vastu to create designs that are intelligently responsive to their surroundings and require less energy. Sustainable techniques are in line with water conservation principles and the incorporation of green spaces. Vastu's cultural awareness also encourages communities to accept and preserve existing structures, which supports social sustainability. Vastu Shastra combines a holistic approach and a natural alignment with nature to create settings that are not only environmentally responsible but also culturally and socially sustainable, even though it begins with current conceptions of sustainability.

By placing a strong emphasis on concepts like waste minimization, cultural sustainability, and energy efficiency. Reduced waste in building is a result of using Vastu's recommendations for effective use of space and materials. Including cultural components also promotes a feeling of community and identity, which helps to sustain society. Human-centric and well-designed environments are vital to sustainable architecture, and Vastu's focus on the physical and spiritual well-being of its occupants is in line with these insights. These elements can be harmoniously combined with modern sustainability and tradition to create settings that are not only environmentally conscious but also socially and culturally enriching and culturally enriching. These attributes are what make Vastu-inspired designs so appealing.

4. Propositions un Vastu Shastra Principles for Modern Library Architecture:

There is an opportunity to use Vastu Shastra's centuries-old knowledge into contemporary library architecture as libraries adapt to the changing demands of communities. In order to create a space that not only fits with current functionality but also encourages good energy flow, cultural resonance, and improved well-being for library users, this proposal promotes the integration of Vastu principles into the architecture and layout of the library.

4.1 Objectives of Integrating Vastu Shastra Framework In Modern Library Architecture:

The objectives of applying Vastu Shastra principles to library architecture can be precisely targeted to improve the ambiance and functionality of the library space:

(a) **Reading Spaces:** By arranging them according to Vastu principles, reading rooms can maximize the flow of energy within them. Users of libraries may find a more concentrated and peaceful atmosphere if reading rooms are positioned in auspicious directions.

(b) **Study Zones:** Using the concepts of Vastu in these areas might help students focus and learn more successfully. A suitable atmosphere for intellectual pursuits may be enhanced by proper spatial layout and directional alignment.

(c) **Entry and Reception:** Creating a pleasant and cheerful environment for patrons can be achieved by designing the library's entry and reception area in line with Vastu principles. It establishes the mood for a peaceful educational setting.

(d) **Book Placement:** Applying Vastu principles to arrange bookshelves and collections can improve the accessibility and positive energy surrounding the library's collection of books. A feeling of order and convenience in finding materials may be enhanced by proper arrangement.

(e) **Integration of Natural Light:** According to Vastu principles, ensuring the reading and study spaces have enough natural light not only supports sustainability but also improves the well-being of library patrons by creating a light and stimulating environment.

(f) **Air Quality and Ventilation:** Vastu's emphasis on the circulation of air is consistent with contemporary ideas about preserving a healthy indoor environment. A more comfortable and healthy library atmosphere is a result of the installation of appropriate ventilation systems.

(g) **Cultural and Artistic Components:** Integrating artistic and cultural components according to Vastu principles can improve the library's visual appeal. This can entail using artwork, design components, or cultural symbols that are in line with the cultural setting of the library.

(h) **Functional Layout:** An effective and functional environment is achieved by aligning the library's general layout with Vastu principles. To maximize energy flow and improve usability, this requires setting up various places, including collaborative spaces, circulation desks, and reference rooms, etc.

(i) **Community Engagement Spaces:** Creating community engagement spaces in libraries that are in line with Vastu principles, such as meeting rooms or event areas, can help to create a vibrant and positive atmosphere for community interactions.

(j) **Preservation of Cultural Heritage:** By incorporating architectural features inspired by Vastu, a library may be created that is both functional and culturally significant. This helps to maintain and promote the community's cultural heritage.

4.2 Implementation Plan:

(a) **Assessment and Analysis:** Carry out an in-depth investigation of the current library space, taking into account architectural components, orientation, and cultural context.

(b) **Collaboration with the Professionals:** To guarantee a smooth transition between conventional knowledge and contemporary design ideas, work together with architects and designers who are knowledgeable about Vastu principles.

(c) **Stakeholder Participation:** Engagement to the process of design with community members and professionals from the library to ensure sure that the application of Vastu principles meets user needs and expectations.

(d) **Gradual Implementation:** Implement Vastu-inspired improvements gradually so that the community can provide input and make necessary adjustments as the library environment changes.

(e) **Education and Documentation:** Provide educational resources for educating library patrons about the design selections and document the integration of Vastu principles, promoting an awareness and respect for the space's cultural and spiritual elements.

The contemporary library architecture offers an exciting opportunity to build a space that goes beyond traditional design, cultivating an energetically balanced, culturally resonant, and user-centric environment by incorporating the principles of Vastu Shastra. The library we have may become a vibrant center for education, cultural inquiry, and community involvement by blending ancient wisdom with contemporary functionality.

5. Green Building Library Architecture Based On Vastu Shastra Principles:

Vastu Shastra mostly concentrates on spatial and architectural principles to create aesthetically pleasing living spaces. In order to comply with sustainable practices,

we might get inspiration from several Vastu concepts to encourage green energy and sustainability in architectural design. Here are some considerations to think about:

(a) **Sun Orientation:** The necessity of appropriate alignment with respect to the sun is emphasized by Vatu Shastra. There is the sun notion associated with orienting structures to receive the maximum sunshine possible, particularly from the north and east. As a result, less artificial lighting and heating may be required. This can maximize the amount of natural warmth and light.

(b) **Wind Flow Considerations:** Vastu encourages appropriate circulation of air and ventilation. Sustainable methods can be coordinated with the use of wind flow factors. By carefully positioning windows and other openings, natural ventilation can be maximized and the need for artificial cooling systems can be decreased.

(c) **Integration with Natural Surroundings:** Vastu places a strong emphasis on living in harmony with the surroundings. It can be in line with sustainable principles to design buildings that blend in with the environment rather than against it. This integration includes, but is not limited to, preserving existing trees, adding green roofs, and sourcing materials locally.

(d) **Strategic Use of Colours:** According to Vastu, certain colours correspond to particular directions. Using brighter colours on external surfaces to reflect sunlight can help with cooling effects and reduce the need for air conditioning during warmer months.

(e) **Green Building Materials:** Eco-friendly and sustainable building materials can be given priority by architects in keeping with Vastu's respect for the natural world. To lessen carbon footprint, this can involve using locally obtained resources, recycled materials, or items with low environmental impact.

(f) **Rainwater Harvesting:** The use of rainwater harvesting systems may be motivated by Vastu concepts. Rainwater collection for non-potable usage can be elegantly incorporated into building designs, is in line with environmental principles, and lessens dependency on external water supplies.

By incorporating these factors, architects can design library architecture that support a more sustainable and energy-efficient future while yet keeping to the cultural and spatial principles of Vastu Shastra. Architectural solutions for libraries that are both culturally and environmentally sensitive might arise from the integration of traditional wisdom with modern sustainability.

6. Why Is It Necessary Today?

The use of Vastu Shastra ideas into contemporary library architecture is considered essential for several convincing reasons. It emphasizes a link to cultural roots, promotes sustainable and eco-friendly practices, prioritizes holistic well-being, and improves learning environments. Implementing Vastu in libraries adds to excellent user experiences, community participation, and a deeper understanding of ancient architectural knowledge. Furthermore, it tackles contemporary issues such as climate change and corresponds with libraries educational significance as organizations that spread cultural and architectural legacy. The integration of Vastu Shastra and current architectural demands results in environments that are not only helpful but also culturally enriching and ecologically conscious.

7. Conclusion:

The article emphasizes the integration of ancient wisdom with contemporary sustainability. The findings emphasize the need of balancing tradition with environmentally responsible techniques, as well as building user-centric libraries that prioritize cultural resonance, well-being, and flexibility to new difficulties. The new paradigm shift promotes a holistic design approach, elevating libraries to symbols of cultural relevance, community connection, and inspiration for future architectural trends. Finally, libraries designed according to sustainable Vastu principles are defined by an integration of tradition and innovation.

References:

1. Dagens, B. (2000). Mayamatam Treatise of Housing, Architecture and Iconography, 1(2).

2. Gupta, R. (2016). Comparison of Vastu Shastra with modern building science. *International Journal of Research and Scientific Innovation (IJRSI)*, 3(7), 118-121.

3. Patra, R. (2006). A Comparative Study on Vaastu Shastraand Heidegger's 'Building, Dwelling and Thinking'1. *Asian Philosophy*, *16*(3), 199-218. https://doi.org/10.1080/09552360600979430

4. Patra, R. (2008). Vaastu Shastra: Towards sustainable development. *Sustainable Development*, *17*(4), 244-256. https://doi.org/10.1002/sd.388

5. Sachdev, V. (2005). A Vastu text in the modern age: Vishvakarma Darpan, 1969. *Journal of the Royal Asiatic Society*, 15(2), 165-178.

6. Sengupta, M. (2016). Vastu Shastra: Revisiting the Ancient, Arcane and Esoteric Science of India. *India International Centre Quarterly*, 43(2), 160-173.

7. Shanta Dash and Mahendra Joshi. (2022). Redefining Vastu Shastra Principles With Reference to the Contemporary Architectural Practices in India. *Journal of Pharmaceutical Negative Results*, 349-358. https://doi.org/10.47750/pnr.2022.13.s08.048

8. Singh, H., Narayan, S., & Chawla, A. (2011). Seismic Design of Buildings in Accordance with Vastu Shastra. *In Proc. of Int. Conf. on Recent Trends in Transportation, Environmental and Civil Engineering*.

A Comprehensive Analysis on-' Transforming Libraries with Creative Implementation of Sustainable Architecture'.

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ABSTRACT: This research paper aims to provide insights on how by incorporating sustainable architectural design practices into library design we can transform libraries not only as a storehouse of information but also as an medium of educating people and inspiring them towards a sustainable lifestyle. The paper explores on various green building design concepts and practices that can be incorporated in the various stages of building design from the planning stage, execution stage to the completion stage that can help to transform libraries in a sustainable way.

Keywords :- Sustainable Architecture, Library Building Design, Ergonomics ,Sustainable Buildings , Universal Design, Ecosystem.

1.Introduction

Background: The growing awareness among people for sustainable living and the consciousness to protect the environment had led to new approaches towards sustainable design. Sustainable Architecture aims to minimize the energy consumption of buildings by conscious planning of developmental space and selection of materials that will lower the negative impact on the ecosystem. The design requirement of library has evolved over the years due to the rapid revolution of digital information where resources are no longer confined to physical format. Hence, we need to come up with design ideas that can meet up with the requirement of the present but also catering to the futuristic requirement of the library for a minimum period of 20 years. While aiming to design sustainable libraries we need to understand its core pillars which are tradition, technology and urbanism.

Tradition can be considered as knowledge and construction techniques which has been passed over by generations for safeguarding and altering the micro – climate and creating habitable spaces. It can be simply expressed as designing for future by looking at the previous experiences and wisdom.

While analyzing about tradition Vernacular Architecture comes into the light. Vernacular Architecture can be defined as an architecture technique that relies

on passive measures ,adaptive and climate responsive methods which has been developed by people over generations by undergoing various trial and error methods .The construction is done by considering the locally available material, culture and the craftsmanship and that is why Vernacular Architecture is sustainable in every sense of its word .As sustainable architecture itself speaks about reaching out to the global community by thinking global but acting local.

Technology, the second most important core pillar of sustainable architecture should work in correlation with tradition . Technology should often emphasize on boosting the sustainable growth without hampering the ecosystem that is by minimizing changes to the functioning of the existing natural system. While designing any structure the focus should be on reinforcing the natural context of the place. As technology is one of the key aspects of Sustainable architecture hence we can boost renewability by presenting new ways of looking at material and adapting a greener and sustainable way of construction.

Urbanism, the third most important core pillar of sustainable architecture aims to develop an innovative approach by keeping ecological , cultural and urban demands in mind and creating strategies to make built environment in a more sustainable way. Therefore, while designing a sustainably designed building the growing demand of the towns and cities should be kept into consideration as the resources are limited and proper planning will help to design for the need and the demand without hampering the existing ecosystem.

2. Aims and Objectives

The aims and objectives of this paper are as follows:-

(a) To provide design strategies that can be incorporated towards planning a sustainable library building complex.
(b) To provide planning strategies at town and city planning level that ensures easy accessibility to the site.
(c) To developing a design that aims to create an inspiring and comforting environment.
(d) To create a hustle free user experience for the people of all age groups and genders.

3. A brief Literature Review on Library Building

A comprehensive analysis on the holistic strategy to reduce negative affects on users and the environment, sustainable buildings offer energy-efficient and ecologically friendly design (Ali & Al Nsairat, 2009).

According to Awala-Ale (2013), there are five main factors that have influenced library architecture over the ages: the way information is recorded, the type of library use and readership, technological advancements in librarianship and architecture, funding availability, and the acknowledgement of traditional architecture as a component of cultural heritage.

Libraries, as important campus structures, can serve as role models for sustainable practices by promoting green building techniques and increasing public knowledge of sustainability (Hardesty, 2011).

Academic libraries that prioritize sustainability are receiving more attention thanks to national and international sustainable ranking systems and certificates (Hardesty, 2011).

4. Design Considerations for Sustainable Library Building Complex

Libraries not only provide information and education with the books or the digital information it stores, it also serves a body of education to the people. The design of the library should be inspiring and also should convey the principal of sustainable approach.

The following are the design consideration suggested for meeting the changing needs and demands of the visitors of library and also making them sustainable:-

4(i). Location of the Library Sustainable Building Complex

(a) **Easy Accessibility** -The location of the Public library building should be in a place that is accessible to all age groups. The ideal location of library should be in the centre of any Institutional Campus or City Design. It should be located in such a place so that it is easy accessible to the people of all age groups as the site chosen plays a pivotal role in creating a significant impact on the amount of energy consumed by the people using the building.

(b) **Site Connectivity** - The building should be well connected with the public transportation system.Emphasis should also be given on pedestrian connectivity as it almost gets neglected in the Urban Landscape. The cyclist also needs to be taken into consideration while deciding the site for library and they also need to be provided shower and changing rooms upon reaching the building complex. The idea of selecting the library site should highlight the green travels plans of the client and the users where efforts were put to minimize the energy consumption.

4(ii). Site Development of the Library Building Complex

(a) **Site Selection** - The site chosen for the library building and its surrounding also plays an important role in attracting visitors to the library. The site chosen should be well developed incorporating well thought sustainable design principles into landscaping and also in the overall building façade design.

(b) **Site Analysis**- The first and foremost step into designing a sustainable building complex is do an indept site analysis to understand the physical characteristics, sun path direction , wind direction ,cultural background of the place. This will help to design the site plan keeping it climate responsive and also geographical and the cultural context intact. the second most important step is to carry out the **SWOT Test** (Strength, weakness, opportunities and the threat). This test helps to understand the various aspect of the site and helps in designing a climatically responsive building.

(c) **Site Plan** – The site plan comprises of the proposed library building or any existing building structure and the remaining open spaces that has been provided as per the byelaws of the state of the proposed library building. So while preparing the site plan sustainable measures needs to be taken into consideration.are as follows:-

(d) **Designing the open spaces** -Landscaping plays a pivotal role in many public spaces so does for designing a sustainable library complex the following are the landscape design stratergies that should be taken into considerations:-

(a) The sharing of knowledge is not limited to the books or digitalization of knowledge transfer, it can happen with social interaction. Therefore, gathering spaces need to be provided within the complex for such interactions between people of all age groups.

(b) Recreational spaces should also be provided within the complex as it promotes to enhancing the quality of life which is one of the key pointers that sustainability promotes.

(c) Incorporating Sustainable design practices like solar energy usuage, water conservation within the landscaping. The stored rainwater and the recycled grey water can be used for various purposes such as watering the plants, ornamental water features, urinal flusing etc.

(d) Plantation of native plants should be encouraged. The landscaped area should have a combination of seasonal and evergreen plants, trees , shrubs and herbs and this will help create harmony and foster a welcoming environment into the complex.

4(iii). Exterior Envelope of the Library Building

The building envelope is the connectivity between the indoor and the outdoor space. Thus proper designing of the building envelope ensures ample amount of light and ventilation into the structure.

(a) **Fenestration** - The exterior façade of the building requires proper fenestration for ensuring natural light and ventilation into the library building. These can be incorporated by studying the site analysis data and providing window positions based on the layout and orientation of the building. The placement of windows , skylight , louvers ,doors and ventilators at proper positions helps to achieve the thermal comfort within the building.

(b) **Green Facades** - While designing the facades the growing problem of heat island also needs to be taken into consideration. In the last couple of years, the many cities are facing the problem of heat island. Hence, sustainable design practices like green facades can be incorporated in the façade of the building. There has been various researches which proves that green facades tend to improve the overall energy performance by creating thermal comfort. The use of green facades provides shading and insulation and also tends to cool the internal temperature of the building thereby minimizing the use of artificial equipment's to maintain thermal comfort. The use of green facades not only provides thermal comfort but also makes the building visually attractive hence also catering to the idea of creating an external façade that generates a sense of space and invite people in to the library building complex.

(c) **Shading Devices** – Sunlight is the prime factor of all living beings existence. Therefore a well planned and execution of sun shading devices can help us to achieve thermal comfort to a great extent. Sun shading devices not only adds to sustainable design but also helps to generate a distinct façade design . The various ways of incorporating shading devices into the building structure are like adjustable louvers, overhangs, fins etc.

4(iv). Interior Spaces of the Library Building

(a) **Natural Light and Ventilation** -The designing of the interior of the library should focus on the efficient planning of space and using natural lighting and ventilation to the fullest . The areas need to be planned according as per the need of light and ventilation required in order to avoid the unnecessary use of space and resources.

(b) **Ergonomics** – The implementation of ergonomics into any library design should be encouraged .Ergonomics takes into consideration the physical,

psychological and work factor and these factors helps to improve the work environment , increase work efficiency and also provides job satisfaction. Ergonomics also adds to improved accessibility by ensuring the furnitures work tools are within the reach of the users.The various ergonomical products that can be used in the library are ergomomic chair, ergonomic mouse, ergonomic keyboard, ergonomic table and many more. Ergonomics helps to improve the quality of life and thus helps in creating a sustainable environment

(c) **Use of Eco- Certified Products** - While designing the interior of the libraries designers should focus on using eco – certified products like workstations, chairs library furnitures .The materials that are used should either be GPSC or BIFMA or Green Guard Certified. The designed model should be user centric and with a futuristic approach..

(d) **Recycle and Reuse** - Recycling and reusing products into the interiors should be encouraged Examples like using recycled paper for various administration work thereby reducing the use of paper by a very large margin and also old furnitures and can be recycled and remodeled in a creative way and be used.

(e) **Use of Indoor Plants** - Indoor Plants play a very important role in enhancing the indoor air quality of the inhibited place by improving the health and well being of the occupants and also by improving the indoor aesthetics. Indoor plants helps in reducing various health issues like the **Sick Building Syndrome** that shows symptoms like headache,dizziness, dry and itchy skin, shortness of breathe, irritation in eyes and throat , difficulty in concentration, fatigue and it generally occurs because of inadequate ventilation , fluctuations in temperature and humidity, poor maintenance of HVAC .. Plants like **Pothos, Areca Palm, Snake Plant, Spider Plant, Peace Lily**, Aloe Vera**, Gerbera Daisy, Tulsi**) helps in absorbing toxins like formaldehydes. Indoor Plants decreases Sick Building syndrome by 25% and other ailments like fatigue by 20% headache 30% cough by 40% and sore throat by 30%.

Thus, by following these sustainable measures a environmental friendly sustainable interior library design can be achieved.

4(v) Designing for the People with Special Needs in the Library Building Complex

(a) Universial Design Approach- The idea of designing a sustainable library should not only be confined to green building designing or minimizing the use of natural resources. It should try to create a space that is accessible to all them only the

target of designing a futuristic library can be achieved . The universal design standards should be followed while designing the library.In order to achieve that we have to take everyone into consideration like the people of all age groups, belonging to different genders..These small changes will make our society a better place to live in. The design of the libraries should be done taking into considerations the people with visual imparities.the display and information like the direction signs should be placed in position that is accessible to them. The libraries should give a feel of wholesome need to people and the sense of self dependant these will boost their confidence and enhances the user experience of all people.

(b) **Applications of Universal Design**- The universal design applications using tactile maps and signage, wheelchair accessible toilets ,unisex toilets, software which provides assistance should be installed such as like Kurzweil 1000(This software generates printed or electronic text to people who are visually impaired or blind), JAWS screenreader software software that coverts the content on the computer screen into voice outputs that can be listened on speakers or headphones. And many more. Such approaches would help people to become and enjoy the experience.

5. Conservation and Utilization of Energy Sources in the Library Building Complex

(a) **Solar Energy-** The use of solar energy consumption should also be encouraged as there are multiple benefits of using solar energy. Solar Energy is limitless and it provides us to be independent of the energy consumption and also provides with ample variety applications. There are various technologies available which helps us to use solar energy like Photovoltaic (PV), Concentrating Solar Power (CSP), Solar Heating and Cooling (SHC) Systems etc. These technologies should be incorporated by designers in the planning of the Library.

(b) **Water Conservation** - Water conservation is very essential in today's scenario. With the rapid scarcity of clean drinking water Library building should be designed to conserve and preserve water and educate the users about water scarcity issues and importance of water conservation. Rainwater harvesting and use of grey water techniques should be encouraged and applied to the structure and therefore minimizing the energy consumptions in the building and contributing to creating a sustainable library design .

6. Appropriate Scheduling of materials used in the Library Building complex

(a) **Scheduling and Sequencing** - If the construction materials are scheduled and sequenced properly we can reduced their material wastage on site. This only reduces the waste but also is a good economical practices and helps us to minimize the use of non – renewable resources.Site waste debries create environmental hazard and hence they should be used reasonably and carefully disposed .

(b) **Eco – Friendly chemicals** - The use of eco – friendly chemicals which are Greenseal GS 35 standard should be used. The use of green consumables that have low impacts on health and environment should always be encouraged. And also strictly avoiding the use of chemicals within the building complex should be avoided as it leads to **Sick Building Syndrome** that have become one of the common problems in many newly constructed building.

7. Conclusion

Hence, it can be concluded that libraries are acting as role models for generating environmentally conscious behavior among its user's and it is necessary to promote green and sustainable libraries globally. Libraries carries information in physical as well as digital format. Therefore, libraries should be design in such a sustainable way that it acts as a medium of education in every sense be it in innovative information preservation to sustainable planning of the building structure to its execution and completion. Hence, green libraries can act as a catalyst in spreading environmentally responsible practices among its patrons and hereby creating awareness among its user's to prefer a sustainable lifestyle as it would enhance the quality of live and also safeguarding the renewable energy resources available, and help to control the growing population and pollution globally.

References

1. Afacan, Y. (2017). Sustainable Library Buildings: Green Design Needs and Interior Architecture Students' Ideas for Special Collection Rooms. The Journal of Academic Librarianship, 43(5), 375–383.

2. Michnik, K. (2015). Public libraries digital services and sustainability issues. The Bottom Line, 28(1/2), 34–43.

3. Bangar, M. S. (2018). Green Libraries in India: An Overview. National Conference on Transforming Libraries into Knowledge Resource Centres, 222–230.

4. Barnes, L. L. (2012). Green buildings as sustainability education tools. Library Hi Tech, 30(3), 397–407

5. George, J. (2013). Green libraries are more than just buildings. Electronic Green Journal,1(35). https://doi.org/10.5070/G313514058

6. Gaffar, A., & Gunjal, B. (2019). Access and usage of e-journals by Research Scholars in National Institute of Technology (NIT) Rourkela, Odisha: A case study. Journal of Indian Library Association, 52(1&2).

7. Gupta, S. (2020) Green Library: A Strategic Approach to Environmental Sustainability (2020). International Journal of Information Studies and Libraries. 5 (2), 82-92 , Available at SSRN: https://ssrn.com/abstract=3851100

8. Zhao, D., He, B., Johnson, C., & Mou, B. (2015). Social problems of green buildings: From the humanistic needs to social acceptance. Renewable and Sustainable Energy Reviews, 51, 1594–1609.

9. ALA , (2020) Building Libraries & Library Additions: General Information. Retrieved from http://libguides.ALA.org October, 2020

10. Awala-Ale, I. (2013).Library Building and Service Development in Nigeria for Entrepreneurship Education. Trends in Library in Information Science in Nigeria. Festschrift in honor of Prof Sam. Ifidon. Lagos: Elis Associate.

11. Afacan, Y., The Journal of Academic Librarianship (2017), http://dx.doi.org/10.1016/j.acalib.2017.07.002

An Overview on Sustainable Architectural Design for Library Building: Issues and Opportunities

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ABSTRACT: In today's world, eco-friendly technologies have become integral, with organizations, including libraries, at the forefront. Countries globally are developing cost-effective technologies to address environmental concerns. Recognizing the benefits of eco-friendly practices, the computer industry emphasizes their importance for public relations and cost-effectiveness. In the realm of Information Communication Technology, libraries leverage advanced technologies to serve information users efficiently. Motivated by awareness campaigns, libraries are integrating eco-friendly practices into their daily operations, supported by literature guiding organizations on energy conservation and reducing paperwork. As universities proliferate in India to enhance education quality, careful consideration of library locations is crucial. This paper proposes selecting areas for new libraries while maximizing eco-friendly techniques in building design, fostering environmental awareness. The integration of these practices not only supports lifelong reading but also reinforces the library's commitment to eco-friendly principles and sustainable operations.

Introduction

In 1953, the word "sustainability" was coined for the first time. It was published in a Land Economics journal article written by Joseph L and was used to describe the amount or rate of a natural resource that is used for a specific purpose but remains available for a considerable amount of time. The world is constantly changing in all dynamic ways, as are social and cultural activities, human behaviour, and organizational aspects (Kamińska, 2021). The world is experiencing many problems in addition to people's changing needs and behavioural patterns, which creates new challenges for human survival. These alterations, which are also brought on by the population's exponential growth and unsatisfaction, are raising serious concerns about pollution and the need for a safe natural environment (Gaffar et al. 2021). Organizations, recognizing impending environmental challenges, are reassessing survival problems. The library, being a service-oriented institution within an academic organization, is well-positioned to incorporate eco-friendly practices into its daily operations (Pangail, 2017).

The aim of any technology is to enhance user services, and society has collectively come to value its utility in improving productivity and providing diverse means of relaxation. Similar to the Industrial Revolution, the technological revolution has introduced its own set of waste and environmental challenges (Gaffar et al. 2021). However, as awareness of environmental responsibility increases among both consumers and businesses, there is a notable shift from the confines of living rooms to corporate boardrooms that prioritize sustainable and green living. In response to social and federal standards, there is a growing popularity of eco tech as a means to achieve sustainability (Mohammed, 2021). This shift underscores a collective recognition of the need for environmentally conscious practices in technology, aligning with broader efforts to address ecological concerns and meet evolving societal expectations. One of the main obstacles to human development in the twenty-first century is the global climate change. Buildings are responsible for 47% of all carbon dioxide emissions in the 25 member states of the European Union. Therefore, the main strategy for reducing the negative effects of climate change on people is to design, build, and operate buildings in a sustainable manner. Colleges and universities serve as academic institutions for scientific research and personnel training, and they also take on leadership and social model roles (Liu et al. 2019).

Needs of Sustainable Library:

Libraries hold a unique position in society, serving as both educational institutions and community centers. As the demand for sustainable living practices intensifies,

it becomes imperative to reimagine the design and construction of library buildings in ways that minimize environmental impact and maximize efficiency. Sustainable architectural design for libraries involves a holistic approach that considers energy consumption, material selection, waste management, and the overall ecological footprint of the structure. Libraries have incorporated cutting-edge technology to satisfy passionate information consumers. As a result, a new revolution known as "green libraries" is beginning to emerge. This revolution is not only thought-provoking but also necessary for the long-term sustainability of the library industry. James and Suzanne proposed in 1991 that green building principles, such as energy, water, and material conservation, should be maximized in library architecture. Since then, Lewis has suggested ways to lower building energy consumption through the use of energy-saving technologies (Liu et al. 2019). Library sustainability literature has expanded since 1990, with an emphasis on green library operations and practices. Sustainability is now a key factor in library design, and there are numerous instances of sustainable libraries worldwide (Afacan, 2017). Preferred to as "green building" or "sustainable architecture," this architectural approach prioritizes the interaction between buildings and their local and global environments. The primary objective is to create buildings that are energy-efficient and environmentally conscious.

New scientific and technological approaches that are beneficial to the environment are the focus of the quickly expanding field of environmentally friendly technology. This field, also known as "green technology," is devoted to protecting our natural resources. Both the creation of novel technologies and the advancement of current ones are involved in this (Tundele, 2015). Sustainability and the environment are key components of green management. Companies' operations may undergo significant changes as a result of going green with their facilities, operations, and products. Their sustainability business may become more advantageous due to it. Businesses and organizations that embrace green innovation maintain a clean and healthy environment. This can be achieved by utilizing technology, services, and goods that don't deplete the resources of the natural world (Gupta, 2021). Manufacturers and software tools, for example, prevent hazardous technological waste from entering the environment (Mohammed, 2021).

Factors Effecting Green Library Building:

Green library buildings are influenced by several factors that contribute to their sustainability and environmental impact. The choice of construction materials, energy-efficient designs, and renewable energy sources significantly affect a library's carbon footprint (Bhattacharjee, 2019). Sustainable landscaping and rainwater harvesting contribute to water conservation, while proper waste

management systems minimize environmental impact. Location and site selection play a crucial role, influencing accessibility, transportation, and the overall ecological context. Interior features like efficient lighting, ventilation, and eco-friendly furniture contribute to energy efficiency and occupant well-being. Additionally, community engagement and awareness programs promote sustainable practices among library users, fostering a culture of environmental responsibility. Overall, a holistic approach to these factors ensures green libraries serve as eco-friendly, resource-efficient, and socially responsible structures (Liu et al. 2019).

In India, several initiatives focus on promoting green and sustainable practices in library buildings. The Indian Green Building Council (IGBC), a part of the Confederation of Indian Industry (CII), offers the Green Library Building rating system. This system assesses libraries based on factors such as energy efficiency, water conservation, use of sustainable materials, and indoor environmental quality. Many Indian libraries, particularly in academic institutions, are adopting green building principles. The LEED-India green building rating system is a widely recognized national and international standard for the design, construction, and operation of high-performance green buildings. To make one library sustainable some of the key areas have to follow :-

Site location: Strategic site selection considers climate change resilience, anticipating potential impacts and implementing necessary measures. Harmonizing with local aesthetics and infrastructure compatibility further enhance the library's cultural relevance and operational efficiency. In essence, the site's thoughtful selection is fundamental, shaping the library's environmental impact and community integration. It takes a sustainable site plan to make the environmentally friendly library project a reality. A sustainable site plan for a green library project is one that meets the project's objectives and minimizes environmental impact while meeting users' diverse information needs (Biswas, 2021). The site plan needs to be modified to accommodate project specifics without compromising environmental concerns. Numerous guidelines for the site selection process have been provided by LEED (Ragheb, 2016).

- The library should be easily accessible to all kind of library user by public transportation and situated in a densely populated area.
- To lessen the impact of heat, there should be environment friendly green surroundings with natural shading.
- Site should have environment friendly modes of transportation, walking and biking, allow libraries to create welcoming and cozy pathways for patrons to enter the building.

Water conservation: Water conservation in green libraries is essential for sustainability. Efficient plumbing systems, rainwater harvesting, and landscaping practices reduce water consumption. Implementing water-efficient fixtures and promoting user awareness ensures responsible water usage. Libraries should design effective water-saving measures, such as

- Collecting and storing rainwater for use in landscaping around buildings.
- If there are lakes and pond near the library building those should be conserved which will help to collect the water naturally.
- It is possible to waste water and reuse it for irrigation (Gaffar, 2021).

Energy efficiency: A library should have an adequate number of windows, including glass windows and skylights, to let natural light the space. This way, during the day, no artificial lighting is needed.

- It is better to use LED Lights to reduce power consumption.
- Renewable energy sources like solar energy can be used for light the library during evening or night time. A solar panel might be installed on the library building to generate solar energy that would then be used inside the building. (Wang, et al. 2021).

Materials: By enhancing the indoor environment quality and reducing the need for mechanical systems, the library's durability can be achieved through the use of recycled materials in its construction (Hartini, 2020). The selection of library materials is the primary responsibility; waste is minimized.

- Utilize locally sourced store components, saving on fuel and transportation expenses.
- The new library building should use much of the modern technology that has emerged in green building. India has a lot of rules and regulations, so a green building outside of the country recycles and uses environmentally friendly materials.
- Naturally obtained material like stone, bamboo can be used as a material.

Indoor air quality: Implementing proper ventilation systems, using low-emission materials, and regular air quality monitoring are essential. This ensures a healthy and comfortable environment for library users while aligning with the sustainability goals of green building design. To keep the air circulation good big windows and door can be added (Bangar, 2018). Indoor plants may be planted inside the library.

Green Roofs: A library building can benefit from a green roof in a number of ways, including rainwater absorption, insulation, wildlife habitat creation, benevolence enhancement and stress reduction for those nearby by creating a more aesthetically

pleasing landscape, and lowering urban air temperatures and reducing the heat island effect (Vandermeulen, 2011;).

Green walls: Adding plants to the façade of a building is also referred to as vertical greenery. Where skyscrapers are the primary building type in the built environment, green walls can cover more exposed hard surfaces than green roofs can (Ragheb, 2016).

Suggestion and Conclusion

Building a green library with eco-friendly initiatives while remaining cost-effective involves strategic planning and innovation. Begin by selecting a site that optimizes natural resources like sunlight and wind. Design energy-efficient structures using sustainable materials to minimize environmental impact. Integrate rainwater harvesting systems for water conservation, and implement efficient waste management practices. Utilize energy-efficient lighting and heating, ventilation, and air conditioning (HVAC) systems to reduce operational costs. It is essential to understand the advantages of this innovation. The advantages it offers for people's lives and businesses should be known. It can lower people's expenses and maintain the health of the planet. They ought to be aware that buying green products can save them money and lead to better health. Government grants and financial support for the upkeep of these kinds of libraries should be used as a means of promoting green libraries. To guarantee sustainability, the library can set up sessions for strategic planning and thought. Whenever feasible, governments and universities should work to transform libraries into green structures.

Safeguarding and preserving life on Earth is a critical global concern. Green libraries hold the potential to inspire individuals to take proactive steps in environmental protection. Therefore, government support for the establishment of green libraries is essential. Librarians should actively participate in the green library movement, as several Indian libraries have successfully initiated green initiatives. The Green Library, as a long-term institution, contributes to environmental improvement and promotes health. Adopting eco-friendly methods not only aligns with sustainability goals but also creates a positive, green impression for stakeholders and users, reinforcing the library's commitment to environmental responsibility. Engage the community in the process, fostering a sense of ownership and environmental responsibility. Seek partnerships with local businesses for cost-effective, sustainable materials. Government incentives and grants can also offset initial costs. Consider modular construction techniques and prefabricated materials for efficiency. Implementing these measures not only

aligns with eco-friendly principles but also ensures long-term cost savings through reduced energy consumption and maintenance. In conclusion, a green library can be built with a balance of eco-friendly initiatives and cost-effectiveness, creating a sustainable and accessible resource for the community.

References

1. Kamińska, A.M., Opaliński, Ł., & Wyciślik, Ł. (2021). The Landscapes of Sustainability in the Library and Information Science: Systematic Literature Review. *Sustainability*.14,441.

2. Tundele, S. (2015). Eco-friendly technology-key for sustainable development. International Journal of Research Granthaalayah, 3(9), 1–3. https://doi.org/10.29121/granthaalayah.v3.i9SE.2015.3171

3. Mohammed, S. I. (2021). Advantages of green technology to mitigate the environment problems. IOP Conference Series: Earth and Environmental Science, 779(1), 012133. https://doi.org/10.1088/1755-1315/779/1/012133

4. Liu, Q., Chen, J., Wu, K., & Du, S. (2019). Sustainable design practice of university library building: Take the guangdong university of finance & economics library as an example. IOP Conference Series: Earth and Environmental Science, 242, 052046. https://doi.org/10.1088/1755-1315/242/5/052046

5. Afacan, Y. (2017). Sustainable library buildings: Green design needs and interior architecture students' ideas for special collection rooms. The Journal of Academic Librarianship, 43(5), 375–383. https://doi.org/10.1016/j.acalib.2017.07.002

6. Gupta, Saumya, Green Library: A Strategic Approach to Environmental Sustainability (2020). International Journal of Information Studies and Libraries. 5 (2), 82-92 , Available at SSRN: https://ssrn.com/abstract=3851100

7. Rabidas, S. (2016). Green Library Buildings: A Sustainable Process. *IJARIIE-ISSN(O).*2(6)

Towards Sustainable Knowledge Hubs: Integrating Environmental Stewardship and User-Centric Design in University Libraries of Assam

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ABSTRACT: This paper addresses the growing need for sustainable practices in libraries, recognizing the urgency posed by global environmental challenges. The purpose of the paper is to investigate and establish a comprehensive framework that integrates environmental stewardship with user-centric design, redefining libraries as sustainable knowledge hubs with special reference to University libraries of Assam.

The research employs a multidisciplinary approach, combining insights from environmental science, architecture, and user experience design. It investigates into the current state of libraries, utilizing a mix of quantitative and qualitative methods to analyse their environmental impact. Additionally, the study explores innovative solutions through case studies and expert interviews to inform the proposed framework.

The paper addresses the framework for sustainable knowledge hub in University libraries of Assam for that only four well established university libraries of Assam namely, Dibrugarh University, Assam University, Tezpur University and Gauhati University. The outcome can be implemented to the other libraries of Assam as well as North East India.

The research reveals the significant environmental challenges faced by traditional libraries and identifies key areas for improvement. Findings include insights into energy consumption, waste generation, and the carbon footprint associated with library operations.

This research contributes original insights by bridging the gap between environmental sustainability and user-centric design in the specific context of University libraries of Assam. The study's value lies in its potential to guide libraries of Assam towards a sustainable future, balancing the needs of both the environment and the user community.

1. Introduction:

Libraries, revered as timeless repositories of knowledge, have stood as bastions of enlightenment and community for centuries. In the age of rapid technological evolution and escalating environmental concerns, the hallowed halls of these knowledge repositories demand a re-evaluation of their design and operational paradigms.

The traditional role of libraries as custodians of knowledge, fostering learning, and nurturing community connections, remains undeniably pivotal. Yet, the shifting landscapes of technology and the intensification of global environmental challenges propel libraries into an era of necessary transformation. The need to adapt, innovate, and reassess their ecological impact becomes increasingly apparent.

As technology saturates every facet of modern life, libraries must evolve to not only keep pace but also to become pioneers in sustainability. The digital age poses opportunities for libraries to embrace innovative solutions that not only reduce their environmental footprint but also enhance the overall user experience.

This paper explores into the bottom of this evolving paradigm, recognizing the pressing need for libraries to embrace sustainability in their design and practices.

Significantly, The pivotal nature of sustainable library design in the contemporary socio-technological background. The paper sets the stage for a deep investigation of how libraries, as custodians of information, can transform into beacons of environmental responsibility without compromising their fundamental role as user-centric knowledge hubs.

2. The Current State of Libraries: Perspectives from University Libraries of Assam

Libraries, as custodians of knowledge, are integral to Assam's cultural and educational landscape. As the state continues its stride towards modernization and sustainable development, it becomes imperative to evaluate the energy consumption, waste generation, and carbon footprint associated with traditional library practices.

2.1 Energy Consumption:

Maximum numbers of libraries of Assam often rooted in historical architectural paradigms, face challenges related to energy consumption. The dependence on conventional lighting, heating, ventilation, and air conditioning (HVAC) systems contributes significantly to their energy footprint.

2.2 Waste Generation:

Waste management poses another critical facet of the environmental impact of libraries. Traditional libraries generate substantial paper waste through book disposals, print materials, and administrative processes. Investigating the waste

management practices within libraries will provide insights into the existing challenges and potential solutions. Initiatives promoting recycling, digitization, and sustainable procurement will be explored within the context of Indian libraries.

2.3 Carbon Footprint:

The carbon footprint of University libraries of Assam is influenced by factors such as energy use, transportation, and resource procurement.

As global environmental challenges escalate, University libraries of Assam must not only adapt but also take a leadership role in fostering sustainable practices in the region. By emphasizing the crucial need for a paradigm shift in the way University libraries approach for environmental sustainability, positioning them as vanguards in the global movement towards eco-friendly knowledge institutions.

3. User-Centric Design in Libraries: Crafting Spaces for 21st-Century Patrons

In the dynamic landscape of libraries, the focal point is shifting towards user-centric design to meet the evolving needs of patrons in the digital age.

3.1 Principles of User-Centric Design:

At its core, user-centric design revolves around placing the needs, preferences, and experiences of users at the forefront of design decisions. By understanding the unique requirements and aspirations of library patrons, user-centric design fosters an environment where every aspect of the library experience is tailored to enhance user satisfaction.

3.2 Evolving Needs in the Digital Age:

The digital age has ushered in a transformative wave in how individuals interact with information. Libraries, traditionally repositories of print materials, must adapt to the changing needs of patrons who increasingly seek digital resources and interactive experiences. The evolving landscape of user needs in the digital age, addressing the integration of technology, online resources, and collaborative spaces within library environments.

3.3 Creating Environmentally Friendly Spaces:

The synthesis of user-centric design and environmental responsibility is crucial for modern libraries. Beyond addressing the informational needs of patrons, libraries

must be designed as sustainable spaces. The integration of environmentally friendly elements in library design, encompassing energy-efficient lighting, sustainable materials, and eco-friendly architecture. By intertwining user-centric principles with sustainability, libraries can offer a holistic and enriching experience to their patrons.

3.4 Catering to Diverse Preferences and Requirements:

Recognizing the diversity of library users is pivotal to the success of user-centric design. The importance of creating spaces that cater to a spectrum of preferences and requirements, ranging from quiet study areas to collaborative zones. Understanding the diverse needs of different user groups – students, researchers, community members – enables libraries to tailor their spaces and services for inclusivity.

4. Environmental Challenges and Opportunities:

Libraries navigate the intricate landscape of contemporary challenges. Libraries, as crucibles of knowledge, can become stalwart contributors to overarching sustainability goals. By embracing innovative strategies and technologies, libraries possess the potential to mitigate their environmental impact significantly. The narrative of environmental challenges and, concurrently, the opportunities for libraries to emerge as eco-friendly knowledge sanctuaries.

4.1 Broader Environmental Challenges:

The canvas of environmental challenges is vast and complex, encompassing issues such as climate change, resource depletion, and pollution. Libraries, as institutions deeply woven into societal fabric, find themselves uniquely positioned to address these challenges. Understanding the interconnectedness of environmental issues allows libraries to formulate strategies that go beyond mere adaptation, steering towards proactive environmental stewardship.

4.2 Energy-Efficient Technologies:

One key avenue for libraries to contribute to sustainability lies in the adoption of energy-efficient technologies. The array of innovative technologies available, ranging from smart lighting systems to energy-efficient HVAC solutions. By leveraging these technologies, libraries can not only reduce their energy consumption but also serve as testbeds for eco-friendly innovations, inspiring broader adoption within the community.

4. Waste Reduction Strategies:

Waste generation is a significant concern, particularly in traditional library practices. The waste reduction strategies, emphasizing the importance of recycling, digitization, and sustainable procurement. Libraries can transition from being consumers of resources to advocates of circular economies, where materials are reused, repurposed, and recycled, thereby minimizing their ecological footprint.

4.4 Integration of Renewable Resources:

Libraries can pioneer change by embracing renewable resources in their operations. This includes the incorporation of solar panels and other sustainable energy sources.

4.5 Minimizing Environmental Impact:

The ultimate goal is to outline a roadmap for libraries to minimize their environmental impact. By addressing energy consumption, waste generation, and resource utilization, libraries can emerge as beacons of environmental responsibility. The pivotal role libraries can play in shaping a sustainable future, not just by adapting to environmental challenges but by actively contributing to the global imperative for ecological balance.

5. Integrating Sustainability and User-Centric Design:

In the pursuit of a transformative vision for libraries, this pivotal section proposes a comprehensive framework that seamlessly integrates environmental stewardship and user-centric design. Embracing the symbiotic relationship between sustainability and usability, this framework navigates through architectural considerations, technology adoption, and community engagement strategies, charting a course for libraries to emerge as dynamic, environmentally conscious knowledge hubs in the 21st century.

5.1 Architectural Considerations:

Architectural design serves as the foundational bedrock for integrating sustainability and user-centricity. The principles of eco-friendly architecture, emphasizing the importance of energy-efficient building materials, natural lighting, and innovative spatial layouts. By reimagining libraries as sustainable architectural marvels, this framework envisions spaces that not only reduce environmental impact but also enhance the overall user experience through thoughtful design.

5.2 Technology Adoption:

The infusion of cutting-edge technologies is instrumental in crafting libraries for the digital age. This section explores how libraries can leverage technology to enhance sustainability and user engagement. From the integration of smart building systems for energy optimization to the implementation of virtual reality for immersive learning experiences, the framework envisions a tech-savvy library ecosystem that caters to the diverse technological preferences of contemporary patrons.

5.3 Community Engagement Strategies:

Sustainability and user-centric design extend beyond the physical infrastructure to encompass community engagement. Preparing the strategies that actively involve library patrons in the sustainable journey, fostering a sense of ownership and connection. Community workshops, collaborative design initiatives, and educational programs on environmental responsibility empower library users to contribute to and benefit from the sustainability goals of the library.

5.4 Enhancing Sustainability and Usability Simultaneously:

The bottom of this framework lies in its ability to enhance both sustainability and usability concurrently. By carefully aligning architectural choices with the needs of diverse user groups, the framework envisions libraries as inclusive spaces that balance environmental responsibility with user satisfaction. The adoption of energy-efficient technologies and community-driven initiatives serves not only to reduce the library's carbon footprint but also to enrich the overall experience for patrons.

These holistic approaches that transcends traditional dichotomies between environmental responsibility and user-centricity. By integrating sustainability and user-centric design, libraries can reimagine their role in the 21st century, becoming vibrant, adaptable knowledge hubs that not only meet the diverse needs of their users but also serve as exemplars of ecological stewardship. This framework sets the stage for libraries to embrace a transformative journey towards a sustainable and user-centric future.

6. Case Studies:

The case studies from the university libraries of Assam, showcasing real-world examples of institutions that have successfully embraced both sustainable practices and user-centric design. The unique socio-cultural and environmental context of Assam provides a rich backdrop for exploring diverse approaches and best practices that can serve as inspiration for libraries worldwide.

6.1 LNB Library, Dibrugarh University

Dibrugarh University Library in Assam exemplifies a holistic approach to sustainability. Through a strategic architectural overhaul, the library incorporated large windows for ample natural light, reducing reliance on artificial lighting. Simultaneously, user-centric design principles were implemented with the creation of collaborative study spaces and the incorporation of modern technologies for an enhanced research experience.

6.2 Rabindra Granthagar, Assam University

Rabindra Granthagar, Assam University stands out for its commitment to community engagement in sustainability efforts. The library adopted an automated system for resource management, providing users with seamless access to a vast array of digital resources. The library organized workshops and awareness campaigns on environmental responsibility, involving students and staff in waste reduction and energy conservation initiatives. This community-driven approach not only fostered a sense of collective responsibility but also enhanced the library's user-centricity by aligning sustainability practices with the values of its users.

6.3 Central Library, Tezpur University

Tezpur University Library serves as a beacon for technological integration in user-centric design. The library adopted an automated system for resource management, providing users with seamless access to a vast array of digital resources. This technological leap not only aligned with the evolving needs of users but also contributed to the reduction of paper waste. Sustainable architectural features, such as natural ventilation systems, further underscored the library's commitment to ecological responsibility.

6.4 KKHL, Gauhati University

KKH Library showcases a balanced integration of sustainable practices and user-centric design through its strategic space planning. The library reconfigured its layout to include designated zones for group collaboration and quiet study, accommodating the diverse preferences of users. The incorporation of energy-efficient lighting and the implementation of a waste segregation system exemplify the institution's commitment to both environmental stewardship and user satisfaction.

These case studies from the university libraries of Assam not only underscore the feasibility of integrating sustainability and user-centric design but also provide

a blueprint for success. The diverse approaches showcased – from architectural innovations to community engagement strategies and technological integrations – offer valuable insights for libraries globally.

7. Challenges:

In the pursuit of creating sustainable and user-centric knowledge hubs, various challenges emerge that warrant careful consideration. The hurdles libraries may face in adopting such an approach and explores potential future directions for research and development to overcome these challenges.

7.1 Financial Constraints:

One of the primary challenge's libraries encounter in transitioning to sustainable and user-centric models is financial constraints. Implementing eco-friendly technologies, renovating infrastructure, and integrating user-centric design elements often require substantial investment.

7.2 Institutional Resistance:

Institutional inertia can pose a significant challenge to the adoption of transformative models. Libraries may face resistance from stakeholders who are accustomed to traditional practices. The importance of change management strategies, emphasizing the need for effective communication and collaboration to garner support from library staff, administrators, and the broader institutional community.

7.3 Ongoing Innovation:

The landscape of sustainable knowledge hubs is dynamic, requiring a commitment to ongoing innovation. Libraries must continuously evolve to keep pace with technological advancements, changing user preferences, and emerging environmental standards.

8. Future Directions for Research and Development:

To sustain libraries for the future, research and development will play a pivotal role. It encourages research on the long-term impacts of sustainable practices, user behaviour in technologically enriched library environments, and the development of innovative, cost-effective solutions for enhancing sustainability.

8.1 Human-Centric Research:

The future of libraries is intrinsically tied to understanding human behaviour and needs. Research should explore into user experiences, preferences, and the psychological impacts of sustainable and user-centric designs. By focusing on the human element, libraries can tailor their strategies to create spaces that are not only environmentally responsible but also deeply resonant with users.

8.2 Technological Advancements:

Technological innovations will continue to shape the landscape of libraries. Future research should explore the integration of emerging technologies, such as artificial intelligence, augmented reality, and sustainable computing, into library environments. Understanding how these technologies can be harnessed to enhance both sustainability and user experience is critical for shaping the libraries of tomorrow.

9. Conclusion: Redefining Libraries for a Sustainable and User-Centric Future

In the wake of extensive exploration into the intersection of environmental stewardship and user-centric design in 21st-century libraries, this paper gives valuable insights that underscore the imperative for transformative change

9.1 Key Findings:

The research has explained the current state of University libraries of Assam, illuminating the environmental challenges they face and the transformative potential inherent in reimagining their design and practices. From energy consumption and waste generation to the adoption of user-centric principles, the key findings emphasize the intrinsic connection between environmental responsibility and user satisfaction.

9.2 Sustainable Knowledge Hubs:

Libraries are poised to become more than repositories of knowledge; they are destined to evolve into sustainable knowledge hubs. By integrating eco-friendly technologies, sustainable architectural considerations, and community-driven initiatives, libraries can transcend their conventional roles. This evolution is not merely a luxury but a responsibility—a commitment to environmental stewardship that aligns seamlessly with the evolving needs of library patrons. By adopting the proposed framework, libraries can position themselves as leaders in the global movement towards environmentally responsible knowledge institutions.

9.3 Contributing to a Sustainable Future:

The case study is not confined to the boundaries of only four no's of libraries; it resonates with the broader mission of contributing to a sustainable future. Libraries, as custodians of knowledge and community hubs, have the unique opportunity to inspire change on a grand scale. By weaving sustainability into the fabric of their existence, libraries can catalyse a ripple effect, influencing patrons, communities, and institutions towards a more environmentally conscious and user-centric paradigm.

In conclusion, this paper advocates for a fundamental shift in the narrative of libraries. It is a narrative that envisions libraries not merely as repositories but as dynamic, adaptive, and sustainable knowledge hubs. The synthesis of environmental responsibility and user-centric design is not a compromise but a harmonious evolution—a journey towards a future where libraries stand as symbols of progress, balance, and positive change.

References

1. Bennett, N., Whitty, T., Finkbeiner, E., Pittman, J., Bassett, H., Gelcich, S., & Allison, E. (2018). Environmental Stewardship: A Conceptual Review and Analytical Framework. Retrieved from https://www.researchgate.net/publication/326306617_Environmental_Stewardship_A_Conceptual_Review_and_Analytical_Framework

2. Chakraborty, S. (2013). Going green or not: realities of the Indian metropolis libraries. IFLA WLIC 2013, Singapore.

3. Pu, R. , et.al (2022). Toward a knowledge economy: Factors affecting the sustainable consumption behaviour in the Chinese online education industry. *Frontiers in Psychology*, https://doi.org/10.3389/fpsyg.2022.1007230

4. Elegbede, I., Matti-Sanni, R., Moriam, O., & Emily Osa, I. (2023). Sustainability Education and Environmental Awareness. In S. Idowu, R. Schmidpeter, N. Capaldi, L. Zu, M. Del Baldo, & R. Abreu (Eds.), *Encyclopedia of Sustainable Management*. Springer. https://doi.org/10.1007/978-3-030-02006-4_128-1

5. Hickerson, H. T., Lippincott, J. K., & Crema, L. (Eds.). (2022). Designing Libraries for the 21st Century*. Association of College and Research Libraries. Retrieved from https://www.ala.org/acrl/sites/ala.org.acrl/files/content/publications/booksanddigitalresources/digital/9780838936726_OA.pdf

6. Oyetola, S., & Oladokun, B. (2023). Library services and sustainable development in the 21st Century Nigeria: The role of librarians. Retrieved from https://www.

researchgate.net/publication/374025507_Library_services_and_sustainable_development_in_the_21st_Century_Nigeria_the_role_of_librarians

7. Gul, S., & Bano, S. (2019). Smart libraries: An emerging and innovative technological habitat of the 21st century. The Electronic Library, 37(5), 764-783. https://doi.org/10.1108/EL-02-2019-0052

8. Manna, D., & Chakraborty, S. (2019). Sustainable strategies for making a green image in University Libraries in Seven-Sister States, India: A study. IFLA WLIC 2019. https://library.ifla.org/id/eprint/2442/1/156-manna-en.pdf

Sustainable Architecture and Design

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ABSTRACT: Sustainable Architecture is considered and referred as 'Green Architecture' or 'Environmental Architecture.' It challenges architects to produce smart designs. The World commission on Environment and Development defines 'sustainability as development that meets the needs of the present without compromising the ability of future generations to meet their own needs'. It concerns with creating healthy living environments for aiming to minimize negative environmental impacts, energy consumption and use of human resources. It is also reflected in a building materials, construction method, resource use and design and also it facilitates building life cycle and ultimate disposal. It has to be functional and aesthetically superior. It refers to use available technologies which are less harmful to ecosystems and the communities.

My paper will be as a mirror to show the reality and what the library and librarians can do for save environment and concern with our social responsibility.

Introduction:

Library is considered as s system which is based on 4 pillars as user, library personnel, collection and services. This system would successfully work if these 4 pillars stand strongly. They are interlinked with each other. We all are witnessing of the various developmental stages of library such as traditional library, computerized library, automated library and digital library.

The libraries have been adopting technological advances have been made embedded in the spirit of adoption to changes.

Sustainable Architecture: What is it?

Sustainable Architecture uses a conscious approach to energy and ecological conservation in the design of the built environment. in a very simple manner sustainable means to live long lasting with proper usability. According to Glenn

Ebersole- Acceptance of the sustainability concept has not been very satisfactory because people have been reluctant to change and compromise the lifestyles they live. Construction is a major global energy consumer. Sustainable Architecture seeks to minimize the negative environmental impact of buildings, through improved efficiency and moderation in the use of materials, energy as well as the developmental space.**1.**

Sustainable Architecture referred as a 'Green Architecture' or 'Environmental Architecture.' It challenges architects to produce smart designs. The World commission on Environment and Development defines 'sustainability as development that meets the needs of the present without compromising the ability of future generations to meet their own needs'**2**.

Buildings designed with sustainable principles are healthier, more energy efficient and have a lower overall cost of ownership. According to UN Environments Global Status Report of 2017,buildings and construction account for more than 35% global final energy use and nearly 40% of energy related to CO2(carbon dioxide) emission. A planet friendly approach is vital to the construction industry given the fact that it has historically associated with high level's of energy and material consumption. Implementations of green technologies are possible after the use of renewable energy sources and the recycling of material's. Architect's themselves have a responsibility to the future and look carefully at the design of buildings and the choice of materials used in order to reduce the amount of energy and resources consumed during construction.



The Covet Garden Building in Brussels, Belgium is a remarkable example of progress being made. It is the 1st structure in Europe to have fully integrated natural purification and recycling systems.**3.**

Definition of Green Library:

Online Dictionary of Library and Information Science (ODLIS):

Define green library "Green/ Sustainable libraries as a library designed to minimize negative impact on the natural environment and maximize indoor environmental quality by means of careful site selection, use of natural construction materials and bio- degradable products, conservation of resources like water energy paper and responsible waste disposal recycling.**4**.

Green Concept:

'Green Building' is defined as a 'building that is designed in a way that protects the natural environment. It is concerned with a high priority on health, environment and resource conservation. Over time with changes in technology, living standard and market forces including personal liking these buildings need to be upgraded with optimum standards to remain relevant and functional.

Some of the concepts are taken up for green buildings are-1.Emphasis on effective site planning. 2. Optimize water, energy and land resources. 3. Minimize lifecycle ecological impact of materials. 4. Conserve non- renewable energy and scarce materials. 5. Reduce human exposure to noxious materials. 6. Use of renewable energy. 7. Protection of indigenous flora and fauna. 8. Preserving air and water quality. 9. Protection and restoring subsoil. 10. Integration of pedestrian friendly infrastructure. Promotion of bicycles and mass transit system.**5.**

Importance of Green Library Building:

Every sector including the building sector has responsibility to leave a healthy planet for the future. This is true for libraries also. Libraries by virtue, of their nature, require a significant amount of energy, water and other resources. Green construction is the need of hour and it focuses on optimized use of the mentioned resources.**6.**

Benefits of Sustainable Architectural Design:

1. Protecting the Environment: Through reducing CO2emisisons with protecting existing ecosystems and bio diversity we can reduce the negative effects of construction. Architects and builder's need to take 360o angle approach to environmental considerations.
2. Reducing Waste and Energy Use: Use of limited energy and reducing waste, use particularly solar energy sources, centralizing water and heating system's and using renewable materials are some approaches for sustainable development.
3. Improving the Health and Wellbeing of a buildings inhabitant: Adopting sustainable building practices improves the health and happiness of residents. It turns out that, healthy buildings promote health lives. Occupants of eco- friendly buildings typically experience better overall health due to improved air and water quality. This practice also help to increase the longevity of built structures and reducing energy costs.

Organic Architecture:

This philosophy emphasizes a design process that is guided by the nature of the buildings environment, materials and purpose. It is an approach to design that focuses on natural surroundings and sustainability. It's a philosophy of architecture which promotes harmony between human habitation and the natural world.**7.**

Other Benefits of Green Building:

Green building continues to grow in popularity. It's beneficial for improvising indoor environment. So definitely quality of life is raised. From interior design elements like improved lighting source, thermal conditions, and ergonomic features as well upgraded air quality. Occupants residing or working in green structures for maintaining good health, stress levels and overall quality of life are necessary. According to studies, people who reside in green structures experience a myriad of health benefits due to eco friendly materials utilized in construction. E.g. Green buildings avoid using building materials that may contain harmful volatile organic compounds. (VOC) or plastic by products which have been known to release toxic fumes and carcinogens into the atmosphere. These dangerous materials are linked to respiratory disease, allergies and other health disorders and in extreme cases, an increased risk of cancer. **8.**

Three Pillars of Sustainable Design:

1. Environmental Responsibility – This includes minimizing the use of energy, water and materials maximizing the use of renewable resources and reducing waste, pollution and emissions.
2. Social Responsibility – This involves creating buildings and spaces that enhance the well b eing of occupants and the larger community while taking into account factors such as culture, climate and context.
3. Economic Responsibility- This involves creating buildings that are cost-effective to operate and maintain long term financial benefits.**9.**

Green Library Buildings : A Study on National and International Rating Systems-

Green Library means libraries built with the intention of protecting the natural environmental and maximizing indoor environmental quality. Green libraries provide a pleasant environment and experience to the user community. These libraries are designed by means of careful site selections, appropriate site planning, use of natural construction materials with emphasis on locally available material and bio degradable products, conservation of resources (water, energy, paper) and waste disposal strategy (recycling). Green library building rating systems provide the framework to assess the greenness of the building. Many prevalent green building rating system's like **l**eadership in **E**nergy and **E**nvironmental **D**esign (LEED) certification. The **I**ndian **G**reen **B**uilding **C**ouncil (IGBC) rating system and **G**reen **R**ating for **I**ntegrated **H**abitat **A**ssessment (GRIHA) are used to certify green building ratings for new and existing buildings including libraries.

The building and construction industry poses a major challenge to the environment. It is estimated that 40% of the total energy use due to buildings. Around 42% of the total water use and 50% of raw material is consumed during the life cycle of buildings. Buildings are also responsible for around 40% of green house gas emissions and lead to issues related to water contamination and solid waste management. The green building concept is one of the concept if implemented can be useful in decreasing the GHG footprint. Authorities and organizations across the globe initiated the rating systems like LEED, GRIHA, BREEM, IGBC for green buildings to minimize –optimize the consumption of natural resources and GHG emissions and control pollution level's. These rating systems provide various levels of certification. The buildings certified under the most stringent level by these

ratings are considered to have optimized the use of energy, water and provide better living environment and contribute to overall reputation of the property. **10**.

Various Global level declarations and conventions have highlighted the importance of sustainable development at the university level. Green Library Management emerged in the early 1990's and gained popularity in the 2003. Greenness can be achieved through traditional wisdom in the form of climate responsive local architecture. Green libraries can manage the use of natural resources to save money and time and they can keep the relationship between living things and their environment so can make an eco- friendly environment.**11**.

Standards of Green Building:

Green libraries are the pre- requisite for future library buildings. Due to automation and technological advancement the library needs to be more resilient. Libraries due to their typology attract a different category of stake holders and can have different times of operations. There is a need for dedicated green building ratings mainly for library buildings.

1.LEED (Leadership in Energy and Environmental Design)US Green Building Council:

LEED is one of the most widely used green buildings rating system across the globe. This rating system not only focuses on energy, water and health but looks into all the important critical elements to create the best possible building. LEED certified buildings enhance individual human health, enhance bio- diversity as well as the quality of life, promote water conservation strategies and promote regenerative material. LEED provides rating system for building design and construction (BD + C), interior design and construction (ID+C), cities and communities, building operation and maintenance (O + M), Neighborhood Development.

2.IGBC (Indian Green Building Council):

IGBC was formed in 2001. The council is responsible for developing new green building rating systems. This council works with the government. World Green Building Council and other agencies for the promotion of the green building concept.

IGBC Green Building Rating system applicability pertaining to libraries:

Sr.No	Green Building Rating system	Green features under the category systems
1.	IGBC green new buildings	1. Sustainable architecture and design
		2. Site selection and planning
		3. Water conservation
		4. Energy efficiency
		5. Building materials
		6. Indoor environmental quality innovation and development
2.	IGBC green existing buildings operation and maintenance (O+M)	1. Site and facility management
		2. Water efficiency
		3. Energy efficiency
		4. Health and Comfort
		5. Innovation

3. GRIHA (Green Rating for Integrated Habitat Assessment):

The GRIHA rating system which was adopted as a national rating system for green buildings by the government of India in 2007 was conceived by TERI and developed with the Ministry of new and renewable energy. (MNRE) GRIHA attempts to minimize a buildings resource consumption, waste generation and overall ecological impact within specific nationally acceptable limits- benchmarks. It evaluates the environmental performance of a building holistically over it's entire life cycle.(https:// www.grihaindia.org). GRIHA provides the rating system for large area development, existing buildings, affordable housing, existing day schools, new construction projects. (SVAGRIHA) Educational institutes can go for rating under large are development.

Sr. No	Rating Name	Eligibility Condition
1.	SVAGRIHA	All new construction projects with built up area 100m2<*<2500m2
2.	GRIHA V2019	All new construction projects with built up area more than 2500m2
3.	GRIHA for affordable housing	All the upcoming projects that have approval/ sanction letter issued by the appropriate government agency.
4.	GRIHA for existing building rating	All operational buildings having a built up area greater 2500 s.q.m
5.	GRIHA for existing day schools	All day schools (excluding hostel/ residential facilities) which have been operational for at least 1 year.
6.	GRIHA for large developments	Large (mixed use) townships, educational and institutional campuses.

GRIHA rating systems give emphasis on various green sustainable practices pertaining to site planning, maintenance, housekeeping, energy, water, social impact, health, comfort etc. Most of the green building rating systems rely on achieving benchmarks related to energy consumption, water consumption, building material and building construction practices.**12.**

IS Codes and Standards:

There are various IS codes pertaining to library design that provide guideless and mandatory provisions which are necessary for creating an optimum design for libraries.

Some of the codes are-

1. IS 1553 (189): Design of library buildings recommendations relating to primary elements.
2. IS 1146: 1985 code of practice for fire safety of library and archives.
3. IS 2672: 1966 code of practice for library lighting.
4. IS 1950: 1962 specification for sound insulation of non industrial buildings.
5. IS 1172: 1983 code of basic requirements for water supply drainage and sanitation.
6. IS 8338: 1976 recommendations relating to primary elements in the design of school library buildings.**13.**

Methods for Converting Libraries into Green Libraries:

The libraries by virtue of their building typology and function have considerable opportunities to showcase green principles and create awareness about green building. Green Libraries can enhance the experience of various stakeholders and can create environmental awareness through communication and environmental education.

There are many ways to go green among them:

1. The proper way of using electric power- Use of artificial light only when it is required. Daylight sensors may be used to switch- off the lights where the availability of natural light is adequate.
2. Water usage- Rainwater harvesting structures should be made mandatory for campus libraries. Water efficient taps can be installed so the use of water can be minimal.

3. Reducing Pollution- Use of an environment friendly transport system for reducing pollution levels within the campus. Creation of track cycles, pedestrian pathways by effective site planning.
4. Growing and Preserving plants and trees- It helps to maintain the ecological balance and environment around the building.
5. Waste Management: Follow the waste management rules and regulations updated from time to time. Reusable pens can be used consciously; single use plastic should be avoided.
6. Use of renewable energy: Use of solar –pv systems, building integrated wind turbine system and solar wind hybrid systems may be installed.
7. Indoor Environment quality: Maintaining indoor air quality is essential for the physical and psychological health of the occupants and thermal comfort.
8. Implementing climate responsive architectural features in building construction.

Benefits of Green Libraries:

Green Libraries generate a pleasant environment for all the stake holders. These are provide-

1. Beautiful and pleasant atmosphere 2. Saving water, energy and optimum use of land 3. Improve mental health and work culture 4. Improve workability 5. Improve the efficiency of the users by providing appropriate and thermal and visual comfort.**14**.

Why Should Library Buildings be Sustainable:

According to Winston Churchill," We shape our buildings and thereafter they shape us.:

Libraries serve as symbol's of the attitudes and values of their creators and can serve to extend those attitudes and values to future generations of occupants and visitors. Sustainably designed libraries would be built to last, to flexibly respond to changing functional demands to provide an environment that is inspiring and safe as well as to perform efficiently. Therefore, several theories have been developed, those are –

1. **The Triple Bottom Line**- The triple bottom line encourages organizations to broaden the focus of their goal setting and self evaluation to include economic, social and environmental values and impact.

2. **The Natural Step**- Natural step began with a Swedish Oncologist, who had noticed rising cancer rates in children. He developed 4 conditions covered cancer was linked to environmental factor.

System Conditions:

1.Substances from the Earth's crust must not systematically increase in the bio sphere. 2. Substances produced by society must not systematically increase in nature. 3. The physical basis for the productivity and diversity of nature must not be systematically deteriorated. 4. There needs to be fair and efficient use of resources with respect to meeting human needs.

3.**McDonough-Braungart Design** Chemistry- This theory is developed by Architect William McDonough and German Chemist, Michael Braungart describes sustainability similarly to the triple bottom line, in an ideal situation all 3 areas would be considered with equal weight.

McDough- Braungart Design chemistry describes 5 steps to eco effectiveness to help the market transition from its current unsustainable practices to ones that are sustainable and regernerative.**15**.

Role of Green Librarian:

Librarian should make efforts to promote green library movement. The green librarian's role is most dynamic, he is also called 'Eco Librarian' because he has to handle the budgets to support the Organization, Economy and Ecology are the necessary things to make healthy and sustainable libraries.

Major Green Library Initiatives in India:

Sr.No.	Name of the Library	Place	Features
1.	Anna Centenary Library	Chennai	Library block at angle that allows maximum day light and eco friendly
2.	Karnataka University Library	Dharwad	No Book- shelves, chairs or tables but benches are installed under the trees so that, students can sit and read the books taken from the university library

Sr.No.	Name of the Library	Place	Features
3.	Delhi University Library	Delhi	The olden days building is naturally cool and pleasant with broad opening for natural lights. Windows are large and too m any accelerating both fresh air and sunlight. Cleanliness is the base of it.
4.	Calcutta University Library	Calcutta	Great height, vast open areas, thick walls, windows all through the eastern wall are some green gestures that are in built in this heritage. Structure as well as nurtured by present library leadership.
5.	Madras University Library	Madras	Existing library building is built in a symmetrical mixture of Indian and British architectural style. Windows are large and too many accelerating both fresh air and sun light.
6.	Mumbai University Library	Mumbai	University library and Rajabai Clock Tower are located in a Heritage Building with height of 280 feet. The architecture itself makes it more environment friendly as it boasts than the recent low height, less width, non thick walls. Calina campus library also provide wood as stack material and providing ample space for the users.
7.	NIT Libray, Silchar	Assam	The initiatives for greening the library taken by NIT, Silchar is the 1st of its kind in the North East Region of India. The new library building was under construction and designed according to LEED certification system of U.S which can be the role model for developing green libraries in Barak Valley.
8.	Perma Karpo Library	Ladakh	Solar Panels surrounded by white lotus garden, innovative technology

Suggestion for the Libraries:

- Libraries can use a variety of tools to popularize the green concept and educate their patrons about the features of green library. It includes library displays, publications and library program's relevant on 'going green'.
- UGC should make it mandatory for all colleges and universities to get the approval to go green for green libraries and green building.
- Government should take to promote green libraries through award and financial aid to maintain such libraries.
- Libraries can arrange strategic thinking and planning sessions to ensure sustainability.
- Government, Universities should make all the efforts to transform libraries into green buildings.**16**.

Plants which are suitable to Office and Library:

1. Peace Lilly 2. Bamboo 3. Cast Iron Plant 4. ZZ plant 5. Pothas

Reference: Web links:

1. https://www.readingeagle.com
2. https://www.barker-associates>co.uk>service>
3. https://www.linkedin.com & https://www.fiberguard.com
4. klibjlis.com,Bangar Macchindra,Green Libraries in India: an overview,2018,page no.224
5. 68th ILA Annual Conference Proceedings,Green Library Buildings: a study on National & International Rating Systems,Sharma S.,Sharma,U.,Gupta,S.,2023,page no.125
6. Ibid,p.no.126
7. https://www.fiberguard.com
8. https://www.newschoolarch.edu
9. https://paablolunastudio.com
10. 68th ILA Annual Conference Proceedings,Green Library Buildings: a study on National & International Rating Systems,Sharma S.,Sharma,U.,Gupta,S.,2023,page no 124

11. Ibid, page no. 125

12. Ibid, page no. 127

13. Ibid, page no. 131

14. Ibid, page no. 131

15. https://www.midhudson.org>sustainable library design, page. No 4

16. klibjlis.com,Bangar Macchindra,Green Libraries in India: an overview,2018,page no.128

Theme-8

Sustainable Data Management

Research performance of IIT Kanpur and IIT BHU during the period 2013-2022: a comparative study

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ABSTRACT: The present study aims to analyze the research performance of two Indian Institute of Technology viz. IIT Kanpur and IIT BHU (Banaras Hindu University). The bibliographic data of both IITs were extracted using the Web of Science (WoS) database for the period 2013-2022. A total of 11761 and 7044 publications for IIT Kanpur and IIT BHU were retrieved respectively. The results of the research performance showed that there was a yearly increase in the number of publications of both the IITs. Being a technical institution, both IIT Kanpur and IIT BHU have engineering as the primary focus area of research. The USA was the most research collaborating country with 1243(10.5%) and 401(5.6%) publications for IIT Kanpur and IIT BHU respectively.

KEYWORDS: Indian Institute of Technology, IIT Kanpur, IIT BHU, Research output, Bibliometric study.

1. Introduction

The Indian Institutes of Technology (IITs) are autonomous public institutes of higher education, located in India. They are governed by the Institutes of Technology Act, *1961* which has declared them as institutions of national importance and lays down their powers, duties, and framework for governance. The Institutes of Technology Act, 1961 lists twenty-three institutes. Each IIT is autonomous, and linked to the others through a common council (IIT Council), which oversees their administration.

Research output is often used as a metric to assess the quality and academic productivity of an institution. It helps in evaluating the impact of the institution's research activities, the quality of research publications, and the reputation of the institution in specific fields. Research output often plays a significant role in global

university rankings. Research output, particularly citations and impact factors of publications, reflects the influence and significance of an institution's work within the academic community. Overall, measuring research output helps in understanding an institution's contributions to knowledge, its academic influence, and its standing within the broader academic and scientific communities.

2. Literature Review

Verma and Singh (2021) analyzed the literature growth of green computing throughout the Web of Science core collection database during the period 2010-2020. Co-authorship network visualization of authors and countries was visualized using VOSviewer software. The results show that the year 2020 has the maximum number of contributions; China has a maximum number of 85 (27.687%) contributions, followed by the USA which has 80 (26.059%) contributions; affiliation wise Jawaharlal Nehru University and Nottingham Trent University have equal and maximum 7(2.280%) contributions; 104 (33.876%) of the publications have the length in between 11-15 pages. Based on the network visualization of co-authorship of authors and countries, there are 8 clusters, 178 links, and the total link strength is 204 and 10 clusters, 141 links, and the total link strength is 233, respectively.

Kumar (2020) analyzed the research productivity of the Indian Institute of Technology (ISM) Dhanbad for a period of twenty years during 2000-2019. The data was harvested from Clarivate Analytics Web of Science (WoS) bibliographical database, and further analysis was done with various prospects to know the high prolific authors and areas of research interest. A total of 6,962 research papers have been published over 20 years in which 5,201 research publications are in referred research journals, and rest of the research publications are in conferences, symposiums, bulletins, reviews.

Siddaiah et al. (2016) analyzed 3656 research publications of the eight new Indian Institutes of Technology (IITs) as covered in Scopus International database from the period 2010-14. The findings reveal that publications of eight new IITs increased at an annual average rate of 68.78% and registered an average citation impact per paper of 4.63. About 35.39% and 28.34% publications of eight new IITs resulted from national and international collaboration respectively during 2010-14. The major areas of research across eight new IITs were engineering, physics & astronomy, computer science, materials science and chemistry, constituting institutional publication share of 34.85%, 27.05%, 25.16%, 22.16% and 18.90% in their total output during 2010-14.

Bala and Kumari (2013) analyzed the research performance of the National Institutes of Technology (NITs) of India from 2001-2010 on several parameters including NITs overall contribution, its growth pattern, citation impact, the share of international collaboration, identification of significant participating countries in NITs international collaboration, contribution and impact by different subject areas, identification of weak and strong subject areas, productivity and impact of prolific authors, pattern of communication of NITs output in most productive journals and characteristics of high cited papers of NITs.

Shettar and Hadagali (2021) analyses the collaboration pattern in the Research Output of National Institutes of Technology in India for the period of twenty years (1999-2018) using the Web of Science citation database. The parameters used in the study are: Degree of Collaboration (DC), Collaboration Coefficient (CC), Collaborative Index (CI), Modified Collaborative Coefficient (MCC), Intra and Inter NIT collaborated articles and growth patterns of domestic and international collaborative articles. The results of the study reveal that the Degree of Collaboration (DC) for the journal articles published by NITs between 1999 and 2018 varied from 0.88 to 0.98. The lowest CI was recorded in the year 2000 (2.66), and the highest CI was recorded for the year 2016 (3.62). The Collaborative Coefficient (CC) ranges between 0.538 and 0.637, with an average rate of 0.626. Out of 16,049 (41.69%) journal articles, 1125 (2.92%) are single-authored, and 14,924 (38.77%) are intra and inter-NIT collaborated journal articles with two or more authors affiliated only with one or more NITs.

Vasishta (2011) investigated the contribution and impact of research output of PEC University of Technology as reflected in its publications covered in Scopus database. The study describes the broad characteristics of research publications of PEC during 1996-2009, its growth, format, media of communication, national and international collaboration profile and overall citation impact, distribution of research output and impact under broad subjects and under different subject departments, most productive authors, and highly cited papers. The finding of the study showed that the international collaborative research activity in the university is still very small, accounting for just 6.21 percent share.

3. Objectives

The objectives of the study are:

- To find out the year-wise growth rate of publications during the last ten years (2013-22).
- To identify the topmost research areas for the publications.

- To find out the most productive authors of the institutes.
- To find out the most prolific journals of the institutes.
- To find out the most prolific research collaborating countries.
- To identify the most prolific research collaborating institutions.

4. Scope and Methodology

The present study is limited to Indian Institutes of Technology (IITs) in Uttar Pradesh. There are two IITs; IIT Kanpur and IIT BHU (Banaras Hindu University). The researcher has applied the search strings OG = ("Indian Institute of Technology, Kanpur ") and OG= ("Indian Institute of Technology, Varanasi"). The database source is SCI-EXPANDED, SSCI, A & HCI, the time span is 2013- 2022, and the retrieval time is November 10, 2023. A total of 11761 records for IIT Kanpur and 7044 records for IIT BHU were retrieved and tabulated in Excel sheet and then analyzed as per the objectives of the study.

5. Data Analysis

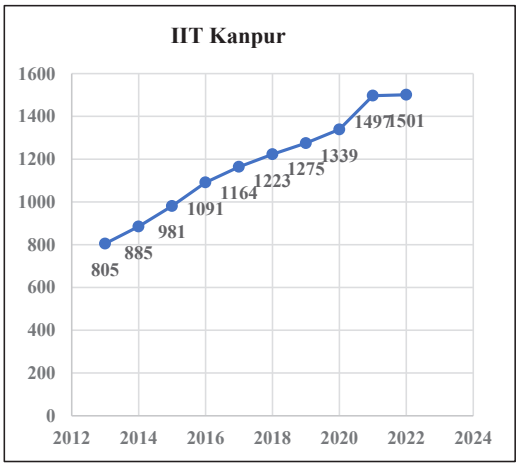
5.1 Year- Year-wise Growth of Publication

Table- 1 Year-wise distribution of research output

IIT Kanpur			IIT BHU		
Years	**Publications**	**%**	**Years**	**Publications**	**%**
2022	1501	12.763	2022	1243	17.646
2021	1497	12.729	2021	1108	15.73
2020	1339	11.385	2020	1100	15.616
2019	1275	10.841	2019	874	12.408
2018	1223	10.399	2018	600	8.518
2017	1164	9.897	2017	565	8.021
2016	1091	9.276	2016	491	6.97
2015	981	8.341	2015	380	5.395
2014	885	7.525	2014	351	4.983
2013	805	6.845	2013	332	4.713
Total	**11761**	**100.00**	**Total**	**7044**	**100.00**

From Table- 1, it can be seen that publications of both the institutes; IIT Kanpur and IIT BHU were gradually increasing. IIT Kanpur has a total of 11761 publications; there were 1501(12.7%) publications in the year 2022, followed by 1497 (12.7%)

publications in the year 2021. There were only 805 (6.8%) publications in the year 2013. Further, IIT BHU has a total of 7044 publications; there were 1243 (17.6%) publications in the year 2022, followed by 1108 (15.7) publications in the year 2021. There were only 332 (4.7%) publications in the year 2013.



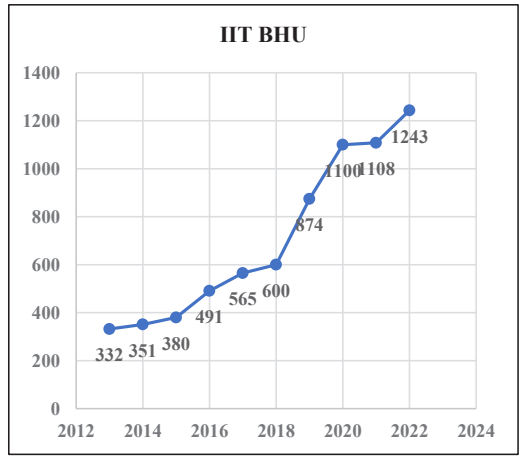


Figure- 1 Year- wise growth of Publication of IIT Kanpur and IIT BHU

5.2 Research Areas for the publication

Table- 2 Research Areas for publications

S. No.	IIT Kanpur			IIT BHU		
	Research Areas	Publications	%	Research Areas	Publications	%
1.	Engineering	2981	25.346	Engineering	1832	26.008
2.	Chemistry	2689	22.864	Materials Science	1581	22.445
3.	Physics	2530	21.512	Chemistry	1363	19.35
4.	Materials Science	2193	18.646	Physics	1125	15.971
5.	Science Technology Other Topics	895	7.61	Science Technology Other Topics	575	8.163
6.	Mechanics	803	6.828	Computer Science	503	7.141
7.	Mathematics	744	6.326	Energy Fuels	427	6.062
8.	Computer Science	588	5	Pharmacology Pharmacy	376	5.338
9.	Energy Fuels	525	4.464	Metallurgy Metallurgical Engineering	331	4.699

S. No.	IIT Kanpur			IIT BHU		
	Research Areas	Publications	%	Research Areas	Publications	%
10.	Environmental Sciences Ecology	408	3.469	Environmental Sciences Ecology	294	4.174
11.	Metallurgy Metallurgical Engineering	392	3.333	Biochemistry Molecular Biology	273	3.876
12.	Tele-communications	372	3.163	Mechanics	236	3.35
13.	Optics	332	2.823	Mathematics	232	3.294
14.	Thermodynamics	310	2.636	Thermodynamics	228	3.237
15.	Geology	283	2.406	Biotechnology Applied Microbiology	203	2.882
16.	Biochemistry Molecular Biology	268	2.279	Tele-communications	173	2.456
17.	Astronomy Astrophysics	257	2.185	Optics	168	2.385
18.	Instruments Instrumentation	224	1.905	Astronomy Astrophysics	167	2.371
19.	Polymer Science	174	1.479	Polymer Science	165	2.342
20.	Electrochemistry	160	1.36	Electrochemistry	162	2.3

Table-2 shows the top twenty research areas of IIT Kanpur and IIT BHU. Being a technical institution, both IIT Kanpur and IIT BHU have engineering as the primary focus area of research, with 2981 and 1832 publications respectively. Chemistry, Physics, and Material Science were further most productive subject areas of IIT Kanpur with publication share of 22.8%, 21.5% and 18.6% respectively. Similarly, Material Science, Chemistry and Physics were the next most productive subject areas of IIT BHU with publication share of 22.4%, 19.3% and 15.9% respectively.

7.3 Most prolific authors

Table- 3 Most prolific authors on basis of number of publications

S. No.	IIT Kanpur			IIT BHU		
	Authors	Publications	%	Authors	Publications	%
1.	Kumar, A	424	3.605	Kumar, A	386	5.48
2.	Sharma, A	215	1.828	Kumar, S	335	4.756
3.	Singh, A	210	1.786	Singh, AK	330	4.685

S. No.	IIT Kanpur			IIT BHU		
	Authors	Publications	%	Authors	Publications	%
4.	Agarwal, AK	181	1.539	Singh, S	311	4.415
5.	Mondal, K	181	1.539	Singh, SK	273	3.876
6.	Chandrasekhar, V	169	1.437	Singh, P	268	3.805
7.	Kumar, R	169	1.437	Kumar, D	244	3.464
8.	Kumar, S	159	1.352	Singh, A	183	2.598
9.	Agarwal, A	151	1.284	Kumar, V	182	2.584
10.	Gupta, A	149	1.267	Kumar, P	171	2.428
11.	Chauhan, YS	141	1.199	Prakash, R	171	2.428
12.	Ghosh, S	138	1.173	Singh, R	170	2.413
13.	Verma, S	138	1.173	Jit, S	161	2.286
14.	Biswas, K	134	1.139	Das, S	155	2.2
15.	Tripathi, SN	134	1.139	Kumar, M	152	2.158
16.	Akhtar, MJ	133	1.131	Singh, RK	148	2.101
17.	Balani, K	131	1.114	Maiti, P	134	1.902
18.	Kar, KK	131	1.114	Singh, V	132	1.874
19.	Das, S	122	1.037	Singh, RS	120	1.704
20.	Gupta, T	120	1.02	Quraishi, MA	119	1.689

Table- 3 shows the list of most prolific authors based on number of publications of both the IITs and it clarifies that Kumar, A has contributed 424 (3.6%) publications for IIT Kanpur, followed by Sharma, A with 215(1.8%) publications. Kumar, A has contributed a maximum 386 (5.4%) publications for the IIT BHU, followed by Kumar, S with 335 (4.7%) publications.

7.4 Most preferred publication titles

Table- 4 Top- twenty publication title

S. No.	IIT Kanpur			IIT BHU		
	Publication Titles	Publications	%	Publication Titles	Publications	%
1	PHYSICAL REVIEW B	168	1.428	RSC ADVANCES	133	1.888
2	PHYSICS OF FLUIDS	165	1.403	JOURNAL OF ALLOYS AND COMPOUNDS	92	1.306
3	RSC ADVANCES	137	1.165	CERAMICS INTERNATIONAL	80	1.136

S. No.	IIT Kanpur			IIT BHU		
	Publication Titles	Publications	%	Publication Titles	Publications	%
4	PHYSICAL REVIEW D	109	0.927	MATERIALS RESEARCH EXPRESS	64	0.909
5	DALTON TRANSACTIONS	98	0.833	JOURNAL OF MATERIALS SCIENCE MATERIALS IN ELECTRONICS	58	0.823
6	JOURNAL OF APPLIED PHYSICS	95	0.808	BIORESOURCE TECHNOLOGY	52	0.738
7	IEEE TRANSACTIONS ON ELECTRON DEVICES	88	0.748	TRANSACTIONS OF THE INDIAN INSTITUTE OF METALS	51	0.724
8	INORGANIC CHEMISTRY	88	0.748	INTERNATIONAL JOURNAL OF HYDROGEN ENERGY	50	0.71
9	PHYSICAL REVIEW E	73	0.621	JOURNAL OF MOLECULAR LIQUIDS	50	0.71
10	SCIENTIFIC REPORTS	73	0.621	JOURNAL OF MATERIALS ENGINEERING AND PERFORMANCE	48	0.681
11	JOURNAL OF ORGANIC CHEMISTRY	71	0.604	CHEMISTRY SELECT	45	0.639
12	JOURNAL OF HIGH ENERGY PHYSICS	70	0.595	IEEE TRANSACTIONS ON ELECTRON DEVICES	45	0.639
13	JOURNAL OF PHYSICAL CHEMISTRY C	68	0.578	MATERIALS CHEMISTRY AND PHYSICS	44	0.625
14	CHEMICAL COMMUNICATIONS	67	0.57	IEEE SENSORS JOURNAL	42	0.596

S. No.	IIT Kanpur			IIT BHU		
	Publication Titles	**Publications**	**%**	**Publication Titles**	**Publications**	**%**
15	ACS APPLIED MATERIALS INTERFACES	66	0.561	INTERNATIONAL JOURNAL OF BIOLOGICAL MACRO-MOLECULES	41	0.582
16	JOURNAL OF ALLOYS AND COMPOUNDS	65	0.55	MULTIMEDIA TOOLS AND APPLICATIONS	40	0.56
17	JOURNAL OF MATERIALS ENGINEERING AND PERFORMANCE	65	0.553	JOURNAL OF APPLIED PHYSICS	39	0.554
18	PHYSICAL CHEMISTRY CHEMICAL PHYSICS	62	0.527	JOURNAL OF ENVIRONMENTAL CHEMICAL ENGINEERING	37	0.525
19	CHEMISTRY A EUROPEAN JOURNAL	61	0.519	JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS	35	0.497
20	INTERNATIONAL JOURNAL OF HYDROGEN ENERGY	61	0.519	BIOMASS CONVERSION AND BIOREFINERY	34	0.483

Table- 4 shows the top twenty journal titles that published the maximum number of research papers of IIT Kanpur and IIT BHU. It is observed from the table that PHYSICAL REVIEW B, PHYSICS OF FLUIDS, RSC ADVANCES, PHYSICAL REVIEW D and DALTON TRANSACTIONS were the top five journals have the most contribution of IIT Kanpur with 168, 165, 137, 109 and 98 publications respectively. Similarly, for the IIT BHU, RSC ADVANCES, JOURNAL OF ALLOYS AND COMPOUNDS, CERAMICS INTERNATIONAL, MATERIALS RESEARCH EXPRESS and JOURNAL OF MATERIALS SCIENCE MATERIALS IN ELECTRONICS were the top five journals that published the most publications with 133, 92, 80, 64 and 58 records respectively.

7.5 Top- ten research collaborating countries

Table- 5 Top- ten research collaborating countries

S. No.	IIT Kanpur			IIT BHU		
	Countries/ Regions	Publications	%	Countries/ Regions	Publications	%
1.	USA	1243	10.569	USA	401	5.693
2.	GERMANY	429	3.648	PEOPLES R. CHINA	234	3.322
3.	ENGLAND	405	3.444	GERMANY	190	2.697
4.	FRANCE	268	2.279	SOUTH KOREA	181	2.57
5.	PEOPLES R CHINA	242	2.058	SAUDI ARABIA	163	2.314
6.	CANADA	198	1.684	SOUTH AFRICA	91	1.292
7.	JAPAN	192	1.633	ENGLAND	87	1.235
8.	AUSTRALIA	172	1.462	JAPAN	83	1.178
9.	SOUTH KOREA	168	1.428	TAIWAN	81	1.15
10.	ITALY	167	1.42	SWEDEN	79	1.122

Table-5 depicts the top-ten research collaborating countries of IIT Kanpur and IIT BHU and it is observed that IIT Kanpur has published 1243(10.5%) papers with USA, followed by Germany with 429(3.6%), England with 405(3.4%) and France with 268(2.2%). Further, IIT BHU has published maximum of 401(5.6%) papers with USA, followed by Peoples Republic of China with 234(3.2%), Germany with 190(2.6%) and South Korea with 181(2.5%).

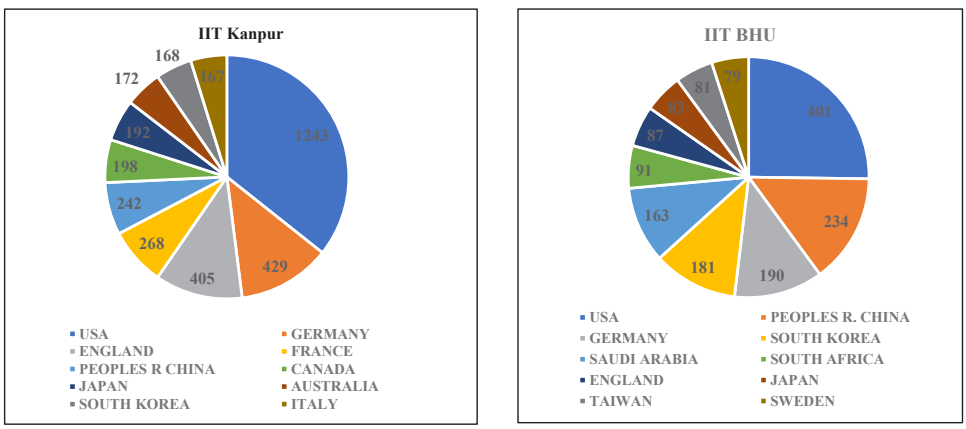


Figure- 2 Top- ten research collaborating countries with IIT Kanpur and IIT BHU

7.6 Top Twenty Research Collaborating Institutions

Table- 6 Top- twenty research collaborating Institutions

S. No.	IIT Kanpur			IIT BHU		
	Affiliations	Publications	%	Affiliations	Publications	%
1.	COUNCIL OF SCIENTIFIC INDUSTRIAL RESEARCH CSIR INDIA	442	3.758	BANARAS HINDU UNIVERSITY BHU	3905	55.437
2.	NATIONAL INSTITUTE OF TECHNOLOGY NIT SYSTEM	375	3.189	NATIONAL INSTITUTE OF TECHNOLOGY NIT SYSTEM	370	5.253
3.	INDIAN INSTITUTE OF SCIENCE IISC BANGALORE	226	1.922	COUNCIL OF SCIENTIFIC INDUSTRIAL RESEARCH CSIR INDIA	233	3.308
4.	TATA INSTITUTE OF FUNDAMENTAL RESEARCH TIFR	220	1.871	BHABHA ATOMIC RESEARCH CENTER BARC	156	2.215
5.	INDIAN INSTITUTE OF TECHNOLOGY IIT BOMBAY	190	1.616	UNIVERSITY OF DELHI	111	1.576
6.	INDIAN INSTITUTE OF TECHNOLOGY IIT DELHI	178	1.513	MOTILAL NEHRU NATIONAL INSTITUTE OF TECHNOLOGY	91	1.292
7.	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS	171	1.454	DEPARTMENT OF SCIENCE TECHNOLOGY INDIA	84	1.193
8.	DEPARTMENT OF SCIENCE TECHNOLOGY INDIA	166	1.411	NATIONAL INSTITUTE OF TECHNOLOGY ROURKELA	79	1.122

S. No.	IIT Kanpur			IIT BHU		
	Affiliations	Publications	%	Affiliations	Publications	%
9.	INDIAN INSTITUTE OF TECHNOLOGY IIT KHARAGPUR	164	1.394	INDIAN INSTITUTE OF TECHNOLOGY IIT KHARAGPUR	76	1.079
10.	UNIVERSITY OF CALIFORNIA SYSTEM	151	1.284	INDIAN INSTITUTE OF TECHNOLOGY IIT KANPUR	72	1.022
11.	DEPARTMENT OF SPACE DOS GOVERNMENT OF INDIA	141	1.199	DEFENCE RESEARCH DEVELOPMENT ORGANISATION DRDO	68	0.965
12.	INDIAN INSTITUTE OF TECHNOLOGY IIT MADRAS	126	1.071	INDIAN INSTITUTE OF TECHNOLOGY IIT ROORKEE	68	0.965
13.	DEFENCE RESEARCH DEVELOPMENT ORGANISATION DRDO	117	0.995	NATIONAL INSTITUTE OF TECHNOLOGY PATNA	65	0.923
14.	NATIONAL INSTITUTE OF SCIENCE EDUCATION RESEARCH NISER	113	0.961	INDIAN INSTITUTE OF SCIENCE IISC BANGALORE	63	0.894
15.	INDIAN INSTITUTE OF TECHNOLOGY IIT GUWAHATI	103	0.876	INDIAN INSTITUTE OF TECHNOLOGY IIT BOMBAY	61	0.866
16.	INDIAN INSTITUTE OF TECHNOLOGY IIT ROORKEE	102	0.867	INDIAN INSTITUTE OF TECHNOLOGY INDIAN SCHOOL OF MINES DHANBAD	61	0.866

S. No.	IIT Kanpur			IIT BHU		
	Affiliations	Publications	%	Affiliations	Publications	%
17.	TIFR CENTRE FOR INTERDISCIPLINARY SCIENCES TCIS HYDERABAD	102	0.867	UNIVERSITY OF ALLAHABAD	60	0.852
18.	BANARAS HINDU UNIVERSITY BHU	101	0.859	NORTH WEST UNIVERSITY SOUTH AFRICA	57	0.809
19.	ACADEMY OF SCIENTIFIC INNOVATIVE RESEARCH ACSIR	97	0.825	KING FAHD UNIVERSITY OF PETROLEUM MINERALS	56	0.795
20.	HOMI BHABHA NATIONAL INSTITUTE	97	0.825	UPPSALA UNIVERSITY	55	0.781

Table- 6 shows the top- twenty research contributing instutions and it is clear from the table that IIT Kanpur has produced highest 442(3.7%) publications in collaborations with COUNCIL OF SCIENTIFIC INDUSTRIAL RESEARCH (CSIR), India, followed by 375(3.1%) with NATIONAL INSTITUTE OF TECHNOLOGY, NIT SYSTEM. Further, IIT BHU has produced maximum 3905(55.4%) publications with BANARAS HINDU UNIVERSITY, BHU, followed by 370(5.2%) with NATIONAL INSTITUTE OF TECHNOLOGY, NIT SYSTEM.

Findings and Conclusion

This paper mainly highlights the qualitative analysis of the research performance of IIT Kanpur and IIT BHU for the period 2013-2022. After analysing and evaluating the research output of both the IITs, it has now been concluded that there are notable variations amongst both IITs in the quality of their research output. IIT Kanpur published 11761 publications while IIT BHU has published 7044 publications. Both institute has come a long way to upgrade research productivity. It was also evident from the analysis that the most trending research areas of IIT Kanpur and IIT BHU were Engineering. Kumar, A has contributed 424(3.6%) publications for IIT Kanpur. The USA was the most research collaborating country with 1243(10.5%) and 401(5.6%) publications for IIT Kanpur and IIT BHU respectively. The study also reveals that IIT Kanpur has more publications in collaboration with the Council of Scientific Industrial Research (CSIR) while IIT BHU with the Banaras Hindu University (BHU).

References

1. Bala, A. & Kumari, S. (2013). Research Performance of National Institutes of Technology (NITS) of India during 2001- 2010: a Bibliometric analysis. *SRELS Journal of Information Management 2013,50*(5):555-72.

2. *Indian Institutes of Technology*. (2020). Retrieved on February 5, 2020 from Wikipedia: https://en.wikipedia.org/wiki/Indian_Institutes_of_Technology

3. Kumar, S.(2022). Scientometric analysis of research productivity of IIT(ISM) Dhanbad, Library Philosophy and Practice (e-journal). 4288. https://digitalcommons.unl.edu/libphilprac/4288.

4. Shettar, I. M. & Hadagali, G. S. (2022). Collaboration pattern in the research output of National Institutes of Technology in India during 1999 – 2018. *Journal of Indian Library Association*, *57*(2): 108-122.

5. Siddaiah, D. K. et al. (2016). Contribution and citation impact of eight new IITs: a Scientometric Assessment of their Publications during 2010-14, *Journal of Scientometric Research, 97*(3): 106-122.

6. Verma, A. and Singh, H. (2021). Global trends and pattern of green computing research: a bibliometric analysis, *Library Philosophy and Practice (e-journal)*. 5791. https://digitalcommons.unl.edu/libphilprac/5791

Do articles get more citations if we share on social media? An investigation through Altmetric lens

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ABSTRACT: This study comprehensively analyzes the top 100 articles published in three Indian LIS journals *(DESIDOC Journal of Library & Information Technology, Annals of Library and Information Studies, Journal of Scientometric Research)* from 2019 to 2023, focusing on their year-wise distribution, journal-wise representation, prolific authors, dissemination patterns through various online platforms, and the correlation between Altmetric Attention Score (AAS) and citations. The year-wise distribution reveals a peak in publications and citations in 2020, followed by a decline in subsequent years. The "Journal of Scientometric Research" emerges as the most prolific journal, indicating quantity and impact. Prolific authors, predominantly affiliated with Indian institutions, demonstrate varied contributions and citation impacts. The dissemination pattern analysis highlights the increasing role of platforms like X (formerly Twitter) and Mendeley. In contrast, the correlation analysis between AAS and citations suggests a weak positive correlation, indicating that online attention does not strongly predict citation count. The study concludes by highlighting the limitations of the present study and the scope for further investigations.

KEYWORDS: LIS research articles, LIS journals, Altmetric Attention Score, Citations, Social media metrics, Altmetrics

Introduction

In the ever-evolving landscape of scholarly communication, the intersection of traditional academic publishing and the pervasive influence of social media has become a focal point of investigation. As information dissemination continues to diversify, questions surrounding the efficacy of sharing research articles on social platforms have gained prominence (Li et al., 2021). With the advent of

platforms like Twitter, Facebook, and other social networking sites, scholars now possess an unprecedented arsenal of tools to circulate their research findings, engage with a broader audience, and potentially augment their scholarly impact. Scholars participate in scientific conversations using blogs, social and professional networking sites, video-sharing platforms, forums, and reference management software (Livas & Delli, 2023).

Social media has undeniably transformed the landscape of academic research and its dissemination, including in Library and Information Science (LIS). Its impact on research is multifaceted, influencing the research process and the subsequent publication of articles. Social media facilitates the rapid dissemination of research findings, accelerating the pace at which knowledge is shared and absorbed (Shmuylovich et al., 2020). This is particularly relevant for the ever-evolving field of library and information science, where timely dissemination of new knowledge is paramount.

In the context of article publication in Indian LIS journals, the impact of social media is equally significant. Platforms like Twitter, Facebook, blogs, and other social platforms serve as effective tools for promoting newly published articles, thereby increasing their visibility and accessibility. This increased exposure benefits the authors and their affiliated institutions and elevates the journals' standing. Moreover, social media offers a direct channel for engaging with readers, receiving feedback, and fostering community among researchers and practitioners. Social media pushes relevant knowledge straight to the end-user via blogs and sites such as Facebook and Twitter (Allen et al., 2013). Hence, the present study explored the impact of social media engagement on citations of the article publications in the three leading Indian LIS journals, i.e., *DESIDOC Journal of Library & Information Technology, Annals of Library and Information Studies,* and *Journal of Scientometric Research.* This study unravels the potential benefits and nuances associated with leveraging social media for scholarly outreach and recognition by scrutinizing the dynamics between digital exposure and academic influence.

Several studies have been conducted to analyze the social media metrics (altmetrics attention) and their impact on research articles in various disciplines. In the field of social sciences, Mendeley, Twitter, and Facebook are the most important channels for disseminating articles (Sedighi, 2023). Additionally, Cho (2021) found that the highly cited research papers in social sciences have significant readers on Mendeley and are referenced in Wikipedia. Furthermore, social media platforms, such as Twitter and Facebook, are the most important

channels of dissemination for research highlights of COVID-19 (Tornberg et al., 2023), Mohs micrographic surgery (Ravipati et al., 2023) in the health and medical sciences domain as well. Studies have also been conducted to investigate the influence of social networking sites on scholarly communication within two renowned LIS journals, the *International Journal of Information Management* and the *Journal of Medical Library Association,* and found that LIS research is most often mentioned on Twitter, followed by news outlets and blogs (Basumatary et al., 2022; Basumatary et al., 2023d). Likewise, amongst social networking sites, Mendeley had the most significant influence on research in artificial intelligence (Shrivastava & Mahajan, 2021). Livas and Delli (2023) pointed out that the citation count of research work is likely to increase after dissemination through specialized social media applications. However, Lehane & Black (2021) argued, concerning their findings of the analysis of critical care medicine literature, that the altmetric attention score (AAS) is not a reliable predictor of future citation count as they found the papers that generate much online attention are less likely to have a high citation count but, highly cited papers are more likely to generate online attentions (Kunze et al., 2020; Lehane & Black, 2021).

As numerous studies have revealed the connection between readership, citation metrics, and the AAS of research articles, the results demonstrate a complex pattern. Hence, this study explored whether published LIS research articles received more readership and citations if users shared research articles on social media platforms. The findings may help in effective research information dissemination strategies for academia and library and information science researchers.

Research Questions

RQ1. What is the year-wise and journal-wise distribution of the top 100 articles, citations and AAS?

RQ2. Who are the most productive researchers?

RQ3. What is the dissemination pattern of research articles and references of top 100 articles in various posts/stories/articles published on social web platforms?

RQ4. Is there a relationship between AAS and citations of the top 100 articles? Can AAS predict future citation counts?

Data and Methodology

The methodology of this study contains three sections. *First*, bibliographic data of the top 100 articles were searched across the Dimensions.ai database on 9th November 2023, using the title of the selected three journals (Figure 1). Search results were filtered based on the Altmetric Attention Score (AAS) in the database, and the bibliographic data of the top 100 articles with the highest AAS and published between 2019 and 2023 were extracted. The 100 articles are sufficient sample to answer the questions of this study as many of the previous studies have been carried out using the same number of samples (Delli et al., 2017; Kim et al., 2019; Moo et al., 2020; Basumatary et al., 2023b; Basumatary et al., 2023c).

Secondly, the AAS of the top 100 articles was collected from the Altmetric.com database, redirecting from the individual articles from the Dimensions.ai database.

Thirdly, the citations of the article were also collected from the Scopus database as it typically represents the central database and citation indexes for scientific literature, including journal articles, conference proceedings, and books, etc. (Pranckutė, 2021; Kumpulainen & Seppänen 2022). Collected data were processed using MS Excel for further analysis.

Initially, the study analyzed the year-wise and journals-wise distribution of articles publications, citations, and AAS of the top 100 articles, followed by the pattern of research dissemination and the correlation analysis between AAS and Citations, which have been done using the SPSS statistical tool based on Pearson Correlation Coefficient (r) using the Range of Pearson correlation coefficient (r) strengths (Table 1). This value was used by previous researchers Meghanathan et al. (2016), Liang et al. (2019), Basumatary et al. (2023a), Basumatary et al. (2023b) and Basumatary et al. (2023c) in their studies.

Table 1: Range of Correlation Coefficient Values (CCV)

Range of CCV	Level of Correlation	Range of CCV	Level of Correlation
0.80 to 1.00	Very Strong Positive	-1.00 to -0.80	Very Strong Negative
0.60 to 0.79	Strong Positive	-0.79 to -0.60	Strong Negative
0.40 to 0.59	Moderate Positive	-0.59 to -0.40	Moderate Negative
0.20 to 0.39	Weak Positive	-0.39 to -0.20	Weak Negative
0.00 to 0.19	Very Weak Positive	-0.19 to -0.01	Very Weak Negative

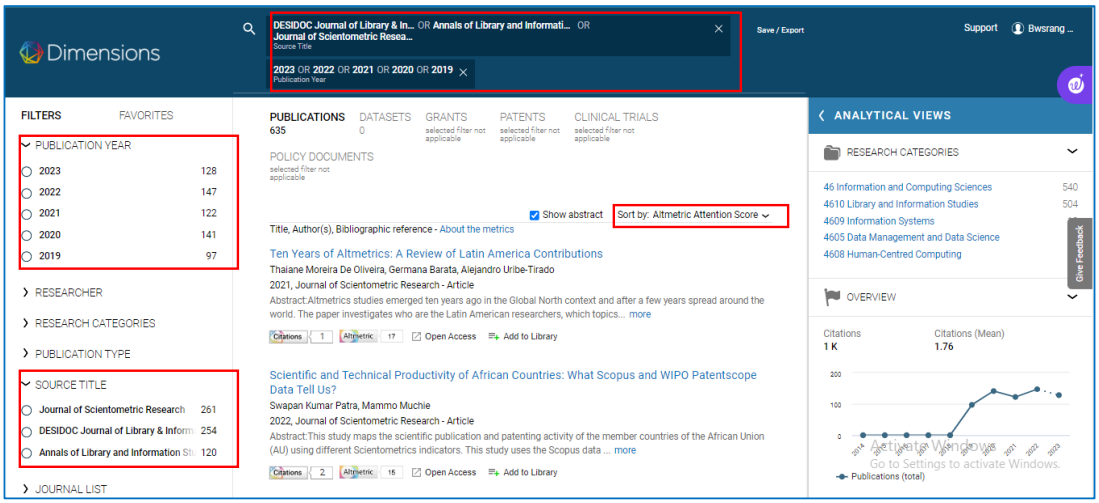


Figure 1: Bibliographic data retrieval from the Dimensions.ai database

Results and Discussion

Year-wise distribution of the top 100 articles

Figure 2 illustrates the year-wise distribution of the top 100 articles, their citations, and AAS. It has been seen that, in 2019, there were 23 publications with cumulative Dimensions citations of 42, Scopus citations of 58, and an AAS of 97. The following year, 2020, saw a significant increase in publications (36) and their respective citations, with Dimensions, Scopus, and AAS reaching 75, 90, and 131, respectively. However, 2021 witnessed a slight decline in the number of publications (31), although the impact metrics remained relatively high, especially in terms of AAS (143). In 2022, they experienced a substantial decrease in both the quantity and impact of publications, with only 9 articles and significantly lower citation metrics. This trend continued in 2023, with only one publication and minimal citation impact, indicating that it takes a few years for a publication to become recognized by the academic community and cited by other researchers.

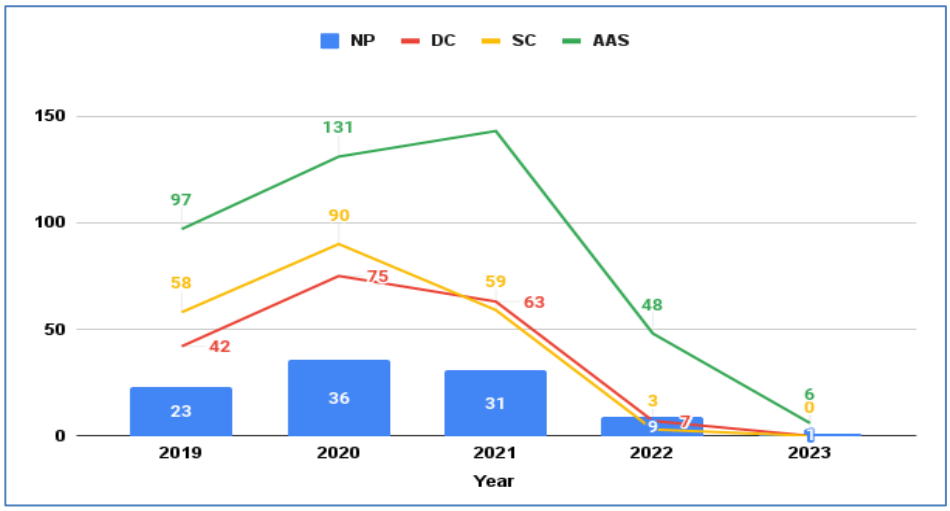


Figure 2: Year-wise distribution of articles, citations and AAS

Journal-wise distribution of the top 100 articles

The "Journal of Scientometric Research" stands out as the most prolific journal (Table 2). With an impressive total of 84 publications, it surpasses the "DESIDOC Journal of Library & Information Technology" and the "Annals of Library and Information Studies" by a significant margin. Moreover, it demonstrates a robust academic impact with 153 citations in Dimensions, 167 in Scopus, and an impressive AAS of 355. This suggests that the journal is well-regarded within the academic community and garners attention and engagement from a wider audience. In contrast, the "DESIDOC Journal of Library & Information Technology" follows with 14 publications, and the "Annals of Library and Information Studies" trails behind with only 2 publications and minimal citations across the board, indicating that it may not be as widely recognized or influential within the field.

Table 2: Journal-wise distribution of the top 100 articles, citations and AAS

Name of Journal	NP	DC	SC	AAS
DESIDOC Journal of Library & Information Technology	14	34	43	65
Annals of Library and Information Studies	2	0	0	5
Journal of Scientometric Research	84	153	167	355

NP=No. of publications, DC=Dimensions citations, SC=Scopus citations, AAS=Altmetric Attention Score

Most productive researchers

The top 100 articles are contributed by 195 authors. Among the total authors, five authors have 4 or more publications. Three authors have 3 publications each, ten have 2 publications each, and the rest have single contributions to the top 100 articles. Table 3 shows the rank of the top 5 most prolific authors who contributed at least 4 articles to the top 100 publications from 2019 to 2023. Fascinatingly, all the prolific authors are affiliated with various Indian institutions and have significantly contributed to their respective fields. **Bidyarthi Dutta** from *Vidyasagar University* has the highest number of publications (9), which comes under the top 100, demonstrating a significant contribution to academic literature. **Anup Kumar Das** from *Jawaharlal Nehru University* closely follows with 7 publications but stands out with a higher citation count, indicating a strong impact in the scholarly community. **Sujit Bhattacharya**, affiliated with the *Council of Scientific and Industrial Research*, has a slightly lower number of publications (5) but maintains a respectable citation count of 5. **Ashish Gosain** from *Jawaharlal Nehru University* and **Vivek Kumar Singh** from *Banaras Hindu University* have 5 and 4 publications, respectively. **Vivek Kumar Singh** received the highest number of citations, and **Anup Kumar Das** received the highest number of AAS, suggesting a significant presence and impact in traditional academic circles and beyond.

Table 3: Most prolific authors

Rank	Author	Affiliation	Country	NP	DC	SC	AAS
1	Dutta, Bidyarthi	Vidyasagar University	India	9	4	6	32
2	Das, Anup Kumar	Jawaharlal Nehru University	India	7	8	7	40
3	Bhattacharya, Sujit	Council of Scientific and Industrial Research	India	5	5	3	29
4	Gosain, Ashish	Jawaharlal Nehru University	India	5	2	3	19
5	Singh, Vivek Kumar	Banaras Hindu University	India	4	9	9	26

NP=No. of publications, DC=Dimensions citations, SC=Scopus citations, AAS=Altmetric Attention Score

Dissemination pattern of research articles

Table 4 shows the dissemination pattern of research highlights through various online social platforms. The results show that *Mendeley*, a platform commonly

used for academic collaboration, shows a noticeable increase from 2019 to 2021, indicating a growing interest and engagement within the academic community. X (formerly known as Twitter*)* appears to be a prominent channel for sharing research articles, with a consistent presence and a notable peak in 2021. *On* the other hand, Facebook exhibits infrequent activity, suggesting that this social media platform might not be as popular or effective for scholarly communication in this context. The decline in the number of mentions on *Peer review sites* and *News Outlets* could indicate a shift in the dissemination focus from broader public forums to more specialized academic platforms. Additionally, the decreasing trend in 2023 across multiple platforms, notably the Mendeley Reader, may suggest a potential decrease in ongoing interest or promotion for the research articles. Blogs and Wikipedia pages indicate an attempt to disseminate information beyond typical academic circles, even if they are minimal.

Table 4: Dissemination pattern of articles through various online social platforms

Year	DC	SC	MR	AAS	Blogs	Wikipedia pages	X users	Facebook pages	Peer review site (Publons)	News outlets
2019	42	58	319	97	4	0	109	2	0	0
2020	75	90	570	131	0	1	198	0	0	0
2021	63	59	639	143	0	0	209	2	1	0
2022	7	3	77	48	0	1	35	0	0	2
2023	0	0	6	6	1	0	0	0	0	0
Total	**187**	**210**	**1611**	**425**	5	2	551	4	1	2

DC=Dimensions citations, SC=Scopus citations, MR=Mendeley Readers, AAS=Altmetric Attention Score

The X (formerly Twitter) is the primary channel for disseminating the research information regarding the top 100 articles published in the three selected journals during the study period. It was found that the X users associated with the 19 countries participated in disseminating the research information, mentioning the article information in their respective X posts. However, 11.80% of X users are affiliated with unknown geographical regions, and 0.73% of articles did not receive any attention from the X users or other social media users. As seen in Figure 3, the Indian X users played an active role in disseminating research highlights with 78.58%, followed by Spain 2.36% and Brazil 1.81%.

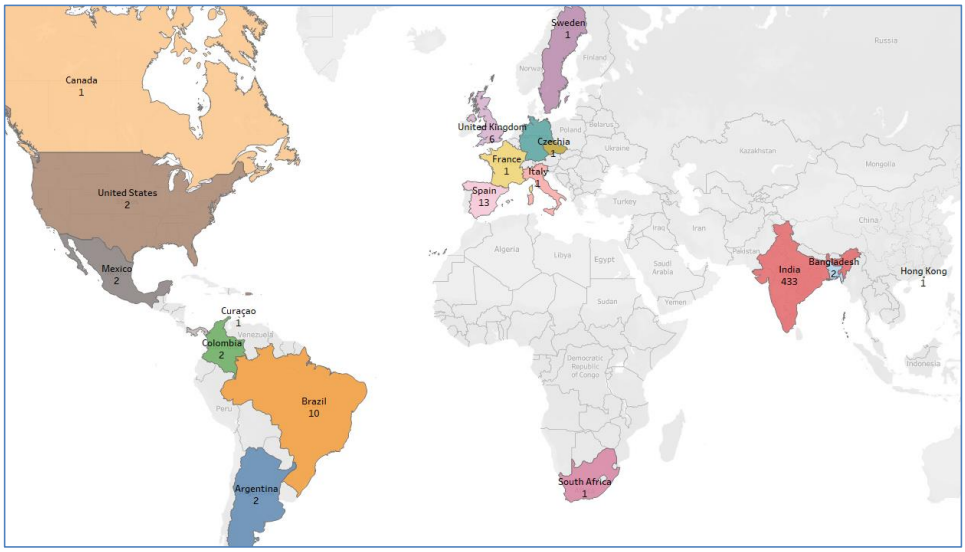


Figure 3: Dissemination pattern of research articles through X (formerly twitter)

Correlation analysis between AAS and Citations

Correlation analysis between AAS and citations is essential for understanding the impact and reach of scholarly publications in the digital age. AAS captures a research article's online attention across various platforms, including social media, news outlets, blogs, etc. (Priem et al., 2010; Basumatary et al., 2023b). On the other hand, citations in articles indicate the influence a paper has within the scholarly community. We can assess how much online engagement aligns with academic recognition by examining the correlation between these two metrics.

A Pearson correlation coefficient (Pearson's R) was computed in the Statistical Package for the Social Sciences (SPSS) software to assess the linear correlation between AAS and Citations. It is the most commonly used method for measuring the strength and direction of a relationship between numerical variables (Basumatary et al., 2023b). A correlation coefficient ranges from -1.00 to 1.00, where 0 indicates no correlation, -1.00 indicates a total negative correlation, and 1.00 indicates a total positive correlation (Table 1).

As seen in Table 5, the correlation analysis between AAS and citations yielded a Pearson correlation coefficient of ($r=0.067$), with a p-value of ($p=0.507$). This indicates a very weak positive correlation between the two metrics. The close to zero correlation coefficient suggests a limited linear relationship between AAS and citations. Additionally, the p-value ($p=0.507$) is greater than the commonly used significance level of analysis ($p<0.05$). It seems that there is no statistically

significant correlation between AAS and citations. This implies that the online attention a research article receives, as measured by altmetric, is not strongly associated with its citation count in the articles published in three selected journals. Therefore, it is not reasonable to rely on the AAS as a strong predictor of future citations of articles published in these three journals.

Furthermore, Figure 4 illustrates the scattered plot graph of a weak positive correlation between AAS and citations. A correlation coefficient indicates how many dots in a scatter plot lie in a straight line (Bahadoran et al., 2020). The x-axis depicts the AAS of the publication received, while the y-axis represents its citations. A positive correlation would be evident if points cluster upwards and to the right, indicating that papers with more AAS tend to have higher citations. The scattered pattern suggests a lack of a clear linear trend, emphasizing the limited association between AAS and citations of the top 100 articles (Figure 4).

Table 5: Pearson correlation between AAS and Citations

		AAS	Citations
AAS	Pearson Correlation	1	0.067
	Sig. (2-tailed)		0.507
	N	100	100
Citations	Pearson Correlation	0.067	1
	Sig. (2-tailed)	0.507	
	N	100	100

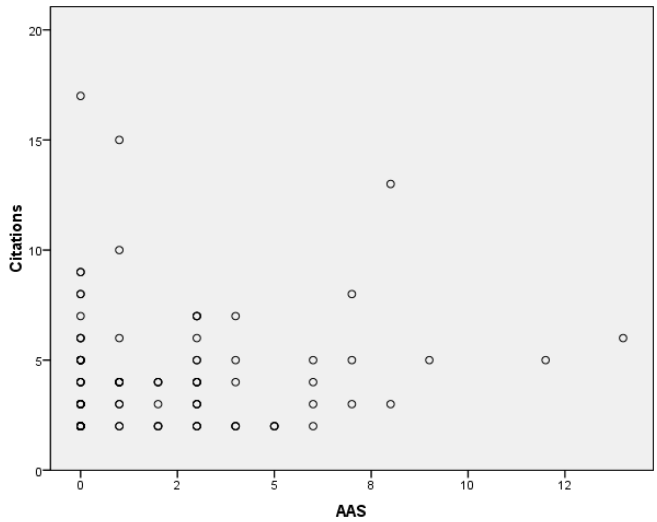


Figure 4: Scattered plot of the correlation between Citations and AAS

Conclusion

This study explored the top 100 articles published in selected journals from 2019 to 2023 and revealed valuable insights into academic impact and dissemination trends. The year-wise distribution reveals a fluctuating pattern in both the quantity and impact of publications, emphasizing the time it takes for recognition within the academic community. The Journal-wise distribution highlights the prominence of the "Journal of Scientometric Research," indicating its prolific nature and significant academic impact compared to other journals. Examining the most productive authors showcases the contributions of Indian researchers, with Bidyarthi Dutta, Anup Kumar Das, and others making substantial impacts in their respective fields.

Among the various social media platforms, the X (formerly Twitter) is a primary channel for research article dissemination, as found in the previous research (Tornberg et al., 2023; Ravipati et al., 2023; Basumatary et al., 2023d). However, a decline in mentions across multiple platforms in 2023 suggests potential challenges in sustaining ongoing interest or promotion for these articles. The very weak positive correlation between AAS and citations suggests that AAS cannot be relied upon solely as a predictive tool for citations in selected journals. The similar result was found in the anlsysis of articles published in the three LIS journals, i.e., *"College & Research Libraries", "Publications",* and *"Journal of the Medical Library Association"* (Basumatary et al., 2023d).

Taken as a whole, such kind of study is crucial for researchers, journals, and institutions seeking to navigate the evolving landscape of scholarly communication and impact. However, this study is limited to the top 100 articles published in the three leading Indian LIS journals indexed in the Scopus database (DESIDOC Journal of Library & Information Technology, Annals of Library and Information Studies, and Journal of Scientometric Research). Further investigations can be carried out by considering more journals and using different types of publications. Additionally, the methodology used in this study can be utilized in various subject domains to evaluate the impacts of scholarly communication.

References

1. Allen, H. G., Stanton, T. R., Di Pietro, F., & Moseley, G. L. (2013). Social media release increases dissemination of original articles in the clinical pain sciences. PloS One, 8(7), e68914. https://doi.org/10.1371/journal.pone.0068914

2. Bahadoran, Z.; Mirmiran, P.; Kashfi, K. & Ghasemi, A. (2020). The Principles of Biomedical Scientific Writing: Citation. International Journal of Endocrinology and Metabolism, 18(2), e102622. https://doi.org/10.5812/ijem.102622

3. Basumatary, B. & Verma, M.K. (2023a). Social Attention Sparked on Artificial Intelligence (AI) Applications in the Library Research: An Assessment Based on Altmetric Tools. In 8th International Conference of Asian Special Libraries: Advancing Asian Special Libraries towards the Fifth Industrial Revolution, 22-24 February 2023, Cebu City, Philippines. 2023. pp. 83-101.

4. Basumatary, B., Boro, B., Verma, M. K., & Mansor, A. N. (2022). Influence of social networking sites on scholarly communication: an altmetrics analysis of selected LIS journals. *Journal of Information and Knowledge Management* (JIKM), 1, 75-89. https://ir.uitm.edu.my/id/eprint/70930

Investigating Citation Database Awareness, Knowledge and Utilization among Science Research Scholars: A Study at Mangalore University, Mangalore, Karnataka, India

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Abstract: Citation databases are significant information sources for researchers as they provide access to a wealth of information on scholarly literature. The study provides valuable insights into research scholars' awareness, familiarity, and perceived importance of citation databases among science research scholars at Mangalore University, Karnataka, India. This study utilized a well-designed structured questionnaire to gather data in this research. The questionnaire consisted of carefully designed questions to gather information about the present study. A study was conducted of 100 science research scholars, and the findings showed that Google Scholar, Scopus and Web of Science, are the most popular citation databases among the surveyed respondents. The outcomes will offer important insights for educators and policymakers to optimize the integration of ICT in research course work, promoting effective ICT practices among research scholars.

KEYWORDS: Citation databases, Science research scholars, Mangalore University

Introduction

Citation databases are an important tool for research scholars. These information resources can be supportive for research scholars, and they can support to expand the quality of research. libraries play an important role in encouraging the use of citation databases by offering conferences, workshops and training programmes. The study provides valuable insights into research scholars' awareness, familiarity, and perceived importance of citation databases among science research scholars at Mangalore University, Karnataka, India. The outcomes will offer important insights for educators and policymakers to optimize the integration of ICT in research course work, promoting effective ICT practices among research scholars.

Review of Literature

In their research Michael Levine-Clark & Esther L. Gil (2021) compares search outcomes in Google Scholar, Microsoft Academic, Web of Science and Scopus.

John R. Beatty (2020) In their paper compares the citation tools. Michael Levine-Clark miclar & Esther L. Gil (2008) In their research displays the results of a comparative study of Web of Science, Scopus, and Google Scholar for a set of 15 business and economics journals. Gertrude Hoogendoorn (2008) In their paper informs readers on the ongoing progress in its growth, including the integration of research performance measurement tools. Jie Li, Judy F. Burnham, Trey Lemley & Robert M. Britton (2010) In their paper compares the citation analysis potential of four databases: Web of Science, Scopus, SciFinder, and Google Scholar.

Objectives of the Study

- To know the level of awareness of citation databases among research scholars.
- To know the most popular citation databases used by research scholars.
- To know the how are citation databases being used by research scholars.
- To know the perceived benefits and challenges of using citation databases by research scholars.

Research Design and Methodology

This study utilized a well-designed structured questionnaire to gather data in this research. The questionnaire consisted of carefully designed questions to gather information about the present study. The chosen methodology was deemed appropriate for gathering data, allowing for a comprehensive understanding of research scholars perceptions of the citation databases. A survey was conducted among 100 science research scholars at Mangalore University, Mangalore, Karnataka, India. The survey assessed the participants' awareness of citation databases, their familiarity with the features of citation databases, and their opinion on the importance of citation databases in their academic activities.

Scope and Limitations

In this research, confinement in Mangalore University is examined. The study collected 100 responses from science research scholars to gain insight into their perspectives on Citation databases. It is important to note that the research only pertains to this specific educational institution.

Data Analysis and Interpretation

Table No I Gender of the Respondents

S.No	Gender	Frequency	Percent
	Male	61	61.0
	Female	39	39.0
Total		100	100.0

The table no I show the gender of respondents. 61 (61%) of the participants are male, while 39 (39%) are female.

Table No II Awareness of Using Citation Databases

S No	Citation Databases	N	Minimum	Maximum	Mean	Std. Deviation	Rank	Decision
1.	Scopus,	100	1.00	5.00	4.5	.88140	2	High Perception
2.	Web of Science	100	1.00	5.00	4.4	.86457	3	High Perception
3.	Google Scholar	100	1.00	5.00	4.7	.70173	1	High Perception
4.	Indian Citation Index	100	1.00	5.00	3.8	1.20705	5	Low Perception
5.	PubMed	100	1.00	5.00	3.9	1.27778	4	Low Perception

(N=100 5=Extremely aware 4=Moderately aware 3=Somewhat aware 2=Slightly aware 1=Not at all aware Decision - weighted average 21.3/5 =4.3)

The table no II shows the awareness of using citation databases among research scholars. Google Scholar is the most recognised citation database, followed by Scopus and Web of Science. Indian Citation Index and PubMed have lower awareness levels. The overall awareness of citation databases is high.

Table No III Familiarity Using Citation Databases

S No	Citation Databases	N	Minimum	Maximum	Mean	Std. Deviation	Rank	Decision
1.	Scopus,	100	1.00	5.00	4.4	.94682	2	High Perception
2.	Web of Science	100	1.00	5.00	4.3	.97747	3	High Perception
3.	Google Scholar	100	1.00	5.00	4.5	.92638	1	High Perception
4.	Indian Citation Index	100	1.00	5.00	3.8	1.09839	4	Low Perception
5.	PubMed	100	1.00	5.00	3.8	1.17534	5	Low Perception

(N=100 5=Extremely familiar 4=Moderately familiar 3=Somewhat familiar 2=Slightly familiar 1=Not at all familiar Decision - weighted average 20.8 /5 =4.2)

The table no III shows the familiarity using citation databases, the participants' Google Scholar is the most familiar citation database, followed by Scopus and Web of Science. Indian Citation Index and PubMed have lower familiarity levels. The overall familiarity with citation databases is high. This information could be valuable for researchers and institutions aiming to gauge and improve their users' database proficiency.

Table No IV Features of Citation Databases

S No	Citation Databases	N	Minimum	Maximum	Mean	Std. Deviation	Rank	Decision
1.	Scopus,	100	1.00	5.00	4.4	.89505	3	High Perception
2.	Web of Science	100	1.00	5.00	4.4	.75069	2	High Perception
3.	Google Scholar	100	1.00	5.00	4.5	.75879	1	High Perception
4.	Indian Citation Index	100	1.00	5.00	4.0	.86363	5	Low Perception
5.	PubMed	100	1.00	5.00	4.0	.91514	4	Low Perception

(N=100 5=Very good 4=Good. 3=Moderately 2=Poor 1=Very poor Decision - weighted average 21.3/5 =4.3)

The table no IV shows the features of citation databases. Based on the above table, Google Scholar is the citation database with the highest perceived feature quality, followed by Scopus and Web of Science Indian Citation Index and PubMed have lower perceived feature quality. The overall perception of feature quality across the surveyed databases is high.

Table No V Importance of Citation Databases in Academic Activities

S No	Description	N	Minimum	Maximum	Mean	Std. Deviation	Rank	Decision
1.	Improved professional competence	100	1.00	5.00	4.4	.89505	1	High Perception
2.	Improved the research quality	100	1.00	5.00	4.4	.75552	1	High Perception
3.	Increased my productivity in terms of publications	100	1.00	5.00	4.3	.81749	3	High Perception
4.	Connects to subject experts across the globe	100	1.00	5.00	4.2	.80554	4	High Perception
5.	Saves time	100	1.00	5.00	4.2	.82945	4	High Perception
6.	Can be accessed anytime and anywhere	100	1.00	5.00	4.1	.88369	6	Low Perception
7.	Gather information together, examine and compare it	100	1.00	5.00	4.1	.83961	6	Low Perception

(Note: N=100 5=Strongly agree, 4=Agree 3=Not sure 2=Disagree1=Strongly Disagree Decision - weighted average 29.7 =4.2)

The table no V shows the importance of citation databases in academic activities. Citation databases are perceived as highly important for academic activities. The highest importance is placed on improving professional competence and enhancing research quality. There is a slightly lower perception of the ability to

access databases anytime and anywhere, as well as the capacity to gather, examine, and compare information. Overall, citation databases are seen as a valuable tool for academics.

Table No VI Importance Of Citation Databases In Academic Activities

S No	Importance of Citation Databases	Respondents
1.	Very important	47 (47.0%)
2.	Important	42 (42.0%)
3.	Fairly important	7 (7.0%)
4.	Slightly important	2 (2.0%)
5.	Not important	2 (2.0%)

The table no VI shows the importance of citation databases in academic activities. 47 respondents consider citation databases to be very important, while 42 consider them important. This indicates that a combined 89% of participants perceive citation databases as important tools for their research. Only a small percentage of respondents, 7%, consider citation databases to be fairly important, while an even smaller 2% deem them slightly important. The remaining 2% do not find citation databases to be important at all.

Table No VII Problems Faced While Using the Citation Databases

S No	PROBLEMS	Respondents
1.	Time Constraint	39 (39.0%)
2.	No privacy ensures	24 (24.0%)
3.	Not user friendly	16 (16.0%)
4.	Lack of Training	10 (10.0%)
5.	Lack of time	4 (4.0%)
6.	Lack of technical knowledge	6 (6.0%)
7.	Do not know how to use	1 (1.0%)

The table no VII shows the problems faced while using the citation databases. The table shows that research scholars encounter various challenges when using citation databases. The most prevalent issue is time constraint, with 39% of participants indicating it as a significant problem. Privacy concerns represent another major obstacle, with 24% of participants citing it as a problem. The lack of user-friendliness poses a challenge for 16% of participants, indicating that some citation databases may have complex interfaces or unclear navigation structures

that hinder their usability, 10% of participants face a lack of training. Other problems faced by researchers include a lack of time (4%), a lack of technical knowledge (6%), and not knowing how to use citation databases (1%).

Findings of the Study

- **Gender of the respondents:** The study found that 61% of the participants were male, while 39% were female.
- **Awareness of Using Citation Databases:** The analysis of participants' awareness of different citation databases revealed that Google Scholar is the most well-known citation database, followed by Scopus and Web of Science. Indian Citation Index and PubMed have lower awareness levels. The overall awareness of citation databases is high.
- **Familiarity Using Citation Databases:** Google Scholar is the most familiar citation database, followed by Scopus and Web of Science. Indian Citation Index and PubMed have lower familiarity levels.
- **Features of Citation Databases:** The study indicated that Google Scholar is the citation database with the highest perceived feature quality, followed by Scopus and Web of Science Indian Citation Index and PubMed have lower perceived feature quality. The overall perception of feature quality across the surveyed databases is high.
- **Importance for Citation Databases:** Citation databases are perceived as highly important for academic activities. The highest importance is placed on improving professional competence and enhancing research quality. There is a slightly lower perception of the ability to access databases anytime and anywhere, as well as the capacity to gather, examine, and compare information. Overall, citation databases are seen as a valuable tool for academics.
- **Problems Faced While Using Citation Databases:** The study identified several challenges faced by research scholars while using citation databases, including time constraints (39%), lack of privacy assurance (24%), and not being user-friendly (16%). Other issues included lack of training (10%), lack of time (4%), lack of technical knowledge (6%), and not knowing how to use the databases (1%).

Suggestions

- **Raise awareness:** Conduct workshops and seminars to introduce scholars to the various citation databases available and their benefits. Provide

tutorials and training materials to help scholars learn how to use these databases effectively.

- **Enhance familiarity:** Encourage scholars to explore different citation databases to gain familiarity with their features and functionalities. Promote the use of these databases in academic activities and research projects.
- **Emphasize importance:** Highlight the significance of citation databases in enhancing the quality of research, improving professional competence, and increasing productivity. Encourage scholars to incorporate citation databases into their research workflows.
- **Improve features:** Continuously evaluate and improve the features of citation databases to make them more user-friendly and accessible. Enhance search capabilities, provide better filtering options, and integrate with other research tools.
- **Address challenges:** Provide training and support to address the challenges faced by scholars, such as time constraints, privacy concerns, and technical difficulties. Simplify the user interface and provide clear instructions to improve usability.
- **Promote collaboration:** Encourage collaboration among scholars to share knowledge and expertise in using citation databases. Establish online communities and forums for discussions and peer support.
- **Customize for specific needs:** Tailor the features and content of citation databases to meet the specific needs of different disciplines and research fields. Collaborate with subject experts to ensure the relevance and accuracy of information.

Conclusion

This study investigated research scholars' awareness, familiarity, and perceived importance of citation databases among research scholars at Mangalore University, Karnataka, India. Citation databases are important sources for research scholars as they provide access to a wealth of information on scholarly literature. Based on the present study, it appears that Google Scholar, Scopus and Web of Science, are the most popular and well-regarded citation databases among the surveyed research scholars. They are perceived as highly aware, familiar, and user-friendly. In contrast, Indian Citation Index and PubMed are less known and regarded as less user-friendly. These resources can be helpful for research scholars, and they can aid to expand the quality of research. University libraries play a role in encouraging

the use of citation databases by offering training programmes, conferences and workshops.

References

1. Gertrude Hoogendoorn (2008) Scopus: The Continuing Development of an Abstract and Citation Database, *The Serials Librarian*, 55:1-2, 227-234, DOI: 10.1080/03615260801970899

2. Jie Li, Judy F. Burnham, Trey Lemley & Robert M. Britton (2010) Citation Analysis: Comparison of Web of Science®, Scopus™, SciFinder®, and Google Scholar, Journal of Electronic Resources in Medical Libraries, 7:3, 196-217, DOI: 10.1080/15424065.2010.505518

3. John R. Beatty (2020) Citation Databases for Legal Scholarship, *Legal Reference Services Quarterly,* 39:1, 56-85, DOI: 10.1080/0270319X.2020.1738198

4. Michael Levine-Clark & Esther L. Gil (2021) A new comparative citation analysis: Google Scholar, Microsoft Academic, Scopus, and Web of Science, *Journal of Business & Finance Librarianship,* 26:1-2, 145-163, DOI: 10.1080/08963568.2021.1916724

5. Michael Levine-Clark& Esther L. Gil (2008) A Comparative Citation Analysis of Web of Science, Scopus, and Google Scholar, *Journal of Business & Finance Librarianship,* 14:1, 32-46, DOI: 10.1080/08963560802176348/

Evaluating Scholarly Communication on Sustainable Data Security in Library Systems

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ABSTRACT: Services provided by libraries have been a fundamental feature of libraries since the beginning of time. The way libraries operate now has changed due to technological advancements. Data security has become a concerning aspect of modern libraries. The study aims to examine the publication trend, research themes, and potential solutions to tackle challenges regarding data security. This study employed mixed methods, such as bibliometric approach and qualitative analysis. A total of 185 research papers collected from Scopus were examined. The findings reveal gradual growth in terms of publication growth. Keyword co-occurance analysis revealed six distinct research themes: "Data Security and Cloud Computing in Digital Libraries," "Library Privacy and Security," "Ethics and Privacy in Library Users Data Protection," "Big Data Management," "Internet and Database Security with a Focus on RFID Technology," and "Information and Cybersecurity in University Libraries". The study also identified major challenges and proposed models from 13 research papers published during 2019-2023, highlighting the current state of knowledge towards sustainable data security. Future research could contribute to the emerging landscape of data security for a better library system.

1. Introduction

The word "sustainability" has been used a lot in policy documents in the past several years, which has an impact on practically every organization, activity, and business in the modern world. Sustainable digital information services are centered around three key principles: social, environmental, and economic sustainability (Abdi, n.d.). Systems like student information services, electronic learning, library automation, and financial management are becoming more and more integrated with digital information services. Today's library users demand seamless access to a wide range of digital information services from the convenience of their laptops, desktop computers, mobile phones, etc. Libraries are vital repositories

of human knowledge, preserving diverse facts, ideas, and accomplishments. They are the priceless heritage of mankind, and preserving this intellectual and cultural heritage is the moral responsibility of librarians, ensuring proper dissemination of materials (Echem & Okwu, 2023). Digitization in modern life brings both benefits and threats, making cybersecurity and sustainable development (SD) crucial worldwide issues. The European Union countries have set goals for both cybersecurity and SD and increasing investments in renewable energy sources contribute to the Sustainable Development Goals (SDGs), often relying on ICT systems and cybersecurity (Sulich et al., 2021).

1.1 Research Questions

The research questions for this study are stated below:

RQ1: How has scholarly communication on sustainable data security within library systems evolved?

RQ2: What are the key themes in scholarly communication on sustainable data security within library systems?

RQ1: How are libraries addressing the challenges of sustainable data security, and what potential strategies are taken or proposed by the researchers?

2. Literature Review

Academic libraries are experiencing an increase in theft, vandalism, mutilation, infiltration, and other fraudulent actions. As a result, library professionals and scholars are becoming concerned about library security aspects, which require the best strategies for resolving security issues and meet patrons' needs effectively (Chander et al., 2022). Digital libraries need to be sustainable in order to ensure that advancements in design and development have a greater impact on practitioners (Adams & Ngimwa, 2012). It is becoming crucial for libraries to figure out how to increase information professionals' data competencies so that they may be viewed as essential partners in the data ecosystem, as library positions continue to evolve toward becoming more and more data-centric (Mani et al., 2021). Advancement in technology has become commonplace in the manufacturing and service industries with the advent of Industry 4.0. Cyberphysical systems (CPS) are being used as one of the most significant examples of sophisticated technologies. Cybersecurity is one of the vital aspects of the usage of technology (Yildiz & Younes Gejam, 2022).

There is a lack of bibliometric research on data security in library systems, particularly focusing on themes and strategies for overcoming challenges.

Therefore, this study aims to fill the gap by exploring keyword co-occurrence for thematic analysis and trend analysis of scholarly publications on sustainable data security in library systems.

3. Methods

3.1 Data Collection

To explore the literature addressing Data Security in Library Systems, bibliographic data collection was performed through the Scopus database as of November 5, 2023. To obtain scholarly publications, the search utilized the following string:

(TITLE ("data security" OR "sustainable data security" OR "data privacy" OR "securing data" OR "collection security" OR "collection protection" OR "collection privacy" OR "information security" OR "cybersecurity" OR "data protection" OR "information assurance" OR "data integrity" OR "privacy measures" OR "digital security" OR "cyber defense" OR "information safety" OR "secure data management" OR "information privacy" OR "privacy protection" OR "confidentiality" OR "data confidentiality" OR "personal data protection" OR "privacy rights" OR "secure data handling" OR "confidential information management" OR "data secrecy") OR KEY ("data security" OR "data privacy" OR "securing data" OR "collection security" OR "collection protection" OR "collection privacy" OR "information security" OR "cybersecurity" OR "data protection" OR "information assurance" OR "data integrity" OR "privacy measures" OR "digital security" OR "cyber defense" OR "information safety" OR "secure data management" OR "information privacy" OR "privacy protection" OR "confidentiality" OR "data confidentiality" OR "personal data protection" OR "privacy rights" OR "secure data handling" OR "confidential information management" OR "data secrecy") AND TITLE (library OR libraries OR museum)) AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "cp") OR LIMIT-TO (DOCTYPE , "re") OR LIMIT-TO (DOCTYPE , "ch") OR LIMIT-TO (OCTYPE , "ed")) AND (LIMIT-TO (LANGUAGE , "English"))

The search on Scopus yielded a total of 230 papers (as of November 5, 2023). A manual screening process was employed to exclude papers not aligning with the study's context and objectives. Finally, 185 papers were considered relevant and included in the study. The timeframe for papers spanned from 1982 to 2023. The 185 papers comprise various document types, such as articles (n=101), followed by conference papers (n=67), reviews (n=11), book chapters (n=5), and an editorial.

3.2 Data Analysis

Data analysis is mainly focused on three key components: trend analysis, keyword co-occurrence for thematic analysis, and identification of challenges faced by libraries in data security and potential solutions or proposed models. Out of these three, the first two components—trend analysis for publications and keyword co-occurance for theme analysis—are based on bibliometric technique. The trend analysis provides a chronological landscape of publication. Keyword co-occurrence is employed for thematic analysis, revealing patterns of common keywords in the literature. These analyses were done through MS Excel and VOSviewer. On the other hand, this study identifies papers proposing models aimed at addressing challenges in data security in libraries. In order to show recent developments, a specific time frame was applied. Publications within the last five years (2019-2023) were selected for qualitative analysis. This approach strived to show the proposed models in response to contemporary challenges.

4. Data Analysis and Findings

4.1 Research Trends

In our chosen database, the first two publications (Vasi, 1982; Bender, 1982) on the topic of sustainable data security in library systems were published in 1982, based on the search criteria we used (Figure 1). Since then, the overall number of publications has increased moderately. With 185 papers to date, 45 nations have contributed to the field of data security within library systems research. Among 45 nations, the USA emerged as the most productive nation with 54 papers. This suggests there can be multiple factors affecting USA's dominance, such as technological advancements in libraries and research infrastructure. Figure 1 illustrates the growth pattern of research papers. The annual growth in the number of publications remained nearly constant between 1982 and 2011. The total number of publications in the scientific literature for sustainable data security has been trending upward (after 2011), rising from two in 1982 to 185 (the total number of research papers) by 2023. Based on the dataset, the average annual number of articles published between 1982 and 2011 was 2. On the other hand, the average annual number of publications from 2012 to 2023 was 11, with 130 papers. It has been observed that publications about sustainable data security are trending upward.

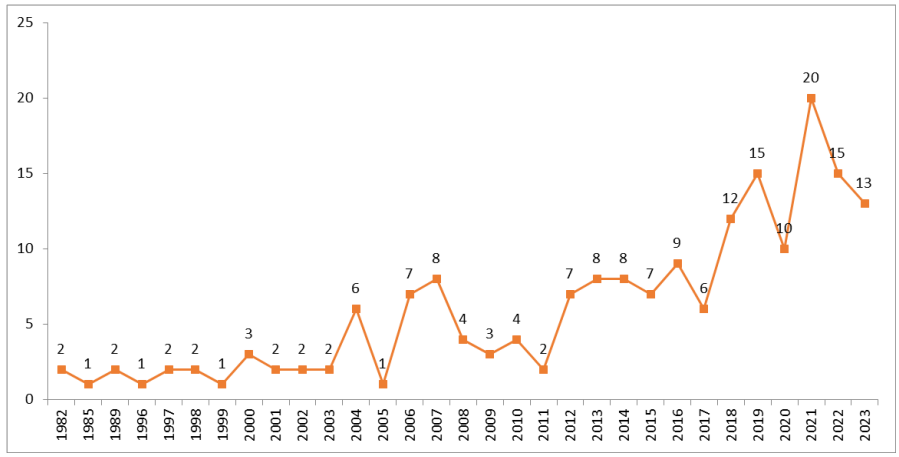


Figure 1. The publication trends related to sustainable data security in library systems

4.2 Analysis of Research Themes

The dataset consists of 530 keywords. The most commonly used keywords are: "privacy" (28), "information security" (27), "data security" (18), "digital libraries" (16), "libraries" (10), and "data privacy" (9). Figure 2 displays relationships between keywords using lines, while node size indicates how frequently a keyword appears. In Figure 2, there are 38 keywords that meet the threshold with a minimum number of occurrences of 3. Co-occurrence analysis can be used to group high-frequency keywords into six themes that are related to the field's areas of interest for future research.

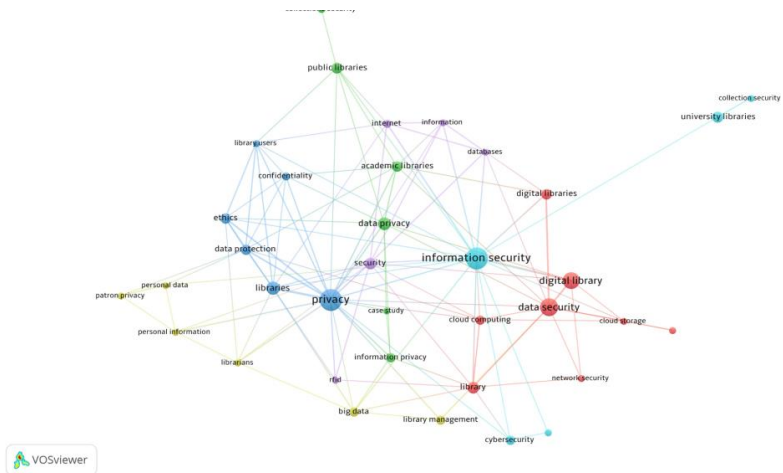


Figure 2. Co-occurrence network of high-frequency keywords

Table 1 presents a thematic analysis of high-frequency terms. Theme 1 (highlighted in red in Figure 2) denotes- "Data Security and Cloud Computing in Digital Libraries." The most common keywords in Theme 1 are: "Data Security" (n=18) and "Digital Library" (n=16). Theme 2: "Library Privacy and Security" (highlighted in green in Figure 2) comprises "Data privacy" (n=9) and "Public libraries" (n=7) as frequently used keywords. Two commonly used keywords in Theme 3 named "Ethics and Privacy in Library Users Data Protection" (highlighted in dark blue in Figure 2) are "Privacy" (n=28) and "Libraries" (n=10). Theme 4 (highlighted in yellow in Figure 2) is "Big Data Management". The keywords used in this theme are: "Big data" (n=5) and "Library management" (n=5). Theme 5: "Internet and Database Security with a Focus on RFID Technology" (highlighted in purple in Figure 2) comprises "Security" (n=8) and "Internet" (n=4) as frequently used keywords. Two commonly used keywords in Theme 6: "Information and Cybersecurity in University Libraries" (highlighted in sky blue in Figure 2) are "Information security" (n=27) and "University libraries" (n=7).

Table 1. Thematic analysis of high-frequency keywords related to sustainable data security in library systems

Themes	Number of keywords	Keywords	Frequency
Theme 1: Data Security and Cloud Computing in Digital Libraries	8	Cloud computing	5
		Cloud storage	3
		Data security	18
		Digital libraries	6
		Digital library	16
		Library	8
		Network security	3
		University library	3
Theme 2: Library Privacy and Security	6	Academic libraries	6
		Case study	3
		Collections security	4
		Data privacy	9
		Information privacy	5
		Public libraries	7

Themes	Number of keywords	Keywords	Frequency
Theme 3: Ethics and Privacy in Library Users Data Protection	6	Confidentiality	4
		Data protection	6
		Ethics	6
		Libraries	10
		Library users	3
		Privacy	28
Theme 4: Big Data Management	6	Big data	5
		Librarians	3
		Library management	5
		Patron privacy	3
		Personal data	3
		Personal information	3
Theme 5: Internet and Database Security with a Focus on RFID Technology	5	Databases	3
		Information	3
		Internet	4
		RFID	3
		Security	8
Theme 6: Information and Cybersecurity in University Libraries	5	Collection security	3
		Cybersecurity	5
		Digital security	3
		Information security	27
		University libraries	7

4.3 Challenges and Proposed Models

This study has identified key challenges and proposed models or solutions in the context of data security in libraries. The standardization of eBooks, discoursed by "Text Encryption" according to (Skrobanek et al., 2021), ensures secure e-content. Data privacy is targeted through a "Protection Algorithm" based on the RFID proposed by (Duan, 2020), emphasizing the essence of protecting important data and information. A "Hybrid Solution", as advocated by (Weigl et al., 2020), emerges as a feasible strategy to exhaustively manage personal online data protection concerns and the aggregation of data into collections within digital libraries. (Fangjing, 2021) depicted users' individual needs, presenting a solution grounded in "Data Encryption/Decryption Architecture" to enhance the defence security of the system while reducing data processing time. Categorizing references based on the research subject, proposed through the "Enhanced Association Rule Framework" by (A et al., 2023), seeks to improve the accessibility and organization of digital resources. Users' privacy and confidentiality are tackled with the "Markov Approach" proposed by (Zerhoudi et al., n.d.). The approach is implemented with the goal of maintaining profiling efficiency. (Ahmad et al., 2020) introduce "Dr. S.R. Ranganathan's Philosophical Thoughts with the Lean-Startup Method" to boost LIS professionals' competencies in big data analytics aspects. Network Storage challenges find resolution in the "Hierarchical Algorithm based on Page Migration and an Effective Data Security Protection Strategy" proposed by (Zhang et al., 2022). Intelligent data curation, advocated by (Paneva-Marinova et al., 2019), employs "The Process of Validation and verification" to prevent duplication and provide data integrity and accuracy in data retrieval within virtual museums. (Huang et al., 2019) employed a "Fuzzy Comprehensive Assessment Method and a Model for Computing the Value of Assets and the Severity of threats" to mitigate information security risks for digital libraries. The implementation of artificial intelligence in libraries is guided by (Lo, 2023) "Practical AI Policy Recommendations." Data security management is reinforced through a "Security Optimization Strategy and the Network Attached Storage Technology" by (Zhao et al., 2022), while library data management system in Academic Libraries experiences "Algorithmic Transformation" presented by Cano et al. (2019). This comprehensive analysis encapsulates different solutions, providing an interpretation of the contemporary landscape towards sustainable data security in library systems.

Table 2. Key challenges and proposed models in the context of data security in libraries from 2019 to 2023

SL. No.	Title	Challenges	Proposed Models/ Solutions	Authors (Year)
1	Information security: New encryption and decryption methodology based on e-books library used in plain text cryptography	Standardization of eBook	Text Encryption	(Skrobanek et al., 2021)
2	Integrating RFID technology to protect privacy in library	Data Privacy	Protection Algorithm	(Duan, 2020)
3	Read/ write digital libraries for musicology	Data Protection	Hybrid Solution	(Weigl et al., 2020)
4	Study on Library Individualized Information Security under the Background of Big Data	Users' Individual Needs and Potential Information Security Problems of Library Users	Data Encryption/ Decryption Architecture	(Fangjing, 2021)
5	Improving Library Document Resource Management and Data Sharing Through Semantic Web Technology	Categorizing References Based on Research Subject	Enhanced Association Rule Framework	(A et al., 2023)
6	Simulating User Interaction and Search Behaviour in Digital Libraries	Users' Privacy and Confidentiality	Markov Approach	(Zerhoudi et al., n.d.)
7	Librarian's perspective for the implementation of big data analytics in libraries on the bases of lean-startup model	LIS Professionals' Competencies for Big Data Analytics	Dr. S.R. Ranganathan's Philosophical Thoughts with Lean-Startup Method	(Ahmad et al., 2020)
8	Data Migration and Storage Security of University Library	Network Storage System of University Library	Hierarchical Algorithm based on Page Migration and an Effective Data Security Protection Strategy	(Zhang et al., 2022)

SL. No.	Title	Challenges	Proposed Models/ Solutions	Authors (Year)
9	Intelligent data curation in virtual museum for ancient history and civilization	Intelligent Data Curation	The Process of Validation and verification	(Paneva-Marinova et al., 2019)
10	Factor identification and computation in the assessment of information security risks for digital libraries	Information security risks for Digital Libraries	Fuzzy Comprehensive Assessment Method and a Model for Computing the Value of Assets and the Severity of threats	(Huang et al., 2019)
11	AI policies across the globe: Implications and recommendations for libraries	AI Implementation in Libraries	Practical AI Policy Recommenda-tions	(Lo, 2023)
12	Analysis of Data Storage Security Technology in University Library	Data Storage and Security Technology of University Library	Security Optimization Strategy and the Network Attached Storage Technology	(Zhao et al., 2022)
13	A case study of library data management: A new method to analyze borrowing behavior	Library Data Management System in Academic Libraries	Algorithmic Transformation	(Cano et al., 2019)

5. Conclusion

In this study, the trend analysis of data security research revealed a gradual growth. Through keyword co-occurance analysis, six distinct themes emerged,on various aspects of data security in library systems towards sustainability. This study also discovered recent developments in data security in library system by analysing challenges and proposed models. The challenges and proposed models not only shows current state of knowledge but also create room for future research growth. This study indicates the need of sustainable data security activities in libraries in a continuous manner. The implications of the study portrays current practices regarding data security and provides valuable information for researchers, practitioners, and decision-makers in libraries for improved library management

and services. This study has some limitations such as, opting single bibliographic database (Scopus), while more databases can be selected for studies. In addition, this study analysed only publication trend and keyword analysis in terms of bibliometric approach. However, this study offers valuable insights regarding data security in libraries. Future research could be done by exploring more metrics, deeper thematic analysis, and investigating proposed models.

References

1. A, M., R, V., & R, K. (2023). *Improving Library Document Resource Management and Data Sharing Through Semantic Web Technology*. 1373–1380. https://doi.org/10.1109/ICPCSN58827.2023.00230

2. Abdi, A. (n.d.). *Sustainable Provision of Digital Information Systems and Services in Academic Libraries: A Case of the University of Nairobi Library System*.

3. Adams, A., & Ngimwa, P. (2012). Digital Library Sustainability and Design Processes. In P. Zaphiris, G. Buchanan, E. Rasmussen, & F. Loizides (Eds.), *Theory and Practice of Digital Libraries* (pp. 76–88). Springer. https://doi.org/10.1007/978-3-642-33290-6_9

4. Ahmad, K., Jianming, Z., & Rafi, M. (2020). Librarian's perspective for the implementation of big data analytics in libraries on the bases of lean-startup model. In *Digital Library Perspectives: Vol. ahead-of-print*. https://doi.org/10.1108/DLP-04-2019-0016

5. Bender, D. R. (1982). *Impact of technologies on libraries: Response*. 47–56.

6. Cano, L., Hein, E., Rada-Orellana, M., & Ortega, C. (2019). A Case Study of Library Data Management: A New Method to Analyze Borrowing Behavior. In J. A. Lossio-Ventura, D. Muñante, & H. Alatrista-Salas (Eds.), *Information Management and Big Data* (pp. 112–120). Springer International Publishing. https://doi.org/10.1007/978-3-030-11680-4_12

7. Chander, R., Dhar, M., & Bhatt, K. (2022). Bibliometric analysis of studies on library security issues in academic institutions. *Journal of Access Services*, *19*, 1–19. https://doi.org/10.1080/15367967.2022.2118058

8. Duan, L. (2020). Integrating RFID technology to protect privacy in library. *International Journal of RF Technologies*, *11*(1), 15–29. https://doi.org/10.3233/RFT-190190

Mapping 500 Highly Cited Papers in AI for LIS: A Bibliometric Exploration on a Global Scale

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ABSTRACT: This study provides a thorough bibliometric investigation of 500 highly cited articles in the domain of Artificial Intelligence (AI) for Library and Information Science (LIS). The objective of this study is to analyze the most cited publications, annual growth, most prolific authors, country, and organization, the pattern of authorship, and analyses of author keywords to explore research themes. This study utilizes bibliometric methodologies to examine and visually represent the important research landscape on AI in LIS. The analysis shows that the 500 most cited papers collectively received 48333 citations. The average citation per publication was 96.67.2009 received the highest citation with 5883 TC, and 2020 contributed the highest number of research papers with 67 publications. The lowest to highest citations ranged from 35 to 2834 among the most cited papers of 500 AI papers in LIS. The Journal of The American Medical Informatics Association was the leading journal in terms of most publications (TP=110) and citations (TC=10015). Dwivedi YK was the leading author in terms of total publication (TP=9) and total citation (TC=2495), USA was most productive in terms of total publication and total (TP=238) citation (TC=21170), Swansea University was the most cited organization with 2311 TC, USA and China collaborated maximum times in producing 500 most cited papers on AI in LIS with 28 publications. The results offer significant insights for academics, practitioners, and policymakers who are interested in comprehending the dynamic connections between artificial intelligence (AI) and information science. The mapping effort not only enhances comprehension of the present condition of artificial intelligence in library and information science (LIS) but also functions as a valuable asset for future research avenues and cooperative initiatives within this dynamic and swiftly progressing field.

1. Introduction

The convergence of artificial intelligence (AI) with library and information science (LIS) has given rise to significant developments in the ever-evolving landscape of information science, altering the way knowledge is accessible, structured, and distributed. As the subject grows at an exponential rate, a thorough knowledge of its philosophical roots is essential for scholars, practitioners, and policymakers alike (Ali, Naeem and Bhatti, 2020; Rouxel, 2020; Cao, 2021). The field of

library and information science (LIS) has witnessed the emergence of artificial intelligence (AI) as a highly influential entity, fundamentally altering conventional methodologies and presenting novel prospects for scholarly investigation and practical implementation (Ali, Naeem, and Bhatti, 2020; Oyelude, 2021; Lin *et al.*, 2023). The incorporation of artificial intelligence (AI) techniques has had a significant influence on the management and accessibility of information in library and information environments, ranging from automated cataloging systems to intelligent information retrieval. Bibliometrics serves as a quantitative approach for evaluating academic publications, providing a comprehensive framework for assessing the influence and dissemination of research contributions (Chellappandi and Vijayakumar, 2018; Şenel and Demir, 2018). As a quantitative tool for examining academic publications, bibliometrics provides a strong lens through which to analyze the effect and reach of research contributions. The selection of the top 500 highly cited publications serves as a strategic focus point, collecting collective wisdom that has had a substantial impact on the AI-LIS nexus. Through the utilization of a bibliometric methodology, our objective is to identify the most cited papers, the yearly distribution of papers, the most productive authors, organizations, and countries, evaluate author keywords, authorship patterns, and country collaboration in producing the 500 most cited papers in AI in LIS.

2. Literature Review

Goebel et al., (2023) analyzed the 100 most-cited dental fluorosis (DF) articles. The top 100 most-cited papers from 1974 to 2014 had 6,717 citations (35–417). Most publishers were Community Dentistry and Oral Epidemiology (24%), Journal of Dental Research (21%), Journal of Public Health Dentistry (17%), and Caries Research (13%). The majority of research was observational (60%) and literature reviews (19%). Epidemiology (44%) and fluoride consumption (32%) dominated. The US (44%), Canada (10%), and Brazil (9%) had the most papers. The US University of Iowa produced the most documents (12%). Most prolific author Levy SM wrote 12% of papers. North American epidemiological observational studies dominated the 100 most-cited DF papers. Interventional studies and systematic reviews were few in the most-cited literature.

Rocha *et al.*, (2022) examined 100 most-cited erosive tooth wear papers from the Web of Science database. Vosviewer is used to create collaborative author and keyword network maps. The 100 most-cited publications have 71–330 citations (average: 97.44). The papers were published 1949–2015. Caries Research (28%) and The Journal of Dentistry (16%) provided most studies. The most prevalent study designs were laboratory (44%) and observational (33%). Epidemiology

(31%) and substance erosive potential (22%), the most investigated issues, were. The most-cited papers were from England (32%), Germany (18%), and Switzerland (10%). The University of Bern has 10% of the papers. The top 100 authors with the most articles was Lussi A (14%). The keyword "dental erosion" was most prevalent with 64 occurrences. Laboratory and observational epidemiology and substance erosiveness research dominated the top 100 ETW articles.

Baldiotti *et al.*, (2021) examined the 100 most-cited Cariology publications. Web of Science citation indexing database was searched for the required data. The Vosviewer program generated bibliometric networks. The top 100 most-cited publications have 168 to 1,961 citations, averaging 292,66. Three publications were cited over 1,000 times. Journal of Dental Research (20%) and Caries Research (17%) had more top papers. The earliest and latest publications were published in 1960 and 2015. The most prevalent study designs were literature reviews (35%) and laboratory (31%). Most-cited papers came from the US (40%), Sweden (10%), and Japan (9%). Most research focused on etiology/pathogenesis (41%), and prevention (20%). Vosviewer maps showed country-organization collaboration. The top 100 most-cited cariology publications were mostly literature reviews on etiology/pathogenesis by European and Anglo-Saxon American writers.

Teh and Heard, (2021) evaluated the 500 most cited papers in Computer science publications from January 2013 to December 2017 through the Web of Science database and analyzed them to identify patterns, correlations, and shared characteristics. The 500 papers have accumulated a total of 10,926 citations, resulting in an average of 21.82 citations per paper. The number of citations is found to be associated with the credibility of the authors, assessed through the QS University Ranking of the first named author's affiliation. Notably, authors affiliated with more than 350 universities tend to receive higher levels of referencing. Furthermore, the ranking of the journal in which a publication appears has also been found to correlate with the number of authors and the length of the article. Interestingly, journals with higher rankings tend to have more authors but shorter articles. Additionally, the rankings of the initial author's affiliated institution and the number of authors involved also impact the length of the article.

Asiri, Kruger and Tennant, (2021) eexamined the top 100 dental papers that have received the most citations. The publications were found using an unrestricted language and design literature search on Elsevier's Scopus. The chosen articles showcase contributors and trends, with citation counts ranging from 638 to 4728. The decade of the 2000s stands out as the most prolific, with Marx RE and Socransky SS playing significant roles. 26% of the papers are periodontology-related, and nearly half are written in the USA. The Journal of Dental Research is

a well-known journal. The bulk of papers come within evidence level V, although 36% of publications are narrative reviews or expert opinions. This highlights the necessity to carefully evaluate citation count when assessing the quality of research. This research offers insightful information about contemporary dental citation pattern.

Sun and Yuan, (2020) analyzed the foremost LIS publications that were published from 2009 to 2019 using web of science which consisted of 499 highly cited articles and 16 hots. The study provides an overview of the document type, language, scientific output, and journal publishing distributions. Additionally, the Vosviewer program was employed to visualize the networks of authorship, organization, and country co-authorship, as well as keyword co-occurrence. It is worth noting that all 501 articles were written in English by a total of 1,579 authors affiliated with 680 organizations from 59 countries/territories. These publications were featured in 40 different field journals. Furthermore, the analysis of all keywords led to the identification of six research groupings.

Panagopoulos *et al.*, (2020)evaluated the top 100 most-cited publications on brain metastases. Research data were retrieved from the Web of Science. The search yielded a total of 11,579 articles that were published between 1975 and the present day. The article by Patchell et al. that has been referenced the most was published in 1990, and it has a total of 1862 citations, with an annual average of 62.07 citations. In contrast, the paper by Gaspar et al. that came in last place on our list was published in 2010, and it has a total of 195 citations, with an annual average of 19.50 citations. The United States (with 75 records) and Canada (16 records) were the two countries that had the most publications that were referenced by other researchers.

Senthamilselvi A, (2020) analyzed highly cited papers on covid-19 between 1989 and 2020. These publications have garnered an average of 227,766 citations per article, with a total of 51,830 cited references. A remarkable 72 nations have contributed to this body of work, collectively submitting 1,000 highly cited research papers, which in turn have received a total of 227,766 citations. Notably, the United States has emerged as the nation with the highest number of citations, amassing 86,603 citations across 432 articles. China closely follows the United States with 83,829 citations spread across 280 publications, while the United Kingdom has accumulated 29,372 citations from 122 publications. Other nations such as the Netherlands, Germany, Canada, France, and Saudi Arabia also rank among the top eight nations with citations exceeding 10,000. In contrast, India has garnered 500 citations. Among the institutions contributing to this vast body of literature, the University of Hong Kong stands at the forefront with 28,278

citations, followed by the Chinese Academy of Sciences with 14,513 citations. Additionally, the Huazhong University of Science & Technology and Wuhan University have received 12,294 and 10,392 citations, respectively. Within the realm of academic journals, LANCET emerges as the publication with the highest number of citations, totaling 22,221 across 249 journals. The 'Journal of Virology' follows closely behind with 22,039 citations. 'The NEW ENGLAND JOURNAL OF MEDICINE' has received 21,213 citations, while 'PNAS' has garnered 11,216 citations. Two prominent periodicals, Nature and Science, have been cited 9,639 and 9,613 times, respectively. It is noteworthy that recently released scientific publications, particularly those focused on methods, have garnered significant attention and citations. For instance, the paper titled "Clinical characteristics of 2019 new coronavirus cases in Wuhan, China" by Huang CL, Wang YM, Li XW, Ren LL, Zhao JP, et al, has accumulated an impressive 3,915 citations. This paper was published in the Lancet on February 15, 2020 (395 [10223]: 497-506). Among Chinese institutions, the University of Hong Kong has received the most citations with 28,278, followed closely by the Chinese Academy of Sciences with 14,513 citations.

Tarazona *et al.*, (2018) evaluated the top 100 orthodontic papers that have been referenced between 1946 and 2016 that are included in the "Dental, Oral Surgery and Medicine" Web of Science category. Using the abbreviated search phrase "orthodon*," one hundred articles were found in the ISI Web of Science and Journal Citation Reports database. Manual refinement and normalization of the records were done to remove typographical, transcriptional, and/or indexing mistakes and to harmonize words. The 100 most referenced papers ranged in citation count from 115 to 881, and they were published between 1946 and 2012. Three writers published four works, compared to 87.65% of the 251 authors that took part. Although the University of Oslo published the greatest number of often-mentioned papers, the majority of authors with multiple citations were from the United States. Mini-implants were the most often mentioned subject, and the majority of the papers were clinical investigations. It was mentioned that bias in bibliometric analysis may arise from self-citation.

Nadri *et al.*, (2017)examined the top 100 referenced medical informatics publications from Thomson Reuters' Web of Science (WOS) in October 2016. We collected data using two methods: first, we included articles from 24 journals in the "Medical Informatics" category, and second, we searched for articles using keywords such as "informatics", "medical informatics", "clinical informatics", and "health informatics". After deleting duplicates, papers were ordered by citations. After identifying the 100 most cited publications, we collected all WOS database

citations, year of publication, journal, author names, authors' affiliation, country of origin, and themes indexed for each record. For the top 100 publications, citations varied from 346 to 7875 and 11.12 to 525 per year. Most articles were published in the 2000s (n=43) and 1990s (n=38). Many articles were published in 10 journals, including Statistics in medicine (n=71) and Medical decision making (n=28). The papers averaged 2.47 authors. The most popular topic was statistics and biostatistics modeling (n=71), followed by artificial intelligence (12) and medical mistakes (3). Other themes included data mining, diagnostics, bioinformatics, information retrieval, and medical imaging.

Cohen *et al.*, (2016) examined the 100 most cited metastatic spine disease. The result shows that Citations varied from 74 to 1169 for the last 100 articles. Finalist articles were published between 1940 and 2009. The most top-100 papers were published between 1990 and 2005, while the most citations happened in 2012. Most publications were published in Spine (15), Cancer (11), and Neurosurgery (9). In the top 100 rankings, 44 people were authors on 2 papers, 9 on 3 articles, and 2 on 4 articles. Batson's 1940 essay on vertebral veins and metastasis was the most referenced (1169 citations). Patchell's 2005 work on spinal cord metastasis decompression (594 citations) was the second most referenced. Gilbert's 1978 work on metastatic tumor-induced epidural spinal cord compression was the third most referenced (560 citations).

3. Research Objectives

- To identify the most cited papers in the field of Artificial Intelligence (AI) in Library and Information Science (LIS).
- To examine the distribution and trends of the identified papers in terms of publication year, Source, Prolific authorship, Authorship Pattern, high-yielded organization, and country.
- To identify the leading author keywords to explore the thematic focus of the most cited papers in AI in LIS
- To examine country collaboration in producing the most cited papers in AI in LIS.

4. Research Methodology

The present study employed bibliometric methods to map and visualize the 500 most cited papers in AI in LIS. In the realm of academic research, bibliometric study has gained significant prominence for its ability to analyze patterns and trends within the scientific literature. This methodological approach involves

the quantitative assessment and analysis of bibliographic data, allowing researchers to gain valuable insights into the impact and influence of scholarly publications. The Web of Science database was utilized for the data retrieval. The Web of Science is a comprehensive research database that offers access to a vast collection of academic journals, conference proceedings, and scientific literature across various disciplines. It provides researchers, scholars, and students with a powerful tool for discovering, analyzing, and tracking scholarly publications, citations, and trends within the scientific community. The publications were searched in the web of science using this (TS=”artificial intelligence” OR”AI” OR “machine learning” OR”expert system*” OR”intelligent retrieval” OR”robotics”) search strategy, which was then refined by highly cited documents, and then 500 most-cited papers were downloaded. The research data were analyzed using different bibliometric software such as Vosviewer (van Eck and Waltman, 2010), Bibexcel, and Biblioshiny (Hassan, Alshater, and Atayah, 2021).

5. Result and Discussion

Table (1) shows the main information about the data on the 500 most cited publications in AI in LIS. The dataset on artificial intelligence (AI) within the field of Library and Information Science (LIS) encompasses a significant timeframe spanning from 1985 to 2023. It has been compiled from a wide range of 60 distinct sources, comprising both scholarly journals and books. This comprehensive collection comprises a total of 500 documents. The citations ranged from 35 to 2834 among the 500 most cited papers in AI in LIS. The article entitled “Expert Systems and intelligent information retrieval” by Brook H (1987) received the lowest citation (TC=35) while “A systematic analysis of performance measures for classification tasks” by Sokolova et al. (2009), with the highest total of 2834 citations. The aforementioned publications have received a substantial total of 48,333 citations, indicating their noteworthy importance and impact within the field. The absence of an annual growth rate indicates a consistent and unchanging pattern in publishing frequency. The average age of the papers inside this dataset is 10.2 years, which indicates the historical and dynamic character of artificial intelligence in library and information science research. Remarkably, the average number of citations per document is 96.67, underscoring the significant scholarly influence of each citation. Furthermore, it is noteworthy to mention that the number of references contained inside these papers totals 28,679, which serves as a testament to the extensive study conducted within the dataset. The incorporation of 1,094 Keywords Plus and 1,459 Author’s Keywords enhances the comprehension of the subjects addressed. The present corpus encompasses a substantial collection

of scholarly works, which encompasses the collaborative efforts of 1,631 authors. Among these authors, 70 individuals have produced singular papers, amounting to a total of 77 such publications. The average number of co-authors per document is 3.79, highlighting the collaborative aspect of research within this field. In addition, it is worth noting that 31.4% of the co-authorships observed in the dataset exhibit a worldwide collaboration, highlighting the extensive global reach and collaborative endeavors in the domain of Library and Information Science research, particularly in the field of AI.

Table (1): Main information about the data on AI Papers in LIS

Description	Results
Timespan	1985:2023
Sources (Journals, Books, etc)	60
Documents	500
Total citations	48333
Annual Growth Rate %	0
Document Average Age	10.2
Average citations per doc	96.67
References	28679
Keywords Plus (ID)	1094
Author's Keywords (DE)	1459
Authors	1631
Authors of single-authored docs	70
Single-authored docs	77
Co-Authors per Doc	3.79
International co-authorships %	31.4

5.1 Yearly growth of 500 most cited publications trends on AI publication in LIS

Table (2) shows the yearly growth and citation trends of the 500 most cited papers on AI publication in LIS between 1985 and 2023. It was found that among the 500 most cited papers in AI in LIS, 1985 published the first paper with 50 citations. The table reveals that there was single-digit research publication during 1985-2008 except in 1996 with 10 publication and 2006 with 11 publication. The analysis shows that since 2009 double-digit research has been produced and there has been a continuous increase in publications from 2009 to 2022. The year 2020 published the highest number of most cited research in the field with 67 publications and 5473 citations, followed by 2019 with 50 publications and 4824

citations, 2021 with 42 publications and 3885 citations, and 2009 and 2016 with 24 publications respectively. 1985, 1992, 2001, and 2023 were the least productive years of most cited papers with a single publication each. As per the most cited year, 2009 contributed the highest number of citations among the 500 most cited papers in AI in LIS with 5883 citations, followed by 2020 with 5473 citations and 2019 with 4824 citations.1985 was the least productive as well as least cited year among the 500 most cited papers in AI in LIS. 2009, 2001, and 2002 have the highest average citation per publication with 245.13, 224.00, and 181.13 TC/TP.

Table (2): Yearly growth of 500 most cited publications trends on AI publication in LIS between 1985 and 2023

Year	TP	TC	TC/TP	h-index
1985	1	50	50.00	1
1986	2	165	82.50	2
1987	4	178	44.50	4
1990	2	111	55.50	2
1991	6	366	61.00	6
1992	1	166	166.00	1
1993	7	584	83.43	7
1994	5	474	94.80	5
1995	6	583	97.17	6
1996	10	821	82.10	10
1997	5	373	74.60	5
1998	7	435	62.14	7
1999	4	428	107.00	4
2000	6	545	90.83	6
2001	1	224	224.00	1
2002	8	1449	181.13	8
2003	5	452	90.40	5
2004	7	329	47.00	7
2005	5	278	55.60	5
2006	11	972	88.36	11
2007	8	868	108.50	8
2008	6	648	108.00	6
2009	24	5883	245.13	24

Year	TP	TC	TC/TP	h-index
2010	11	1847	167.91	11
2011	18	2404	133.56	18
2012	16	1873	117.06	16
2013	17	980	57.65	17
2014	19	1572	82.74	19
2015	11	895	81.36	11
2016	24	1600	66.67	24
2017	19	1396	73.47	19
2018	47	3901	83.00	40
2019	50	4824	96.48	41
2020	67	5473	81.69	47
2021	42	3885	92.50	38
2022	17	1163	68.41	17
2023	1	138	138.00	1

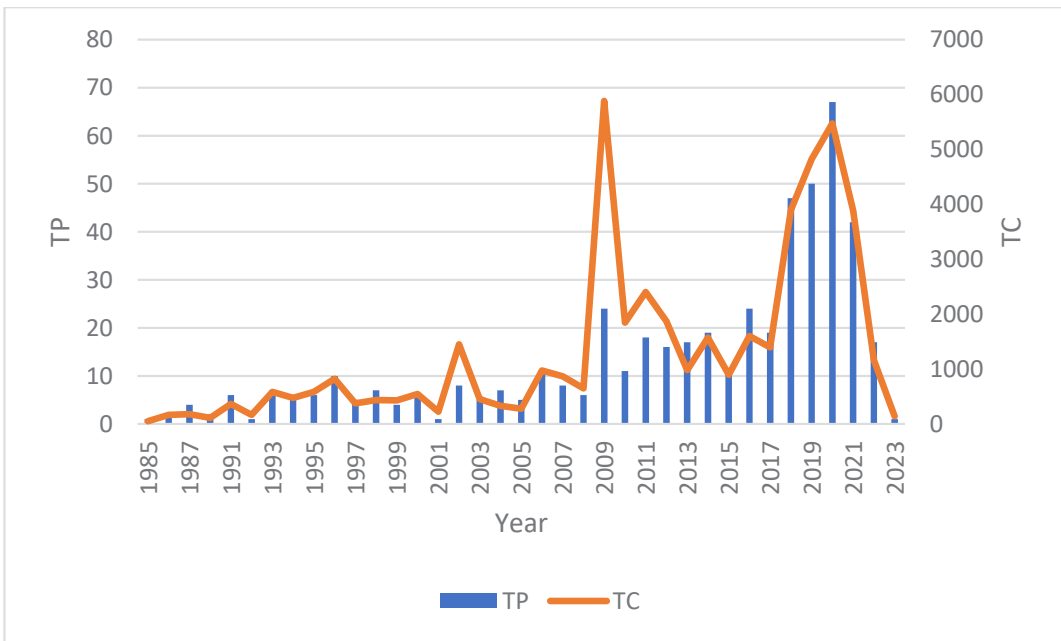


Figure (1): Yearly growth of 500 most cited publications trends on AI publication in LIS

5.2 Prolific authors of 500 Most cited papers on AI in LIS

Table (3) evaluated the top ten most prolific authors among the 500 most cited papers on AI in LIS. Dwivedi YK was the most productive author with 9 publications and 2495 citations, followed by Uzuner O with 8 publications and 1539 citations, Xu H with 7 publications and 782 citations, Chatterjee S, and Chen Y with 6 publications each and 368 and 614 citations respectively. Chen H, Chen HC, and Cheng X were the least productive among the top ten authors in the list with 4 publications each. As far as the average citation per publication, Duan Y has the highest TC/TP with 363.60, followed by Dwivedi YK with 277.22 TC/TP, and Uzuner O with 192.38 TC/TP.

Table (3): Top 10 Most Prolific authors of 500 Most cited papers on AI in LIS

Rank	Element	TP	TC	TC/TP	h_index
1	Dwivedi YK	9	2495	277.22	9
2	Uzuner O	8	1539	192.38	8
3	Xu H	7	782	111.71	7
4	Chatterjee S	6	368	61.33	6
5	Chen Y	6	614	102.33	6
6	Denny JC	5	367	73.40	5
7	Duan Y	5	1818	363.60	5
8	Chen H	4	333	83.25	4
9	Chen HC	4	274	68.50	4
10	Cheng X	4	274	68.50	4

5.3 Pattern of Authorship of 500 most cited papers in AI in LIS

Figure (2) shows the Pattern of Authorship of the 500 most cited papers in AI in LIS. The figure reveals that the range of authorship is between single to 66th. Three authorships contributed the highest number of publications with 117 papers and 10665 citations, followed by Two authorships with 108 publications and 12288 citations, Four authorships with 85 publications and 6643 citations, and one authorship with 77 publications and 6895 citations. 15, 20, 30, 34, 49, and 66 authorship were the least productive pattern with one publication each. The analysis reveals that Two authorship received the highest number of citations with 12288 TC, followed by Three authorship with 10665 TC and Singe authorship contributed 6895 citations. As far as the average citation per publication in the

authorship patter, 30 Authorships received the highest TC/TP with 631.00, and 20 authorships received the lowest average citation per publication with 40 TC/TP.

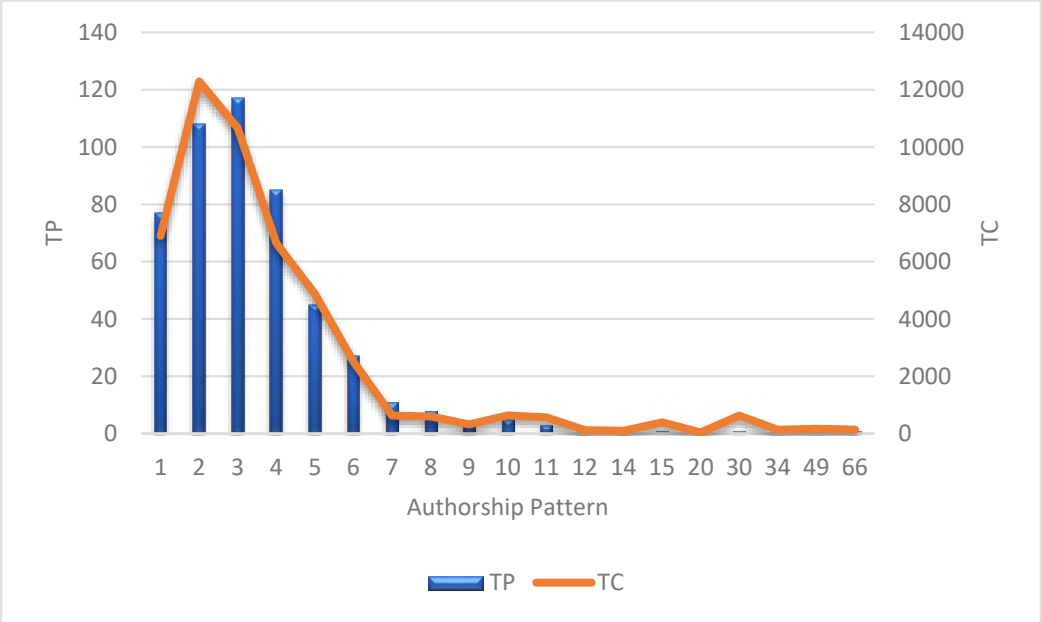


Figure (2): Pattern of Authorship of 500 most cited papers in AI in LIS

5.4 Productive Sources of 500 Most cited papers on AI in LIS

Table (4) presents the top 10 most productive sources that hold significant influence in the domain of Artificial Intelligence in Library and Information Science (LIS). The "Journal of The American Medical Informatics Association" holds the top position in terms of ranking, having published a total of 110 publications that have garnered a cumulative citation count of 10,015. On average, each paper in this journal has received 0.011 citations, followed by Information Processing & Management with 73 publications and 7846 citations, International Journal of Information Management with 51 publications and 6781 citations, International Journal of Geographical Information Science with 22 publications, and 1682 citations, and Mis Quarterly with 20 publications and 2286 citations. Journal of Information Science was the least productive in the list with 12 publications and 1017 citations. The provided information has significant value for academics and professionals as it enables them to effectively identify prominent journals within their respective fields and assess their influence and significance within the scholarly community.

Table (4): Top 10 Most Productive Sources of 500 Most cited papers on AI in LIS

Rank	Source	NP	TC	TC/TP	h_index
1	Journal of The American Medical Informatics Association	110	10015	0.011	58
2	Information Processing & Management	73	7846	0.009	47
3	International Journal of Information Management	51	6781	0.008	44
4	International Journal of Geographical Information Science	22	1682	0.013	22
5	Mis Quarterly	20	2286	0.009	20
6	Ethics and Information Technology	17	1444	0.012	17
7	Journal of the American Society for Information Science and Technology	16	3466	0.005	16
8	Government Information Quarterly	14	1368	0.010	14
9	Scientometrics	13	752	0.017	13
10	Journal of Information Science	12	1017	0.012	12

5.5 Bibliographic coupling of Organizations

Figure (3) and Table (5) demonstrate productive organization most 500 most cited papers in AI in LIS. A minimum of five documents from an organization and zero citations were set as the criteria for inclusion in the analysis. Out of the initial pool of 701 organizations, only 27 met these thresholds. The selected 27 organizations were clustered into three groups. The analysis reveals that Vanderbilt University, USA was the most productive organization with 15 publications and 1254 citations, followed by MIT, USA, and Stanford university, USA with 12 publications each. Columbia University and the University of Arizona from the USA contributed 9 publications each with 734 and 536 citations respectively. Copenhagen Business School, Loughborough University

Mayo Clinic, national university of Singapore, New York University, Penn state Univ, University of Florida, University of Melbourne, University of Twente, and University of Wolverhampton were the least productive organizations with 5 publications each. Swansea University, USA received the highest citation among the top 27 organizations with 2311 citations while the National University of Singapore received the least citation in the list with 271 citations. The analysis also reveals that organizations from the USA and UK were the most productive in the fields.

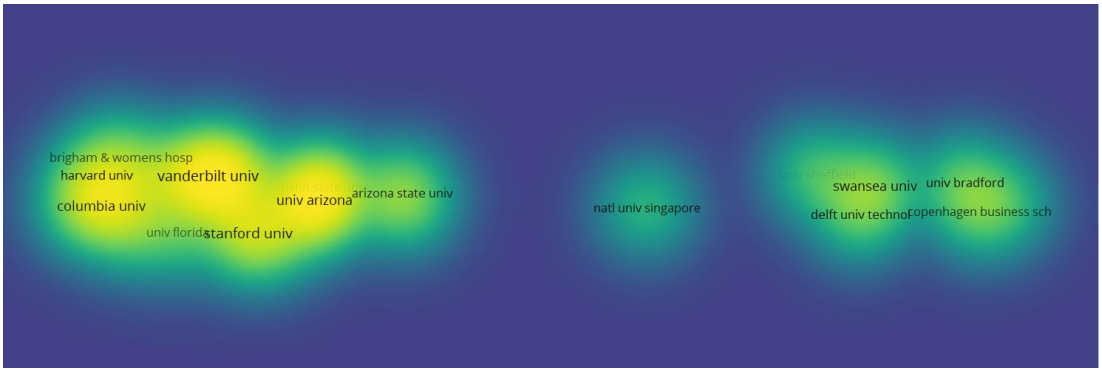


Figure (3): Bibliographic coupling of the organization; 5 Minimum number of papers of an organization: Generated by Vosviewer software

Table (5): Top productive organization on AI paper in LIS

Rank	Organization	Country	TP	TC	cluster	TC/TP	cluster
1	Vanderbilt University	USA	15	1254	1	83.60	1
2	MIT	USA	12	949	2	79.08	2
3	Stanford university	USA	12	964	1	80.33	1
4	Columbia university	USA	9	734	2	81.56	2
5	University of Arizona	USA	9	536	1	59.56	1
6	Suny Albany	USA	8	1539	2	192.38	2
7	Swansea university	USA	8	2311	3	288.88	3
8	Harvard university	USA	7	581	2	83.00	2
9	Arizona state university	USA	6	595	1	99.17	1
10	Brigham and Women's Hospital	USA	6	325	2	54.17	2
11	Chinese Academy of Science	China	6	459	1	76.50	1
12	Delft univ technol	UK	6	1086	3	181.00	3
13	University of Bradford	UK	6	1557	3	259.50	3
14	University of British Columbia	Canada	6	654	1	109.00	1
15	University of Michigan	USA	6	523	1	87.17	1

Rank	Organization	Country	TP	TC	cluster	TC/TP	cluster
16	university of Sheffield	UK	6	873	3	145.50	3
17	University of Utah	USA	6	886	2	147.67	2
18	Copenhagen Business School	Denmark	5	1372	3	274.40	3
19	Loughborough University	UK	5	1261	3	252.20	3
20	Mayo Clinic	USA	5	451	2	90.20	2
21	national university of Singapore	Singapore	5	271	3	54.20	3
22	New York University	USA	5	370	1	74.00	1
23	Penn state univ	USA	5	622	1	124.40	1
24	Univ Florida	USA	5	489	2	97.80	2
25	University of Melbourne	Australia	5	479	2	95.80	2
26	University of Twente	Netherland	5	394	1	78.80	1
27	University of Wolverhampton	UK	5	2049	1	409.80	1

5.6 Bibliographic coupling of countries

Figures (4) and Table (6) examined the productive countries of the 500 most cited papers of AI in LIS. Minimum of 5 documents from the country were considered for the analysis. Out of 64 counties, 30 countries met the criteria, and all the 30 countries were grouped in 3 clusters as shown in the figure (4). The table shows that the USA was the leading productive country with 238 publications and 21170 citations, followed by China with 58 and 4475 citations, England with 54 publications with 7190 citations, India with 32 publications and 3712 citations, and Australia with 30 publications and 3374 citations. Malaysia was the least productive in the list with 5 publications and 661 citations. USA, England, Canada, China, and India most cited countries with 21170, 7190, 5531, 4475, and 3712 citations respectively. New Zealand was the least cited country with 380 citations for 6 publications. The analysis reveals that Denmark and Wales have high average citation values, indicating a strong impact per publication.

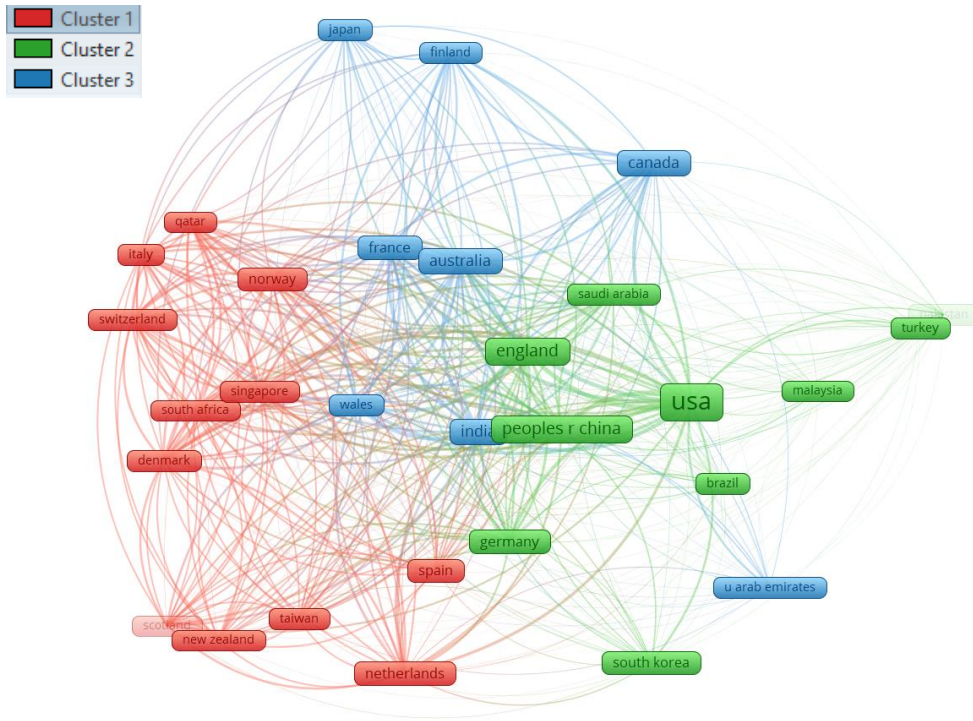


Figure (4): Bibliographic coupling of Country; 5 Minimum number of papers of a country: Generated by Vosviewer software

Table (6): Top productive country on AI paper in LIS

Rank	Country	Continent	TP	TC	TC/TP	cluster
1	USA	North America	238	21170	88.95	2
2	peoples r china	Asia	58	4475	77.16	2
3	England	Europe	54	7190	133.15	2
4	India	Asia	32	3712	116.00	3
5	Australia	Australia	30	3374	112.47	3
6	Canada	North America	30	5531	184.37	3
7	Netherlands	Europe	23	2619	113.87	1
8	France	Europe	20	1723	86.15	3
9	Germany	Europe	20	2988	149.40	2
10	south Korea	Asia	14	1280	91.43	2
11	Spain	Europe	13	980	75.38	1
12	Norway	Europe	12	1138	94.83	1

Rank	Country	Continent	TP	TC	TC/TP	cluster
13	Denmark	Europe	11	2180	198.18	1
14	Finland	Europe	11	1211	110.09	3
15	Turkey	Asia	11	1201	109.18	2
16	wales	Europe	11	2622	238.36	3
17	Singapore	Asia	10	763	76.30	1
18	Pakistan	Asia	9	428	47.56	2
19	Taiwan	Asia	9	735	81.67	1
20	Brazil	South America	8	814	101.75	2
21	Saudi Arabia	Asia	8	811	101.38	2
22	Switzerland	Europe	8	765	95.63	1
23	UAE	Asia	8	488	61.00	3
24	Italy	Europe	7	625	89.29	1
25	japan	Asia	7	484	69.14	3
26	New Zealand	Australia	6	380	63.33	1
27	Qatar	Asia	6	531	88.50	1
28	Scotland	Europe	6	1018	169.67	1
29	south Africa	Africa	6	714	119.00	1
30	Malaysia	Asia	5	661	132.20	2

5.7 Analysis of author keywords

The term "co-occurrence of author keywords" pertains to the occurrence of two or more distinct keywords in the metadata of scholarly publications. This type of analysis assists in bibliometrics and information retrieval in identifying associations and relationships between various concepts or themes in a body of literature. A minimum of 5 author keywords were considered for the analysis. Out of 1345 author keywords, 39 keywords met the criteria. The selected 39 keywords were groped in 5 clusters, and each cluster represented a particular research theme which is shown in Figure (4) with different colors.

Cluster 1 (AI in the context of COVID-19): Comprised of 11 author keywords namely blockchain, COVID-19, decision support systems, expert systems, information systems, information technology, knowledge management, knowledge-based systems, neural networks, supervised machine learning, and trust.

Cluster 2 (AI in the context of data analysis): Consists of 9 author keywords such as big data analytics, classification, data mining, feature selection, machine

learning, opinion mining, sentiment analysis, social media, and text mining

Cluster 3(AI in the context of Healthcare ethics): composed of 8 keywords i.e. ai, artificial intelligence, artificial intelligence (ai), ethics, healthcare, research agenda, robotics, systematic literature review

Cluster 4 (AI in the context of retrieval of healthcare data): consists of 6 keywords such as clinical decision support, electronic health records, information extraction, information retrieval, named entity recognition, and natural language processing.

Cluster 5 (A in the context of big data analytics): This cluster includes 5 author keywords namely big data, convolutional neural network, deep learning, text classification, and topic modeling.

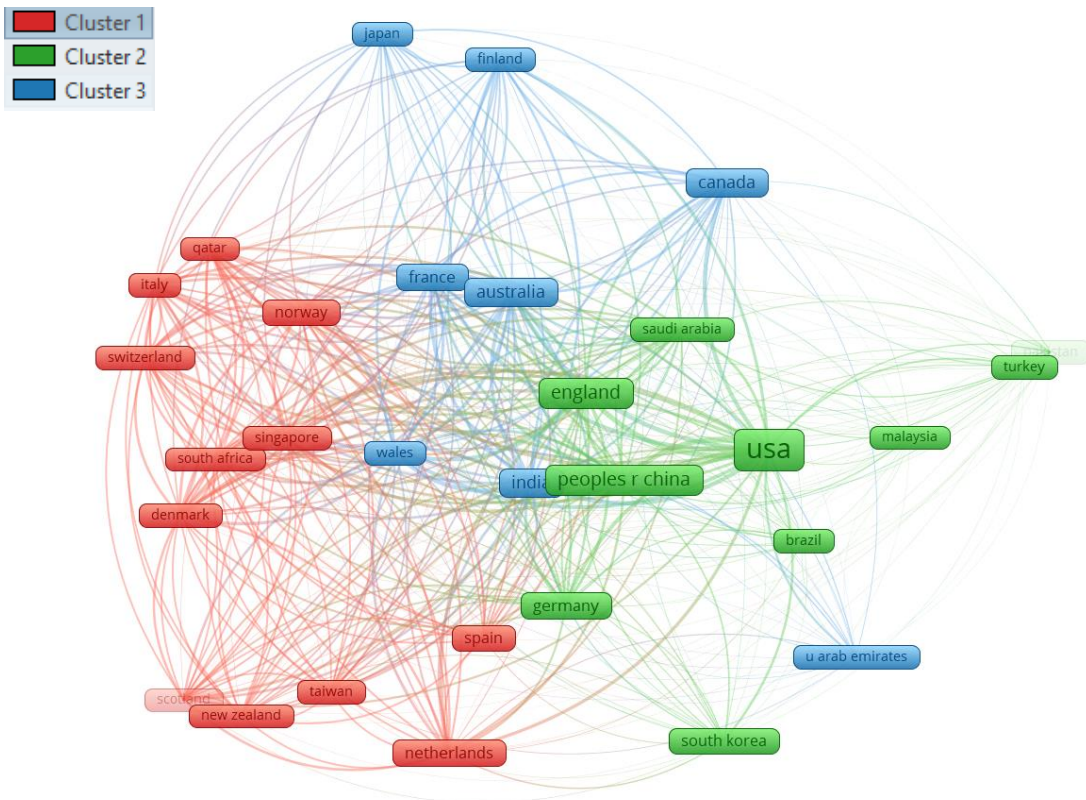


Figure (4): Co-Occurrence of Author keywords; 5 Minimum number of keywords considered for the analysis: Generated by Vosviewer software

5.8 Most cited papers on AI in LIS

Table (7) demonstrates the top ten 10 cited papers on AI in LIS. The analysis shows that among the 500 most cited papers, "A systematic analysis of performance measures for classification tasks" by Sokolova et al. (2009), with a remarkable total of 2834 citations, followed by "Sentiment Strength Detection in Short Informal Text" by Thelwall's (2010) with 992 citations, "A survey of modern authorship attribution methods" by Stamatatos E (2009) with 712 citations, "Artificial intelligence for decision making in the era of Big Data – evolution, challenges and research agenda" by Duan Y (2019) with 637 citations and "Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy" by Dwivedi Yk, (2021) with 631 citations." Setting the future of digital and social media marketing research: Perspectives and research propositions" by Dwivedi Yk (2021) was the least cited paper among the top ten list with 395 citations. These papers collectively represent seminal contributions in areas such as classification tasks, sentiment analysis, authorship attribution methods, and the evolving landscape of artificial intelligence-occurrence of author keywords refers to the phenomenon where two or more specific keywords appear together in the metadata of scholarly publications. In the context of bibliometrics and information retrieval, this type of analysis helps identify relationships and associations between different concepts or themes within a body of literature.

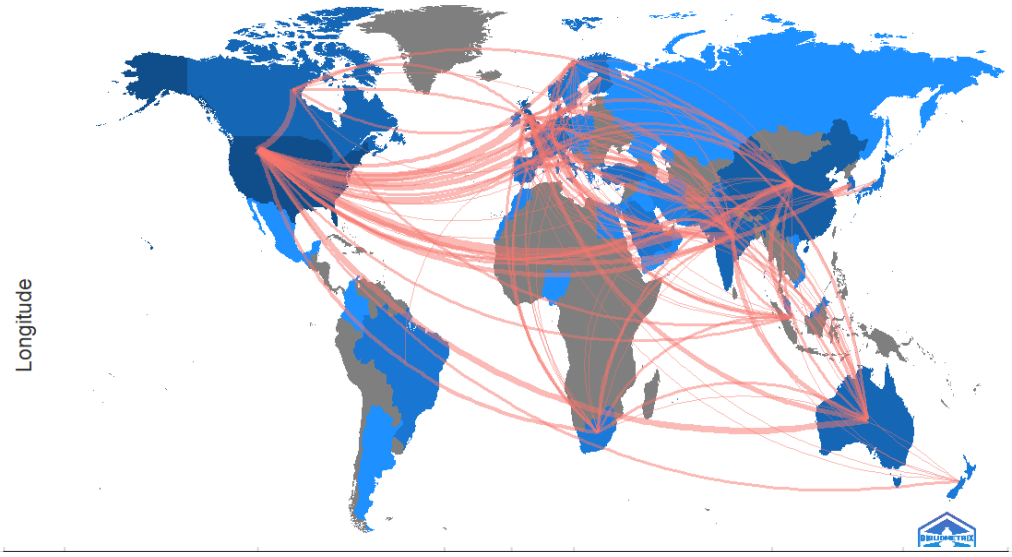
Table (7): Top 10 Most cited papers on AI in LIS

TC	Title	Autor, Year & Source	TC per Year	Normalized TC
2834	A systematic analysis of performance measures for classification tasks	Sokolova M, 2009, Inf Process Manage	188.93	11.56
992	Sentiment strength detection in short informal text	Thelwall M, 2010, J Am Soc Inf Sci Technol	70.86	5.91
712	A survey of modern authorship attribution methods	Stamatatos E, 2009, J Am Soc Inf Sci Technol	47.47	2.9
637	Artificial intelligence for decision making in the era of Big Data – evolution, challenges and research agenda	Duan Y, 2019, Int J Inf Manage	127.4	6.6

TC	Title	Autor, Year & Source	TC per Year	Normalized TC
631	Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy	Dwivedi Yk, 2021, Int J Inf Manage	210.33	6.82
613	Sentiment strength detection for the social web	Thelwall M, 2012, J Am Soc Inf Sci Technol	51.08	5.24
573	2010 i2b2/VA challenge on concepts, assertions, and relations in clinical text	Uzuner O, 2011, J Am Med Inf Assoc	44.08	4.29
531	Natural language processing: an introduction	Nadkarni Pm, 2011, J Am Med Inf Assoc	40.85	3.98
455	A Design Theory for Systems That Support Emergent Knowledge Processes	Markus Ml, 2002, Mis Q	20.68	2.51
395	Setting the future of digital and social media marketing research: Perspectives and research propositions	Dwivedi Yk, 2021, Int J Inf Manage-A	131.67	4.27

5.9 Country collaboration of 500 Most cited papers on AI in LIS

Figure (5) evaluated the country collaboration of the 500 most cited papers on AI in LIS. It was found that the authors of the USA and China collaborated most times in producing the most cited papers on AI in LIS with 28 publications, followed by the USA and UK with 19 publications, the UK with India, and the USA with Canada published 13 publications each, and USA and Australia published with 12 publications. China and India were the least top ten collaborated countries with 7 publications. This map suggests the strength and frequency of collaborative efforts in the development of AI technologies related to Library and Information Science, with the USA being a prominent collaborator with several countries namely the UK, China, India, Canada, Australia, and Germany.



Rank	From	To	Freq	Rank	From	To	Freq
1	USA	CHINA	28	6	USA	GERMANY	9
2	USA	UNITED KINGDOM	19	7	CHINA	SINGAPORE	8
3	UNITED KINGDOM	INDIA	13	8	UNITED KINGDOM	AUSTRALIA	8
4	USA	CANADA	13	9	USA	INDIA	8
5	USA	AUSTRALIA	12	10	CHINA	INDIA	7

Figure (5): Country collaboration map of 500 most cited papers on AI in LIS

Conclusion

In conclusion, this bibliometric exploration of 500 highly cited papers in the field of Artificial Intelligence for Library and Information Science has provided a comprehensive understanding of the research landscape. The analysis revealed key insights into the most cited publications, annual growth patterns, prolific authors, countries, organizations, authorship trends, and research themes. The collective citation count of 48,333 with an average of 96.67 citations per publication underscores the significant impact of these papers. The article entitled "Expert systems and intelligent information retrieval" by Brook H (1987) received the lowest citation (TC=35) while "A systematic analysis of performance measures for classification tasks" by Sokolova et al. (2009), with the highest total of 2834 citations among the 500 most cited papers. The prominence of the Journal of The American Medical Informatics Association, the leading role of authors like Dwivedi

YK, and the productivity of the USA and China in collaboration demonstrate the global nature of AI research in LIS. The mapping effort not only contributes to our current comprehension of the intersection between artificial intelligence and information science but also serves as a valuable resource for future research directions and collaborative initiatives in this rapidly evolving field. These findings are particularly beneficial for academics, practitioners, and policymakers seeking to navigate the dynamic connections between AI and information science. As we move forward, the insights gained from this study will undoubtedly inform and inspire further advancements, fostering continued growth and innovation at the intersection of AI and LIS.

Reference

1. Ali, M. Y., Naeem, S. Bin and Bhatti, R. (2020) 'Artificial intelligence tools and perspectives of university librarians: An overview', *Business Information Review*, 37(3), pp. 116–124. doi: 10.1177/0266382120952016.

2. Asiri, F. Y., Kruger, E. and Tennant, M. (2021) 'The Top 100 Most Cited Articles Published in Dentistry: 2020 Update', *Healthcare*, 9(3). doi: 10.3390/healthcare9030356.

3. Baldiotti, A. L. P. *et al.* (2021) 'The Top 100 Most-Cited Papers in Cariology: A Bibliometric Analysis', *Caries Research*, 55(1), pp. 32–40. doi: 10.1159/000509862.

4. Cao, L. (2021) 'Artificial intelligence in retail: applications and value creation logics', *International Journal of Retail & Distribution Management*, 49(7), pp. 958–976. doi: 10.1108/IJRDM-09-2020-0350.

5. Chellappandi, P. and Vijayakumar, C. S. (2018) 'Bibliometrics, Scientometrics, Webometrics / Cybermetrics, Informetrics and Altmetrics - An Emerging Field in Library and Information Science Research', *International Journal of Education*, 7(1), pp. 5–8. Available at: http://www.shanlaxjournals.in.

6. Cohen, J. *et al.* (2016) 'The 100 most cited articles in metastatic spine disease', *Neurosurgical Focus*, 41(2), p. E10. doi: 10.3171/2016.5.FOCUS16158.

7. van Eck, N. J. and Waltman, L. (2010) 'Software survey: VOSviewer, a computer program for bibliometric mapping', *Scientometrics*, 84(2), pp. 523–538. doi: 10.1007/s11192-009-0146-3.

A Website Analysis of Selected State University Library Portals of Assam

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ABSTRACT: Library websites are a reflection of the institution; they showcase its mission, programmes, services, and all other aspects of the institution and its staff. Any type of library, whether it is an academic library, a public library, or a special library, must now take this into account. This study attempts to analyse the library portals of 10 selected state govt. University library portals of Assam. The selected universities are the oldest to newest from the year of establishment. The main objective of the study is to learn about the library portals and what information they provide through these portals. The investigation discovered that the contents of the library portals differ from each other. It was discovered that a few of the library portals do not provide the basic information about the library.

KEYWORDS: Information, Library, Library Portal, Library Website, University

1. Introduction

A well-equipped library is crucial for academic institutions because it serves as a hub for teaching, learning, and research. Libraries must utilize modern technologies and web services to provide efficient, user-friendly systems. Library websites should provide quick access to authentic information about the organization and its resources, both physical and digital. Web-based services such as e-CAS, e-SDI, Virtual Reference Desk, and Web-OPAC are examples of tools that enhance the user experience. The content and presentation of library websites have a direct impact on usability; good content attracts more users. To ensure user satisfaction, the website should be well-maintained, interactive, and regularly updated with accurate and current information. Periodic evaluation and analysis of the library

website are crucial for improvements and continued effectiveness.

Content analysis is a systematic approach to studying texts, images, and symbols, focusing on recorded information rather than collecting data from people. It sets itself apart from other social science research methods and shares similarities with documentary research.

The objectives of the study are as follows:

(a) To evaluate the Structure and content of selected state University library portals of Assam
(b) To find out the information about library services, collection, rules etc.
(c) To know about the libraries.

2. Literature Reviews:

Numerous content analyses have been performed on library websites, primarily focusing on academic libraries.

Indira (2022) conducted a study analyzing the content of library websites of 68 colleges affiliated with Mahatma Gandhi University in Kerala, India. The research focused on the significance assigned to libraries on the institutions' websites, assessing e-resources and web-based services provided. Findings revealed that only 50% of colleges had active websites with Web OPAC and access to online resources. The study suggests implementing remote access to e-resources, web OPAC, and utility-based value-added services in college library websites.

Arandhara (2021) conducted four university libraries' websites were compared and their contents analysed: the Dr. Suryya Kumar Bhuyan Library of Cotton University, the Lakshminath Bezbaroa Library of Dibrugarh University, the Central Library of Tezpur University, and the Krishna Kanta Handiqui Library of Gauhati University. Understanding the collections and services offered by the libraries as they appear on their websites is the main goal of this paper.

Devi & Verma (2017) studied the content of the website of NIT libraries in North-Eastern India, finding that only NIT Sikkim has a library website, while others have web pages. They recommend including contact information, library collections, and highlighting services on these sites, as well as ensuring all links are accessible.

3. Methodology

The main and secondary literature used in this study includes books, journals, documents, seminar papers, as well as some excellent websites and articles that

were found by using a checklist made to go through the websites of the chosen libraries. The information was collected using survey methods and observation methods on the official webpage of prestigious portals of the state university library. Microsoft Excel was used to analyse the data. The websites belonging to the chosen libraries were examined at different points.

4. Overview of State University Libraries of Assam:

A university is a higher education and research centre that awards degrees in a number of academic fields. Assam, a north-eastern state, is a land of natural beauty, cultures, education and faith. There are numerous government and private universities in Assam. Out of these, 10 selected state universities were chosen to study and analyse the contents of these university library portals. The following list shows the universities and library portals –

Table 1: Status of University and the Library Portals

Sl. No	Name of the University	District	Year	University Portal	Library Portal
1	Assam Agricultural University (AAU)	Jorhat	1968	www.aau.ac.in	http://www.aau.ac.in/academics/library
2	Assam Women's University (AWU	Jorhat	2013	www.awu.ac.in	https://www.awu.ac.in/library.html
3	Bodoland University(BoU)	Kokrajhar	2009	https://buniv.edu.in/	https://bulibrary.in/
4	Bhattadev University(BU)	Bajali	2017	www.bhattadevuniversity.ac.in	https://www.bhattadevuniversity.ac.in/library.jsp
5	Cotton University(CU)	Kamrup	2017	www.cottonuniversity.ac.in	https://cottonuniversity.ac.in/library/
6	Dibrugarh University(DU)	Dibrugarh	1965	www.dibru.ac.in	https://dibru.ac.in/portals/lnblibrary/temp/index.htm
7	Gauhati University(GU)	Kamrup	1948	www.gauhati.ac.in	https://gauhati.ac.in/academic/library/kk-handiqui-library

Sl. No	Name of the University	District	Year	University Portal	Library Portal
8	Kumar BhaskarVarma Sanskrit & Ancient Studies University (KBSASU)	Nalbari	2011	www.kbvsasun.ac.in	https://kbvsasun.ac.in/library/
9	Madhabdev University(MU)	Lakhimpur	2018	https://madhabdevuniversity.ac.in/frontend/page/homepage	https://library.madhabdevcollege.org.in/
10	Majuli University of Culture(MUC)	Majuli	2018	www.muoc.ac.in	https://library.muoc.ac.in/

5. Data Analysis And Interpretation

5.1 Information of the Libraries and Librarians:

Table 2 shows the details regarding the libraries, i.e., the name of the libraries, the year of establishment, and the names of the librarians, as found on the library websites. It shows that out of the 10 libraries, 3 library portals (AWU, KBSASU and MU) have no information about the librarians. It also demonstrates that MU and KBSASU are ignorant of the name of the library and other details.

Table 2: About The library and the name of Librarian

SL.No	University	Name of the Library	Year of Establishment	Librarian
1	AAU	B.M. Pugh Library	1969	Dr.ChandanHazarika i/c
2	AWU	Central Library AWU	2015	N/A
3	BoU	Padma ShriMadaram Brahma Central Library	2009	Sangrang Brahma
4	BU	Central Library BU	2017	ArjunMedhi
5	CU	Surya Kumar BhuyanLibrary	1901	Dr.sureshykrNath i/c
6	DU	LakshminathBezbaroa Library	1967	Utpal Das

SL.No	University	Name of the Library	Year of Establishment	Librarian
7	GU	KK Handiqui Library	1948	Dr.Prasanta Kr. Deka
8	KBSASU	N/A	2011	N/A
9	MU	N/A	2018	N/A
10	MUC	Central Liobrary MUC	2023	SekharjyotiNeog (Asstn Lib)

5.2 Basic information:

Library portals need to provide basic details regarding the library, such as history, mission statement, various rules, library hours, library staff, library collections, library committee etc. Table 3 shows that 80% of library portals include a brief introduction and history of the library. 70% of library portals contain information about different sections. 50% of library portals include information about collections and library rules. 40% of library portals provide details regarding the library mission and library committees. And it was discovered that 2 university library portals (KBSASU & MU) do not contain any information.

Table 3: Basic information about Library portals.

	About The Library	Mission Statement	Different Sections	Library Collection	Library Rules	Library Timings	Library Staffs	Library Committee
AAU	Y		Y	Y		Y	Y	
AWU	Y	Y						Y
BoU	Y		Y	Y	Y	Y		
BU	Y		Y		Y		Y	
CU	Y	Y	Y	Y	Y	Y	Y	Y
DU	Y	Y	Y			Y		
GU	Y	Y	Y	Y	Y	Y	Y	Y
KBSASU								
MU								
MUC	Y		Y	Y	Y	Y	Y	Y

(Note: Y=Yes)

5.3 Information on library Collection

The strength of a library can be determined by its collection. Libraries can showcase their collections through library portals to attract users. Table 4 shows that seven university libraries (70%) have provided statistical information about the collection and three libraries (30%) have no information about the collection. 60% of the libraries have information about the collection of books, newspapers and magazines and 5 libraries have a collection of audiovisual documents. 60% libraries has a collection of dissertation. It is also noted that only Gauhati University (GU) has information about manuscript collection. KBSASU and MU do not have any information.

Table 4: Information on library collection (Print Material)

	Statistics of Collection	Books	Newspaper	Magazine	Dissertation/ Theses	Audio Visual	manuscript
AAU	Y	Y	Y	Y	Y	Y	
AWU							
BoU	Y		Y	Y	Y		
BU							
CU	Y	Y	Y	Y	Y	Y	
DU	Y	Y	Y	Y	Y	Y	
GU	Y	Y	Y	Y	Y	Y	Y
KBSASU	Y	Y					
MU							
MUC	Y	Y	Y	Y	Y	Y	

(Note: Y=Yes)

In the digital age, electronic collections are also needed to serve users so that people can find and use this information anywhere in the world. Table 5 shows the information about electronic resources available in library portals. 6 out of 10 university libraries have a collection of electronic books. 4 libraries have a collection of electronic journals and databases. 5 libraries have links to other resources and a collection of consortia.

Table 5: Information on Library Collection (E-resources; Non-Print material)

	E-books	E-Journals	Databases	Consortium	Link to Other Reseources
AAU	Y		Y	Y	
AWU					
BoU	Y			Y	Y
BU					Y
CU	Y	Y	Y	Y	Y
DU	Y	Y	Y		
GU	Y	Y	Y	Y	Y
KBSASU					
MU					
MUC	Y	Y		Y	Y

(Note: Y=Yes)

5.4 Information on Library services:

Table 6 shows that all the libraries except KBSASU and MU has the circulation services as information provided by the library portals. There's no information on any library portals on repository and ask a librarian service. 70% libraries provide OPAC service & 50 libraries have reference service. Only two libraries namely AAU & MUC has book bank service. 40% libraries have Current awareness service.

Table 6: Information on Library Services

	Circulation	Reference	Repository	Reprographic	Book Bank	OPAC	Ask A Librarian	User Education	CAS
AAU	Y			Y	Y	Y		Y	
AWU	Y	Y							
BoU	Y					Y			
BU	Y					Y			
CU	Y	Y				Y			Y
DU	Y	Y				Y			Y
GU	Y	Y				Y		Y	Y
KBSASU									
MU									
MUC	Y	Y			Y	Y		Y	Y

Conclusion:

Libraries are the heart of a university and library portals are the gateway to the library. Based on the content analysis, this study of 10 selected govt. Assam state university libraries. From the research it is found that all the university libraries have library portals. Out of them only two library portals do not have any details on library website namely KBSASU and MU. It is also found that 80% of libraries have information about their history. 5 university libraries have a name and the other 5 have no name. The information about printed and non-printed document collections is also available on the library websites. All libraries have a book collection and 60% of the libraries have a collection of e-resources, all libraries offer various services as indicated in the doorways of libraries.

References:

1. Arandhara, R. (2021). Content Analysis of Library websites of four selected Universities of Assam: A Comparative Study. *Library Philosophy and Practice (e-journal)* , 6059.

2. Bajpai, K. &. (2021). Content Analysis of Library websites of CSIR-Institutions of Uttar Pradesh and Delhi, India. *Library Progress (International), 41* (2), 337-346.

3. Brahma, P. (2015). Content Analyis of University Library portals of Assam. *The International Journal of Humanities & social Studies., 3* (8), 302-305.

4. Bulla, S. &. (2020). ANALYSIS OF CENTRAL UNIVERSITIES' LIBRARY WEBSITES IN INDIA: A STUDY. *Journal of Indian Library Association, 56* (3), 40-51.

5. C.A, A. &. (2021). Central University Library Websites In India: Web Content Analysis. *Library Philosophy & Practice (e-Journal)* , 5405.

6. Jange, S. (2014). Library Websites of Universities in Karnataka State: An Evaluative study. *Journal of Advances in Library and Information Science, 3* (3), 195-202.

7. Kumar, S. &. (2017). Content Analysis Of Central Universities Library Websites Of Central Region Of India: A Survey. *INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH , 6* (06), 283-286.

8. Verma, M. &. (2017). A webometric analysis of National Libraries' websites in South Asia. *Annals of Library and Information Studies, 64*, 116-124.

Library Catalogues Of SAARC National Libraries: Anexamination Of Web Opac Search-Interfaces For Sustainability Based On Web Mining

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ABSTRACT: Web OPACs are an essential element in any library for the end-users as well as to enhance libraries' value in terms of relevance, usability, accessibility etc. Its search interfaces play a vital role in advancing sustainable development in the context of libraries and information systems. These interfaces serve as the digital gateway to vast repositories of knowledge, enabling users to efficiently discover and access information. The features that a Web OPAC provides decides the efficiency of it. This paper attempts to highlight the available search-interface features of National Library of India (NLI), National Library of India Bhutan (NLAB) and National Library of India Sri Lanka (NLS). A comprehensive checklist was developed by considering earlier studies and accumulating features available on the web OPACs of the considered libraries. The features were selected keeping in mind the search-interface aspect. It is revealed from the study that however all the libraries had various features with NLI being the top scorer with maximum number of features, some features like word adjacency/word proximity operators and limiting the number of records displayed were absent in all the three libraries.

Introduction

Library cataloging is a fundamental aspect of library management that involves organizing and describing the library's collection of resources, making them easily accessible to library users. Prior to the introduction of Web OPACs, libraries relied on traditional cataloging methods, primarily card catalogs to accomplish this task. Card catalogs consisted of physical cards, each representing a book or resource in the library's collection. These cards were organized alphabetically and by subject, requiring users to physically visit the library and manually search through cards to locate materials. Effective library cataloging is essential because it helps users find

the materials they need efficiently. Cataloging ensures that library collections are organized, indexed, and searchable, enhancing the information retrieval process.

With the advent in ICT, libraries have revolutionized in various prospects, one being adoptingOPACs and WebOPAC services. OPAC are "Online Public Access Catalogue"that allow users to connect with the library resources by dedicated computer terminals whereas WebOPAC, short for "Web Online Public Access Catalog,"services could be used over the internet allowing remote access. OPACs/ Web OPACs primarily serve two purposes: finding the database documents that match the search term(s) and providing the information needed to find or access those documentsSunil & Chandrappa (2014).

WebOPAC is a digital solution that allows library users to access the library catalog and search for materials over the internet. It is a significant leap from traditional library cataloging systems, offering libraries and their users to benefit in terms of accessibility, efficiency, and user experience. It brings the entire library collection to the fingertips of users, breaking down physical barriers and reducing the need for in-person visits to the library. Some noteworthy aspects of WebOPAC are:Accessibility, real time information, efficient search, and user-friendly search-interface, which plays a pivotal role in connecting users with the resources available.It isdesigned to meet the needs of both novice and experienced library users. It provides features like user-friendly interface, basic and advanced search capabilities, faceted search and filters, detailed bibliographic information,various output functionalities etc. that are essential for a user to efficiently access the materials that they desire.

The Sustainable Development Goals (SDGs) set by the United Nations addresses a broad spectrum of concerns, such as poverty, hunger, health, education, gender equality, clean water, sustainable energy, and more. The idea is to create abalance between economic growth, social progress, and environmental protection to build a more resilient and sustainable global society. Effective information management is one of the keycriteria of sustainable development for the availability, accessibility, and effective use of information. Information management systems provide the foundation for building the knowledge base necessary to address the complex and interconnected challenges of sustainability.Web OPAC search interfaces contribute to this by facilitating the organization and retrieval of information. Users can explore a diverse range of resources, including books, articles, and other materials that address sustainability challenges and solutions.ICT can effectively deliver services that not only require no additional cost, energy, or space but also promote sustainability through the utilization of virtual and energy-efficient solutionsHilty & Ruddy (2000).

Today, web OPAC services are provided by most of the libraries, but the attention should be drawn towards its efficiency. Therefore, this study focuses on the search-interface perspective of the Web OPACs of National Libraries of SAARC countries. National libraries are institutions within each country that serve as repositories of the nation's cultural heritage, knowledge, and literature. It preserves and provides access to a country's intellectual and literary resources. "The South Asian Association for Regional Cooperation (SAARC)" is an organization comprised of countries in South Asia those are India, Bhutan, Nepal, Maldives, Bangladesh, Pakistan, Sri Lanka, and Afghanistan. This study is based on web mining of the Web OPACs. Web mining is the practise of using data mining techniques (data discovery in any databases) to extract knowledge from web-based data, such as web documents, document links, website usage logs, etc. Srivastava et al. (2005).

Review of Literature

Haridasan & Firdaus (2021)investigated the web-based services and sources offered by university libraries in India, focusing on 42 top-ranked institutions. The findings reveal a predominant emphasis on traditional services over modern innovations like library applications and virtual tours. Notably, there's room for improvement in utilizing social media and web 2.0 tools. The paper highlights the importance of academic libraries in promoting sustainability through collection development, information literacy, awareness initiatives, and events related to sustainable development.Adebayo et al. (2018)reviewed the major benefits of ICT in libraries, highlighting its pivotal role in sustainable development whichinclude speedy and easy access to information, remote and round-the-clock user access, cost-effective operations, and efficient management of information overload. The study emphasizes the significance of ICT resources like computers, the internet, electronic mail, and online catalogs in achieving sustainable development goals. However, the paper also addresses challenges, such as limited financial resources, shortage of ICT facilities and skills, lack of ICT policies, poor equipment maintenance, erratic power supply, and issues related to copyright and intellectual property rights.Hiremath & Kumar (2018)evaluated the web OPAC interfaces and the usability pattern of it revealing that the OPAC confirms all the important features except for "external/electronic links to resources". It further revealed that majority of users were aware only of a very limited web OPAC featuresand uses it rarely, laptops are most used channels, access is mostly done from campus, availability of required materials being the main reason of using OPAC, topical search is the most used search entry, majority believed the service to be satisfactory and agreed to its faster accessibility, provision of search instruction and "menu based interaction" is most desired for inclusion in the OPACs and lastly majority

believed in "lack of knowledge on searching".Rout & Panigrahi (2018)examined the OPAC usage pattern and found majority were aware of OPAC but use it based on requirement not regularly and research scholars are the most frequent users of OPAC. The study found that the users mainly used the OPAC to check the availability and location of a specific book in the library and searched by title and author. Phrasing queries was the major problem among OPAC malfunction, slow response, no spell check, insufficient education, and lack of guidance from library employees. Kumar Sarma (2016)comparative study of "Evergreen, Koha, NewGenLib, OpenBiblio and PhpMyBibli" revealed that the "server installation and client application" of all the software are platform independent except for Evergreen and Koha whose former part is done by Linux. Koha had all the modules like acquisition, circulation, Inter Library Loan (ILL) etc. compared to others. It is also concluded that Koha has most of the features mandatory in OPACs like MARC display, External links, downloading records etc making it the most desirable.Kaur & Kathuria (2015)investigated OPAC use and found majority users are graduates and aware of OPAC but frequency of use is less. Most of the users find OPAC very useful but face difficulty in using it; Access points mostly used is title followed by author; it is also found majority of the users were compatible with multilingual OPACs and require library professionals' guidance. Respondents mostly use OPAC to check resources availability; fast display time and presence of adequate terminals were also indicated in the study.Sunil & Chandrappa (2014)conducted a comparative study of OPACs of 10 Indian University Libraries with reference to Phoenix Public Library. LMS used by the libraries were SOUL, Koha, NewGenLib, LibSys and Home Grown.SOUL OPAC utilised by multiple colleges needs "style, display format, data exporting, and external source linkages improvements". However, Koha, LibSys and Comtek Services Pvt were commendable. Koha excels in search and presentation, whereas other systems lag in search and user support. The cluster search results nicely but lack navigation and integration with "Open Access or Subscribed e-Resources". The OPACs also lack capabilities like linking to relevant e-resources, social media data collection, user suggestions, and content sharing. Lack of user interaction essential for user centred OPACswas also evident. Chintha (2013)explored the expansion of web OPACs services in India. The findings revealed that a significant number of libraries in India utilise the KOHA LMS software as their first choice, followed by Alice LMS, E-Granthalaya, and so on. The most often utilised software in the field is open-source software, followed by commercial learning management systems (LMS), free LMS, and in-house produced LMS.Ruzegea (2012)attempted to correlate resource retrieval to "effectiveness and user-interface features" which resulted positive. The study indicated the need of availing multimedia resources, proper display and design of the interfaces, navigation speed, usage guidelines etc. Multiple navigation, user

friendly interfaces etc are some features that was appreciated by the users. Kumar & Vohra (2011)assessed the usage of OPACs to determine the user's understanding, frequency of usage, and encountered challenges of Panjab University Library. Based on a checklist used it was revealed that basic search facilities, access points, "search limit by type/form of publications", and "short and long bibliographic displays" were present; whereas the provision of search limit by year of publication, online spell check and prompts to indicate steps in search, new arrivals, reservations, renewal, book loans and over dues information, hypertext links were lacking. It was noted that the major issues were utilisation was not known and the OPACs were complicated to use.Mahmood (2008)examined 16 Pakistan's academic, special, and national libraries' web OPAC catalogues using a "91-item checklist" which was developed byElhafiz (2005)incorporating some minor modification.The investigation reveals poor or no utilization of "Boolean, truncation, proximity search and hypertext links facilities", "search limits and search strategy". The lack of MARC format and Z39.50 was also evidentthat is crucial for facilitating "shared cataloguing". Despite progress in including Urdu and local scripts, the implementation is still restricted to a few libraries.Ramesh Babu & Tamizhchelvan(2003)investigated special, academic and public libraries of Tamil Nadu to provide an overlook of the features present in their OPACS and found all catalogues continue to be dominated by conventional access points "author, title, class number, and accession number". Controlled vocabulary tools usage is often absent from subject access provisions. Most libraries provide both "full and short displays" for records and uses DDC classification scheme.It is also seen simple search is available in most libraries, followed by "advanced and complex search" ; "exact searching" and Boolean are the most widely used search techniques, followed by truncation; majority of the libraries have a search history display followed by "provision for sorting retrieved records"; search limits are applicable only via year and publication type in most of them with language limitation being unavailable in more than half of them.Ramesh Babu & O'Brien (2000)gave a comprehensiveanalysis of six Web OPAC interfaces often utilized in"UK Academic Libraries namely Talis, INNOPAC, WebCat, Voyager, GeoWEB and ALEPH".A checklist for determining theimportant features of an interface and searching capabilities was developed. It was observedthat only WebCat provide the log in options; advanced search options was present in WebCatand Voyager; provision of hypertext link was available in all except Talis; access points in advanced search least used are series and publisher; "keyword access to subject headings" is another feature available in all the OPACs; in case of limiting the search results INNOPAC does it via Year of Publication;Talis, GeoWeb, ALEPH and WebCat via Author and Voyager via Title; and the option to "mark, store and export the records" was also provided by all the OPACs except Talis.Smith (2000)explored

various “search facilities” of 11 digital libraries and came to know that significant number of libraries are yet to implement some crucial featureslike the Boolean operators, proximity and phrase search facility, browsing capabilities, multifaceted display options etc. The study also highlighted some issues that could appear in near future like “multilingual indexing and searching”, need to standardise interfaces which could be done by adopting Z39.50 protocol but none of the studied libraries had implemented that either.

Methodology

For the purpose of this study a checklist was developed using a prior developed checklist by Elhafiz (2005)and including some features available on the Web OPACs of the three libraries considered for the study that seemed essential from the search-interface perspective. The checklist comprised of 11 major categories further divided in 70 sub-categories. All the features of the checklist were searched for their presence in the Web OPACs and listed as tables which gave the basis of analysis.

Sample: The studyintended to study the search-interface of web OPACS of National Libraries of SAARC countries using Koha Library management software hence National Libraries of India, Bhutan and Sri Lanka was considered but National Libraries of Pakistan and Maldives were excluded as they usesSLiMS and Liberty LMS respectively. Also, the National Librariesof Bangladesh, Afghanistan and Nepal were excluded due to unavailability andinaccessibility of theirweb OPACs.

Data Analysis: The analysis was done by MS Excel 2019 version.

Findings: This section includes tabular of the analysed data.

Table 1 Types of searches

S.No.	Characteristics	NLI	NLAB	NLS	Number	Percentage
	Types of searches					
1	Offers several types of searches such as simple, complex or advanced	Yes	Yes	Yes	**3**	**100%**
2	Provision of browsing capabilities	Yes	Yes	Yes	**3**	**100%**
3	Provision for phrase searching	Yes	Yes	Yes	**3**	**100%**
4	Provision for Boolean search	Yes	Yes	Yes	**3**	**100%**
5	Provision for truncation	Yes	Yes	Yes	**3**	**100%**

S.No.	Characteristics	NLI	NLAB	NLS	Number	Percentage
6	Provision for word adjacency and/or word proximity operators	No	No	No	**0**	**0.00%**
7	Hypertext links to full bibliographic record display	Yes	Yes	Yes	**3**	**100%**
	Number of availabilities	6	6	6		
	Percentage (%)	85.71%	85.71%	85.71%		

Table 1represents that all the National Libraries has all the Search Type options(85.71%) except for word adjacency/proximity search (0.00%).

Table 2Access points available in basic search

S.No.	Characteristics	NLI	NLAB	NLS	Number	Percentage
	Access points available in basic search					
1	Title	Yes	Yes	Yes	**3**	**100%**
2	Author	Yes	Yes	Yes	**3**	**100%**
3	Subject	Yes	Yes	Yes	**3**	**100%**
4	ISBN	Yes	Yes	Yes	**3**	**100%**
5	ISSN	Yes	No	Yes	**2**	**66.66%**
6	Series	Yes	Yes	Yes	**3**	**100%**
7	Call number	Yes	Yes	Yes	**3**	**100%**
8	Keyword	Yes	No	No	**1**	**33.33%**
9	Accession No.	Yes	No	No	**1**	**33.33%**
10	Books	Yes	No	No	**1**	**33.33%**
11	Serials	Yes	No	No	**1**	**33.33%**
12	Albums	Yes	No	No	**1**	**33.33%**
13	CD Rom etc.	Yes	No	No	**1**	**33.33%**
14	eResource	Yes	No	No	**1**	**33.33%**
	Number of availabilities	14	6	7		
	Percentage (%)	100%	42.85%	50%		

Table 2reveals the availability of access points in web OPACs with NLI having all the access point (100%) like title, author,subject etc. Whereas NLAB and NLS has 42.85% and 50% of the access points. They lack to provide important access points like keyword, accession number, ISSN etc. in the Basic Search Category.

Table 3 Access points available in advanced search

S.No.	Characteristics	NLI	NLAB	NLS	Number	Percentage
	Access points available in advanced search					
1	Author (author phrase/personal name/ personal name phrase/ corporate name/conference name/conference name phrase)	Yes	Yes	Yes	**3**	**100%**
2	Title/Title phrase	Yes	Yes	Yes	**3**	**100%**
3	Keyword	Yes	Yes	Yes	**3**	**100%**
4	Keyword phrase	Yes	No	Yes	**2**	**66.66%**
5	Keyword in title	Yes	Yes	Yes	**3**	**100%**
6	Subject (subject phrase/subject and broader terms/subject and narrower terms/subject and related terms)	Yes	Yes	Yes	**3**	**100%**
7	Combined search such as author/ title, author/keyword	Yes	Yes	Yes	**3**	**100%**
8	Call number	Yes	Yes	Yes	**3**	**100%**
9	ISBN	Yes	Yes	Yes	**3**	**100%**
10	ISSN	Yes	Yes	Yes	**3**	**100%**
11	Series	Yes	Yes	Yes	**3**	**100%**
12	Barcode	Yes	Yes	Yes	**3**	**100%**
13	Accession number	Yes	No	No	**1**	**33.33%**
14	Notes/comments	Yes	Yes	Yes	**3**	**100%**
15	Curriculum	Yes	Yes	Yes	**3**	**100%**
16	Publisher	Yes	Yes	Yes	**3**	**100%**
17	Publisher location	Yes	Yes	Yes	**3**	**100%**
18	Provision for the copy location	Yes	Yes	No	**2**	**66.66%**
	Number of availabilities	18	16	16		
	Percentage (%)	100%	88.88%	88.88%		

Table 3 represents the availability of advanced search access points. It is revealed that NLI has all the access points (100%). NLAB and NLS has 88.88% of the access points with accession number being absent in both the libraries.

Table 4 Search strategy

S.No.	Characteristics	NLI	NLAB	NLS	Number	Percentage
	Search strategy					
1	Provides suggestions under each type of search	Yes	No	No	**1**	**33.33%**
2	Option for search history	Yes	Yes	Yes	**3**	100%
	Number of availabilities	2	1	1		
	Percentage (%)	100%	50%	50%		

Table 4reveals the status ofprovision of suggestion under each search and option of search history where NLI has both the features (100%) but NLAB and NLS lacks the former (50%).

Table 5Search limits/search refinement features

S.No.	Characteristics	NLI	NLAB	NLS	Number	Percentage
	Search limits/search refinement features					
1	Provision for comprehensive search limits such as item type, publication date, language.	Yes	Yes	Yes	**3**	**100%**
2	Facility for sorting records	Yes	Yes	Yes	**3**	**100%**
3	Ranks output by relevance	Yes	Yes	Yes	**3**	**100%**
4	Limit to currently available item	Yes	Yes	Yes	**3**	**100%**
5	Collection	Yes	No	Yes	**2**	**66.66%**
6	Audience, content, format, additional content types for books/printed materials	Yes	Yes	No	**2**	**66.66%**
7	Location, author, series	Yes	Yes	Yes	**3**	**100%**
8	Places	Yes	No	Yes	**2**	**66.66%**
9	Topics	Yes	No	Yes	**2**	**66.66%**
10	Titles	No	No	Yes	**1**	**33.33%**
	Number of availabilities	9	6	9		
	Percentage (%)	90%	60%	90%		

Table 5is a representation of the available search limits and refinement features with NLI and NLS having 90% of the features and NLAB has 60% of the features. NLAB lacks to provide the collection, places, topic and title refinement features.

Table 6 Display

S.No.	Characteristics	NLI	NLAB	NLS	Number	Percentage
	Display					
1	Provision for brief/long bibliographic displays or both	Yes	Yes	Yes	**3**	**100%**
2	Display levels (customisable display screens)	Yes	Yes	Yes	**3**	**100%**
3	Limiting the number for the display of records (output control)	No	No	No	**0**	**0.00**
	Number of availabilities	2	2	2		
	Percentage (%)	66.66%	66.66%	66.66%		

Table 6 represents the display feature where all the libraries provide provision of long and brief display i.e.,66.66% but lack to limit the number of display recordi.e.,33.33%.

Table 7Bibliographic view

S.No.	Characteristics	NLI	NLAB	NLS	Number	Percentage
	Bibliographic view					
1	Support for MARC formats	Yes	Yes	Yes	**3**	**100%**
2	Support for ISBD formats	Yes	Yes	Yes	**3**	**100%**
3	Normal View	Yes	Yes	Yes	**3**	**100%**
	Number of availabilities	3	3	3		
	Percentage (%)	100%	100%	100%		

Table 7represents that all the librariessupport MARC, ISBD and normal viewi.e., 100%.

Table 8Output

S.No.	Characteristics	NLI	NLAB	NLS	Number	Percentage
	Output					
1	Provision for printing, storing, exporting/downloading of retrieved records	Yes	Yes	Yes	**3**	**100%**
2	Provision for the transmission of retrieved records through e-mail, Facebook, LinkedIn, Twitter	No	No	Yes	**1**	**33.33%**

S.No.	Characteristics	NLI	NLAB	NLS	Number	Percentage
3	Provision of suggest to purchase	Yes	No	No	**1**	**33.33%**
4	Provision for the transmission of retrieved records through QR scan	Yes	No	Yes	**2**	**66.66%**
5	Provision of adding to cart	No	Yes	Yes	**2**	**66.66%**
6	Provision of next/previous	Yes	Yes	No	**2**	**66.66%**
	Number of availabilities	4	3	4		
	Percentage (%)	66.66%	50%	66.66%		

Table 8reveals that NLI and NLS has 66.66% of the output features whereas NLAB lacks to provide transmission of records and purchase suggestionresulting to only 50% of the featureprovision.

Table 9 External links

S.No.	Characteristics	NLI	NLAB	NLS	Number	Percentage
	External links					
1	Links to electronic sources	Yes	No	No	**1**	**33.33%**
2	Links to external sources	Yes	Yes	No	**2**	**66.66%**
	Number of availabilities	2	1	0		
	Percentage (%)	100%	50%	0.00		

Table 9 represents NLI provides both links to eResource and external sources (100%) whereas NLAB and NLS provides 50% and 0% links respectively. NLS lacks both the features.

Table 10 Services/facilities

S.No.	Characteristics	NLI	NLAB	NLS	Number	Percentage
	Services/facilities					
1	Provision for options such as ILL	Yes	Yes	Yes	**3**	**100%**
2	Provision of online mailboxes for user comments or suggestions	Yes	Yes	Yes	**3**	**100%**
	Number of availabilities	2	2	2		
	Percentage (%)	100%	100%	100%		

Table 10represents the provision of interlibrary loan (ILL) services and the availability of online mailboxes for user feedback and recommendations, i.e., 100%.

Table 11 Layout

S.No.	Characteristics	NLI	NLAB	NLS	Number	Percentage
	Layout					
1	Simple layout	Yes	Yes	Yes	**3**	**100%**
2	Instructions on the screen are simple, clear and inviting	Yes	Yes	Yes	**3**	**100%**
3	Use of less technical jargon and codes	Yes	Yes	Yes	**3**	**100%**
	Number of availabilities	3	3	3		
	Percentage (%)	100%	100%	100%		

Table 11 represents all the libraries have simple layout, simple instruction and avoids technical jargon and codes.

Conclusion and Suggestions

In the contemporary age, web-based services, such as Web OPACs, play a pivotal role in advancing library development.As libraries struggles with providing effective and efficient services, the need for library automation and digital libraries arises Rani et al. (2022). Library users areansignificant factor for the development and recognition of the library, so to be anexemplary library its services should meet the need of the users. This indicates the need of an interfacethat provides all the search types, access points, search limits, search strategy, output features, simple display etcthat suits the users.This study reveals that some of the important features like word adjacency/proximity and display record limit are not implemented in any of three libraries. NLAB and NLS lacked to provide options of accession no., keyword, books, serials, eResources etc. in the basic search criteria, suggestion under each type of search. It is hence suggested that not all the users are well equipped to use the advance search so features like item type i.e., books, serials, accession number etc should also be added in the basic search criteria like NLI does. Providing example under each search makes it easy for the users to navigate to related or a wide range of option to the searched material should also be implemented by NLAB and NLS. Adjacency/proximity search and limiting the number of records for relevant and concise record displays should be given importance by all the libraries.By providing intuitive and user-friendly search functionalities, Web OPAC interfaces empower researchers, educators, students and the general public to access relevant information quickly. This accessibility leads to informed decision-making and encourages the integration of sustainable

practices into various fields. Libraries, as hubs of information, contribute to the dissemination of knowledge that promotes sustainable development, and Web OPAC interfaces serve as powerful tools in this context.

References

1. Adebayo, O. A., Ahmed, Y. O., & Adeniran, R. T. (2018). THE ROLE OF ICT IN PROVISION OF LIBRARY SERVICES: A PANACEA FOR SUSTAINABLE DEVELOPMENT IN NIGERIA. *Library Philosophy & Practice*, 1–12. http://digitalcommons.unl.edu/libphilprac/1951

2. Chintha, N. (2013). A STUDY OFWEB-BASED OPACs SERVICES IN INDIA. *E-Library Science Research Journal*, *I*(IV), 1–6. https://doi.org/10.9780/2319-8435/142013/24

3. Elhafiz, I. A. (2005). Displays of Arabic script on web-based OPACs in GCC institutions. *The Electronic Library*, *23*(4), 419–432. https://doi.org/10.1108/02640470510611481

4. Haridasan, S., & Firdaus, S. (2021). *Application of Web-Based Sources and Services for Sustainable Development in University Libraries*.

5. Hilty, L., & Ruddy, T. (2000). Towards a Sustainable Information Society. *Informatik/Informatique*. https://www.academia.edu/451699/Towards_a_Sustainable_Information_Society

6. Hiremath, S., & Kumar, P. D. (2018). Evaluation of Indian Institute of Management Bangalore Library Web OPAC: A Case Study. *World Digital Libraries - An International Journal*, *11*(1), 41–58. https://doi.org/10.18329/09757597/2018/11104

7. Kaur, K., & Kathuria, K. (2015). Use of OPAC in Bhai Kahn Singh Nabha Library, Punjabi University Patiala: A Case Study. *International Journal of Information Dissemination and Technology*, *5*(2), 80–86.

8. Kumar, S., & Vohra, R. (2011). Online Public Access Catalogue Usage at Panjab University Library. *DESIDOC Journal of Library & Information Technology*, *31*. https://doi.org/10.14429/djlit.31.4.1110

9. Kumar Sarma, G. (2016). OPAC Module in Open Source Library Management Software: A Comparative Study. *DESIDOC Journal of Library and Information Technology*, *36*(1), 56-61`. https://doi.org/10.14429/djlit.36.1.9223

10. Mahmood, K. (2008). Library web OPACs in Pakistan: An overview. *Program: Electronic Library and Information Systems*, *42*, 137–149. https://doi.org/10.1108/00330330810867693

11. Ramesh Babu, B., & O'Brien, A. (2000). Web OPAC interfaces: An overview. *The Electronic Library*, *18*(5), 316–330. https://doi.org/10.1108/02640470010354572

12. Ramesh Babu, B., & Tamizhchelvan, M. (2003). An investigation into the features of OPACs in Tamil Nadu (India). *Library Review*, *52*(6), 257–267. https://doi.org/10.1108/00242530310482033

13. Rani, M., Sukula, S. K., Kondamudi, N. R., Jain, R. K., & Rigzin, S. (2022). Information retrieval and data mining through library OPAC keyword searching: An experience of recent trends and JNU, New Delhi, Library. *KIIT Journal of Library and Information Management*, *9*(2), 79–90. https://doi.org/10.5958/2455-8060.2022.00010.6

14. Rout, R., & Panigrahi, P. (2018). ONLINE PUBLIC ACCESS CATALOGUE (OPAC) USAGE PATTERNS AMONG THE LIBRARY USERS OF ODISHA: A STUDY. *INTERNATIONAL JOURNAL OF LIBRARY AND INFORMATION SCIENCE*, *7*(1). https://doi.org/10.34218/IJLIS.7.1.2018.005

15. Ruzegea, M. (2012). The Usability of OPAC Interface Features: The Perspective of Postgraduate Students at International Islamic University Malaysia (IIUM). *Library Philosophy and Practice (e-Journal)*. https://digitalcommons.unl.edu/libphilprac/691

16. Smith, A. G. (2000). *Search features of digital libraries*. https://informationr.net/ir/5-3/paper73.html#ref2

17. Srivastava, T., Desikan, P., & Kumar, V. (2005). Web Mining – Concepts, Applications and Research Directions. In W. Chu & T. Young Lin (Eds.), *Foundations and Advances in Data Mining* (pp. 275–307). Springer. https://doi.org/10.1007/11362197_10

18. Sunil, M., & Chandrappa. (2014). *Next generation of catalogues: Comparative study of five Indian Univeristes OPACs*.

Web Search Engines : A Comparative and Performance Evaluation

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ABSTRACTS : In this paper a methods for optimizing the information retrieval effectiveness of major search engines based on various query topics. Initially, major search engines, namely, Google and Yahoo, are selected. Each search engine was evaluated in terms of their search capabilities (e.g., Boolean logic, truncation, field search, word and phrase search) and retrieval performances (i.e., precision, Relevance Recall and response time) using sample queries drawn from real reference questions. Ranking of the search engines were done based on assigned points to each parameter and found that Google was in first rank followed by Yahoo.

KEYWORDS: Search Engine; Google; Yahoo; Evaluation; Searching; Web Search Engines; World Wide Web; Recall: Precision.

Introduction:

In recent years, Internet has emerged as the most powerful medium for storage and retrieval of information. It works round the clock and connects every nook and corner of the globe. "With an unprecedented growth in the quantum of knowledge worldwide and the easy accessibility, Internet has become an unavoidable necessity for every institution of higher learning and research." It is a million of computers interconnected through the worldwide telecommunication system. All the computers are able to share information with each other because they use common communication protocols. Internet protocols allow many different network technologies form local area networks to wide area networks to be interconnected for information communication and its application. It supports audio and video clips as well as the text and images. Thus the Internet is at once a world-wide broadcasting capability, a mechanism for information dissemination and a medium for collaboration and interaction between individuals and their computers without regard for geographic location.[7]

In the last decade search engines have improved their performance to the point of becoming a tool of everyday use for most Internet users. The leading search engine companies and many smaller players continue to invest in improving performance of their engines and inventing new methods of indexing and searching for content.

While the web search arena is very saturated, the localized (enterprise) search technology is still developing and has room for improvement.[8]

The continuous and fast development of the internet has made it an integral part of everyday life for people and organizations. According to statistic data from Internet World Stats, on June 30, 2022,[11] internet users reached the 67.9 % of the world population. But, as the internet is sharply increasing, the amount of data available via the web is increasing as well. That is why internet users use search engines in order to locate the data they want, without wasting much time and avoiding the risk to get lost into the immense amount of data available through the net. The search engines are information retrieval systems that match the queries of the users with relevant documents and links. The search engines developed for internet users are not only engines for general use that search all the web, but also site-specific search engines that are provided by individual websites for data searching in their databases.

Search engine evaluations serve both search engine constructors, as they provide a means to differentiate and rank their product, and users, as they provide a means to assess the quality available search engines. Most of research studies about search engine evaluation compare general purpose search engines or meta-search engines. The answer to research question is going to enable organizations to appreciate whether they should develop their own search software or they should purchase the search function as a separate service. Moreover, the answer to research question can also help search engine users to find more easily the information they are interested in, choosing every time the right search engine.[3]

Objective of The Study

The study will be carried out with the following objectives.

1. To examine the search capabilities of search engines using Boolean logic, Truncation field search, word and phrase search.

- Authority and copyright statement
- User support systems
- Search techniques
- Search capabilities
- Type of searches
- Search operator
- Content coverage

Precision & Relative Recall

2. To study& compare the availability of relevant search results of selected LIS facets on search engines.
3. Tries to investigate potential usage of data obtained from search engines to improve of web search results.

Scope and Limitation of the Study

The present study will be restricted by retrieving the two selected search engines i.e.

1. Google : http://www.google.com
2. Yahoo!: http://www.yahoo.com

The Five information technology facets of LIS have been selected based on the current needs of LIS students.

Reference Question

1. Library Automation
2. Library Networks
3. Internet Security
4. Virtual Library
5. Web 3.0

Research Methodology

In the present study all efforts shall be made to employ a thoroughly comprehended and well-planned methodology to compare of search engines under study. Investigative method of research will be followed which further includes:

1) **Selection of search engines**

General purpose of search engines uses crawler mechanisms in order to scan as many web documents as possible. Usually, they focus on the general population of internet search engine users and they cover all types of information needs.

2) **Selection of queries**

The queries from Library & Information Science are used in search engines evaluation were collected from the database of each website in order to insure

the fact that the content of each query existed in the website's database. The type of queries used in the evaluation was informational as their intent was to acquire information which was supposed to be present on certain web pages. Thus, 05 queries were inserted in each Web search engine.

3) **The Test Suite Development**

The test suite development includes two steps: step one is the selection of the topics/queries to be searched for and then, step second, decide exactly what search expression to be submitted. As far as the selection of query is concerned it is decided that to take-up the keywords from LIS profession.

4) Evaluation Criteria and Assumptions

The criteria for the evaluation of selected search engines will be precision and relative recall. Precision and recall remain the most convenient and efficient ones. Regarding the recall as a criterion, as it is very difficult to calculate the "absolute recall" considering the huge size of the web, in this evaluation the relative recall will be used from the retrieving documents of the search engines. Thus, the precision and relative recall scores were calculated from the quotients below:

$$\text{Relative recall} = \frac{\text{Total number of results retrieved by a search engine}}{\text{Sum of results retrieved by all search engines}}$$

$$\text{Precision} = \frac{\text{Number of relevant results retrieved by a search engine}}{10}$$

For the searches carried out with the general purpose search engines. During this study, total two search engines and five Quires ware studied based on Library & Information Sciences.

Table No. 1 Type of Search

Sr. No.	Search Tool	No. of Studied
1	Search Engine	2
2	Keywords	5

In this study, total 3 search engine were studied. The details of these search engines along with their URL and copyright statement is described in Table No.2

Table No. 2 Statement of Search Engines

Sr. No.	Search Engine	URL	Copyright Statement
1.	Google	https://www.google.co.in/	**Google Inc.** 1600 Amphitheatre Parkway Mountain View, CA 94043 USA
2.	Yahoo	http://in.yahoo.com/	Copyright Agent c/o Yahoo! Inc. 701 First Avenue Sunnyvale, CA 94089

Table No. 3 Search Capabilities of Search Engines

Sr.No.	Search Engine	Domain Name	Other Databases
1	Google	google.co.in	Web, Google alerts, images, shopping, travel, video, books, finance, news, patent, Google scholar, YouTube, advertisement, marketing, blogger, classroom, Google meet, Gmail, Google calendar, Google document, slides, Google sheets, Google drive, Google jam board, Horoscope, Health, translate, map etc.
2	Yahoo	yahoo.com	Yahoo web, search, Mail, news, finance, sports, native, movie, Yahoo auctions, Rivels, Yahoo briefcase, marketing, books, Yahoo green, maps, Yahoo Messenger, photos, Yahoo personals, RocketMail, travel, Horoscope, Health, etc.

Domain Name among the Two Search Engines and the details of other databases were studied and it is reported in Table No.3**.** All the two Search Engines uses the Domain name ".com & .co.in". Two Search Engines provides the search result from searching through various databases like Images, News, Audio, Video, Books, Advertisement, Finance, marketing, Drive, Chats and Yellow Pages databases.

Table No. 4 Types of Searches allowed by search Engines

Sr. No.	Search Engine	Boolean Search	Advanced Search	Preferences Search	Expert Search
1	Google	Yes	Yes	Yes	Yes
2	Yahoo	Yes	Yes	No	No

Table No.5 Percentages of Types of Searches

Sr. No.	Type of Search	No. of Search Engines having the Facility	Percentages
1.	**Boolean Search**	2	100%
2.	**Advanced Search**	2	100%
3.	**Preferences Search**	2	100%
4.	**Expert Search**	2	100%

It has been observed that advanced search, Boolean Search, Preference searches and Expert search is common in all two search engines. i.e. 100% results.

Table No.6 Search Operators used by Search Engines

Sr. No	Search Engine	Default	Phrase	Truncation	Boolean	Case Sensitivity
1	Google	Or	Quotes ""	Yes *	AND,OR,NOT	Yes
2	Yahoo	Or	---	Yes *	AND,OR,NOT	Yes

Table No.7 Content Coverage links in Search Engine

Sr. No	Search Engine	E-mail	Chatting	Yellow Pages	White Pages	Games	Movies	Horoscope	Finance	Shopping	Travel	Health	Maps	Jobs	News	Message Boards	Language Tools	Translation
1	Google	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2	Yahoo	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N

[Note : Y indicates Yes and N for No.]

It has been observed that Google and Yahoo search engines provided maximum same facility. Google and Yahoo Search Engines are not provided Yellow and White Pages facility, Translation facility is available only in Google.

Table No.8 Analysis of No of result shown in one page in search engine

Sr. No	Search Engine	No. of Result shown in one page
1	Google.com	10
2	Yahoo.co.in	07

Google search engine shows 10 and Yahoo search engines shows 07 result on one page.

Table No. 9 Total Result on Each Search Engine

S.No	Keywords	Search Engines	
		Google	Yahoo
1	Library Automation	102,000,000	32,700,000
2	Library Networks	311,000,000	205,000,000
3	Internet Security	1,180,000,000	259,000,000
4	Virtual Library	208,000,000	78,200,000
5	Web 3.0	846,000,000	232,000,000

Maximum Search results are shows result are shown by Google in comparison of Yahoo Search Engines.

Table No. 10 Total Domain name result on Google in first 20 results

S.No.	Keywords	.ac.in	.edu	.com	.gov	.net	.ppt	.org	Total Result
1	Library Automation	06	02	06	00	02	00	04	**20**
2	Library Networks	03	03	00	03	01	00	10	**20**
3	Internet Security	03	00	15	00	0	00	02	**20**
4	Virtual Library	03	05	02	02	01	00	07	**20**
5	Web 3.0	00	01	16	00	01	00	02	**20**

Table No. 10 shows the Total Result of Domain Name on Google. Domain Name is presented by .ac.in, .edu, .com, .gov, .net,.ppt and .org. Total 20 Results were analyzed. Out of 20 Result Maximum results were in .com. followed by .org, .edu, .ac.in, .gov, .net,.ppt.

Table No 11 Total Domain name result on Yahoo in first 20 results

S.No.	Keywords	.ac.in	.edu	.com	.gov	.net	.ppt	.org	Total Result
1	Library Automation	05	02	08	00	01	00	04	**20**
2	Library Networks	03	02	03	01	01	00	10	**20**
3	Internet Security	01	00	17	00	00	00	02	**20**
4	Virtual Library	01	01	05	03	01	00	09	**20**
5	Web 3.0	00	00	14	00	02	00	04	**20**

Table No.11 shows the Total Result of Domain Name on Yahoo. Domain Name is presented by .ac.in, .edu, .com, .gov, .net,.ppt and .org. Total 20 Results were analyzed. Out of 20 Result Maximum results were in .com. followed by .org, .ac.in, .edu, .gov, .net,.ppt.

Table No.13 Relevant results in Search Engine shown in first 20 result

S.No.	Keywords	Search Engines	
		Google	Yahoo
1	Library Automation	15/20	17/20
2	Library Networks	18/20	13/20
3	Internet Security	19/20	20/20
4	Virtual Library	18/20	14/20
5	Web 3.0	19/20	16/20
Total		**89/100**	**80/100**
Percentage		89	80

The relevant results all shows in Table No. 13 on each Search Engine. It is examined that Google provide 89% Result, where as Yahoo provides 80%. The percentage rate of Google is more than yahoo Search Engines.

Table No.14 Precision and Relative Recall of search engines

S.No.	Evaluation Criteria	Search Engine	
		Google	**Yahoo**
1	Precision	0.28	0.24
2	Recall	0.39	0.33

Comparing the Precision, Google scored the highest rank (0.28) followed by Yahoo (0.24).

Comparing the Recall, Google scored the highest rank (0.39) followed by Yahoo (0.33).

Table No.15 Evaluation Methodology of Web Search Engine

Sr. No.	Evaluation Criteria	Search Engine	
		Google	**Yahoo**
1	Updated	Daily	Daily
2	Response Time	1-2 Sec..	3 Sec.

An Evaluation Methodology of Web Search Engine is shown in Table No.15 It shows that Google and Yahoo updated Daily.

Findings :

1. Boolean search, advanced search, Preference searches and Expert search is common in all two Search Engines.
2. Preferences Search facility is allowed by both Search Engine. All Search Engines allow "Or" as default search operator.
3. For phrases double quotes are Allow in Google and yahoo. Truncation & Case Sensitivity allowed by all two Search engines.
4. All two Search engines provided the E-mail Facilities. Yellow Pages & white pages are not observed in both Search Engine.
5. Google Search engines shown Ten and Yahoo shown seven Result per page.
6. Google and Yahoo are Daily updated.
7. Two Search Engines shows that result of .com and co.in. Domain name.

References

1. **Al-Masri, E.and Mahmoud,O.H**. Discovering web services in _Search Engines. *IEEE International journals on Internet Computing*.12,3(2008):4-77.

2. **Anuradha and Sharma, A.K.** Accessing the Deep Web Using Ontology. *3rd International Conference on Emerging Trends in Engineering and Technology (ICETET),* 2010:565-568.

3. **Atsaros G., Spinellis D. and Louridas P.** Site-Specific versus General Purpose Web Search Engines: A Comparative Evaluation. *Panhellenic Conference on Informatics,* 2008:44-48.

4. **Bhatia Komal Kumar, Sharma A.K., Madaan Rosy.** AKSHR: A Novel Framework for a Domain-specific Hidden Web Crawler. *IEEE 1st International Conference on Parallel Distributed and Grid Computing (PDGC),*2010:307-312.

5. **Han, Jiawei.,jain, pei.** Data Mining Concepts and Techniques. Waltham: Morgan Kaufmann, 2012.Print.

6. **Harley, Hahn.** The Internet complete reference. Tata McGraw-Hill,1997.

7. **Lihitkar Shalini R.** World Wide Web search engines: A comparative study. 2010: Page No.

8. **Lovic, S.and Meiliu Lu.** Enhancing Search Engine Performance Using Expert Systems. *IEEE International Conference on Information Reuse and Integration.* 2006:567-572.

9. **Mishra, R.K. and Prabhakar, T.V.** KhojYantra: an integrated meta___engine with classification, clustering and ranking . *International Database Engineering and Applications Symposium,* 2000:122-133.

10. **Sharma A. K., Aggrawal N., Gupta R.** Web Search Result Optimization by Mining the Search Engine Query Logs. *IEEE International Conference on Methods and Models in Computer Science (ICM2CS),* 2010:39-45

11. **Vaughan Liwen.** New measurements for search engine evaluation proposed and tested. *ELSEVIER Journals on Information Processing and Management*. 40(2004):677-69.

12. http://www.google.com (Retrieved on dated 24/10/2023)

13. http://www.yahoo.com (Retrieved on dated 24/10/2023)

Mapping of research productivity in the area of Diabetes Mellitus type 1 during the period 2018-2022: Scientometric study

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ABSTRACT: This scientometric analysis aimed to provide a comprehensive global overview and identify research trends in the field of Type 1 Diabetes Mellitus (T1DM). A robust dataset comprising 14,565 scientific articles retrieved from the Web of Science database between 2018 and 2022 formed the basis of our investigation. Leveraging the power of scientometric tools, particularly VOSviewer software, we conducted co-authorship analyses for authors, organizations, and countries, as well as co-occurrence analysis for keywords. We mapped out the collaborative landscape among researchers and institutions through network maps and critical data, revealing key contributors and their interconnectedness. Simultaneously, the co-occurrence analysis unveiled prevalent themes and emerging concepts within T1DM research during the specified timeframe. This scientometric approach not only provides a snapshot of the current state of T1DM research but also serves as a valuable resource for stakeholders, facilitating informed decision-making, collaboration, and the identification of future research directions in the ongoing quest for a deeper understanding and effective management of Type 1 Diabetes Mellitus.

1. Introduction

Scientific research in the field of Type 1 Diabetes Mellitus (T1DM) has witnessed significant growth and productivity in recent years, as reflected by scientometric indicators. Scientometrics involves quantitatively analysing scientific publications, citations, and collaboration patterns within a specific field. In the context of T1DM, bibliometric analyses have shown a surge in the number of publications, indicating a growing interest and investment in this area. Researchers and institutions are increasingly focusing on T1DM due to its rising prevalence and the need for advancements in treatment and management.

Indicators such as citation counts, h-index, and impact factor of journals publishing T1DM research demonstrate the influence and significance of the work in this field. The h-index, which quantifies both the productivity and citation impact of researchers, has shown an upward trend, reflecting the impact and reach of their contributions. Additionally, the impact factor of journals publishing T1DM research highlights the quality and visibility of research output, with prestigious journals increasingly dedicating space to T1DM-related studies. Collaboration networks and co-authorship patterns are another crucial aspect of scientometrics in T1DM research.

Overall, Scientometric indicators affirm the growing research productivity in Type 1 Diabetes Mellitus, emphasizing the need for continued collaboration and interdisciplinary efforts to advance knowledge and treatments, and ultimately improve the lives of individuals affected by this chronic condition.

1.1 Diabetes Mellitus Type 1

Diabetes mellitus type 1, often referred to as T1DM or simply type 1 diabetes, is a chronic autoimmune condition characterized by the immune system's destruction of insulin-producing beta cells in the pancreas. Insulin is a hormone essential for regulating blood sugar (glucose) levels and facilitating its entry into cells to provide energy. In individuals with type 1 diabetes, the loss of beta cells leads to an absolute insulin deficiency, resulting in elevated blood glucose levels. As a result, individuals with type 1 diabetes require regular insulin injections or insulin pumps to manage their blood sugar levels effectively. The condition typically manifests in childhood or adolescence, and its exact cause is not fully understood, although genetic and environmental factors likely play a significant role. Effective management involves a careful balance of insulin administration, monitoring blood sugar levels, a well-managed diet, and regular physical activity. Left uncontrolled, type 1 diabetes can result in various complications, including cardiovascular disease, kidney damage, nerve damage, and vision problems.

2. Objectives

(i) To examine the annual trend in the production of research articles on type 1 diabetes mellitus between 2018 and 2022, with a focus on calculating the Relative Growth Rate and Doubling Time of these publications.
(ii) To identify the highly prolific authors of top cited papers.
(iii) To determine the organizations contributing top cited papers.
(iv) To find out the countries contributing top cited papers.

(v) To identify the highly preferred journals.

(vi) To map the co-authorship pattern among authors, organizations and countries and co-occurrence of keywords of research papers to analyse the overall trend and direction of research in the field of T1DM.

3. Review of Literature

Gomis et.al (2023) conducted a scientometric analysis of research articles under the theme of learning resources in Higher Education. The study analysed 4489 scientific articles from the Web of Science database between 1970 and 2022. The study revealed that the USA had a significant research input, and Salamin, N. from the University of Lausanne was recognised as the most frequently published author. The University of Illinois, USA, has the highest contribution to research articles, and the most popular research hotspots and trends were e-learning, Education, Academic libraries, Learning resources, and Cloud computing.

Arya & Jaiswal (2022) conducted a study to investigate the collaborative pattern in review articles published on diabetes mellitus type 1. The study is based on data extracted from Pubmed database. A total of 1545 articles were retrieved during the years 2012 to 2022. The major findings of the study were that the highest number of articles (13.78%) was published in the year 2021. Three authors' collaboration was most elevated in number with 22% articles. The average degree of collaboration for all 10 years is 0.92 while the highest degree of collaboration was 0.95 found in the year 2021. The study reveals that collaborative papers were dominated in this field rather than solo.

Suresh & Thanuskodi (2019) conducted an in-depth analysis of the research output from ICAR- Indian Institute of Horticulture, Bangalore (ICAR-IIHR) covering the period from 1989 to 2018 using data sourced from the Web of Science database. The study revealed that the growth of literature accounted for 90.13%. The analysis also highlighted the United States and Horticultural Experiment Station as the leading collaborating countries and institutions, respectively. Furthermore, an examination of collaborative authorship patterns indicated a significantly high degree of collaboration, amounting to 90%. Overall, the research paper provides a comprehensive and well-informed overview of ICAR-IIHR's research performance.

Goswami & Hazarika (2016) conducted a Scientometric analysis of Assam University's research productivity from 2000 through 2015. Data was collected through the Web of Science. A total of 714 papers were analysed to study the study's various attributes, such as publication pattern, authorship pattern, collaboration

pattern, etc. The study found that the research output of Assam University shows a simultaneous increase from 2 records (0.28%) in 2000 to 131 records (18.35%) in 2015. Most of the published papers are in the form of articles (90.34%). Out of the total 714 published papers, only 21 papers (3%) are single-authored, while 693 papers (97%) are multi-authored, in which 3-5 authored contribution (58%) is maximum. Current Science is the most preferred journal in which 23 papers (6.67%) contributed by various researchers are published.

Teli & Dutta (2016) conducted a research analysis of Vidyasagar University from 1989- 2014. The data were retrieved from the WOS database. The study focuses on various parameters such as publication pattern, authorship pattern, citation pattern, etc. The study showed that 986 papers were published from 1989-2014, with an average citation of 8.3 per paper. Most of the publications are during the year 2013 (i.e-129). The multi-authored publication is more prominent than the single-authored. The most prolific author is Syed Sirajul Islam from the Department of Chemistry with 89 publications. IITS has the highest number of collaborative papers (i.e-126) with Vidyasagar University, and the most preferred journal is Carbohydrate Research.

Rasolabadi et al. (2015) examined Iran's research performance on diabetes nationally and internationally. The study is based on the Iranian publication data in diabetes research retrieved from the Scopus citation database till the end of 2014. The study found that Iran's cumulative publication output in diabetes research consisted of 4425 papers from 1968 to 2014, with an average number of 96.2 papers per year and an annual average growth rate of 25.5%. Iran ranked 25th place with 4425 papers among the top 25 countries with a global share of 0.72 %. The average of Iran's publication output was 6.19 citations per paper. The average citation per paper for Iranian publications in diabetes research increased from 1.63 during 1968-1999 to 10.42 for 2014.

Gupta & Bala (2011) analysed tuberculosis (TB) research output carried out in India during 1998-2009 using SCOPUS Citation Database. To compare the profile of Indian research output with China, South Africa and Brazil, the study downloaded the data on these countries using the Affiliation field of this database. India ranks at 3rd position among the top 21 countries and its global publication share (7.73%) is higher than China (2.93%), South Africa (2.60%) and Brazil (2.47%). However, its average annual publication growth rate and international collaborative publication share are lower than these countries. Citation quality as reflected in citations per paper for South Africa and Brazil is found to be higher than in India.

4. Scope and Methodology

This study focuses on analysing scientific publications related to Type 1 Diabetes mellitus within the Social Science Citation Index (SSCI), Science Citation Index (SCI), and Arts and Humanities Citation Index (A&HCI). The research period under consideration spans from 2018 to 2022. To gain insights into the Scientometric literature regarding Type 1 Diabetes mellitus, a search was conducted in the Web of Science (WOS) database (https://www.webofscience.com/wos/woscc/basic-search). Specifically, we employed a title-based search, using the term "diabetes mellitus type 1*", and confined the search to publications from 2018 to 2022. This search took place on October 4, 2023. It's worth noting that results for 2023 might be incomplete due to the ongoing updates in the databases and the study's timing.

The total 14565 articles were imported from WOS in both plain text and Excel files to analysis of data. The data analysis was performed with MS Excel and VOS viewer software. Ultimately, our evaluation encompassed various parameters, including Relative Growth Rate and Doubling time, prolific authors, geographical origins, organizations, journals etc.

5. Data Analysis

The Relative Growth Rate (RGR), Doubling Time (Dt), and Activity Index (AI) have been calculated using the following formulas:

5.1 Relative Growth Rate (RGR):

The Relative Growth Rate (GR) is a crucial metric in understanding the expansion of a particular phenomenon, such as the number of publications in the context of a scientometric analysis. As per Mahapatra's (1985) equation, the Relative Growth Rate is calculated as the increase in the number of publications per unit of time. The formula for computing the mean Relative Growth Rate (GR) is given by the following expression:

R= W2-W1/T2-T1

where:

R = mean relative growth rate over the specific period of intervals;

W1 = Log W1 (natural log of the initial number of articles);

W2 = Log W2 (natural log of final number of articles);

T2 – T1 = the unit difference between the initial and final time

5.2 Doubling Time (Dt.):

The doubling time (Dt) is a key metric that represents the period required for a quantity to double in size or value. In the context of scientometric analysis, it can be applied to assess how quickly the number of publications in a specific field, such as Type 1 Diabetes Mellitus research, is doubling over time. Mahapatra (1985) suggests a formula for calculating the doubling time, which can be expressed as follows:

Doubling time Dt = 0.693/R

Table :1 Relative growth Rate and Doubling time

Publication Years	Total no. of articles	% of articles	Cumulative Numbers of articles	log1	log2	Relative Growth Rate	Doubling Time
2018	2474	16.99	2474		7.81		
2019	2519	17.30	4993	7.81	8.52	0.71	0.98
2020	2956	20.30	7949	8.52	8.98	0.46	1.56
2021	3199	21.96	11148	8.98	9.32	0.34	2.04
2022	3417	23.46	14565	9.32	9.59	0.27	2.57

Table 1 displayed years wise growth of articles as well as Relative Growth Rate and doubling time of articles. While observing the year wise production of articles, it is found that article on diabetes Mellitus type 1 continuously increased during the year from 2018 to 2022 with 16.99% to 23.46%. It is found that the Relative Growth Rate (RGR) exhibited a declining trend over the years, while the Doubling Time (Dt) demonstrated an annual increase. The relative growth rate decreases with rate 0.71 to 0.27 from the year 2018 to 2022. while Doubling time of the publication increases with rate 0.98 to 2.57.

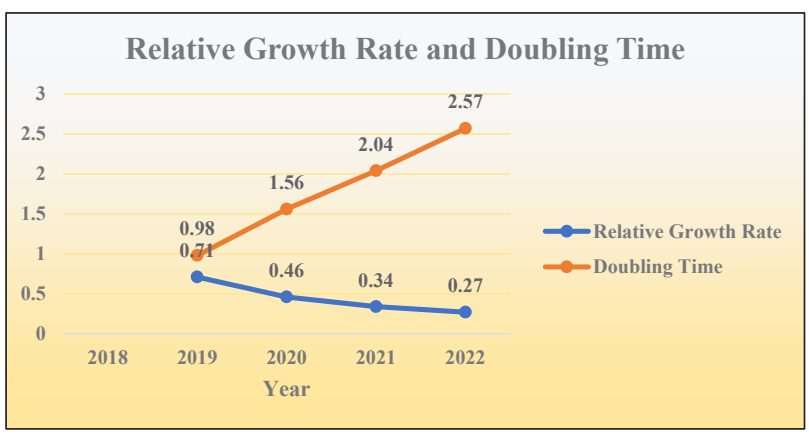


Fig.1 Relative Growth Rate and Doubling Time

Table:2 Top 20 Most prolific author

Authors	Contributions	Percentage	Rank
Wang Y	113	0.776	1
Zhang Y	111	0.762	2
Li X	106	0.728	3
Liu Y	102	0.7	4
Li J	98	0.673	5
Wang L	90	0.618	6
Li Y	86	0.59	7
Liu J	83	0.57	8
Li L	77	0.529	9
Zhang L	72	0.494	10
Zhang J	71	0.487	11
Chen Y	70	0.481	12
Wang J	69	0.474	13
Yang Y	63	0.433	14
Khunti K	61	0.419	15
Chen L	60	0.412	16
Yang L	60	0.412	17
Wang H	59	0.405	18
Mcguire D. K	56	0.384	19
Li Q	51	0.35	20

Table 2 illustrates the top 20 authors who have made significant contributions to the body of literature on Type 1 Diabetes Mellitus. Wang Y emerges as the top-ranking author, with a notable contribution of 113 articles, constituting 0.78% of the total 14,565 articles on DM1. Following closely, Zang Y secures the second position with 111 articles (0.76%), and Li X occupies the third rank with 106 articles (0.73%). It is noteworthy that Mcguire D.K and Li Q are situated at the bottom of the list, holding the 19th and 20th ranks, and contributing 56 articles (0.38%) and 51 articles (0.35%), respectively.

Table :3 Contribution of Top 20 Institutions and Universities in Diabetes Research

Affiliations	No of Papers	% of Papers	Rank
Harvard University	544	3.735	1
Harvard Medical School	380	2.609	2
University of London	364	2.499	3
University of California System	295	2.025	4
Brigham Women S Hospital	268	1.84	5
University of Copenhagen	238	1.634	6
Karolinska Institute	219	1.504	7
University of Toronto	219	1.504	8
Shanghai Jiao Tong University	211	1.449	9
University of Texas System	198	1.359	10
Ciber Centro De Investigacion Biomedica En Red	195	1.339	11
University of Groningen	193	1.325	12
Peking University	189	1.298	13
University of Colorado System	187	1.284	14
Egyptian Knowledge Bank Ekb	184	1.263	15
Udice French Research Universities	182	1.25	16
University College London	178	1.222	17
University of Sydney	176	1.208	18
Capital Medical University	175	1.202	19
University of Colorado Anschutz Medical Campus	175	1.202	20

Table 3 emphasizes the leading 20 institutions actively engaging in research publications on Type 1 Diabetes Mellitus. Notably, three prominent organizations have contributed over 300 papers each. Harvard University claims the top position with a remarkable 544 publications, constituting 3.74% of the total. Following closely is Harvard Medical School, securing the second position with 380 publications (2.61%), while the University of London holds the third rank with 364 publications (2.50%).

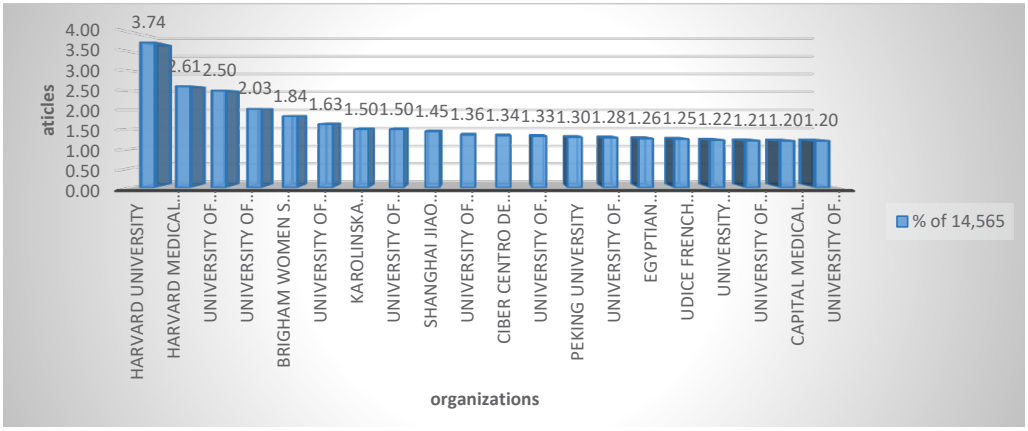


Fig 2: Influential Organization

Table 4: top 20 highly productive counties

Countries	No. of Papers	Share of papers	Rank
China	3394	23.302	1
USA	3330	22.863	2
England	1320	9.063	3
Japan	998	6.852	4
Germany	813	5.582	5
South Korea	689	4.731	6
Australia	647	4.442	7
Italy	630	4.325	8
Netherlands	575	3.948	9
Spain	564	3.872	10
Canada	554	3.804	11
Sweden	552	3.79	12
Taiwan	508	3.488	13
Denmark	481	3.302	14
Brazil	398	2.733	15
France	364	2.499	16
Saudi Arabia	363	2.492	17
Poland	342	2.348	18
India	330	2.266	19
Switzerland	250	1.716	20

Table 4 shows the top 20 highly productive countries that produced the largest number of articles on Diabetes Mellitus type 1. It is found that China is at the top of the list sharing 3394 (23.30%) articles followed by USA is on second rank with 3330 (22.86%) publications and England is on third rank with 1320(9.06%) publications. It is interesting to note that India got 19th rank with 330 (2.27%) publications followed by Switzerland with 250 (1.72%) publications.

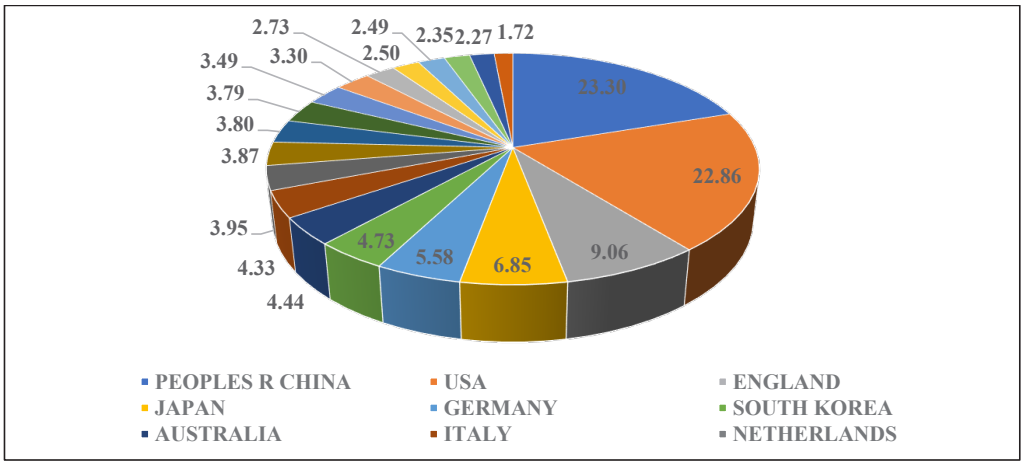


Fig:3 Most productive countries

Table: 5 Top 20 Most Productive Journals

Publication Titles	Number of articles	% of 14,565	Impact Factor
Frontiers in Endocrinology	381	2.616	5.2
PLOS one	374	2.568	3.7
Scientific Reports	317	2.176	4.6
Cardiovascular diabetology	313	2.149	9.3
Diabetes metabolic syndrome and obesity targets and therapy	304	2.087	3.24
BMJ open diabetes research care	294	2.019	4.1
Diabetes therapy	293	2.012	3.8
Diabetes care	279	1.916	16.2
Pediatric diabetes	265	1.819	3.41
Journal of diabetes investigation	251	1.723	4.32
International journal of environmental research and public health	205	1.407	4.614

Publication Titles	Number of articles	% of 14,565	Impact Factor
Journal of clinical endocrinology metabolism	204	1.401	6.134
Diabetes obesity metabolism	200	1.373	5.8
Journal of diabetes research	198	1.359	4.3
Diabetologia	194	1.332	8.2
Nutrients	193	1.325	6.71
Journal of clinical medicine	180	1.236	3.9
BMC endocrine disorders	175	1.202	2.7
BMJ open	172	1.181	2.9
Medicine	168	1.153	1.3

The ranking of journals based on their research output and impact factor are displayed in table 5. Total 1801 journals published article on Diabetes Mellitus type 1out of that illustrates the top 20 most preferred journals by authors are represented in the above table. The most productive journal is "Frontiers in Endocrinology" 381(2.62%) articles with 5.2 impact factor followed by "PLOS One" 374(2.57%) with 3.7 impact factor and "Scientific Reports" 317(2.18%) with 4.6 impact factor.it is noted that "Diabetes care" has highly impact factor(16.2) journal contributing only 279(1.92%) articles during the period of study.

5.3 Co-authorship analysis

Co-authorship analysis is a fundamental component of Scientometric studies that seeks to understand the collaborative networks among researchers in a specific field or discipline. This analysis involves examining patterns of co-authorship, which occur when two or more authors collaborate on a research project and publish their work together. By investigating co-authorship patterns, scientometric researchers can gain valuable insights into the structure and dynamics of the scientific community.

When developing a co-authorship mapping in a scientometric study, it is essential to set nominal thresholds for categories such as authors, organizations, and countries. These thresholds are established to clarify and enhance the readability of the network visualization by eliminating less significant contributors and avoiding overlaps. The goal is to create a visual representation that effectively highlights the most relevant and influential aspects of the collaboration network.

5.3.1 Authors

A total of 78,456 research authors were identified from 14,565 published bibliographic research articles. To maintain clarity in the dataset, anonymous articles and authors were excluded. Subsequently, 78 authors were identified who each had a minimum of 20 documents. In Figure 4, degree centrality is represented by the size of vertices. Total 8 clusters were obtained in different colors. Authors such as Mcguire, Darren K., Leiter, Lawrence A. and Khunti, Kamlesh exhibited the highest degree of centrality, with their vertices being the largest in the network. Mcguire, Darren K. in the (lime color) cluster 4 is the most cited author (4795 times) followed by Leiter, Lawrence A. in cluster 4 is the second most cited author (4396 times). The lines connecting two nodes in the network represent collaborations between authors, and the strength of collaboration is indicated by the line value. This suggests a notable characteristic of these researchers, indicating a tendency to dominate and collaborate extensively in the field.

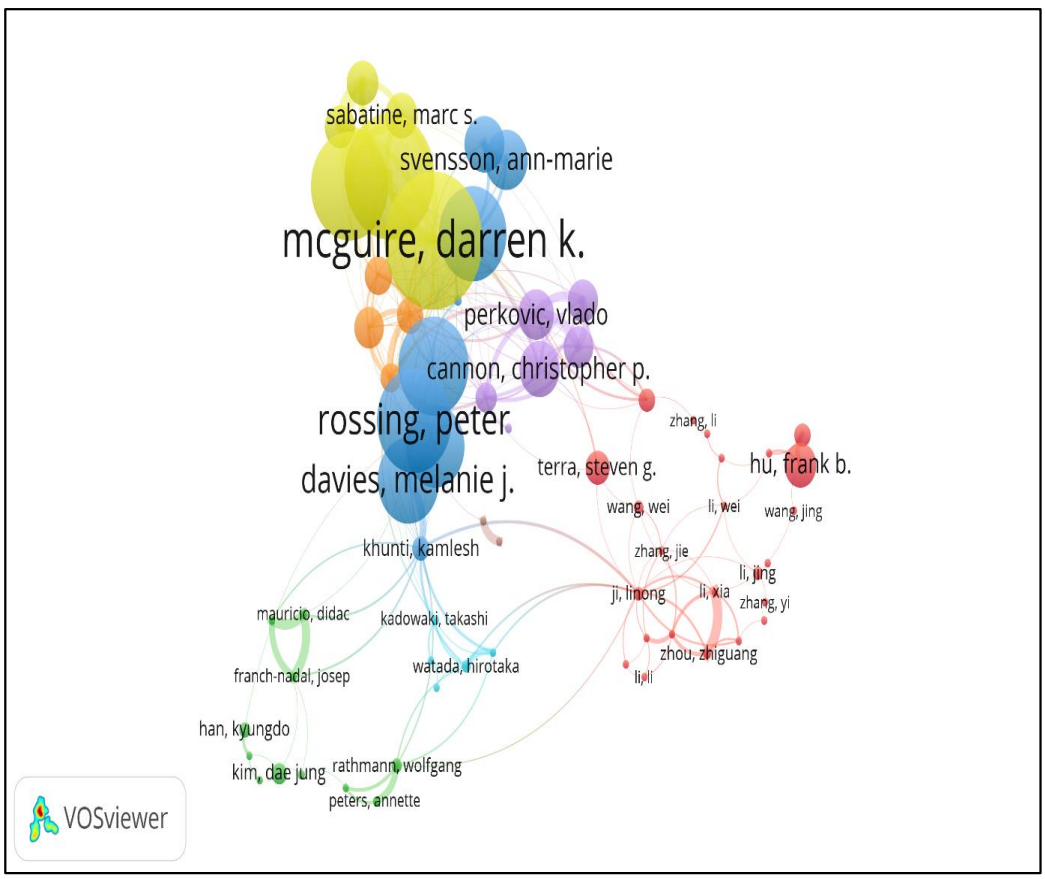


Fig: 4 Mapping of co-authorship network of most prolific Authors

5.3.2 Organizations

Out of the 14,937 organizations identified in the bibliographic data, only 140 organizations surpassed the threshold of having a minimum of 50 documents each. The analysis delves deeper into the number of publications attributed to each organization and considers their geographic locations, aiming to identify the top-performing research institutions.9 clusters were obtained from the data analysis. In figure 6 Harvard Medical School in green cluster is the most cited organization (17510 times) followed by the University of Toronto in the red cluster is the second most cited organization (11916 times).

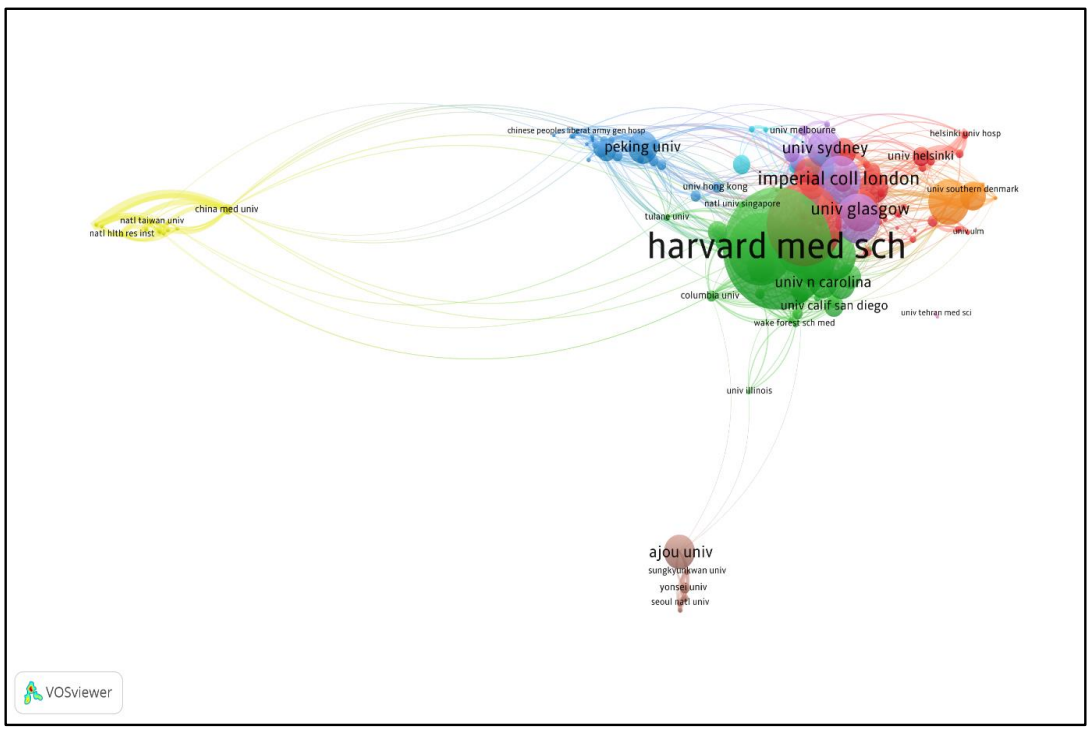


Fig: 5 Mapping of co-authorship network of highly cited organizations

5.3.3 Countries

Figure 6 represents the co-authorship map of countries. 159 countries contributed to the retrieved research articles analyzed within the study. However, only 68 countries met the threshold of 20 publications per country. total of 5 clusters were obtained from the analysis. It is found that USA in red cluster is the most cited country (76147 times) and the total link strength of this country is 3967 followed

by China in red cluster is the second most cited country (39387 times) and the total link strength of this country is 1246. Different colors indicate different clusters and the size of circles indicates the number of publications. The thickness of the lines represents the link strength of the countries

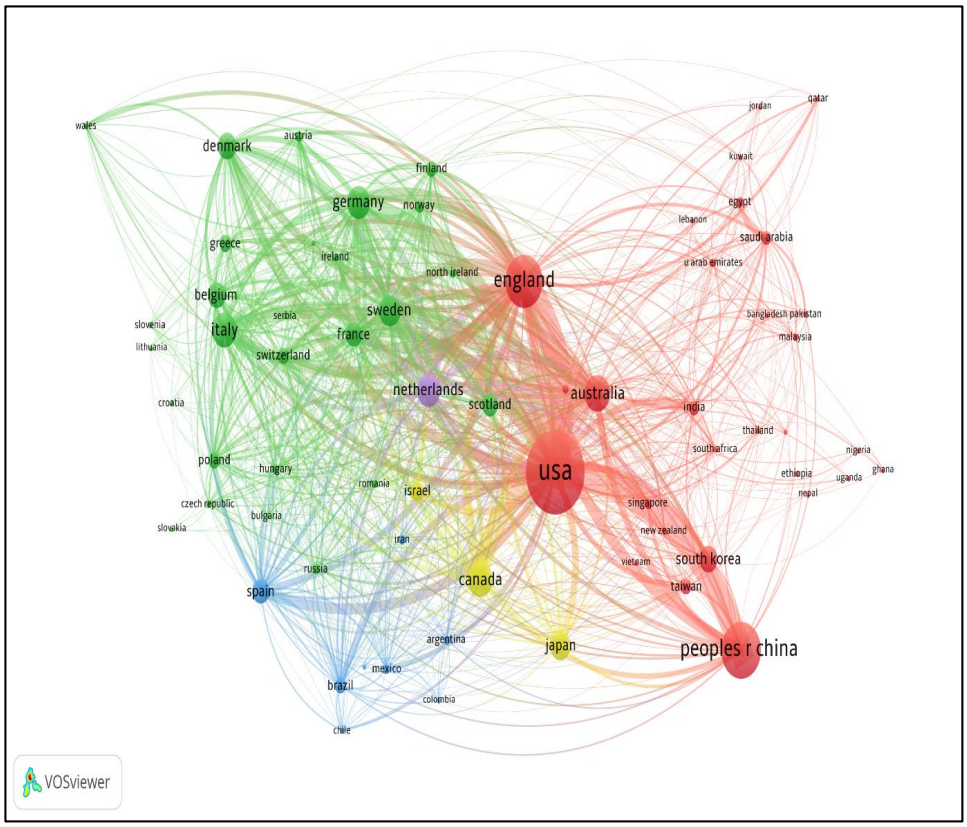


Fig: 6 Mapping of co-authorship network of highly productive countries

5.4 Co-occurrence: Author keywords

Figure 7 displays the co-occurrence of author keywords. 50 keywords were obtained when the threshold was provided at 100 occurrences from 14565 articles. For each 50 keywords, the total strength of the co-occurrence link with other keywords analyzed.it is clear from the map that "Diabetes Mellitus" in (azure color) cluster 6 has the largest occurrence (2176 times) with 49 links and 2060 total link strength followed by "type 2 Diabetes Mellitus" in (green color) cluster 2 has the second largest occurrence (1788 times) with 45 links and 1189 total link strength.

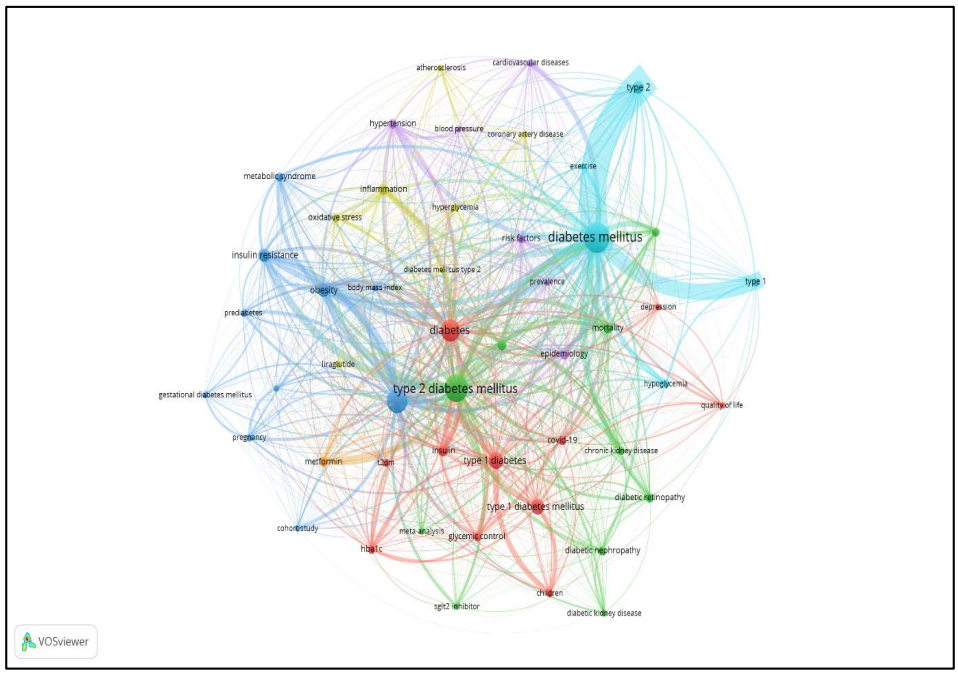


Fig: 7 Mapping of co-occurrences network of Author keywords

6. Key Findings of the study

The major findings of the study are as follows:

- It is found that articles on diabetes Mellitus type 1 continuously increased during the year from 2018 to 2022 with 16.99% to 23.46%. The relative growth rate decreases with rate of 0.71 to 0.27 from the year 2018 to 2022. while the Doubling time of the publication increases with a rate of 0.98 to 2.57.
- Wang Y emerges as the top-ranking author, with a notable contribution of 113 articles, constituting 0.78% of the total 14,565 articles on DM1.
- Harvard University gets the first position with a remarkable 544 publications, constituting 3.74% of the total followed by Harvard Medical School, securing the second position with 380 publications (2.61%).
- It is found that China is at the top of the list sharing 3394 (23.30%) articles followed by USA is on second rank with 3330 (22.86%) publications.
- The most productive journal is "Frontiers in Endocrinology" 381(2.62%) articles with 5.2 impact factor followed by "PLOS One" 374(2.57%) with 3.7 impact factor.

- Mcguire, Darren K. in the (lime color) cluster 4 is the most cited author (4795 times) followed by Leiter, Lawrence A. in cluster 4 is the second most cited author (4396 times).
- Harvard Medical School in green cluster is the most cited organization (17510 times) followed by the University of Toronto in the red cluster is the second most cited organization (11916 times).
- It is found that USA in red cluster is the most cited country (76147 times) and the total link strength of this country is 3967 followed by China in red cluster is the second most cited country (39387 times) and the total link strength of this country is 1246.
- It is clear from the network map of the author keyword occurrences that "Diabetes Mellitus" in (azure color) cluster 6 has the largest occurrence (2176 times) with 49 links and 2060 total link strength followed by "type 2 Diabetes Mellitus" in (green color) cluster 2 has the second largest occurrence (1788 times) with 45 links and 1189 total link strength.

7. Conclusions

In conclusion, this scientometric study on Type 1 Diabetes Mellitus (T1DM) has provided valuable insights into the landscape of research surrounding this complex and chronic medical condition. Through a systematic analysis of scientific literature, citation patterns, and collaboration networks, we have gained a comprehensive understanding of the current state of T1DM research. The study highlights the evolving trends, key contributors, and seminal works that have shaped the field over time. Moreover, the identification of research gaps and emerging areas indicates avenues for future investigation. As we navigate the dynamic landscape of T1DM research, it becomes evident that collaboration among multidisciplinary teams is crucial for advancing our understanding and developing innovative strategies for prevention, management, and ultimately, a cure for this challenging disease. This scientometric analysis not only contributes to the existing body of knowledge on T1DM but also serves as a valuable resource for researchers, clinicians, and policymakers seeking to address the multifaceted aspects of Type 1 Diabetes Mellitus.

References

1. Arya, R. & Jaiswal, B. (2022, October). Research collaboration pattern in the field of Diabetes mellitus type 1: a scientometric study. 12th International Conference of University Librarians Association of Sri Lanka – 2022.Colombo, Shri Lanka. Retrieved from: https://www.ulasl.lk/

2. Gomis, et al. (2023). A scientometric analysis of global scientific literature on learning resources in higher education. *Heliyon.* https://doi.org/10.1016/j.heliyon.2023.e15438

3. Goswami, R., & Hazarika, T. (2016). Mapping Research Contributions of Assam University: A Scientometric Study. 2012, 286–293

4. Gupta, B.M. & Bala, A. (2011) Mapping of Tuberculosis Research in India: A Scientometric Analysis of Publications Output during 1998–2009. *Collnet Journal of Scientometrics and Information Management,* 5(1):33-51, DOI: 10.1080/09737766.2011.10700901

5. Mahapatra, M. (1985). On the Validity of the Theory of Exponential Growth of Scientific Literature, Proceedings of the 15th IASLIC Conference, Bangalore, P.61-70.

6. Rasolabadi, M. et al. (2015). Diabetes Research in Iran: a Scientometric Analysis of Publications Output. *ACTA INFORM MED, 23*(3): 161-165. doi: 10.5455/aim.2015.23.160-164

7. Suresh, N. & Thanuskodi, S. (2019) Research Output of ICAR-Indian Institute of Horticultural Research: A Scientometric Study. *Library Philosophy and Practice (e-journal)*. 2166. https://digitalcommons.unl.edu/libphilprac/2166

8. Teli, S. & Dutta, B. (2016) Research Trend Analysis of Vidyasagar University since 1989: A Bibliometric Study. *Journal of Advancements in Library Sciences,3*(2):89-102. https://sciencejournals.stmjournals.in/index.php/JoALS/article/viewFile/350/179

Author's gender and citations in open access publications: A study of DESIDOC Journal of Library & Information Technology

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ABSTRACT: The present study maps the LIS literatures and their author's gender of the journal DESIDOC Journal of Library & Information Technology. The documents of the selected journal have been exported from the Scopus database during 2014-2023. The search found total of 550 documents published during that time period. The gender has been identified using a software called Namsor. The study aimed to investigate the year wise growth of literature, gender of the first author and citation received by the authors. The findings revealed that the number publication is decreasing since 2021 in the journal, female authors contribution is found to be very less than the male authors and same goes with citation also. The female LIS professionals need to be more active and willingness to participate in research for filling the gaps as well as development of the subject.

Introduction

Gender equality has always been a topic of concern in many sectors of the human civilisation so as the scientific world also. There a number of research on evaluating male and female author's participation in research Science (Jadidi, et al, 2018) mental health (Bashir & Albahari, 2020); Critical care publications (Chary, et al., 2021) Medicine (Rachid, et al, 2021); Humanities and Social sciences (Vuong, et al, 2021); Covid-19 (Liu, et al, 2022). Thus, the field Library and Information science is also not an exception (Vinay et al, 2019; Pattel & Verma, 2020; Bisaria, 2021). These studies have only found female authors to be underrepresented than the male authors. At present, lifting the exposure of women has become one of a primary goal of every nation. Even though the empowerment of women is much improving in compared to the past decades but the differences still persist according to some studies. Kuchansky et al, (2023) claims that the gap may occur due to various factors like cultural, socioeconomic and natural homophily, which can be overcome by safeguarding the rights of the people in all divergence. Vuong, et al, (2021) states that the inequality in research may persist because of a weak

financial support which occurs as a barrier for women. Chatterjee and Werner, (2021) found that the gender gap also exist in the citation received by the authors where the works of women have less citation than that of men. However, the rate of gender gap in research is higher in the STEM (Science, Technology, Engineering and Mathematics) (Sa, et al, 2020) and lower in Social Sciences (Bello, M. & F. Galindo-Rueda, 2020)

Research & development have always contributed a major share for the growth of the world. So, the present study aims to evaluate and identify the participation of the female researchers in LIS research in an Indian open access journal i.e, DESIDOC Journal of Library & Information Technology based on the highest Citescore (2.0). The findings of the study will reflect about all the practitioners, students and researcher's gender based scientific contribution to the field. The emergence of Open Access has set a remarkable landmark into the scientific world which has paved many ways for building a sustainable future. Therefore, the study will reveal the gender representation in open access publication in India.

Objectives

1. To identify the growth of literature,
2. To identify the gender of the first author of research publications
3. To compare the citation rate between female and male first author

Methodology

The present study aims to investigate the contribution of the male and female authors belonging to the field of LIS in the journal DESIDOC Journal of Library & Information Technology during 2014-2023. Bibliometric methods have been applied to conduct the study. The data has been collected from the Scopus database by selecting the "sources" using the name of the journal as search keyword "DESIDOC Journal of Library & Information Technology" performed on 10th November 2023. The search results in total of 685 documents and after filtering the data by limiting years 2014-2023 it results in 551 documents. The analysis and scrutinization of data are performed using MS excel. For determining the gender, a software named *Namsor* (https://namsor.app/) which identifies personal names based on gender, country and ethnicity. The software requires the first name and last name of the author to process the gender. The growth and citation have been determined manually in the Excel sheet.

Data Analysis and Interpretation

Publication growth



Figure 1: Yearwise growth of research publications

The journal DESIDOC Journal of Library & Information Technology have published 550 research publications in the last ten years (2014-2023). Figure 1 portrays the growth of publication in yearly basis which shows that 2014 has the maximum publications with an unsteady growth but again seems decreasing since 2021with the least publication in the year 2023.

Gender of the First author

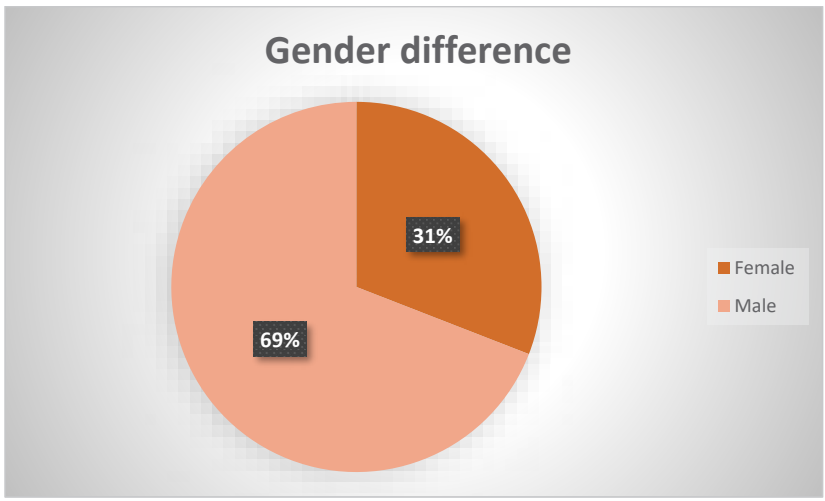


Figure 2: Gender of the first authorship

The sequence of an author indicates the overall contribution of the authors to the manuscript and the first author has always greater contribution to it. Figure 2. depicts the proportion of the male and female authors in the first position of the authorship. The figure reveals that in the last ten years the rate male first author is higher with 69% than female first authors with 31% in the field Library and Information Science. Even though the gender gap is still there but it is improving than the past years because in the study of Bisaria (2018) have found male authors to be 75.38 % and female authors with 24.62 %. Therefore, the positive reflection is that women are increasing their participation in research with time but it still needs to be more to bring into the line.

Rate of citation received by male and female authors

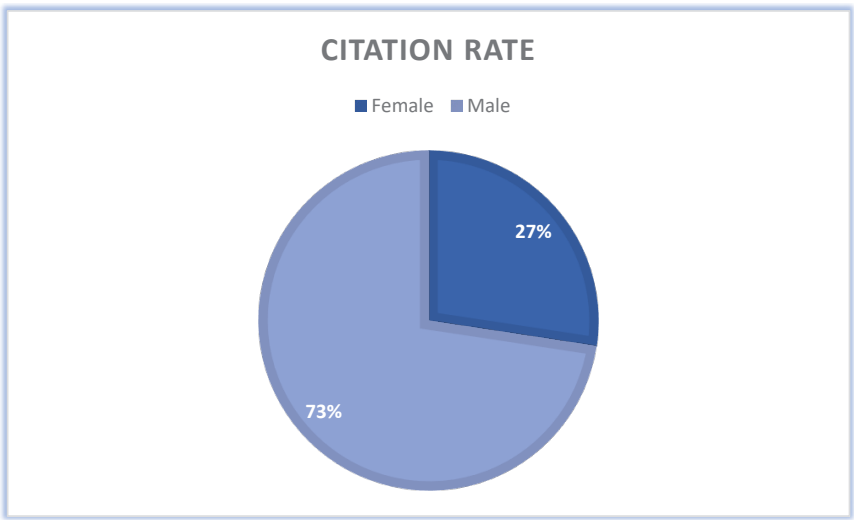


Figure 3: citation rate of male and female author

Citation is an important factor in research which is a source of recognition for a researchers in academia. The present study also investigates the rate of citations received by both male and female researchers as shown in figure 3. It reveals about an existing gap where male first authors have received 73% citation on the other hand female authors have received only 27 % citations. Because the contribution of male is more so as the citations. The lower rate of citation for female authors is also found by other studies (King et al., 2017; Andersen et al., 2019; Dworkin et al., 2020) however Bisaria (2018) proved that citedness doesn't dependent on the gender of the authorship but on the quality of the works.

Conclusion

The journal DESIDOC Journal of Library & Information Technology is one of an old Indian open access LIS journal published by DRDO since 1981. In 2012, the journal has been indexed in the Scopus which is a largest scientific database. Presently, this the journal has the highest citescore of 2.0 than any journal in India. From the above analysis it is found that in the last ten years of this journal, the male authors have been more dominant in comparison to the female authors and same gender gap occurs with rate of citation received. It reveals that the female LIS professionals are less aware for contributing their scientific knowledge to the subject than the male author and because of the less contribution they receive less citation. Therefore, for bringing up the gender equality in the field, the LIS professionals come forward and create a warm environment to help the female professionals to conducting and publishing their research work. Females should have the willingness to work hard in the profession and set mark in research in many highly reputed journals. The present study is limited to one Indian journal only, future researches can be conducted by considering other Indian journals also for a generalised finding.

References

1. Albahari, D., & Bashir, M. (2020). Women's productivity in mental health research in the Gulf Cooperation Council (GCC). *Asian Journal of Psychiatry*. https://doi.org/10.1016/j.ajp.2020.102311

2. Andersen, J. P., Schneider, J. W., Jagsi, R., & Nielsen, M. W. (2019). Gender variations in citation distributions in medicine are very small and due to self-citation and journal prestige. *eLife*, *8*. https://doi.org/10.7554/elife.45374

3. Bisaria, G. (2018). DESIDOC Journal of Library and Information Technology: A gender perspective. *DESIDOC Journal of Library & Information Technology*, 38(6), 410. https://doi.org/10.14429/djlit.38.6.13238

4. Chary, S., Amrein, K., Soeteman, D. I., Mehta, S. & Christopher, K. B., (2021) Gender disparity in critical care publications: a novel female first author index, *Annals of Intensive care,* 11(103), 1-8 doi- https://doi.org/10.1186/s13613-021-00889-3

5. Chatterjee, P., & Werner, R. M. (2021). Gender disparity in citations in high-impact journal articles. *JAMA Network Open*, 4(7), e2114509. https://doi.org/10.1001/jamanetworkopen.2021.14509

6. Dworkin, J. D., Linn, K. A., Teich, E. G., Zurn, P., Shinohara, R. T., & Bassett, D. S. (2020). The extent and drivers of gender imbalance in neuroscience reference

lists. *Nature Neuroscience*, *23*(8), 918–926. https://doi.org/10.1038/s41593-020-0658-y

7. Jadidi, M., Karimi, F., Lietz, H. & Wagner, C. (2018) Gender disparities in science? Dropout, productivity, collaborations and success of male and female computer scientists, *Advances in Complex Systems* 21(3), 1750011. Doi- https://doi.org/10.1142/S0219525917500114

8. King, M. M., Bergstrom, C. T., Correll, S. J., Jacquet, J., & West, J. D. (2017). Men set their own cites high: gender and self-citation across fields and over time. *Socius*, 3, 237802311773890. https://doi.org/10.1177/2378023117738903

9. Kuchansky, A., Andrashko, Y., Biloshchytskyi, A., Omirbayev, S., Mukhatayev, A., Biloshchytska, S., & Faizullin, A. (2023). Gender-related differences in the citation impact of scientific publications and improving the authors' productivity. *Publications*, *11*(3), 37. https://doi.org/10.3390/publications11030037

10. Liu, M., Zhang, N., Hu, X., Jaiswal, A., Xu, J., Chen, H., Ding, Y., & Bu, Y., (2022) Further divided gender gaps in research productivity and collaboration during the COVID-19 pandemic: Evidence from coronavirus-related literature, *Journal of Informetrics*, 16(2), 1-17. Doi - https://doi.org/10.1016/j.joi.2022.101295.

11. Patel, R & Verma, M. K. (2020) Gender Variation in LIS Research Productivity: A case study of SRELS Journal of Information Management, *2nd International conference on information systems & management science (ISMS)* at Tripura University

12. Rachid, E., Noureddine, T., Tamim, H., Makki, M. Naalbandian, S. & AI-Haddad, C. *(2021)* Gender disparity in research productivity across departments in the faculty of medicine: a bibliometric analysis. *Scientometrics* 126, 4715–4731. Doi - https://doi.org/10.1007/s11192-021-03953-8

13. Vinay, R. S. & Basavaraja, M. T. (2019). Trends in Library and Information Science Research: A scientometric analysis *9th KSCLA National Conference on Library in the Life of the User* held at Tumakuru.

14. Vinay, R. S., Kumar, B. T. Sampath, & Kumbar, M. (2019) Gender divergence in two Indian LIS journals: A bibliometric study. *7th International on Libraries, Information and society* held at University of Malaya.

15. Vuong, Q., Nguyen, H. T. T., Ho, M. & Nguyen, M. (2021) Adopting open access in an emerging country: Is gender inequality a barrier in humanities and social sciences? *Learned Publishing* 34(4) 487-498.

16. Bello, M., & Galindo-Rueda, F. (2020). Charting the digital transformation of science. *OECD Science, Technology and Industry Working Papers*. https://doi.org/10.1787/1b06c47c-en

17. Sá C, Cowley S, Martinez M, Kachynska N & Sabzalieva E., (2020) Gender gaps in research productivity and recognition among elite scientists in the U.S., Canada, and South Africa. *PLoS One*, 15(10), 1-14. doi: 10.1371/journal.pone.0240903

Towards Sustainable Metadata Arrangement Using Ranganathan's Normative Principle in Shodhganga Thesis Repository

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ABSTRACT: A novel attempt is made in this study to show how Ranganathan's Normative principles are relevant to Metadata arrangement in the Shodhganga repository. A deeper comprehension of normative principles would make keyword categorisation more effective rather than depending just on intuition. In order to demonstrate an application of the Normative principle, the study investigates the local-level metadata structure of the Shodhganga thesis repository. Additionally, the study portrays a faceted approach model for categorising thesis keywords into facets. Finally, for metadata sustainability and discoverability, the reconciliation with Wikidata and creation of Wikidata Schema were performed. The study finds inconsistencies in approach term categorisation. Lastly, the study suggests to use of faceted controlled vocabularies for approach term representation and Wikibase for metadata sustainability.

Introduction

The twenty-first century has seen an unprecedented transformation as various modifications in information organisation strategies and terminologies have been noticed. Significant transformations have been noted in the progression from the catalogue card to the bibliographic record, the bibliographic record to the Online Public Access Catalog (OPAC), and subsequently, the metadata, library portal, and library gateway. In order to improve resource discovery in a distributed network environment, metadata is a viable strategy that will continue to develop. The utilisation of metadata has gained significant ground in modern culture through the implementation of metadata for digital libraries, the extraction of metadata for institutional repositories, and the adoption of metadata standards. Metadata makes matching query terms with terms embedded in source content possible. By

standardising the structure and content of information, metadata is anticipated to improve matching (Calhoun, 2006). In order to organise the information and improve the visibility of the thesis in the Shodhganga repository, this study aims to present an application of Dr Sr. Ranganathan's well-known approach, known as the Normative approach, to the thesis bibliographic metadata of Shodhganga. Further, in this article, the authors describe the workflows created to improve the sustainability of metadata quality before uploading the thesis to improve discoverability and facilitate search and retrieval.

Objectives of the Study

The study aimed to focus on identifying the following objectives

(i) To comprehend the metadata structure of the Shodhganga repository, especially of local-level metadata.
(ii) To examine the relevancy of normative principles on generic metadata arrangement policy.
(iii) To apply the normative principles on thesis bibliographic metadata of Shodhganga.
(iv) To reconcile with Wikidata and create the Wikidata schema for the thesis.

Method

The Shodhganga repository does not provide the API (Application Programming Interface). Although the OAI-PMH protocol is used in DSpace, it is not accessible in Shodhganga. As a result, we used a web-scraping tool to extract the thesis bibliographic metadata into an Excel spreadsheet (XLSX). Since Tibetology falls under "Himalayan Studies," which is regarded as one of the thrust areas of the northeast part of India, we have chosen it as the subject of study. The query retrieved 50 theses, which have been uploaded to the repository.

For this study, we considered only two specific metadata fields*. i.e., Title of the thesis and keyword of the thesis*. In case the title's keywords are not listed under the subject, the title is parsed to identify the keywords. Further, the open-source software application OpenRefine was incorporated to reconcile and create Wikidata schema.

Review of Literature

Internal and external users must evaluate the metadata to increase the sustainability of metadata. The metadata assessment study on Canadian Institutional

Repositories was conducted by Park & Richard (2011) and discussed the issues related to variations and inconsistencies in Dublin Core data used by participating repositories. The study found that the current metadata elements have significant inconsistency and variation. A similar kind of study was conducted by Windnagel (2014). He explored the metadata quality of three digital repositories based on completeness, accuracy, and consistency. Another study on metadata assessment presented the repository metadata best practice in supporting operational and long-term needs (Lubas, 2009). An assessment of Google Books' Metadata was conducted to find the error rates in the metadata records of texts scanned by the Google Books digitisation project (James & Weiss, 2012). Biswas (2015) did a comparison research examining the practical implementations of Resource Description and Access (RDA) concepts and the Normative concepts of cataloguing proposed by Dr. SR Ranganathan. The analysis revealed that the guidelines for Resource Description and Access (RDA) exhibit a significantly higher level of adherence to the scientific principles established by Ranganathan. Asundi (2013) discussed helpful sequence and highlighted the inherent element of knowledge organisation. The study brought a relation between principles for helpful sequence and knowledge organisation. In contrast, Rajaram (2016) explored the relevance of principles for helpful sequence and their relevance in technical writing. He concluded that understanding the principle of helpful sequence is part of the core competencies of technical writers, even in the web environment.

Shodhganga Metadata

The Shodhganga Repository is an institutional repository for all types of documents, including text, audio, video, and data sets, created by INFLIBNET with the use of DSpace, an open-access program. Shodhganga has the capability to gather, index, store, preserve, and retrieve theses in open access mode. DSpace is compatible with the "Open Archives Initiative's Protocol for Metadata Harvesting" (OAI-PMH) and employs the qualified Dublin Core Metadata Schema. Furthermore, the INFLIBNET Centre actively promotes the establishment of Institutional Repositories for Electronic Theses and Dissertations (ETDs) among its member Universities, employing software that adheres to the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH) standards. Universities with enough equipment and networks can also host their ETD repository to save research student theses in electronic format. Additionally, participating universities can utilise Shodhganga to store theses' back files. To provide reliable and uninterrupted availability of theses via its harvesting server, INFLIBNET Centre, the governing body of Shodhganga, has established a central server to aggregate data from

several electronic theses and dissertations (ETD) repositories located across different academic institutions (Inflibnet Center, n.d.).

Shodhganga supports the Dublin Core Metadata Schema. Moreover, Shodhganga has included local level created metadata of its own. This local metadata is created with the mapping of existing metadata in DSpace. That shows the interoperability of Dublin core metadata schema. The primary metadata for a thesis in Shodhganga are *Title, Researcher, Guide, University, Completed Date, Abstract, Pagination, URI, Appears in Department*. Figure 1 shows the XML tags that were extracted from schema.org, showing the required metadata elements in Shodhganga for the thesis.



Fig 1. Dublin Core Metadata Schema XML tag in Shodhganga

Metadata Quality Parameters

Metadata serves a crucial role in facilitating the finding, accessibility, and utilisation of resources inside the thesis database. The distinctive attributes that define thesis databases also have a significant impact on the quality of metadata. For example, harvesting using the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH) involves the collection of metadata from diverse and separate resources. In 2004, the Canadian Association of Research Libraries concluded an analysis of

metadata records: "*Metadata inconsistency and incompleteness are presenting a significant challenge to the effective harvesting and searching of institutional reposit records*" (Jordan et al., 2004). In the context of Shodhganga, several inconsistencies and incompleteness are found. Sometimes Title of the thesis is found to be incomplete or rather typo or spelling errors. Sometimes, there is a repetition in the thesis title. The keywords are usually incomplete or missing; sometimes, they are not reflected in the Title itself. Furthermore, the utilisation of harvesting methods such as OAIster has brought to light the extensive issues pertaining to the quality of metadata. Metadata harvesting reveals a range of issues, including inconsistent data entry in the author and title sections, topic descriptions that are not properly formatted, and date formats that lack standardisation (Lubas, 2009).

Results

Integrative approach

Ranganathan proposed a holistic and cohesive methodology for developing and utilising information systems and services. He has developed a number of normative principles specifically for this purpose, suggested classifying them into levels or categories, created a hierarchy between the groups, and offered instructions for how to apply them (Neelameghan, 1992a).

Level 1 encompasses the Basic Laws, namely the Law of Symmetry, Law of Impartiality, Law of Context/Local Variation, Laws of Interpretation, and Law of Parsimony. These laws are universally relevant to intellectual endeavors across the universe of knowledge.

Level 2 encompasses the Fundamental Laws that apply to a whole domain of study or discipline.

Level 3 consist of Canons, which are relevant to a specific area of a subject (e.g., Canons of Classification in the field of Library Science).

Level 4 pertains to the Principles, that are specifically relevant to a sub-division within a branch of a certain discipline. An example of this would be the Principles of Helpful Sequence in Array in Classification.

Additionally, certain postulates are applicable to each of the aforementioned levels. The utilisation of principles, techniques, or strategies should be aimed at facilitating users in acquiring relevant information in a manner that is convenient and time-saving, hence promoting effective administration of the information system. These guidelines are part of the Five Laws of Library Science proposed by Ranganathan.

The primary objective of normative principles is to provide guidance for research and development activities, spanning from individual to societal levels. These principles serve as benchmarks for evaluating the relevance and suitability of findings or achievements within the library and information service domain (Neelameghan, 1992b).

Normative Principal approach on Shodhganga

The methodology employed involves categorising keywords using title-oriented information structured into numerous orthogonal groupings of categories known as facets. These facets are derived from Ranganathan's (1960) faceted classification system. The utilisation of facets and the resulting metadata serves to segregate the categorisation data pertaining to a specific item, therefore offering a multidimensional taxonomy that reveals the fundamental domain categories. The utilisation of faceted metadata for the classification and organisation of keywords offers enhanced browsing and searching capabilities, resulting in more pertinent search outcomes (Uddin & Janecek, 2007). Figure 2 shows the model for applying a faceted approach model to the extracted thesis title.

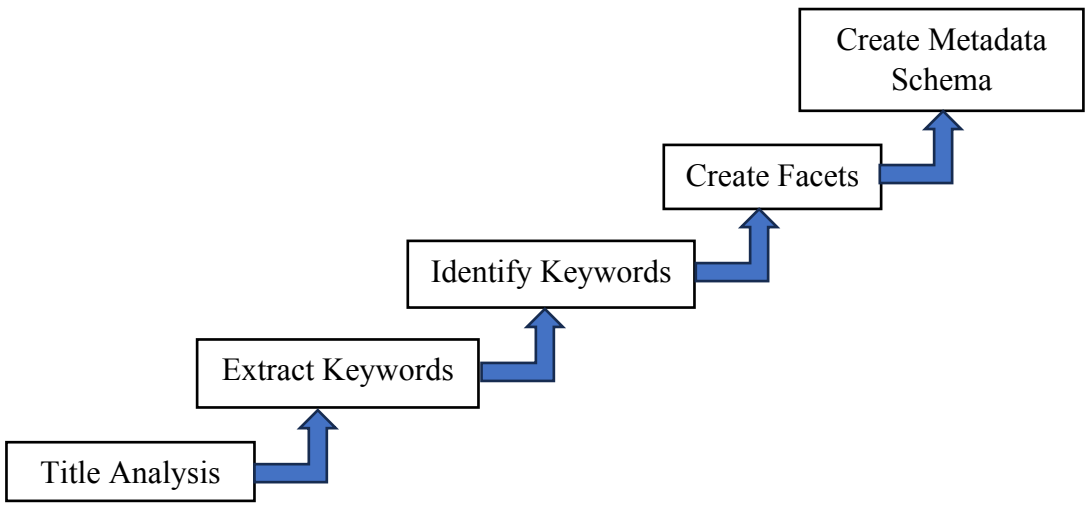


Figure 2. Faceted approach model

During the 1930s, Ranganathan proposed the idea of dissecting and categorising complex subjects based on their essential principles, which he referred to as facets. In his colon classification scheme, Ranganathan (1960) proposed five facets for subject classification. These facets include personality, matter, energy, space, and time. Personality refers to the nature or identity of the object being classified. Matter pertains to the composition or material of the object. Energy encompasses

the processes, changes, evolution, or actions associated with the object. Space denotes the location or position of the object. Lastly, time signifies the temporal aspect of the object, indicating when it occurs or takes place. In our faceted approach model used a similar methodology, wherein the retrieved datasets were initially analysed, followed by the identification of keywords. The keywords were altered in the event that any typographical errors were identified in the keywords or title. The aspect categorisation was further conducted into personality, matter, energy, space, and time. The consideration of the time facet is omitted, as it may not be the preferred approach term.

Table 1 shows a sample dataset of Thesis Title, Keywords, Modified Keywords and Facet categorisation. For example, The title "Religion culture and identity_ a comparative study on the Lepchas of Dzongu Kalimpong and Ilam" has keywords like Religion, Culture, Identity, Lepchas, Dzongu, Kalimpong, and Ilam. Following the Ranganathan's normative approach, the Facet categorisation was done as Religion (Basic Subject), Culture (Energy), Identity (Personality), Lepchas (Personality), Dzongu (Space), Kalimpong (Space), and Ilam (Space). The same approach was used throughout the datasets to categorise the keywords into facets.

Table 1 Facet categorisation of keywords

S.No.	Thesis Title	Keywords	Modified keywords	Facet categorisation
1.	India and Nepal a study of commercial relations 1846 to 1900	Commercial Political Relations Routers Trade	Commercial Political Relations Routers Trade	Commercial [E], Political[P], Relation[E], Routers[P], Trade[E]
2.	Uddyotakaras refutation of the Buddhists	Buddhists Refutation Testimony Uddyotakara	Buddhists Refutation Testimony Uddyotakara	Buddhists[P] Refutation[E] Testimony[E] Uddyotakara[M]
3.	Nature of external objects a critical estimate of the yogand#257;cand#257; ra view	Buddhist logic Buddhist philosophy Yogeaceara (Buddhism)	Buddhist logic Buddhist philosophy Yogeaceara (Buddhism)	Buddhist logic[P] Buddhist philosophy[P] Yogeaceara (Buddhism)[P]
4.	A study of gelugpa sect with comparison to Nyingma pa sect of Buddhism in Tibet	Gelugpa Sect Comparison Nyingma Bhuddhism	Gelugpa Sect Comparison Nyingma Bhuddhism	Gelugpa[E] Sect[P} Comparison[E] Nyingma[P] Bhuddhism[P]

S.No.	Thesis Title	Keywords	Modified keywords	Facet categorisation
5.	Socio Economic conditions of Sikkim under colonial domination 1889 1947 an authenticity discourse	colonial domination Socio Economic condition	colonial domination Socio Economic condition	colonial domination[P] Socio Economic condition[P]
6.	Religion culture and identity_ a comparative study on the Lepchas of Dzongu Kalimpong and Ilam	Religion, Culture, Identity, Lepchas, Dzongu, Kalimpong, Ilam	Religion, Culture, Identity, Lepchas, Dzongu, Kalimpong, Ilam	Religion[BS] Culture[E] Identity[P] Lepchas[P] Dzongu[S] Kalimpon[S] Ilam[S]
7.	Museum information service its management and marketing for the survival of museums in India today	Information Management Marketing Museum Survival	Information service, Information management, Information marketing, information Management Marketing Museum Survival	Information service[E], Information management[E], Information marketing[E] Information Management[E] Marketing[E] Museum[P] Survival
8.	Nagarjunas thought through the ages Sanskrit Tibetan and Chinese text analysis and comparative research	Comparative Devel+D13opment Madhyamika Philosophy Similarity	Nagarjunas, Comparative Devel+ D13opment Madhyamika Philosophy Similarity	Nagarjunas[P], Comparative[E] Development[E] Madhyamika[P] Philosophy[BS] Similarity[E]
9.	Agricultural in Sikkim with special reference to the mixed farming of La chen and La Chuang Valleys of North Sikkim	La-chen and La-Chuang Valleys Mixed farming	Agriculture, La-chen and La-Chuang Valleys Mixed farming	Agriculture[BS] La-chen and La-Chuang Valleys[S] Mixed farming[E]
10.	Politics and Government of Sikkim		Politics, Government	Politics[BS], Government [P]

Wikidata Schema for Shodhganga repository

Now the extracted datasets were reconciled with Wikidata using OpenRefine. The OpenRefine is a powerful java based tool using for working with large dataset.

It is useful for cleaning up or transforming messy tabular data. It provides an environment for matching the datasets with that of external sources. Libraries, archives, museums, academic organisations, scientific institutions, non-profits, or interest groups might produce datasets for comparison. It provides reconciling against user-edited data on Wikidata or other Wikibase or reconciling against a local dataset. In this study, reconciliation was performed against Wikidata. Wikidata is a versatile platform that accommodates a wide range of users and provides suitable APIs to facilitate data integration. Wikidata offers an extensive range of entity attributes, facilitating access to a substantial amount of information. Furthermore, it establishes connections with over 2,000 other knowledge bases. Notably, Google utilises Wikidata, and the number of organisations linking to this platform is seeing rapid and quantifiable growth.

The extracted Excel dataset was imported to OpenRefine and created the new project. The facet categorisation column was chosen. The reconciliation was started after clicking on Start Reconcile button. As a result, the five matched and 43 unmatched facets were found, has shown in the Figure 2.

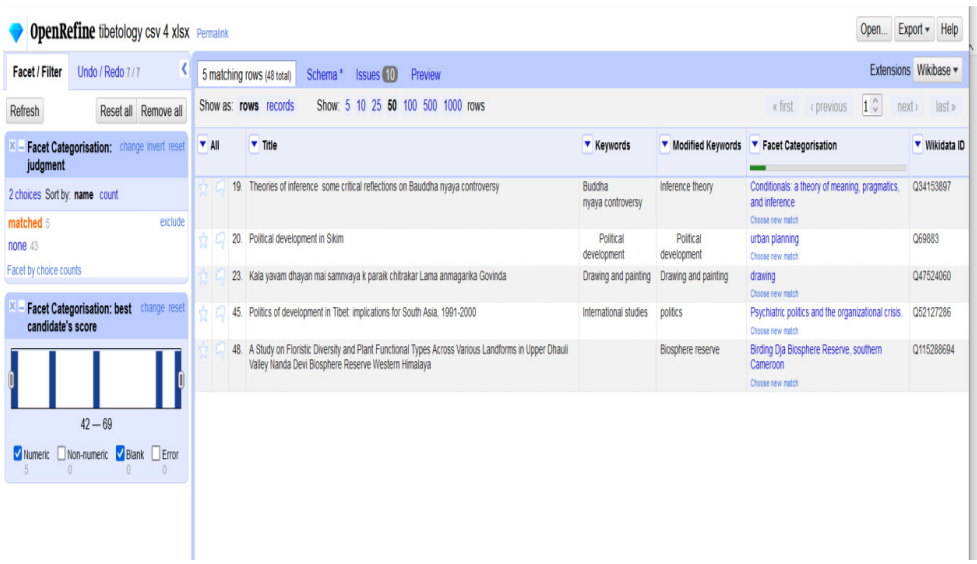


Figure 2. Data Reconciliation

After reconciliation, the matched facets with their respected Wikidata ID were retrieved for further Wikidata Schema editing. Now, a dialogue box was opened after clicking on edit Wikibase schema. The Items were added as per the requirement in the dialogue box window. At the end, the preview tab popped out, and the Wikidata Schema for the Sodhganga thesis dataset was created, as shown in Figure 3.

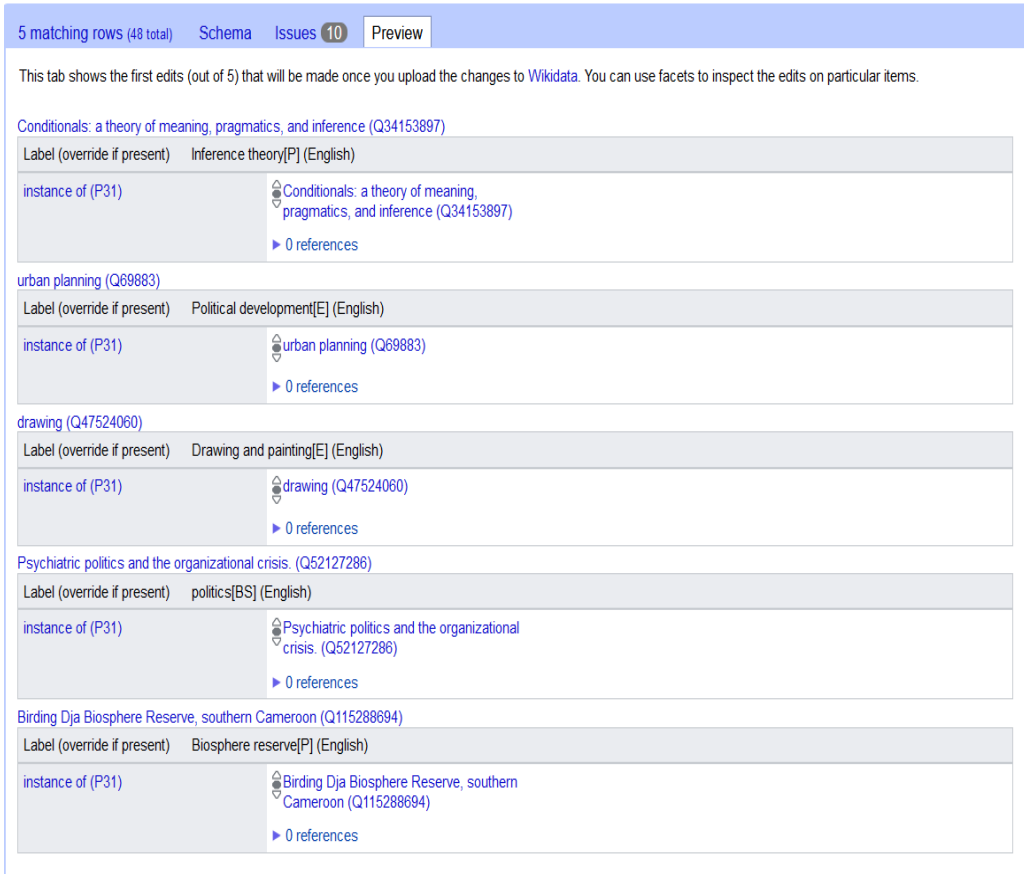


Figure 3: Wikidata Schema for Shodhganga Thesis

Discussion

For any digital repository, metadata sustainability is vital in information retrieval, where keywords are the pointers to reach over there. A well-assigned metadata provides better visibility and searchability to information. In the context of Shodhganga, it is found that metadata in Shodhganga is created using ***DSpace*** software and supports ***Dublin Core Metadata Schema.*** It is also found that there are inconsistencies in keyword assignment to the individual titles. From the keywords in Table 1, it appears that all the terms are not even approach terms. It has been observed that for representation of approach terms, many a times the personality has given preferences. Furthermore, some cases Matter and Energy isolates are also treated as approach terms. Surprisingly, the geographical isolates have also been treated as approach terms. It shows sheer inconsistencies in approach term categorisation by the agency that violates the canon of consistency as propounded

by Dr S.R. Ranganathan. In case of keyword derivation, the facet categorisation is the grounding concept that initiates from the ***Idea Plane***. It is utterly warranted that while organising isolates, the basic laws of normative guidelines should be followed for intellectual metadata representation for precise and pertinent retrieval of information. However, it is seen that no such normative guidelines are followed in subject determination. In certain cases, generic cataloguing prescriptions is used for keywords representation. It should be optimal, to use a faceted controlled vocabulary, like Colon Classification or Universal Decimal Classification or Subject Vocabularies like LCSH (Library of Congress Subject Headings) or SLSH (Sears List of Subject Headings) for such representations. The same is suggested by Strader, 2009; Schwing et al, 2012; and Maurer & Shakeri, (2016). Wikidata, a prominent online platform accessible at https://wikidata.org, is progressively emerging as a significant center of authority. It plays a crucial role in facilitating universal access to the web of data, therefore contributing to the advancement of sustainability. In certain cases, when the utilisation of Wikidata attains a significant level of adoption, it may potentially function as an authoritative control mechanism for certain institutions. However, given the rapid increase in collections linking entities to Wikidata, we may eventually arrive at a situation where people believe that "if an item is not in Wikidata, it doesn't exist." This would encourage the addition of more items to Wikidata and reduce the significance of local descriptions. Decision makers may raise the topic from a strategic standpoint: "What is the rationale behind maintaining a local thesaurus when Wikidata already exists?" Sustainability and discoverability of the repository have been ensured by reconciling linked data IDs generally, and employing the Wikidata identifier as a universal identification specifically. This study used a small sample to demonstrate how reconciliation works. In this study we reconciled the facets with Wikidata. The results show only five matching terms and 43 unmatched terms. The remaining unmatched terms can be added manually to the Wikibase for the future perspective of the research.

Conclusion

Electronic Thesis and Dissertation (ETD) are a novel pathway for supporting, transforming, and distributing thesis content. Metadata protocols serve as a valuable instrument for disseminating intellectual knowledge among the academic community. Similarly, Shodhganga, an Indian ETD, creates a path of information and knowledge for all scholarly communities. In this study, a modest attempt is made to present the application of Ranganathan's Normative Principle on thesis metadata mined from Shodhganga. It is evident that adhering to all of Ranganathan's Normative criteria in the assignment of keywords will enhance the

acceptability, stability, and flexibility of the thesis repository. For this purpose, this study portrays a faceted approach model for categorising keywords into facets. The study finds inconsistencies in approach term categorisation by the agency that violate the canon of consistency. Besides providing a much better foundation for keyword judgment or approach term assignment. Therefore, it is recommended to use a faceted controlled vocabulary for approach term representations. In keywords assignment, matching with Wikidata the knowledge base will help to make the metadata sustainable and discoverable.

References

1. Asundi, A. Y. (2013). Principles for Helpful Sequence and Deduction of Knowledge Organization Systems - An Exploratory Study. *Journal of Information Science Theory and Practice*, *1*(2), 6–15. https://doi.org/10.1633/jistap.2013.1.2.1

2. Biswas, S. (2015). Reflections of Ranganathan's Normative Principles of Cataloging in RDA. *Cataloging and Classification Quarterly*, *53*(8), 948–963. https://doi.org/10.1080/01639374.2015.1057885

3. Calhoun, K. (2006). *The Changing Nature of the Catalog and its Integration with Other Discovery Tools Prepared for the Library of Congress*.

4. Center, I. (n.d.). shodhganga.pdf. *Inflibnet*. http://www.inflibnet.ac.in

5. James, R., & Weiss, A. (2012). An Assessment of Google Books' Metadata. *Journal of Library Metadata*, *12*(1), 15–22. https://doi.org/10.1080/19386389.2012.652566

6. Jordan, Shearer, M., & Kathleen. (2004). Developing a National Metadata Profile for Institutional Repositories. *Developing a National Metadata Profile for Institutional Repositories*, 2. http://hdl.handle.net/1880/43356OtherDownloadedfromPRISM:https://prism.ucalgary.ca

7. Lubas, R. L. (2009). Defining best practices in electronic thesis and dissertation metadata. *Journal of Library Metadata*, *9*(3–4), 252–263. https://doi.org/10.1080/19386380903405165

8. Maurer, M. B., & Shakeri, S. (2016). *Cataloging & Classification Quarterly Disciplinary Differences: LCSH and Keyword Assignment for ETDs from Different Disciplines*. https://doi.org/10.1080/01639374.2016.1141133

9. Neelameghan, A. (1992a). *Theory of Knowledge Classification in*. *42*(3), 202–226.

10. Neelameghan, A. (1992b). Application of Ranganathan's General Theory of

Knowledge Classification in Designing Specialized Databases. *Libri*, *42*(3), 202–226. https://doi.org/10.1515/LIBR.1992.42.3.202/MACHINEREADABLECITATION/RIS

11. Park, E. G., & Richard, M. (2011). Metadata assessment in e-theses and dissertations of Canadian institutional repositories. *Electronic Library*, *29*(3), 394–407. https://doi.org/10.1108/02640471111141124

12. Rajaram, S. (2016). Principles for helpful sequence and their relevance in technical writings: A study. *Annals of Library and Information Studies (ALIS)*, *62*(4), 268–273. https://doi.org/10.56042/ALIS.V62I4.11371

13. Ranganathan, S. R. (1960). *Colon Classification Basic Classification*. Asia Publishing House.

14. Schwing, T., Mccutcheon, S., & Maurer, M. B. (2012). *Cataloging & Classification Quarterly Uniqueness Matters: Author-Supplied Keywords and LCSH in the Library Catalog*. https://doi.org/10.1080/01639374.2012.703164

15. Strader, C. R. (2009). Author-Assigned Keywords versus Library of Congress Subject Heading—Implications for the Cataloging of Electronic Theses and Dissertations. *Library Resources & Technical Services*, *4*, 243–250. https://doi.org/https://doi.org/10.5860/lrts.53n4.243

16. Uddin, M. N., & Janecek, P. (2007). The implementation of faceted classification in web site searching and browsing. *Online Information Review*, *31*(2), 218–233. https://doi.org/10.1108/14684520710747248/FULL/XML

17. Windnagel, A. (2014). The Usage of Simple Dublin Core Metadata in Digital Math and Science Repositories. *Journal of Library Metadata*, *14*(2), 77–102. https://doi.org/10.1080/19386389.2014.909677

Prospects of Data Analytics in Data-Driven Librarianship

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ABSTRACT: Due to accelerating enormous growth of data, there is huge impact on library services. It is almost impossible to survive without skill transformation to deal with the outburst of digital knowledge. Data analytics came up as a boon for the library professionals to design the learning services with lesser cost and optimum quality.

KEYWORDS: Big Data Analytics, Data Analytics, Library Science, Library Automation, Big Data

1. Introduction

Learning, growth and development are very much relevant to business. Each gentleman in this world is typically involved in these three activities. Information technology improvised the way of research publication and its global accessibility. And as a result we are experiencing exponential growth of literature, which simply means continuously reducing doubling time of the size of literature. This enormous growth of literature is resulting complexity in finding relevant information on time, as humans can't grasp exponential growth. Let's understand why it is not possible to deal with exponential growth of literature:

Humans are driven by their intuition which is eventually developed over the time to deal with gradual or steady growth rather than exponential growth. Accelerating and exponential growths are beyond the understanding of human brain. Humans tend to prioritize short term gain. By nature human involved gaining low hanging foods. At present, things are getting complicated with the growth of population which is itself one kind of exponential growth. To deal with exponential growth, human invented computers with powerful computational capabilities to process large amount of data.

Efficient algorithms for exponential computation, parallel processing by distributing workload into multiple processors, Big data, machine learning and cloud computing are trending techniques to deal with exponential growth. These computer-aided technologies are helping us to understand complicated and fast growing situations. High-end-computers are analyzing problems and presenting results in human acceptable models which are easy to understand.

Human have been using analysis since starting up to a level of his requirement. But recently in late of 19th century, modern statistical techniques were developed to analyze huge data and draw meaningful conclusions. Development of digital technologies and application of computers played very important role, which laid foundation of **data analytics**. Now machine generated huge data are getting analyzed with significant information to learn from past transactions.

Data analytics is a multidisciplinary field that employs a wide range of analysis techniques, including math, statistics, and computer science, to draw insights from data sets. Data analytics is a broad term that includes everything from simply analyzing data to theorizing ways of collecting data and creating the frameworks needed to store it.

Scope of improvement is everywhere which can be understood by analyzing big transactions over the period. Data analytics is almost important for every industry for the decision makers to make informed decisions.

2. Definition of Data Analytics

Data analytics is all about examining, arranging and processing large amount of data, for the purpose of predicting business trends. Businesses use these trends as informed-decisions.

Below mentioned selected definitions describe Data Analytics:

"Data and analytics is the management of data for all uses (operational and analytical) and the analysis of data to drive business processes and improve business outcomes through more effective decision making and enhanced customer experiences." **(Gartner, 2023)**

"Data analytics is the pursuit of extracting meaning from raw data using specialized computer systems. These systems transform, organize, and model the data to draw conclusions and identify patterns." **(Informatica, 2023)**

"Data analytics converts raw data into actionable insights. It includes a range of tools, technologies, and processes used to find trends and solve problems by using

data. Data analytics can shape business processes, improve decision-making, and foster business growth." **(AWS, 2023)**

3. A Brief History of Analytics

Since starting of human race analytics had been prominent instrument to judge the things based on past occurrences. Over the period of time, it got refined by incorporating statistics, Digital storage, Big data, Internet of Things, cloud computing and artificial intelligence.

Ancient Roots of Data Analysis:

18000 BCE: Although not known which methods exactly, but people were using some methods of analytics in Paleolithic era:

"The Ishango bone, got discovered at the "Fisherman Settlement" in the Democratic Republic of Congo, is a bone tool and possible mathematical device that dates to the Upper Paleolithic era." **(Wikipedia, 2023)**

2400 BCE: Ancient Babylon was using the abacus to perform calculations

100-200 CE: the first mechanical computer, the ***Antikythera*** Mechanism was constructed by Greek Scientists, which was based on 30 bronze gears to keep record of Olympic Games and astrological tracking

From Statistics to Data Analytics:

In 1663: John Graunt, regarded as the founder of Demography, maintained demographic data to hypothesize the early warning of plague. This was first experiment of it own kind in the milestone of analytics.

In 1865: the phrase "Business Intelligence" was coined by Richard Miller Devens.

In 1880: the Invention of the Hollerith Tabulating Machine (based on punched cards) helped to process huge data of US census.

In 1920s: Modern data storage system invented using magnetic tapes, which was starting of digital data storage.

In 1944: A librarian at Wesleyan University, **Fremont Rider**, attempted to quantify the huge amount of learning data that were created that time, getting doubled in every 16 years.

From Statistics to Data Analytics:

In 1965: Large data centers transformed the storage capability and US Government planned first data center for the purpose tax returns on magnetic tapes.

In 1970: IBM devised relational database to connect multiple databases for retrieving information promptly. This was really 1st step of data analytics using computers.

In 1989: The term "big data" was coined by Eric Larson. By this time, analytics was deployed to get informed-decisions based on available data under the discipline of Business Intelligence.

In 1997: Digital storage became cheaper option to store data. Internet got popular with Google search, getting information based on data available in Internet.

In 1999: "Big data" and "Internet of Things" were devised to interact with large data without much human involvement.

In 2001: Cloud computing emerged based on "software-as-service"

In 2005: Hadoop was created to store and analyze huge amount of data.

In 2008: Worldwide servers processed over 9 zettabytes of data

In 2010: Data lakes emerged to store data in its raw format.

In 2014: a greater number of people started using mobile devices to access information and social networking using various social media platforms

Mobile upgraded from 3G to 4G network providing 10x faster speed of communication. In 2014 mobiles passed desktop for accessing online information and social networking.

The 2020s: In 2010, 90% data was stored in local servers. By 2022, 60% data shifted to the clouds.

This is the era of digital revolution, producing huge data that can be explained in zettabytes (1ZB=10e+12 GB).

IDC forecasts that by 2026, 40% total revenue for G2000 organizations will be generated by digital products, services and experiences.

Journey of Data Analytics started in the 1960s and 1970s with advent of Computer capabilities. **John W. Tukey** realized the need to simplify cumbersome traditional statistical methods using computer applications, and developed Exploratory Data Analysis (EDA).

EDA focused on visual exploration of data through techniques like box plot, scatter plots and histograms, enabling valuable insights to guide further analysis.

"John W. Tukey's legacy in data science and statistics is immeasurable. His innovative ideas and pioneering spirit laid the groundwork for modern data analysis techniques.

EDA, in particular, has become a cornerstone of data science, enabling analysts to extract insights from data quickly and intuitively." (LinkedIn, 2023)

4. Importance of Big Data Analytics in Future

International Data Corporation (IDC) is the premier global provider of market intelligence, advisory services, and events for the information technology, telecommunications and consumer technology markets. IDC helps IT professionals, business executives, and the investment community make factbased decisions on technology purchases and business strategy.

To understand importance of Big data and analytics in coming future, we must deep dive with "The following 10 predictions represent the expected trends with the greatest potential impact on data, integration, and analytics initiatives:

- **Prediction 1:** By 2023, 70% of G2000 companies will have metrics in place to evaluate value realized from data, enabling them to optimize internal resource allocation decisions across the enterprise.
- **Prediction 2:** By 2024, enterprises that deploy ML-powered data management, integration, and analysis solutions will see a doubling of data-centric employees' productivity.
- **Prediction 3:** By 2022, a third of G2000 companies will have formal data literacy improvement initiatives in place to drive insights at scale, create sustainable trusted relationships, and counter misinformation.
- **Prediction 4:** By 2025, 30% of organizations will be using crowdsourcing-based internal or external prediction markets to make important business decisions.
- **Prediction 5:** By 2023, 60% of organizations will use data catalogs to unify data discovery, access, and intelligence and to bring increased transparency and trust in DataOps and business outcomes.
- **Prediction 6:** By 2021, 25% of data-driven organizations will have turned 30% of their unstructured data into repurposed discrete elements that fuel adaptive decision making and automate data-driven workflows.
- **Prediction 7:** By 2025, 100% of memory-optimized DBMSs will use persistent memory, with system performance benefits yielding competitive advantages in areas such as logistics, financial services, and IoT management.
- **Prediction 8:** By 2022, 50% of ICT vendors will use anonymized data collected within their platforms to provide insights and benchmarks, leading to increased value and differentiation for their offerings.

- **Prediction 9:** By 2023, the drive to monitor operations pervasively will have shifted to workers, with 25% of enterprises engaging in detailed digital work monitoring to improve the value of work performed.
- **Prediction 10:** By 2024, 10% of adults in developed economies will manage their personal data via data trusts, with new controls and transparency affecting digital business models and mediating customer relationships."

(Dan Vesset, et. al, 2019)

5. How Data Analytics Can Help Librarians to derive better Decisions?

Data is everywhere, getting generated through operational activities continuously. Every application deployed in services is well designed to record the transactions for further investigation to bridge the gaps to make the services better and cost-effective. The ability to drive Key Performance indicators (KPIs) or valuable information which can be used further to take better decisions is not a simple task now-a-days because of growing size of data. Authorities needs insights from the past to plan the future strategies to compete the market. Any delay in deriving better insights (or information) may fail to cast better future for the organization because right decisions are responsible always to lead the things in right directions.

Librarians are responsible to interpret the available vast records for the benefits of the organization, for which special analytical skills are required because the size of the data is not in limit to be managed with conventional methods. The data is vast and scattered all around the organizational operations, therefore special planning is needed to collect and store in its natural format considering all possible requirements in future. Diversity of formats and incompleteness of data is another complexity to gather effective data. To overcome of these type problems at scale, database is required with better database management skills.

At present almost all libraries are heavily depends on e-learning portals to fulfill the learning requirement effectively. At the time of procuring the learning resources, you need to have usage report of all these learning portals and feedback mechanism to get information to take better decisions.

"In the digital age, data is the driving force behind informed decisions and strategic planning. For librarians, the ability to analyze and interpret data is vital to enhancing library services, improving user experience, and demonstrating the library's value.

Through data analysis, you can gain insights into user behaviours and preferences, identify trends and patterns, measure the effectiveness of your services, and make

evidence-based decisions. For instance, data analysis can help you understand which resources are most used, what times the library is busiest, which services are most valued by users, and where there might be gaps in your offering." **(Alex Lockey, 2023)**

6. Essential Skills and Competencies for Future Librarian

Semantically Librarian is an owner of huge data about learning resources, readily available for scholars for the purpose of higher studies and research endeavors. Therefore data analytics is in blood by which he is functioning learning programs.

But skill transforming is must for librarians, to sharpen the axe, keeping in mind that future would not be without Big Data and Analytics (BDA).

These are important essential skills for the libratrians to cope up with super-growing data and information:

Data Literacy: The true value of library services is to support its parent organization for research and development activities. Every research banks upon a qualitative data, which can be managed by the data literate professionals. Once should have ability to understand, interpret, and communicate data effectively. Currently this is very essential skills for the librarians to support decision making and operational excellence.

Research Data Management: Proper awareness of research data management is essential for librarians supporting researchers. They should be able to:

- Understand all formats of research data
- Share and manage research data
- Understand the expectations of researchers and subject matter experts
- Assist the researchers for their complex demad of information or data

Data Visualization: Data in textual or tabular format is not easy to grasp. It is natural that human mind understands pictorial diagrams by grasping logic embodied in size and shape of the picture. With the help of computer applications, like tableau, PowerBI, Google Charts, librarians should be able to draw info-graphics (charts, plots, maps, even animations). This is very much important to create presentations of the findings

Data Ethics: Data ethics is all about ethical use of data by abiding basic human rights into the digital age. Data ethics guides to protect against any potential harms due to unethical data exchange, at the level of people, organization, or system.

"Data ethics ensures that users consent to shared data and organizations adhere to compliances and privacy laws. Organizations are also held to task on using insights derived from data responsibly and legally with regard to social and economic justice—mitigating biases against certain groups and data sets. Data must also be used for the purpose it was gathered for and consented to." (Virtusa, 2023)

Data Innovation: Data innovation is all about creating valuable service by using available data by applying analytics. Data innovation provides prospects to innovate from large available data. It could be collaborative efforts to solve big problems by pooling data from industry partners, even it can be new initiative to open new revenue stream without much investment.

Data Advocacy: It is act of promoting and supporting the use and importance of data-driven information. Data advocates communicate data access, quality, and literacy regarding implementations of decisions based on facts derived though data analytics.

Librarian plays very crucial role to provide artifacts in policy making decisions for the betterment of services.

"The data advocate is someone who understands the data of the business and the systems through which the data flows. Because such advocates are tech-savvy, they see how a new technology can open doors for the business. They have a deep business process knowledge that drives their understanding of the business' true data needs." **(Wes Flores, 2016)**

Every organization needs some technical staff that has good command over the latest technologies and can handle the organizational external and internal affairs. Libraries are considered as a non-profit organization and every second library deployed skillful, well trained and knowledgeable staffs that can run the library externally and internally with the demand of the current environment. Furthermore, it is dire need of today's library community to appoint talented personnel that can handle library works. Today, the world of information needed skillful librarians that can testify relevant information and can disseminate information to the library users without any facing trouble. (Muhammed Anawar, 2019)

7. Why Data-Driven Librarianship?

Outstanding demand of relevant and accurate data, is well understood in 2000, and data scientists role came in picture in 2008. Since then data enormously kept on growing in size because of machine-generated records, resulted into "Big data".

Data Analytics only can churn this data into useful information. Every organization is now depending on data analysts to look back their services to learn upon mistakes and clue future prospects.

"Data librarians need to know the skills required in data science. Data librarians also needs to possess the same standard development skills as a data scientist. The skills required of a data scientist include those of a hacker, scientist, quantitative analyst, trusted adviser, and expert businessperson. These skills do not require the data librarian to undertake a computer science, statistics, or business course; however, he/she needs to have at least an intermediate level of knowledge in these areas. Data librarians need to understand how to integrate multiple data technologies into library services. He/she needs the ability to demonstrate hacking skills to program, extract, and structure data. He/she also needs to know the basic methods and tools adopted in metrics studies (bibliometricand informetric). Finally, data librarians need to acquire some of these skills gradually" **(Alexandre Ribas Semeler and Adilson Luiz Pinto, 2020)**

Data-driven Librarianship aims effective data management for the researchers. The Data Librarian transforms skills to become a data scientist by learning capabilities to innovate information as product.

8. Trending in Data Analytics: Data-as-a-service (DaaS)

Software-as-a-Service (SaaS) products were introduced in the 1990s under as-a-service offering to provide end-to-end solutions, taking SalesForce as an interesting example. In the same line SaaS is new addition to as-a-service offering focusing data as commodity to generate revenue out of it. For smaller businesses it is not so simple to cashify the operational data by repackaging it into marketable information.

"DaaS is similar to software as a service, or SaaS, a cloud computing strategy that involves delivering applications to end-users over the network, rather than having them run applications locally on their devices." (Talend, 2023)

Not every business has expertise to source, store and analyze data as easily as the largest tech companies like Snowflakes. Snowflakes allow customers to store and analyse data on its platform and host vendors selling data products to end users through its platform.

DaaS provider can:

- Minimize the risk that a small business will enter analysis paralysis

- Pull out deeper insights than what's available via Google Analytics
- Propel them out of an innovation loop to the next level of growth

There are potential challenges of DaaS, like data security, compliance regarding sensitive data moving into cloud, limited technical expertise, data stransfer timing. DaaS provides following advantages:

- Minimal Set-up time
- Improved functionality
- Greater flexibility
- Cost saving
- Automated Maintenance
- Smaller Staff requirement

9. Conclusion

Data Analytics is getting popular for its unique feature to showcase heavier data unlike the past one. Librarian is well known for advocating the voice of data since olden time. In this era too, librarians are important for learning and development of the organization, but with finer and trending technical skills to manage and repackage it as commodity. This study talked about prospects of data analytics for the librarians.

Data analytics is like earthmovers to shape the unorganized data in the form of even road for information and communication. Data analytics has capabilities to read the dumb data and enhancing the service quality. Finding of various surveys points out towards data analytics to deal with data explosion.

References

1. Alex Lockey. (2023). Top 10 Skills Every Librarian Needs to Succeed in Today's Digital World. Retrieved from https://www.boltjobs.com/blog/skills-librarians-need-digital

2. Alexandre Ribas Semeler and Adilson Luiz Pinto. (2020). Data librarianship as a field study. Retrieved from https://www.researchgate.net/publication/344942824_Data_librarianship_as_a_field_study

3. AWS. (2023). What is Data Analytics. Retrieved from https://aws.amazon.com/what-is/data-analytics/

4. Dan Vesset, et. al. (2019). IDC FutureScape: Worldwide Data, Integration and Analytics 2020 Predictions. Retrieved from https://www.oracle.com/a/ocom/docs/solutions/business-analytics/idc-futurescape-2020-predictions.pdf

5. Gartner. (2023). Data and Analytics. Retrieved from https://www.gartner.com/en/information-technology/glossary/data-and-analytics

6. Informatica. (2023). What is Data Analytics. Retrieved from https://www.informatica.com/in/services-and-training/glossary-of-terms/data-analytics-definition.html

7. LinkedIn. (2023). Meet the Pioneer of Data Science: Unveiling the Legacy of John W. Tukey. Retrieved from https://www.linkedin.com/pulse/meet-pioneer-data-science-unveiling-legacy-john-w-tukey-devsort/

8. Muhammed Anawar. (2019). SKILLS, KNOWLEDGE AND COMPETENCIES FOR FUTURE LIBRARIANS: A REVIEW PAPER. Retrieved from https://www.researchgate.net/publication/336720250_SKILLS_KNOWLEDGE_AND_COMPETENCIES_FOR_FUTURE_LIBRARIANS_A_REVIEW_PAPER

9. Talend. 2023. What is Data as a Service?. Retrieved from https://www.talend.com/resources/what-is-data-as-a-service/

10. Virtusa. (2023). Data Ethics. Retrieved from https://www.virtusa.com/digital-themes/data-ethics

11. Wes Flores. (2016). Boost Your Data-Driven Culture with Data Advocacy. Retrieved from https://tdwi.org/articles/2016/08/26/boost-your-data-driven-culture-with-data-advocacy.aspx

12. Wikipedia. (2023). Ishango Bone. Retrieved from https://en.wikipedia.org/wiki/Ishango_bone

Learning from the Leaders: Strategies of Fundraising for Public Libraries in Assam

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Introduction

Fundraising is an alternative way to collect funds for a specific cause by appealing to a large number of people and asking them to contribute small amounts of money in a short period of time. This method can be conducted both online and offline. It helps the organization grow financially and makes them independent in making decisions for their development (Sawant, 2018). Sustainability is an essential concept for our future that gives importance to the environment and economic and social well-being. In 2015, the UN's "Transforming Our World: The 2023 Agenda for Sustainable Development" focused on global collaboration between developed and developing countries to transform society positively (U.S. Green Building Council, 2023). Libraries have been a vital influence in raising awareness about sustainability. The library works as a social institution as they provide equal service to everyone, and their facility of borrowing books reduces the need for everyone to buy books. Through the teaching of digital skills, technology, information literacy, and writing skills to educate people about sustainability, the contribution of libraries is truly appreciable.

Libraries are transforming into information centers, handling vast amounts of digital information. However, challenges like increasing costs, user satisfaction, and the demands for materials and services make it difficult to manage within the limitations of a traditional budget. This brings up the need for alternative funds in libraries (Mahmood, Hameed & Haider, 2005). To support the sustainability goals, libraries are facing challenges in managing changing priorities and budgets. Economic considerations are essential to the growth of public libraries. Public libraries mostly depend on government funding, which constitutes the majority of their financial support and creates difficulty for them. As a result of their excessive reliance on the government, public libraries suffer tremendous challenges in implementing new services, automating processes, digitizing information, and satisfying the growing demands of their users (Pautz, 2014). Government funding

can fluctuate or remain static, leading libraries to potentially face economic crises. Public libraries shouldn't only depend on funding from the government and associations like RRRLF and DLS, Assam, to maintain sustainability. Instead, they should focus on raising their income so they can achieve independence and sustainability. Achieving financial sustainability requires libraries to explore alternative sources to improve their financial standing. Fundraising activities represent a practical option for libraries to diversify their funding sources.

In Assam, the condition of public libraries is failing day by day (Chakraborty, 2020; Barman, 2022). They have become static in their positions and do not align with users' expectations or attract them to the libraries. Since they are entirely dependent on government funding, they are restricted in their activities. Alternative funding could offer them the freedom to organize various activities and provide different services to capture the attention of users. Therefore, there is an urgent need to study the success stories of fundraising and the strategies used by public libraries in other countries. This will facilitate their learning from the libraries in leading countries.

Sustainability in the Libraries

Libraries not only use a lot of energy, such as electricity, paper, water, etc., but also produce a significant amount of waste. Green libraries attempt to address these issues. They primarily focus on eco-friendly solutions when renovating or constructing libraries. In the United States and India, different standards are given by different organizations for the maintenance and sustainability of libraries. The Leadership in Energy and Environmental Design (LEED) rating system was developed in 2000 by the United States Green Building Council (USGBC). It evaluates a building's sustainability based on various aspects, including the building's location, water conservation, energy efficiency, materials and resources, indoor air quality, and innovative design. It provides a framework for cost-effective, highly efficient, and safe green building that promotes social, political, and environmental goals, and it gives the green library concept standards in these factors (Stoss, 2010). LEED has also influenced standards in Chicago and California. In India, the Indian Green Building Council (IGBC) adopted the LEED standard and developed a gold rating system to promote green buildings. The Energy and Resources Institute (TERI), New Delhi, introduced the Green Rating for Integrated Habitat Assessment (GRIHA), a system suitable for different types of buildings across India. The GRIHA Large Developments tool is designed for evaluating large projects like campuses and townships. These standards play a vital role in promoting eco-friendly practices in the construction and renovation of libraries and other buildings (Pangali, 2015).

Literature Review

The rising costs of materials, reductions in budgets, and the necessity to meet users' expectations are identified as reasons for the fundraising integration of the libraries **(Ashman, 2012).** It compares various surveys conducted on library fundraising through a literature review and identifies an increasing trend in libraries' fundraising activities. **Kernochan (2016)** examines the success stories of three American public libraries concerning their fundraising activities and highlights that relying solely on government funding can detrimentally affect a library's operational framework. It is suggested that libraries should prioritize raising awareness among the general public regarding the significance of libraries and engage in fundraising activities to increase their financial resources for developmental purposes. On the contrary, in Pakistan, **Manmood, Hameed, and Haider (2005a)** found that factors such as insufficient staffing and earlier unsuccessful outcomes discourage many libraries from engaging in fundraising activities. The lack of government interest in allocating funds for library development, as they have already suffered from national economic crises, underscores the importance of fundraising for the survival of these libraries. In another article, they also investigated fee-versus-free based library services and noticed that, due to inadequate funding, most librarians in Pakistan advocate for fee-based library services **(Manmood, Hameed, and Haider, 2005b).** Fundraising is presented as the ultimate solution to offer services that complete users' needs, as it is their fundamental right. Reviewing different literature on income generation by public libraries, **Pautz (2014)** also examines the fee-versus-free based service debate and observes that fundraising activities seem highly dependent on the local government of the library, making it challenging to deal with theories of justice. In India, fundraising is still a relatively new concept in libraries, with many possibilities as the public expresses genuine interest; however, a lack of awareness and attention has kept fundraising unexplored in this context **(Athulya & Thanuskodi, 2022).**

Objectives

- To identify the fundraising strategies used by foreign public libraries to become sustainable.
- To conduct a critical analysis of all sustainable strategies for their suitability in the context of public libraries in Assam.

Methodology

A comprehensive literature review was conducted to gather knowledge about the relationship between sustainability and public libraries, particularly focusing on alternative funding. The review covers fundraising and public libraries. Google Scholar, Scopus, and JSTOR were utilized for literature searches using keywords like "Sustainability and Public Libraries," "Fundraising and Public Libraries," "Alternative Funding of Public Libraries," and "Crowd Funding in Libraries." Again, the literature review identified fundraising stories from public libraries in foreign countries. Later, case studies of selected public libraries were conducted using available literature and by checking their websites. The goal was to understand their success and the methods they employed. Finally, a critical analysis was undertaken to assess the practical implementation of those methods in public libraries in Assam.

Fundraising and Sustainability

Sustainable libraries mainly focus on designing architecture that minimizes resource consumption and reduces environmental impact throughout the lifespan of the structure. However, they often face financial limitations in their commitment to creating a sustainable library. Convincing authorities to provide funding for the creation of a sustainable library is a major challenge. Limited funds consistently create barriers to developing a sustainable library. To overcome this challenge, libraries must find alternative funds to deal with budget limitations.

Financial Stability: Libraries sustain their operations, programs, and services through fundraising. Without depending on government grants or conventional revenue sources, which can fluctuate or be insufficient to meet increasing needs, fundraising ensures a consistent flow of income.

Resource Diversification: Relying solely on government funds or a fixed budget can create barriers to a library's growth, expansion, and meeting the changing needs of society. By minimizing dependence on a single source and enabling flexibility in resource allocation, fundraising diversifies available resources.

Program and Service Expansion: Community engagement projects, innovative technology, and new initiatives often require additional funding that might not be covered by regular budgets. Fundraising helps libraries expand their programs and services.

Community Engagement and Support: Fundraising helps improve relationships and engagement in the community. Participation in fundraising activities boosts a sense of community ownership and support for the library. As a result of this engagement, the library and its users develop a closer bond, which can translate into sustained support over time.

Long-Term Viability and Adaptability: Sustainability means not only preserving the status quo but also changing and growing to meet the demands of the times. Through fundraising, libraries remain relevant and viable by investing in staff training, upgrading infrastructure, future planning, technology additions, and so on.

Innovation and Creativity: With the help of additional funding, libraries can experiment with new, creative approaches to serve their communities. To increase relevance and adaptability, libraries can include pilot projects, experimental programs, or implement new technology.

Case Studies

In foreign countries, fundraising within public libraries is a basic part of their developmental services. This study incorporates a comprehensive review of published literature on fundraising and focuses on two specific libraries: the West Chester Public Library in West Chester, Pennsylvania, referenced in Agosto (2008), and the Los Angeles Public Library in Los Angeles, California, mentioned in Kernochan (2016). By examining these examples, this study offers an expansive view of fundraising activities and their successes in foreign countries. The fundraising data, obtained from their annual reports accessible on the libraries' websites, offers insights into the methods employed by studying their respective websites.

Los Angeles Public Library: The Los Angeles Public Library (LAPL) serves as a perfect example of how overreliance on government funding can harmfully affect a library's operations. Despite achieving successful results, LAPL stands as a reminder of the risks of excessive dependence on government funds and the mess of politics within the library system. With 73 branches in the Los Angeles area, LAPL has been serving the community since 1872 (Velasquez, 2015). Earlier, the library heavily relied on government funding; however, in 2007-10, the Mayor of Los Angeles reduced the budget for the library, parks, and recreation, and this led to a decrease in the library's open hours from 6 to 5 days, a reduction of 328 staff positions, and limitations on the library's programs. These changes significantly impacted the lives of many, especially students who rely on the library for their

homework. Consequently, public complaints arise directed at the city government due to the changed operating hours. In 2011, LA's voters passed an amendment to increase the funds from approximately $11.7 million to $51.7 million (Velasquez, 2015). Government decisions are often influenced by politics and agendas, and thus, taking government funding for granted can pose challenges for any system. Velasquez (2015) suggests that LAPL's story mirrors that of other public libraries in the United States, Australia, and Canada. Emphasizing fundraising not only ensures self-reliance but also contributes to sustainability.

West Chester Public Library: Established in 1815 as a subscription library, WCPL in West Chester, Pennsylvania, was initially heavily dependent on non-tax funding (Agosto, 2015). By 1898, it had transitioned into a free, tax-supported institution. Throughout much of the 20th century, the library primarily operated on tax-based funding. However, owing to reduced state and local funding, the library's director prioritized securing non-tax revenue. This library actively seeks alternative funding sources, distancing itself from reliance on the local government and library foundation. Fundraising responsibilities within this institution fall upon the Board of Trustees and the library director. They have also engaged a part-time development officer tasked with establishing and maintaining a fundraising program, supported by other library staff. According to Agosto (2015), in 2007, WCPL received taxes equal to just 45% of the total budget; the remaining 55% came from non-taxable sources such as grants, fundraising activities, and donations.

In the 2022 Annual Report of WCPL, it was mentioned that 21.72% of the total income came from fundraising activities. This percentage is truly encouraging for the success of fundraising. The library relies heavily on individual donations for funding. In September, the staff organizes an annual appeal, sending letters to potential donors. The appeal includes personalized letters to known donors and those who have expressed interest in giving. A one- to two-percent response from the second list is considered successful. The library also features a button for donations. The library also collects corporate donations by using corporate logos on public relations materials, offering VIP seating at events, and acknowledging donors in newsletters. Every year, the library organizes a major fundraising event called 'the Literary Heroes Breakfast,' which honors individuals in the community for their contributions to regional initiatives. This event not only raises funds but also promotes the library's mission related to literacy.

Strategies for Fund Raising

There are different strategies adopted by public libraries in foreign countries, such as Portland Public Library, Wells Branch Library, Dallas Public Library, Parmly

Billings Library, American Public Library, and Billerica Public Library, as well as the Library of Michigan, for fundraising activities. To examine all these activities, the authors summarize some main activities they commonly follow. To examine all these activities, the authors summarize some main activities they commonly follow:

Grant Applications: Public libraries depend on governmental bodies, non-profits, and private foundations for their funding. Many other organizations offer grants specifically for library projects and programs. It is essential to identify these opportunities and create effective grant proposals.

Friends of the Library: Creating a group called "Friends of the Library" is quite useful for libraries. Through membership drives, book sales, and various events, this group comprises volunteers who raise money. They work as a support system for the library.

Corporate Sponsorship and Partnerships: Building connections with local businesses and corporations may lead to getting financial support. This might include sponsoring library events, programs, or even specific sections.

Crowdfunding and Online Fundraising: Using online platforms, libraries collect funds through crowdfunding or fundraising campaigns. They can use different platforms or put a direct donation option on the library's website.

Special Events and Fundraisers: Libraries can attract the general public and library supporters by organizing events such as book sales, silent auctions, community gatherings, and collecting funds through ticket sales, donations, or auction proceeds.

Membership and Donation Programs: One practical strategy to keep a consistent flow of money coming in is to set up a membership program or donation program where community members can contribute regularly.

Selling Library Merchandise: In addition to raising money, libraries can offer branded bags, bookmarks, and other literature-related items. This can also promote the library.

Fee-based Services or Rentals: Charging a fee for specific services or renting out library space for events, workshops, seminars, or meetings can be an extra source of revenue.

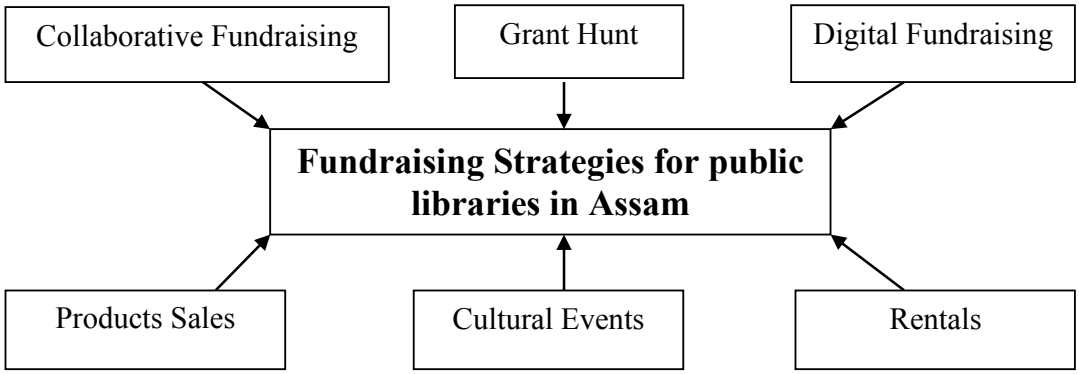
Fundraising and Public Libraries of Assam

Public libraries serve as lifelong learning centres by providing education without discrimination based on age, caste, religion, gender, etc. While libraries

traditionally function as storehouses of knowledge, contemporary libraries work towards raising awareness on crucial societal issues, with a particular focus on environmental concerns. They aim to educate the general public about these issues through their collections, sustainable and eco-friendly facilities, programs, and initiatives, eventually contributing to the creation of responsible citizens (Athulya & Thanuskod, 2022). Green or sustainable libraries are a direct outcome of these environmental concerns.

The data from the Director of Library Service (DLS), Assam, and Barman (2021) reveals that there are 246 public libraries in Assam, consisting of district libraries, sub-divisional libraries, branch libraries, and rural libraries, all of which are government-registered. According to the 2011 census, Assam had a population of 3.12 crore, and in the subsequent years, these numbers have continued to rise, despite the capacities of the libraries. Public libraries in Assam receive financial support from a limited number of sources. The state government allocates an annual budget to public libraries based on their activities and programs. Furthermore, the Raja Rammohan Roy Library Foundation (RRRLF) provides matching funds, of which 10% are provided by the state (Directorate of Library Services, 2023).

Government financing is a primary source of funding for public libraries in Assam. Despite strong public support for the financial growth of libraries, this potential remains largely unused. With a decrease in government funding over time, public libraries must actively seek sufficient funding to support their growth (Farheen, 2018). This strategy is necessary to ensure their success and reduce their reliance on government support. Public libraries in Assam can find inspiration in fundraising strategies from foreign countries and adapt them to increase funds for developing sustainable libraries. Libraries should actively pursue grants from different government bodies, NGOs, and influential individuals in society. For collaborative fundraising activities, engaging with educational institutions, other libraries, or community groups through the formation of a 'Friends of the Library' can prove fruitful. Libraries can also utilize social media platforms like Facebook, Instagram, and Twitter to promote online crowdfunding campaigns. Creating and selling items with the library's logo, such as t-shirts and bags, not only provides a means of earning money but also serves as a promotional tool. Organizing special events rooted in local traditions fosters a sense of community involvement. Fee-based services or rentals, such as charging for specific services or renting out library spaces for local events, offer an additional revenue stream. These strategies collectively present a comprehensive approach to funding Assam's public libraries, tailored to their unique context and needs.



Conclusion

Public libraries in India, including Assam, are evolving towards sustainability. The National Education Policy and the G20 highlight the importance of sustainability. Sustainability goes beyond having a green building; it involves education, daily services, and self-reliance for development. However, fundraising, a crucial aspect of this transformation, is still not widely explored in Indian libraries. Learning from the experiences of developed countries, Indian libraries must adopt fundraising for sustainable growth. This adaptation can turn them into vibrant centers for knowledge, education, and community development in the 21st century.

References

1. Agosto, D. E. (2008). Alternative funding for public libraries: Trends, sources, and the heated arguments that surround it. In D. A. Nitecki & E. G. Abels (Eds.), *Influence of Funding on Advances in Librarianship* (Vol. 31, pp. 115–140). Emerald Group Publishing Limited.

2. Ashman, A. B. (2002). A comparative examination of public library fundraising. *Public Library Quarterly*, *21*(2), 47–57.

3. Athulya, S., & Thanuskodi, S. (n.d.). Sustainable development of libraries: Some possibilities. *Specialusis Ugdymas*, *1*(43). Retrieved November 28, 2023.

4. Barman, B. (2022). *A comprehencive book on library and information science*. LIS links.

5. Chakraborty, K. (2020). Survey of district libraries in Assam. *Palarch's Journal of Archaeology of Egypt/Egyptology*, *17*(6).

6. Farheen, S. S. (2018). Finance and fund raising for libraries in India. *Knowledge Librarian*.

7. Directorate of Library Services. (2023). *Functions and Objectives. Government of Assam, India. https://publiclibraryservices.assam.gov.in/about-us/detail/functions-and-objectives-25*

8. Kernochan, R. (2016). Fundraising in American public libraries: An overview. *The Serials Librarian*, *71*(2).

9. Mahmood, K., Hameed, A., & Haider, S. J. (2005). Library fundraising in Pakistan. *Library Management*, *26*(8/9), 429.

10. U.S. Green Building Council. (2023). *Mission and vision. https://www.usgbc.org/about/mission-vision*

11. Pangail, R. K. (2015). Green libraries: Meaning, standards and practices. *Episteme: An Online Interdisciplinary, Multidisciplinary & Multi-Cultural Journal*, *4*(3).

12. Pautz, H. (2014). Income generation in public libraries: Potentials and pitfalls. *Library Review*, *63*(8/9).

13. Sawant, S. (2018). Crowd funding in libraries: By the people and for the people. *Library Hi Tech News*, *35*(10).

14. Stoss, F. (2010). *Libraries taking the leed green libraries leading in energy and environmental design*. www.Onlinemag.Net.

15. Velasquez, D. (2015). How the Los Angeles public library responded to budget cuts. *Public Library Quarterly*, *34*, 230–244.

Sustainable Practices in KL Deemed to be University Library

Dr.B.Dhanalakshmi

ABSTRACT: Koneru Lakshmaiah Education Foundation is NAAC A++ premier institution designated as a Category 1 Institution by the UGC in 2019.

The KLEF Central Library is housed in a 6 storied building with radiant cooling technology and green ambiance. The building is ventilated and allows sunlight to drench the inner area. The building is solar powered and is equipped with BLDC fans, efficient LED, sensor bulbs.

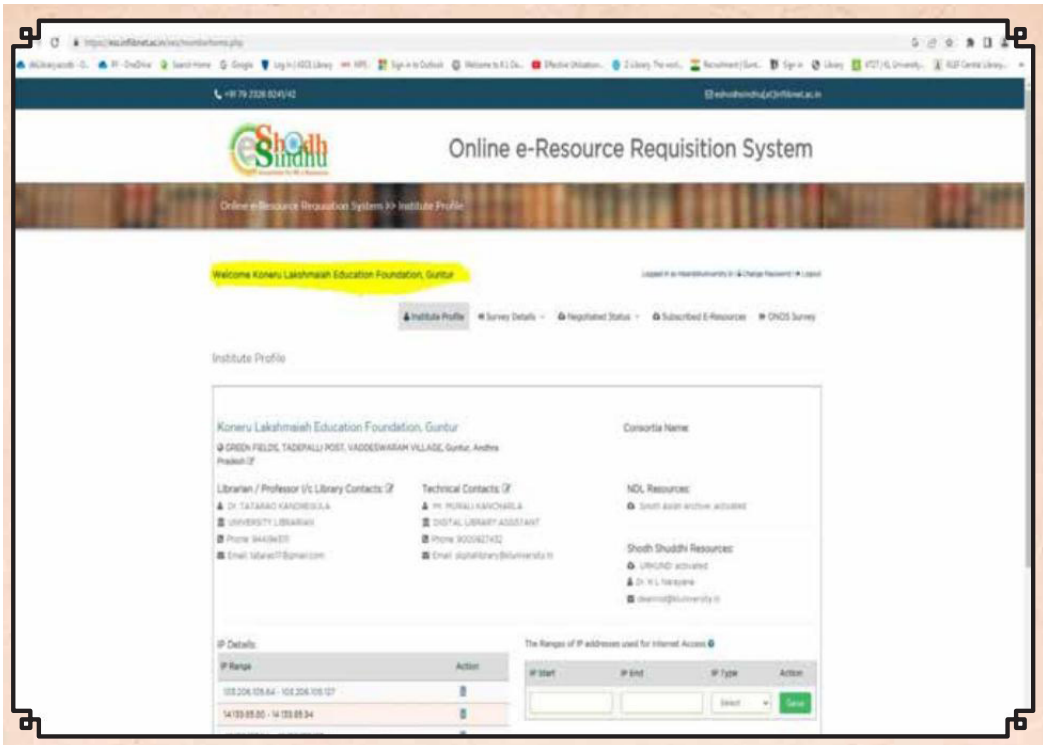
With more than 2 lakh books, 15 lakh e-books, and 20 databases of e-resources, the library is fully digitalized.To enhance ILL services (Inter Library Loan) and outcomes, the library became a member of INFLIBNET, NDL, DELLNET, & BCL.

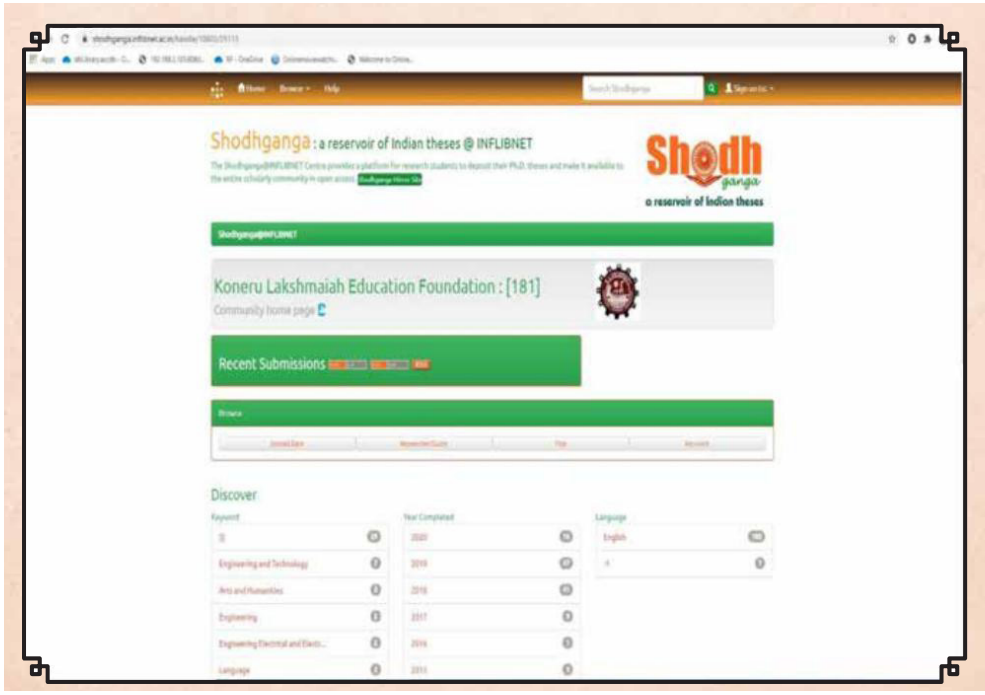
The Smart Village Revolution (SVR) was initiated in coordination with CEA(Centre for Extension Activities) and SAC(Student Activity Centre) to address certain issues faced by the village and agricultural communities using innovative technology so as to meet the SDGs(Sustainable Development Goals) set forth by the UN. 4% of the budget was allocated for SVR Project supported by library.

108 villages in Mylavaram Mandal in Krishna District, AP, India, were adopted under this programme. A team of specialists including (20 students & 10 faculty), stayed for one week in Mylavaram mandal as a part of their social responsibility in a semester, interacted with locals and created a tech-based solution to address the issues. They also trained villagers on utilization of technological solutions for eco friendly developments. Weather forecasting and cyclical changes in climate are regularly intimated to the people residing in those adapted villages.

Out of the108 villages, 5 were designated as smart villages out of which One was awarded the Gandhi Adarsh Gram by Indian government. Among the adopted villages, the SVR initiative benefits around 5000 inhabitants.

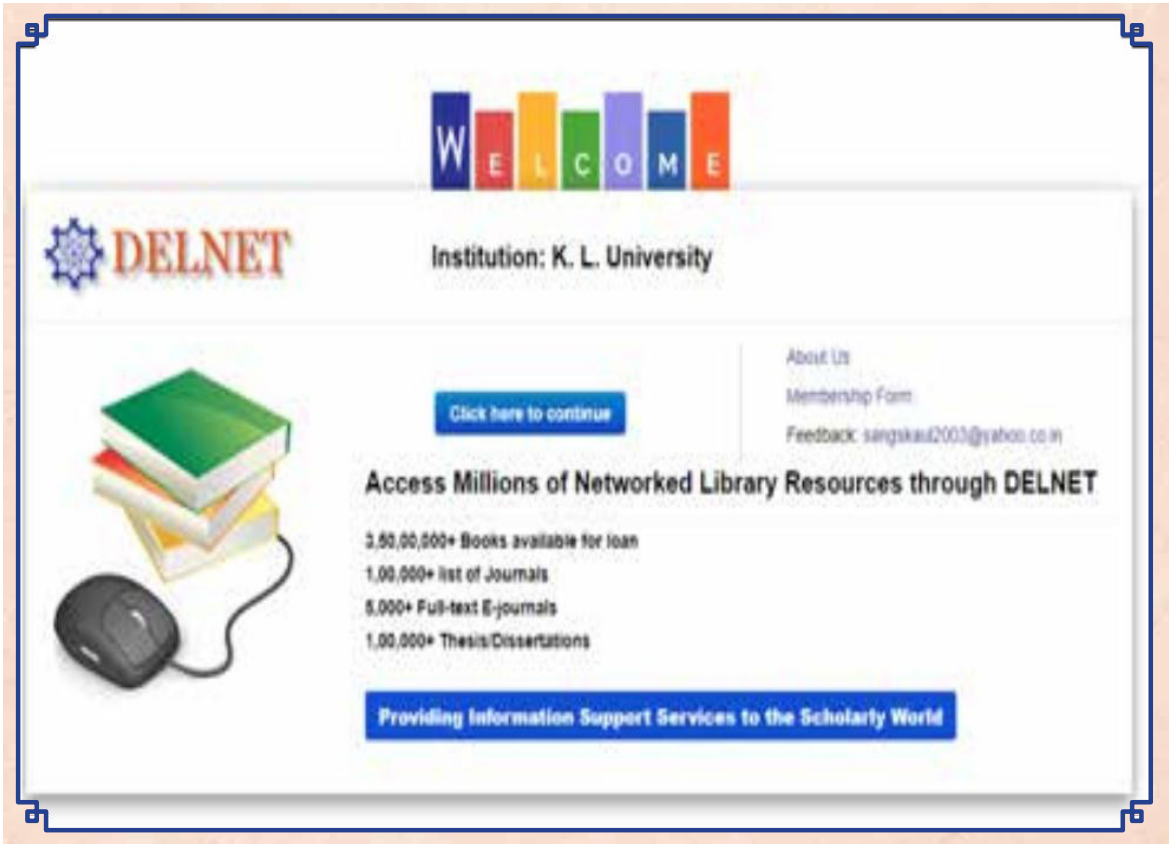
The team aims to work on Social Community Activities, Green Innovation, Water Conservation, Energy Availability and Efficiency, Materials and Resources.


Online e-Resource Requisition System
Welcome Koneru Lakshmaiah Education Foundation, Guntur
Institute Profile
Koneru Lakshmaiah Education Foundation, Guntur
Consortia Name
Librarian / Professor I/c Library Contacts
Technical Contacts
NDL Resources
Shodh Shuddhi Resources
IP Details
IP Range
Action
IP Start
IP End
IP Type


Shodhganga : a reservoir of Indian theses @ INFLIBNET
Shodh ganga
a reservoir of Indian theses
Koneru Lakshmaiah Education Foundation : [181]
Community home page
Recent Submissions
Discover

DELNET(ILL)

KL university library has adapted a Inter Library Loan facility whichis one of the changes that has made its advent into the library annals .This service allows out central library to share all its E content, books and other required information to other libraries spreadover the state. It is also vice versa that the books pertaining to otherlibraries are also accessible if required with a mere request the libraryloan facility is available to most of the institutes who have an MOUsigned with DELNET. Whoever has membership with DELNET can utilize the exchanging and sharing of with other universities.



Out Come

ILL Inter library Loan : Reduction in Carbon Hand print

SDG Achieved : SDG 16

Diversity

KL University right from commencement after reaching the Deemed university status has been drawing students from every nook and corner of the globe. The university proudly announces that it has given rise to a cosmopolitan outlook as behave students from variouswalks of life, speaking different languages, hailing from differentcultural back grounds with a lot of ethnicities. Apart from students amajor chunk of the faculty is also from diverse cultural and different to sum up the whole scenario in KL University is conglomeration of umpteen number of people from various countries.



Out Come

Global Relations : Diversity in Education

SDG Achieved : SDG 10, 17

BMS – Building Managemen Systems – Library Block

BMS-System otherwise called as BAS or building automation is computer-based control system which reduces the workforce, automate the system, and saving the energy consumption in buildings by monitoring and controlling the mechanical and electrical equipment in modern-day buildings or any industrial plants.

Not only that but BMS helps to

- Increase the equipment lifetime and better performance.
- Identify the systems faults earliest.

Nowadays all the modern buildings built with BMS to support facilities management to accomplish the maintenance and save the energy in the building from one place of computers.

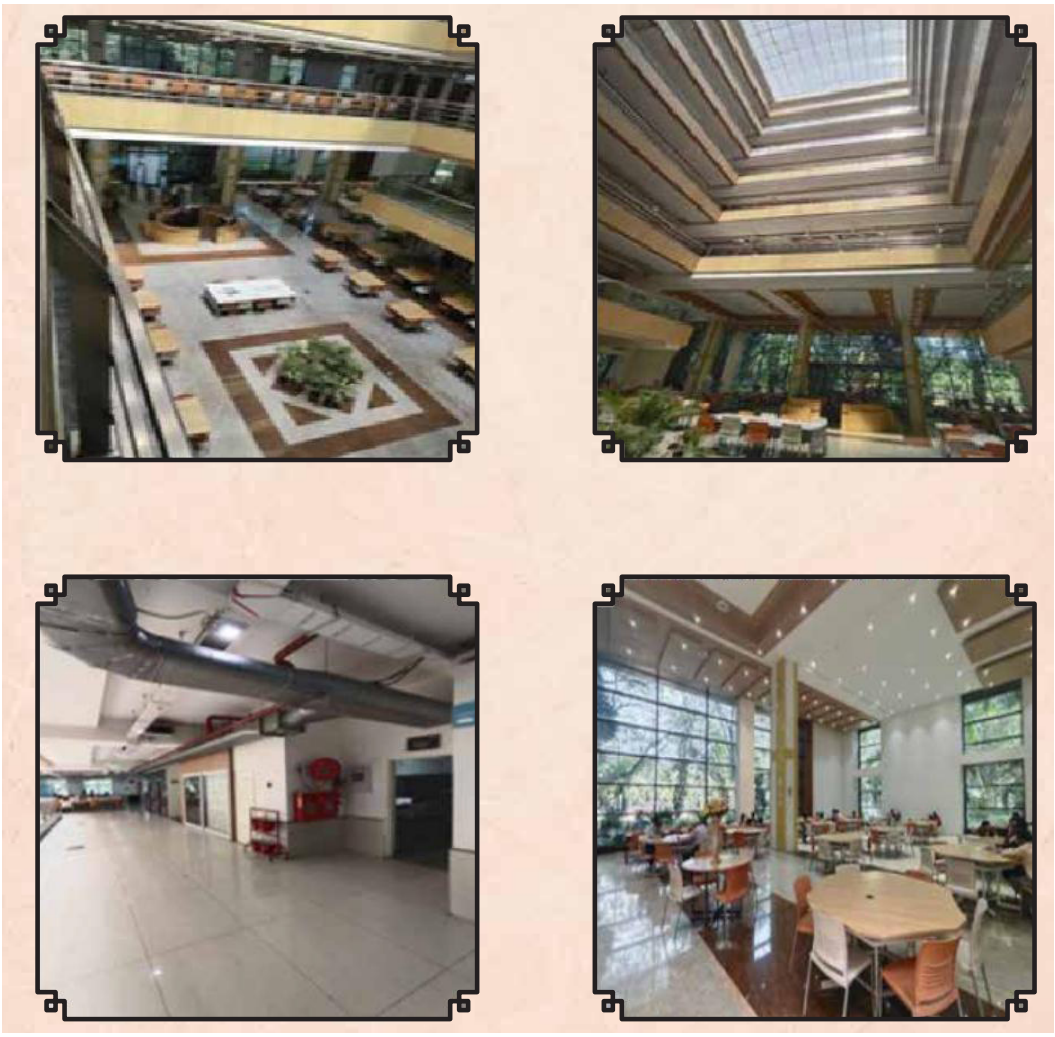
Essential Features of BMS

- Monitoring and controlling connected equipment in the building.
- The alarm should be a popup in operator workstation for any critical
- faults in the system.
- Any types of equipment on, off status and alarm should be logged or stored in PC to retrieve later.
- Schedule the equipment to on and off automatically by preset time.
- User interface graphics should be available to visualize the field equipment to monitor for BMS operator easily.

List of Equipment controlled by BMS or BAS in buildings

HVAC (Heating, Ventilation, and Air-conditioning or all supply andexhaust fans, ACs etc.)

- Water Chiller monitoring
- Water pumps ON/OFF/Trip Status and ON/OFF Control
- VFD Control for primary pumps
- VFD Control for Cooling towers
- AHU ON / OFF / Trip status and control ON / OFF and VFD control.
- VAV – Variable Air Volume Control based on measurement oftempera-ture and humidity in each room.
    - Fire alarm system – Integration of exiting fire system
    - Lift control system – Integration status of lift ON / OFF / position.
    - Electrical meters – All the panel energy meters integrated which will
    - give total information of energy, power, current and voltages.



Out Come

Reduced Global Warming : Reduction in Carbon Emission

SDG Achieved : SDG 7

Green Building Certification

Today, buildings have evolved into a diverse array of typologies designed to meet the highly specific requirements of the people who live andwork in them. Over time, with our growing technological skills, these buildings have also been increasingly designed and operated to place exorbitant demands on

natural resources, such as land, water, and energy, to mention a few. Therefore, incorporation of sustainable practices in building design and operation is no longer a choice but a necessity for a sustainable future.

KL University is more focused and committed to provide utmost facilitiesto it's the residents occupying the building.



All the buildings which are under construction are built as per the norms of the green buildings and aiming to get the green building certification. Following are the Green Building Initiatives in KLU

The benefits

This helps the environment by reducing GHG (greenhouse gas) emissions, reducing energy consumption and the stress on natural resources.

Some of the benefits of a green design to a building owner, user, and the society are as follows:

- Reduced energy consumption without sacrificing the comfort levels.
- Reduced destruction of natural areas, habitats, and biodiversity, and
- reduced soil loss from erosion etc.
- Reduced air and water pollution (with direct health benefits)
- Reduced water consumption.
- Limited waste generation due to recycling and reuse
- Reduced pollution loads.
- Increased user productivity, Enhanced image, and marketability.

Out Come

Sustainable Environment Acheived

SDG Achieved : SDG 9

ERP

KL ERP is an educational Enterprise Resource Planning software designed and developed by KL University. It automates and streamlines all the processes functioning within the boundaries of the institution to significantly improve the effectiveness of allocation and operating academic resources better. KL ERP is a well-designed web based ERP application which integrates the functions of all the departments in the university. Technology everywhere is the main moto behind the development of KL ERP. It is a web and mobile-based application which features a centralized data storage structure which helps management, students, faculty and parents to access data from anywhere and anytime. (https://newerp.kluniversity.in/)



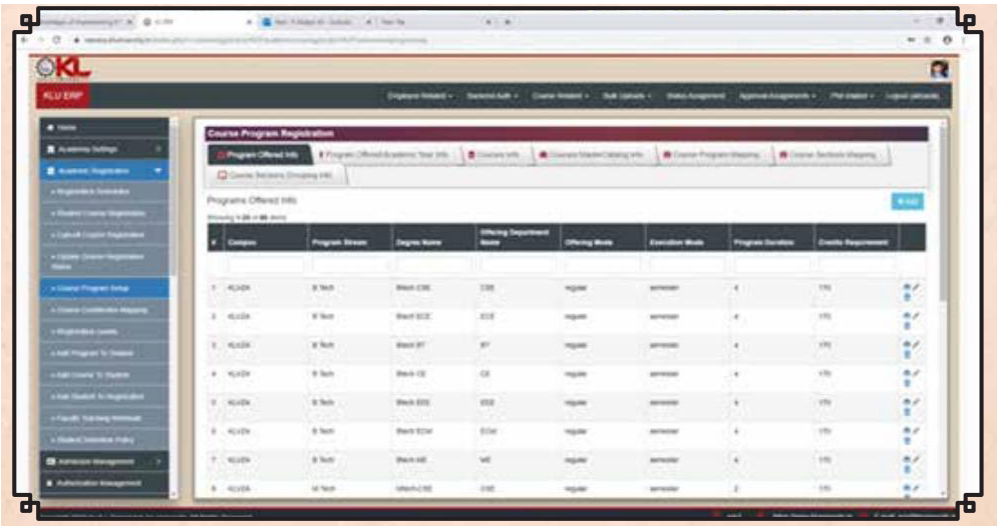
Main features of KL ERP are :

- Deepen student learning with technology.
- Complete Automation for smarter Decisions
- Improve Resource Management
- Centralized Data Management

- Increase Daily Productivity of the Staff and Faculty
- Save time and Reduce faculty workload.
- Connect multiple departments and Campuses.
- Employee Satisfaction and High performance
- Cost Effective & Quicker Management process.
- Complete Student centric and parents' satisfaction

ERP Modules:

1. Academic Registration
2. Admission Management
3. Authorization Management
4. Committee Management
5. Courses
6. Hostel Management
7. HR Management
8. Infrastructure Management
9. Inventory Management
10. Leave Management
11. Library Management
12. Ph.D Scholars
13. Employee Profile
14. Programs
15. Reports / Dashboard
16. Research Related
17. Student Profile
18. Timetable Management
19. User Management
20. Course Handout, QB & Examination



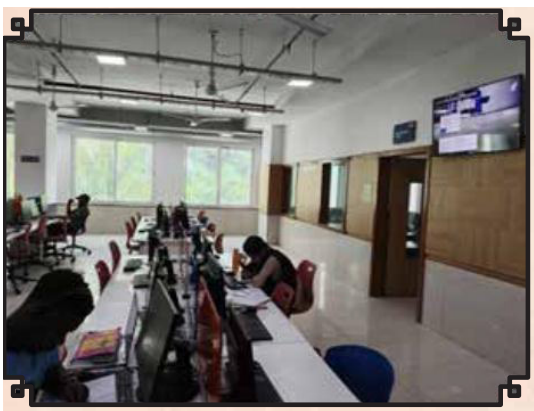
Out Come

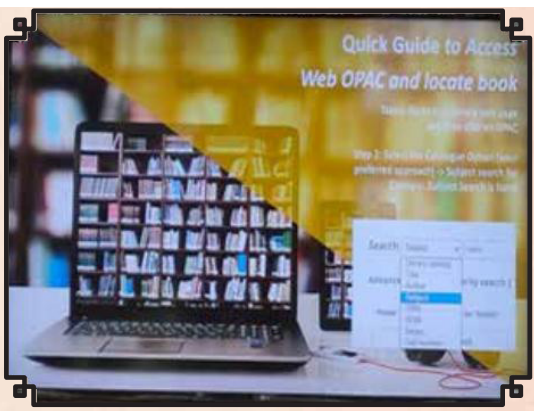
Paper less Office : Reduction in Carbon Emission

SDG Achieved : SDG 9, 17

KL TV

KL Central library has ready TV's installed in its Premises at various places. They provide an easy and quick accesses and quick guide with specific instruction as to how one can access all the information related the library books and material and services which cater to the need and the requirements of the library eyes. The monitor explain how to easily access compiled theses, new arrival, uploaded content of E resources books and journals etc. Hence it is a very useful tool helping one and all without much do.



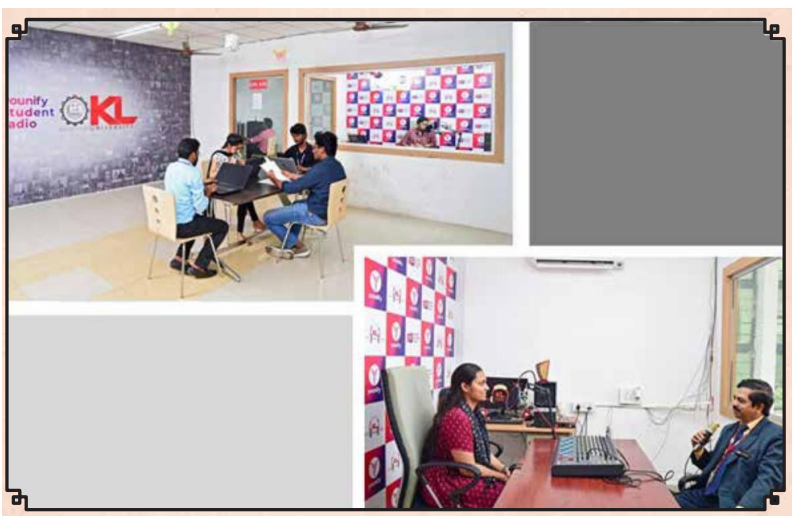




KL Radio

KL Radio is fully manned by students themselves through specific instructions issues related to any student activity or event is given an instruction through KL radio. All current events occurring in any

parent or ancillary department are highlighted to enable the student community to be aware of those technicalities. It all started on a large scale during covid and crescendo the post covid. Not a single item is missed and everything is updated time and again in the course of the rituals & KL Radio.



Kiosk -Central Library

Kiosk - self-issue of books. The machine helps every library user either to go for self-issue of books or return them on his own. It drives out write out the involvement of any library personnel. The alarming covid situation has banned the conglomeration of more than 2-3 people at the same place and at the same time, thereby reducing both carbon footprint carbon handprint of every individual. The users can be safe in such ambience. The kiosk machines are user friendly and work the 24/7 helping users visiting the library at all hours. The optimum use of kiosk stationary is seen as kiosk supplement, they're to the maximum passive extent need.



Out Come

Paper less Office : Reduction in Carbon Emission

SDG Achieved : SDG 17

RFID Library System & Flap Barriers

The practice today in libraries is to keep all collection in the form of RFID enabled manner for better lending and operations. This RFID system prevents wrong handling and loss of library material were tags of supplement with creative software. It adds integration and value for the voluble investment made.

KLU Central; Library has been using RFID technology since 2015 and it enables perfect maintains of records adds security through wireless of identification of people.

The flap barrier allows the person to enter the library permission without any specific permission or leaving behind learning behind any carbon footprint. There is another advantage as the flap barrier records the in time and outgoing time along with ID number. it also gives the occupancy rate of the library for any length of time.



Out Come

Paper less Office : Reduction in Carbon Emission

SDG Achieved : SDG 17

Web-OPAC

Web OPAC stands for online public access catalogue. It is a systematic application and could be used in a successful manner. The libraries in the world are equipped with its

evolutionary change that as improvised the service to its member. The use of state of art technology and professionally WAN Internet and intranet which extensively is server-based Web application. It is must of any library providing effective services with in limited spaces.

Technology alone cannot bring required changes attitude, practice and policies need to be changed. One of the key components and application of the library today is WEB OPAC.



Out Come

Paper less Office : Reduction in Carbon Emission

SDG Achieved : SDG 17

Digital Library

The Central Library is the hub of information services at the university. It is a creative and innovative partner supporting teaching, learning, and research activities. With a fast-growing collection, both in digital and print format using state-of-the-art facilities, currently the Central Library has 1,90,000 volumes,32,0000 E-Journals, 15 lakhs E-Books, 20 e-Databases, and 10,000 CD-ROMs.

It subscribes to 450 national and international journals/magazines in print besides a larger number of e-journals.

It also subscribes to International databases - ASCE, ASME, NATURE BIO-TECHNOLOGY, BENTHAM SCIENCES, LEXIS NEXIS, J-GATE EBSCO, IEEE, WORLD LIBRARY, AND CMIE.

Central Library is a member of consortia like INFLIBNET, DELNET, AND BRITISH COUNCIL LIBRARY which connects 5000 libraries over the cuntry and is a member of the National Digital Library (NDL).



Out Come

Paperless Office : Reduction in Carbon Emission

SDG Achieved : SDG 17

Innovative Climate Smart Initiatives

Storms taking premeasured from time to time to prevent any loss of life men and material. People living in low lying areas are evacuated to safer zones and are provided basic amenities.

Cyclonic circulation over south Andaman Sea and neighborhood lay over north Andaman Sea and neighborhood at 0300 UTC of today, the 18th October 2022. Under its influence, a low pressure area is likely to form over southeast & adjoining east-central Bay of Bengal during next 48 hours. It is likely to move west-northwestwards and concentrate into a depression by 22nd morning over central Bay of Bengal. It is very likely to intensify further into a cyclonic storm over west-central Bay of Bengal subsequently.

Intense convection lay over Andaman Sea. It has enhanced during last 24 hrs. Minimum cloud top temperature is minus 93 degree Celsius. Scattered to broken low and medium clouds with embedded intense to very intense convection n lay

over central & south Bay of Bengal and Andaman Sea. Scattered low and medium clouds with embedded moderate to intense convection lay over north Bay of Bengal (IMD report).

(https://www.kluniversity.in/WEATHERMATICS/Weekly1.html)

Out- Come

Weather forecast & Prediction

SDG Achieved : SDG 13

Sustainable Development and Libraries: The Emerging Idea of Green Libraries

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ABSTRACT: We must prevent further harm as the global population increases and we begin to experience the long-term effects of excessive energy consumption and industrial expansion. Our responsibility entails safeguarding healthy habitats for future generations and minimizing our impact on the biodiverse ecosystems of the planet. Sustainably operating any form of business and ensuring future growth potential without causing excessive environmental damage constitutes sustainability for any organization. Libraries have a unique and prominent position that allows them to successfully promote sustainable practices by adding role models. Libraries often engage with local communities, making them essential institutions for protecting and preserving the environment. This paper explores the possibilities and challenges of the role of libraries in sustainable development with an emphasis on the idea of Green Libraries.

The Context

Environmental sustainability entails responsibly engaging with the environment to prevent natural resource depletion or deterioration while ensuring long-term ecological quality preservation. The implementation of environmental sustainability aims to guarantee the satisfaction of the current population's requirements while safeguarding the capacity of future generations to fulfil their own needs. To satisfy ever-increasing human wants, society perpetually prioritizes economic growth, job creation, poverty alleviation, and the introduction of large-scale initiatives. This phenomenon is occurring not just at the grassroots level but also at the national and international levels. This ultimately leads to environmental pollution, primarily manifested in land degradation, inadequate water resource management, the consequences of extensive deforestation, biodiversity loss, coastal erosion, water scarcity, pollution, insufficient waste disposal infrastructure, and diminished agricultural productivity, among others.

The critical importance of addressing this issue at every level of an organization underscores the significant duty that falls upon each country's citizens (Premarathne and Bandara, 2019). Over the last two or three decades, we have

witnessed that the ecosystem's health has suffered for economic expansion. As a result, the environment has suffered from decreased air quality and climate change caused by greenhouse gases. These have resulted in the necessity for sustainable development as if left unchecked, they might cause lasting environmental damage. Sustainable development aims to create a sustainable economy growing in the right direction. It aspires to human contribution to protecting and enhancing the natural environment by minimizing pollution and waste and trying to reduce the global carbon footprint. This construction also focuses on providing housing for future generations and creating healthy, robust, and thriving global communities.

A carbon footprint refers to the comprehensive quantity of greenhouse gases, encompassing carbon dioxide and methane, produced by human activities. For instance, the mean carbon footprint per individual in the United States is 16 tonnes, among the highest rates globally (What Is Your Carbon Footprint?, n.d.). On a global scale, the average carbon footprint is approximately four tons. To maximize the likelihood of mitigating a 2 increase in global temperatures, the annual average worldwide carbon footprint must be reduced to less than 2 tons by the year 2050. Reducing individual carbon footprints from 16 to 2 tons is not an immediate process.

India is a developing nation with the world's second-highest population. Problems like pollution, depleting resources, poverty, industrial production, ecological deterioration, etc., are causes of worry. For this reason, there needs to be more focus on the most up-to-date new problems, such as sanitation and energy conservation, because environmental protection is not a regional issue, including the academic world; it permeates everywhere. As such, policy for sustainable development must also be incorporated in academia.

By providing more comprehensive access to resources, enabling remote access, fostering digital literacy, and supporting research and education, library services' digital transformation now increases their capacity to promote sustainable development. This, in turn, contributes to achieving global sustainability objectives and assists communities and individuals in making sustainable, well-informed decisions. Practical library and information services contribute to socio-economic development by fostering a knowledge society and empowering marginalized and poor people to exercise their rights, be economically active, learn new skills, enrich cultural identity, and participate in decision-making. As such, this paper explores libraries' role in sustainable development and the emerging idea of Green Libraries.

Objectives

To explore the possibilities and challenges of the role of libraries in sustainable development with an emphasis on the idea of Green Libraries.

Methodology

The paper is based on qualitative research. Data Sources are secondary, comprising the existing academic literature, studies and reports.

Libraries and Sustainable Development

Libraries occupy a distinctive and prominent position that allows them to effectively promote sustainable strategies by incorporating role models. Libraries typically engage with local communities, presenting significant potential for becoming a pivotal institution. Library services play a crucial role in promoting sustainable development through digital transformation. Digital technologies have opened new opportunities for libraries to provide information and support in more efficient, accessible, and environmentally friendly ways. Here are several ways in which library services contribute to sustainable development through digital transformation:

Access to Digital Resources: A variety of digital resources are accessible through libraries; these resources consist of databases, e-books, online journals, and multimedia materials. This facilitates sustainable development through the increased accessibility of information and the decreased reliance on resource-intensive physical reproductions.

Remote Access: By enabling remote access to library resources, digital transformation eliminates patrons' need to physically visit the library. This practice saves time and energy and mitigates the carbon emissions typically linked to commuting.

Virtual Learning and Education: Libraries can offer digital learning platforms, seminars, and online courses to aid education and skill development. This holds particular significance when considering upskilling and continuous learning within the framework of sustainable development.

Open Access Initiatives: Many libraries participate in open access initiatives, which grant unrestricted online access to scholarly publications and research. Open access facilitates the transmission of knowledge and encourages international cooperation, both critical in the fight against sustainability issues.

Digital Preservation: To prevent the loss of valuable information over time, libraries accomplish a crucial function by preserving digital content. Digital preservation endeavours help ensure that knowledge and cultural heritage remain accessible indefinitely.

Digital Inclusion: By providing access to digital technologies, internet connectivity, and digital literacy programmes, libraries attempt to bridge the digital divide. Critical to inclusive, sustainable development is the provision of digital navigational skills and resources to all individuals.

Information Literacy: The information literacy skills that library patrons gain enable them to evaluate digital content critically and make well-informed decisions regarding sustainable practices and issues.

Data Management and Research Support: The assistance that libraries provide to researchers in managing and sharing their data is crucial for reproducible and transparent research, a fundamental element of sustainable development.

Community Engagement: Digital platforms are employed by libraries for community engagement, hosting virtual events, and promoting sustainable practices. They can serve as centres for local campaigns and initiatives promoting sustainability..

Green Library Initiatives: Incorporating environmentally friendly and sustainable practices into their daily operations is possible for libraries. This consists of the construction of energy-efficient structures, the reduction of paper usage, and the integration of sustainable technological solutions.

Collaboration and Knowledge Sharing: Collaboration among organizations, policymakers, and researchers engaged in sustainable development is facilitated by libraries. Digital platforms facilitate global collaboration and the exchange of information.

Citizen Science and Crowdsourcing: By utilizing digital technologies, libraries can involve the general public in citizen science initiatives and crowdsourcing endeavours that pertain to sustainability research and environmental monitoring.

AI and Big Data Analytics: By utilizing AI and big data analytics to extract insights from massive datasets, libraries can aid in the data-driven resolution of complex sustainability challenges.

The digital transformation of library services extends their capacity to support sustainable development by providing broader access to resources, facilitating remote access, promoting digital literacy, and supporting research and education.

This, in turn, helps individuals and communities make informed, sustainable choices and contributes to achieving global sustainability goals.

Green Library Concept

When we use the term Green with another word, we refer to something that advocates sustainability as the supreme consideration for managing all human activities. As such, a Green Library is an idea through which the libraries must be structured and operated in such a way that it promotes environmental sustainability. It is an emerging idea, and we might need help finding a specific univocal definition. "Green Library" encompasses a library's operational aspects and physical infrastructure. Hence, the concept is quite extensive. More precisely, a green library refers to a library that prioritizes environmentally friendly practices and promotes sustainability. And operated in an environmentally friendly manner to minimize their negative environmental impact. These libraries prioritise using sustainable materials, energy-efficient technologies, and waste-reduction strategies in their construction and ongoing operations. By adopting green practices, libraries may contribute to the overall sustainability efforts and serve as models for other institutions. The structures can be restored, managed, or repurposed in an environmentally conscious manner that optimizes the use of resources (Kulkarni, 2023).

The International Federation of Library Associations and Institutions exemplifies a sustainable library. The provided statement elucidates that "environment" refers to the encompassing surroundings or circumstances in which individuals, entities, fauna, or flora reside and function. Environments encompass various dimensions, including natural, social, and cultural aspects. Sustainable development effectively addresses society's current demands while ensuring that future generations' capacity to fulfil their own needs is not compromised. Existing ecosystems are at risk due to the impacts of climate change and various other challenges, such as societal disparities. All organizations must prioritize safeguarding the environment by adopting sustainable development practices. Multiple types of libraries can actively and significantly contribute to sustainable development (Hinz, 2023). Thus, a green and sustainable library considers the principles of environmental, economic, and social sustainability.

Green Library- The Opportunities

The library serves as a community centre and plays a crucial role in facilitating the mobilization and organization of knowledge across several domains. Hence, the

green library holds significant relevance in raising awareness among individuals regarding the imperative need to safeguard the environment and promote the sustainable use of resources. A public library is an institution formed, supported, and financed by the community, either through governmental entities at the local, regional, or national level or through other forms of community organizations ("From the IFLA International Office for UBC," 1981).

Libraries facilitate the provision of knowledge, information resources, and services to all individuals within the community. The community's requirements and wants to surpass the available resources result in limitations. Hence, it is imperative to employ resources to ensure their sustainability. Inadequate architectural design of library buildings, negligent utilization of resources by library patrons, limited understanding of environmentally sustainable practices, failure to implement energy-conserving methods, improper resource management practices, and inadequate waste disposal methods have been identified as significant factors contributing to the environmental impact of libraries. Hence, the primary determinant in formulating policy decisions for a more environmentally sustainable future lies in determining the level of awareness and the activities made.

Therefore, implementing green libraries is vital in fostering environmental stewardship, reducing expenses, providing educational opportunities to the community, and establishing a commendable model for sustainable behaviours (Essmiller et al., 2019; Singh & Mishra, 2019; Sharma & Sinha, 2021).

There exist numerous justifications for the significance of green libraries:

1. **The concept of environmental responsibility:** It is exemplified by green libraries, which actively mitigate their environmental impact by adopting energy-efficient systems, using sustainable materials, and advocating for eco-friendly practices. These efforts align with the overarching objective of ecological conservation.
2. **Cost Reduction:** Sustainable practices can benefit financially by decreasing energy usage and minimizing maintenance costs. Additionally, this practice may yield enduring financial advantages for the library.
3. **Effective educational instruments:** Incorporating green libraries can function as effective educational instruments, facilitating the dissemination of knowledge regarding environmental concerns and fostering the adoption of sustainable lifestyles and reading habits among library users.
4. **Community engagement:** Libraries can actively include their communities by organizing events, workshops, and activities centred around

sustainability and the environment. By doing so, libraries can cultivate a collective consciousness of accountability towards preserving our world.

5. **Illustration of leadership**: Through adopting environmentally friendly practices, libraries serve as a model for their communities, fostering the inclination of other organizations and individuals to emulate their actions and embrace more sustainable alternatives.
6. **Health and well-being**: Incorporating green elements in libraries has enhanced library users' and staff members' overall health and well-being. This is primarily attributed to the positive effects of improved air quality, abundant natural lighting, and green areas within these libraries, all of which contribute to the promotion of well-being.
7. **Implementing measures:** The long-term sustainability of libraries can be ensured by implementing measures that address the difficulties posed by climate change and resource scarcity, thereby ensuring their continued relevance and functionality for future generations.

In the library and information science field, the green library movement gained momentum in the early 1990s (Meher & Parabhoi, 2017). Professionals in libraries are also working to create libraries that use the least electrical power possible while being environmentally friendly and energy efficient. Even though it still needs to be fully implemented in libraries, we are still making progress.

Green Library and India

In India, the Energy and Resources Institute (TERI) has been instrumental in starting the "green library" movement. To ensure that all academic buildings, including libraries, adhere to GRIHA (Green Rating for Integrated Habitat Assessment) standards, necessary guidelines have been created. The Indian Green Building Council (IGBC) was founded in 2001 to advance the cause of environmentally friendly construction in India through various service initiatives and a training programme for professionals in the field. Green building projects in India have been pushed forward with the help of LEED's partnerships with other rating systems (Mahawariya, 2020). Some of the prominent green libraries include Mumbai University Library, Madras University Library, Chhatrapati Shahu Ji Maharaj University, Kanpur, Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur, National Library of India, Kolkatta, Anna Centenary Library, Tamil Nadu, Karnataka University Library, Perma Karpo Library, Ladakh, and Delhi University Library (Bherwani, 2020; Vasanthi, 2019; Hasan & Panda, 2023)

Basic Parameters Towards Building a Green Library

Green and sustainable libraries might vary in size. Nevertheless, they need to possess a well-defined sustainability agenda that encompasses the following:

Green buildings and equipment: Efforts are made to reduce the emissions actively, also known as the carbon footprint generated by the building and equipment.

Green office principles: Operational routines and procedures exhibit a high degree of environmental sustainability.

Sustainable economy: Consumption is controlled, and sharing economy and circular economy techniques are developed and available to the public.

Sustainable library services: Users may quickly obtain relevant and current information, shared spaces and gadgets are available, environmental education is provided, and operations are efficient.

Social sustainability: Considerations include a good education, literacy, cross-cultural variety, community involvement, social inclusion, and general participation. The library actively strives to lessen inequity.

Environmental management: The library strives to lessen its adverse environmental impact and has set SMART (Specific, Measurable, Achievable, Realistic and Timebound) ecological goals. A larger audience is informed about the library's environmental policy, how it is being implemented, and the outcomes of its environmental efforts.

Commitment to general environmental goals and programmes: The Paris Climate Agreement, the Sustainable Development Goals of the United Nations, and associated ecological certifications and timetables provide guidelines for commitment (What Is a Green Library? n.d.).

Further, research on the Sri Lanka Public Libraries conducted by Premarathne & Bandara demonstrates ideas that may be useful for future planning of the libraries with the green concept (Premarathne & Bandara, 2019). To educate the public about the green library concept, library staff should organize awareness programmes and set aside finances for them. The "library readers" society needs to manage tree-planting initiatives. The yard outside the library needs to be redesigned as a green area. It is crucial to provide a welcoming space for reading and to enhance the landscape in an eco-friendly manner. In addition, it would be helpful if the garden is planted with plants appealing to the target audience. To successfully construct the Green Library, a shift in perspective is required. Local government institutions

should take the lead on this because of its critical importance. All libraries should have access to computers and the internet through a reliable network. Any library worth its salt will have undergone careful pre-foundational planning, including site selection. Essential resources should be introduced to raise awareness of recycling, energy-saving, cleaning, and water-saving programmes, among others, that protect the environment.

When libraries consider being green, they frequently research the LEED (Leadership in Energy and Environmental Design) rating system. LEED notes the following;

Community Collaboration: Maintaining public support and maximizing the usefulness of community resources are outcomes of community collaboration.

Area: Consider the advantages and disadvantages of the available space before settling on a building layout.

Water: Clean, healthy, and environmentally friendly libraries can be achieved by carefully planning their water and sanitation systems.

Light: The library's windows, skylight, and vents should all allow for adequate natural light and airflow. The use of low-energy bulbs and tube lights can conserve electricity. Energy expenditures can be lowered by combining natural and artificial light during the day.

Green Materials: Wood, linoleum, bamboo, and cork are examples of green materials. Rooftop gardens are an excellent way to improve air quality.

Green rooftops: Roofs can be equipped with solar tiles or panels.

Floor System: Raise the floor to let in more air, and use paper insulation for an additional eco-friendly touch with raised floor systems. Insects and flames are both kept at bay, too.

Air Quality: Breathing clean, healthy air is crucial. The surrounding area needs to be planted adequately for the library's air to be healthy. Extra airflow was planned for, reducing the need for air conditioning. Maintaining a high standard of indoor air quality is essential to achieving our goals ("Leadership in Energy and Environmental Design (LEED) Award," 2008).

Challenges Toward a Green Library

Although there are many potential upsides to creating a green library, some risks and obstacles should be considered. Some typical challenges libraries may encounter on their greening journey (Landes, 2018).

Costs: Putting green technologies and sustainable practices into place could necessitate an initial financial outlay. While these strategies typically result in cost savings over the long run, some libraries may need help allocating funding for the initial investments required to implement them.

Limited Resources: Smaller or less well-funded Libraries may need more money for sustainability projects. This can make it challenging for them to invest in energy-efficient infrastructure or adopt green technologies.

Resistance to change can be an obstacle, whether from employees or customers. Library patrons won't embrace changes to their work processes, technology, or the building.

Lack of Expertise: It might be difficult for libraries to properly implement and maintain green programmes due to a lack of in-house expertise on sustainable practices. This may result from a need for more information concerning topics like energy conservation, garbage disposal, or green architecture.

Building Constraints: Existing library facilities may have architectural or infrastructure restrictions that make it difficult to apply some green practices. Updating older structures to current sustainability standards can take time and effort.

Educational Outreach: Effective educational outreach is necessary to inform library staff and patrons of the value of sustainability and green projects. It could be difficult for libraries to promote awareness and change in patron behaviour.

Regulatory Compliance: Libraries may need help understanding and adhering to legislation governing environmental and sustainability requirements locally or nationally.

Balancing Priorities: Libraries, especially those with few resources, must weigh the importance of green efforts against the need to maintain other critical services and programmes.

Measuring Impact: It can be challenging to provide convincing evidence of the success of sustainability projects and their positive influence on the environment.

Technological Obsolescence: Libraries may need help making sound investments due to the danger of adopting technologies that may become obsolete quickly due to the rapid improvements in green technologies.

Despite these difficulties, several libraries have found ways to employ sustainable practices. Libraries can strive towards developing more ecologically friendly places by carefully planning, gaining stakeholder cooperation, and progressively

implementing green projects. Collaboration with specialists and relationships with local sustainability organizations can also be beneficial in solving these difficulties.

Role of Librarians towards Green Library

Librarians have consistently played a significant role in facilitating community learning initiatives, and it is fitting for them to assume a leading position within the sustainability movement.

Librarians endeavour to encourage users to engage in the green library project by acquainting them with the advantages of green libraries.

Librarians ought to embrace the implementation of green library standards when designing library buildings to attain sustainability and promote the library's expansion in an environmentally conscious manner.

Adopting green library design by librarians enhances the library's reputation and general image.

Librarians possess the necessary skills and knowledge to manage the financial resources required to establish and operate a library, supporting the organization. This is made possible by the implementation of a green library system.

The librarian's function is significant in achieving a harmonious balance between the two essential aspects of economy and ecology, which are critical for developing healthy, prosperous, and sustainable libraries (Mahawariya, 2020).

Conclusion:

Green Library incorporates environmentally friendly building materials, maximizes the utilization of natural resources, minimizes waste, utilizes renewable sources effectively, and operates cost-effectively and efficiently. In contemporary times, there is a heightened necessity for libraries to prioritise the implementation of environmentally sustainable practices within their physical spaces. In the present situation, library professionals must make informed judgements and undertake necessary actions to promote environmental sustainability inside their libraries. Additionally, active participation in the green library movement is crucial. Numerous domestic and international organizations actively contribute to transforming libraries into environmentally sustainable spaces. However, in addition to these entities, it is imperative for library users, librarians, and government officials to proactively engage and contribute to the green library movement to ensure its

success. It is essential to acknowledge that contemporary libraries, serving as conduits for knowledge, are responsible for promoting sustainability and setting a precedent via their actions. It is imperative to bear in mind that incremental actions towards environmental sustainability might yield significant outcomes in the long run.

References

1. (Junior Research Fellow), P. S., & (Associate Professor), R. M. (2019, April 25). *Environmental sustainability in libraries through green practices/services*. "Environmental Sustainability in Libraries Through Green Practices/Serv" by Priti Singh (Junior Research Fellow) and Rajani Mishra (Associate Professor). https://digitalcommons.unl.edu/libphilprac/2312

2. Bherwani. (2020). Concept of Green Library in Indian Context. *Aayushi International Interdisciplinary Research Journal (AIIRJ)*, *VII*(II). https://www.aiirjournal.com/uploads/Articles/2020/03/4433_24.Dr.%20Mohini%20T.%20Bherwani.pdf

3. Brundtland, G. H. (1987). Our Common Future—Call for Action. *Environmental Conservation*, *14*(4), 291–294. https://doi.org/10.1017/s0376892900016805

4. Environmental Sustainability Practices in Rural Libraries. (2021, March 31). *International Journal of Service Management and Sustainability*, *6*(1). https://doi.org/10.24191/ijsms.v6i1.12885

5. Essmiller, K., Thompson, P., & Alvarado-Albertorio, F. (2019, December 26). Performance Improvement Technology for Building a Sustainable OER Initiative in an Academic Library. *TechTrends*, *64*(2), 265–274. https://doi.org/10.1007/s11528-019-00467-2

6. From the IFLA International Office for UBC. (1981, October). *IFLA Journal*, *7*(3), 298–299. https://doi.org/10.1177/034003528100700318

7. From the IFLA International Office for UBC. (1981, October). *IFLA Journal*, *7*(3), 298–299. https://doi.org/10.1177/034003528100700318

8. From the IFLA International Office for UBC. (1981, October). *IFLA Journal*, *7*(3), 298–299. https://doi.org/10.1177/034003528100700318

9. Hasan, S., & Panda, S. (2023). Charting a Sustainable Path: Empowering Green Libraries for a Greener Future in India. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4535214

10. Hinz, A. (2023, July 3). *"Libraries Exist to Serve the Sustainable Development Goals": An Interview with Barbara Lison - De Gruyter Conversations*. De Gruyter

Conversations. https://blog.degruyter.com/libraries-exist-to-serve-the-sustainable-development-goals-an-interview-with-barbara-lison/

11. Hinz, A. (2023, July 3). *"Libraries Exist to Serve the Sustainable Development Goals": An Interview with Barbara Lison - De Gruyter Conversations*. De Gruyter Conversations. https://blog.degruyter.com/libraries-exist-to-serve-the-sustainable-development-goals-an-interview-with-barbara-lison/

12. Kulkarni (Vanikar), A. S. (2023, June 12). Green Library: Features, Elements, Standards and Green Library initiatives in India. *International Journal of Research in Library Science*, *9*(2), 218–223. https://doi.org/10.26761/ijrls.9.2.2023.1671

13. Landes, C. (2018, October 8). *16. Challenges and Opportunities in Implementing a Sustainable Approach at Academic Libraries*. De Gruyter. https://www.degruyter.com/document/doi/10.1515/9783110608878-018/html?lang=en

14. Leadership in Energy and Environmental Design (LEED) Award. (2008, April 18). *Management of Environmental Quality: An International Journal*, *19*(3). https://doi.org/10.1108/meq.2008.08319cab.001 *Library Associations and Institutions.*

15. Mahawariya, K. (2020, June 22). *Transforming Modern Era Libraries into Green Library: A study | Mahawariya | Journal of Indian Library Association*. Transforming Modern Era Libraries Into Green Library: A Study | Mahawariya | Journal of Indian Library Association. https://www.ilaindia.net/jila/index.php/jila/article/view/338

16. Meher, P., & Parabhoi, L. (2017). Green Library: An overview, issues with special reference to Indian libraries. *International Journal of Digital Library Services*, *7*(2), 62-69.

17. Premarathne, B. N. G. S., & Bandara, B. E. S. (2019, August 28). Current Status of Green Library Concept in Public Libraries of Central Province in Sri Lanka. *Journal of the University Librarians Association of Sri Lanka*, *22*(2), 119–128. https://doi.org/10.4038/jula.v22i2.7941

18. Sharma, J., & Sinha, S. (2021). Green library: An overview. *Journal of Library and Information Communication Technology*, *10*(2), 55–61. https://doi.org/10.5958/2456-9399.2021.00015.8

19. Vasanthi. (2019). GREEN LIBRARY TRENDS AND DEVELOPMENT IN INDIA: A STUDY. *International Journal of Advance Research and Innovative Ideas in Education* , *5*(5).

20. What is your carbon footprint? (n.d.). The Nature Conservancy. https://www.nature.org/en-us/get-involved/how-to-help/carbon-footprint-calculator/

Applicability of Zipf's Law in the Domain of Library and Information Science

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ABSTRACT: The aim of this paper is to analyse, evaluate and apply Zipf's Law in the field of Library and Information Science through content analysis of articles published in library and information science journals. Two online two years library and information science journals i.e. Annals of library and Information science studies and DESIDOC journal of library and information science technology are selected for the study. The researcher applied zipf's law on a total 167 articles published in these source journals. In addition, the researcher also focused on the keywords in titles and length of abstract.

Introduction

In 1949, American linguist George Kingsley Zipf created Zipf's Law. A statistical observation called Zipf's law explains the connection between a word's rank and frequency in a corpus of texts. The law states that a word's frequency and position in the frequency is inversely correlated. This is an approximation of the rank-frequency relationship provided by Zipf's law. This law is also one of the empirical laws in bibliometrics. This law mathematically stated as

$$r_* f = c$$

Where 'c' is a constant, 'f' is the word-type's frequency of occurrence, and 'r' is its rank.

It has been observed that in linguistic circumstances Zipf's Law proved the acceptance (---). However non–linguistic text or technical wrings concern this law yet not proves his acceptance (---). This study is to check whether Zipf's Law is valid for non-technical text.

Numerous fields have used Zipf's Law, including natural languages, web-access statistics, informetrics, commerce and finance, ecological systems, etc. The approach of content analysis, which has been proven effective in bibliometric studies, is used to characterize the content of research and communication.

According to B. K. Sen (1998) in technical writings only textual part concerns excluding alpha numeric alpha symbolic words, abbreviations, tables, and formulas, this law follows. However, it is not generalized that the law will be applicable to all types of technical writings. Rajneesh and Rana, M. S. (2015), this study focused on the application of Zipf's Law on analysis of keywords in computer science literature and they conclude that study in computer science has been thoroughly covering every facet, and the pattern for nearly all keyword occurrences has been growing. But Zipf's Law only makes approximations in some areas of the data set not across all areas. Saxena Anurag; Jauhari and Gupta, B. M., in summary, the conflicting results may be explained by the fact that Zipf's Law is not universally applicable across different sample sizes. Mikros, George K. stated that Zipf's law is valid for the 1000 most common terms, as we shown. Zipf's law also applies to the 1000 most prevalent lemmas, but with less accuracy. Using an index for the order of observed values of the variables in a Zipf-type connection, Chen, Ye-Sho and Leimkuhler, Ferdinand F. (1984) have conducted a thorough investigation of Zipf's law. Three significant qualities that are related to rank, count, and frequency were found and gave Zipf's law a strong foundation.

Different studies done applying ZIpf's law in different literary corpus. However, no. such study is still carried out in technical writing concerns. The library and information subject comes under the technical subject.

Objectives

1. To determine the length of the abstract and the percentage of keywords in technical writing related to library and information science.
2. To determine the rank-ordered frequency distribution of the words in the text.
3. To determine the length of the sentences that are used in the articles.
4. To validate Zipf's Law in Technical Writing for Library and Information Science

Scope

The main source of data for this study was Indian journals on library and information science. While collecting the relevant data, the following two journals published during 2021 to 2022 are taken into account. The online versions of these journals are listed below.

1. The Annals of Library and Information Studies
2. The DESIDOC Journal of Information and Library Technology.

Methodology

167 articles were studied to examine Zipf's law. These 167 articles are published in the above mentioned journals in the field of Library and Information Science journals in the year 2021 and 2022. First, all words in an article are counted. And they are arranged below each other in a specific manner. In this arrangement, the words which appear more often in the article are placed at the top. Then all other words are arranged in descending order. The same procedure was followed for all 167 articles.

The names, affiliations, abstracts, keywords, alpha-numeric expressions (such as 3rd and h10), alpha-symbolic expressions (such as a= and au=), acronyms, serial numbering, formulas, citation marks, intra and extra textual references, tables, figures, and appendices were among the sections of an article that were not included in the counting.

An abstract is a shortened form of an article and may not always correspond to the author's usual writing style. Furthermore, the abstract may occasionally be written by a person other than the author. As a result, it was not taken into account. Alphanumeric and alphanumeric-symbolic phrases, formulas, abbreviations, numbers written with digits, serial numbering with a, b, c, etc., roman numbers and numbers written in words are excluded. Therefore, only the article's textual content—with the previously mentioned exceptions was taken into account because it appeared to be most appropriate for determining the word.

On the basis of these counting the analysis has been done considering the set objectives.

Hypothesis

The chosen dataset from the source journals of library and information science is not suitable for Zipf's Law.

Data Analysis

Table 1 shows the Number of articles published in the journals year wise viz., Annals of Library and Information Studies and DESIDOC Journal of Library and

Information Technology a publication within the field of library and information science that is under consideration for this study. The information used in the research came from these journals that were published between 2021 and 2022. Out of 167 articles the highest no. of articles published in DESIDOC Journal of Library and Information Technology in the year 2021 i.e. 51. However the lowest number of articles published Annals of Library and Information Studies in the year 2022 i.e. 22. Out of 167 articles the highest number of articles published in DESIDOC Journal of Library and Information Technology i.e. 95. As mentioned in the above table the lowest number of articles published in Annals of Library and Information Studies. Total number of 167 articles the highest number of articles published in the year 2021 i.e. 93 articles.

Table 1 : Year wise Number of Articles Published in the Source Journals

Sr. No.	Year	No. of Articles Published in Journals		Total
		Annals of Library and Information Studies (ALIS)	DESIDOC Journal of Library and Information Technology	
1	2021	42	51	93
2	2022	30	44	74
Total		**72**	**95**	**167**

Table 2 : Number of articles in terms of length of abstract considering the number of words

Sr. No.	Range of Words In Abstract	No. of Words in Abstract	Percentage
1	00-50	2	1.20 %
2	51-100	18	10.78 %
3	101-150	37	22.16 %
4	151-200	58	34.73 %
5	201-250	36	21.56 %
6	251-300	14	8.38 %
7	301-350	0	0.00 %
8	351-400	2	1.20 %
Total		167	100%

Table 2 exhibits the length of abstracts of articles published in source journals that the researcher attempted to verify in this study by looking at their word count.

Table 2 demonstrates that, of the 167 articles, 58 articles had abstracts between 151 and 200 words in length. The percentage of which is 34.73 %. 37 articles represents the next lowest figure. These papers' number of words in the abstracts are between 101 and 150 words having the percentage is 22.16%. The standard size of an article abstract can vary depending on the publication guidelines and the specific field of study. Generally, the abstract should be between 150 to 250 words in length. The journal to journal may have different policies on it. Yet it shouldn't go on for too long. There are 131 articles that fall into the range of 150 to 250 words, which is the normal length for an abstract. That is 78.55% of the total. There are several exceptions where the abstract is longer than 300 words. Table 2 illustrates that the range of abstract terms in two articles is 351 to 400 words in length.

Table 3. exhibits the number of articles in terms of quantity of keywords. The themes covered in the article are indicated by the keywords. It makes it easier to identify appropriate information or articles. Generally speaking, no other source addresses the optimal number of keywords for a research article. But in general, no more than ten keywords should be used. The DESIDOC Journal of Library and Information Technology Author's Guidelines, one of two source journals, states that authors should include no more than six to ten keywords in their work. Table 3 shows that out of 167 articles published in two source journals, in 122 articles 04 to 6 range of keywords indicates. The percentage of which is 73.1%. Followed by in the range of 07 to 9 keywords published in 26 articles. Percentage of which is 15.6%. This table also indicates that in one article no such keywords were mentioned. It is also noticed that 3.0% articles have 10 to 12 ranges of keywords published. There are a total of 5 articles out of 167.

Table 3 : Number of Articles in terms of quantity of keywords

Sr. No.	Range of Keywords	No. of Articles	Percentage%
1	**0**	**1**	0.6%
2	**01-3**	**13**	7.8%
3	**04-6**	**122**	73.1%
4	**07-9**	**26**	15.6%
5	**10-12**	**5**	3.0%
Total		167	100.0%

Table 4 : Percentage occurrence of Keywords in the title

Sr. No.	Percentage	Occurrence of Keywords
1	00-20	21
2	21-40	79
3	41-60	42
4	61-80	19
5	81-100	6
Total		**167**

Table number 4 shows the percentage occurrence of keywords in the title. In the 79 articles titles 21 to 40 percent of keywords are included. It means that out of 5 keywords two keywords mentioned in the title are. Titles that are rich with keywords can help readers identify the concept or subject matter of a document more quickly. Followed by 41 to 60% keywords mentioned in 42 articles after that in 21 articles 00 to 20 % keywords found. It observed that no one keyword or 1 to 2 keywords were found in the title. The lowest means in 6 articles near about 100% keywords present in the titles, and such types of articles easily find out the articles in the view of researchers.

Table 5 : Length of Articles in Terms of Number of Sentences

Sr. No.	No. of Sentences	No. of Articles
1	001-100	9
2	101-200	97
3	201-300	48
4	301-400	9
5	401-500	4
Total		**167**

Through an analysis of 167 articles published between 2021 and 2022, the researcher attempted to determine the average number of sentences in each article. The outcomes of this analysis shows in Table number 5. In this table we observed that in 97 articles 101 to 200 range of sentences is included. Followed by in the range of 201 to 300 sentences observed in 48 articles. The minimum 001 to 100 range of sentences mentioned in 9 articles. However the highest range of sentences i.e. 401 to 500 mentioned in 4 articles out of 167 articles.

Table 6 : Words count of the length of articles

Sr. No.	No. of words	No. of Articles	Percentage
1	0001-1500	3	1.8%
2	1501-3000	70	41.9%
3	3001-4500	68	40.7%
4	4501-6000	19	11.4%
5	6001-7500	7	4.2%
	Total	167	100.0%

As per the guidelines of the selected source Indian journals published in the domain of library and Information science journals, it can be shown that DESIDOC Journal of Library and Information Technology 3000 words for research articles accepted and for Review articles limit is 5000 words. Annals of Library and Information Studies no such type of guidelines mentioned. The table number 6 indicates the highest number of words shown in 7 articles. The range of words is between 6001 to 7500 and the percentage of which is 4.2 %. However, the lowest range of words i.e. 0001 to 1500 observed in 3 articles, percentage of the same is 1.8 %. Out of 167 journal articles published in the year 2021 and 2022. In this table also seen The highest number of articles i.e. in 70 articles, the range of words between 1501 to 3000 , The percentage of which is 41.9%. Followed by in 68 articles 3001 to 4500 range of words shown. It means that the maximum article's word length is between 1501 to 4500.

Table 7: Journal-wise Length of Articles in Terms of Rank of Words

Sr. No.	Range of Words	No. of Articles Published in Journals		Total
		ALIS	DESIDOC	
1	001-500	6	9	15
2	501-1000	49	82	131
3	1001-1500	17	4	21
	Total	**72**	**95**	**167**

Table 7 shows the Journal-wise length of articles in terms of rank of words. A total 167 articles published in the source journals i.e. Annals of Library and Information Studies and DESIDOC Journal of Library and Information Technology in the year 2021 and 2022. Out of these the highest number of words of articles published in the range of 501 to 1000 in 131 articles. Followed by 21 articles 1001 to 1500

range of words published. The lowest range of rank of words between 001 to 500 published in15 articles.

This table also shows that DESIDOC Journal of Library and Information Technology published the most articles, i.e. 95 of these top 82 articles were published in the 501 to 1000 word range and the lowest range of words published in the 001 to 500 range of words. In Annals of Library and Information Studies out of 72 articles the highest rank of words, range between 501 to 1000 published in 49 articles and the lowest range of words i.e. 001 to 500 published in 6 articles out of 72 articles.

Table 8 : Result of Zipf's Equations Considering all Samples

Sr. No.	Year	No. of Sample Articles considering testing of Null Hypothesis		Total	Percentage (Accepted)
		Accepted	Rejected		
1	2021	0	93	93	0%
2	2022	0	74	74	0%
	Total	0	167	167	0%

Total 167 articles published in two source journals in the year 2021 and 2022. In all these sample articles applied Kolmogorov-Smirnov Test (KS Test) and the result of this is the Asymptotic Significance 2 tailed value for all variables is less than our value of significance (i.e. 0.000<0.05) in all 167 samples, therefore we failed to accept the null hypothesis therefore, it is concluded that Zipf's Law is fit for the selected dataset of the source Journals of Library & Information Science.

Conclusion

This study is not only related to Zipf's law but focused on various aspects of the articles mentioned in it such as abstracts, sentences, keywords rank of the words in the articles and similarly by applying KS test to those articles where Zipf's Law is Satisfied or not. An abstract is the short summary of the research paper. Generally it includes 150 to 250 words. But it varies publication to publication and journals to journals. Our research indicates that keywords are crucial for summarizing the articles' contents. Researchers found that the DESIDOC Journal of Library and Information Technology journals criteria mentioned i.e. 6 to 10. If we follow this criteria, researchers found that out of 167 journals 153 articles follow this criteria. Researchers discovered that a significant number of publications lack a single keyword, and that certain keywords must be present in the article's title because Keyword-rich titles can help readers identify the theme or subject matter

of a document more quickly. The study found that 20 to 40 percent occurrence of keywords in titles found in most of the articles. Research articles usually require a word count of 2500–3000. However, it also varies throughout various publications. The research found that 70 articles were published in the word range of 1500 to 3000.

The researcher observed that the majority of the article's length in terms of sentences comes between 101 and 200 sentences. The researcher explored if Zipf's Law could certainly be applied to a corpus of technical writing in the field of library and information science and the result found that when only textual part of the writing is considered Zipf's law is fit for the selected dataset of the source journals of library and information science journals.

References

1. J. L. Clark, K. T. Lua and J. McCallum, *Proceedings 1986 International Conference of Chinese Computing*, 1989-Aug.

2. Booth, Andrew D. (1967). A Law of Occurrences for Words of Low Frequency. *Information and Control*, 10, 386-393.(2020, March 9) Retrieved fromhttps://www.sciencedirect.com/science/article/pii/S001999586790201X

3. British Standards Institution (1976). *Glossary of documentation terms, 5408 (1976)*, 86p.

4. Cancho, Ramon Ferrer I and Sile, Richard V. (2002). Zipf's Law and Random Texts. *Advances in Complex Systems, 5*(1), 1-6.

5. Devarajan, G. (1997). *Bibliometric Studies.* New Delhi, Ess Ess Publications.

6. Hill, Bruce M. (1974). The Rank-Frequency Form of Zipf's Law. *Journal of the American Statistical Association, 69* (348), 1017-1026.

7. Li, Wentian (1992). Random Texts Exhibit Zipf's-Law-Like Word Frequency Distribution. *IEEE Transaction on Information Theory, 38* (6), 1842-1845. (2020, January 10) Retrieved from https://ieeexplore.ieee.org/document/165464

8. Manin, Dmitrii Y. (2008). Zipf's Law and Avoidance of Excessive Synonymy, *Cognitive Science 32,* 1075-1098.

9. Piantadosi, Steven T. (2014). Zipf's word frequency law in natural language: A critical review and future directions. *Psychan Bull Rev. 21* (5), 1112-1130. (2020, March 12). Retrieved from https://link.springer.com/article/10.3758/s13423-014-0585-6

10. Powers, David M.W. (1998). Application and Explanations of Zipf's Law. (2020. March 12). Retrieved from https://dl.acm.org/doi/abs/10.5555/1603899.1603924

11. Rajneesh and Rana, M. S. Content Analysis and application of Zipf's Law in Computer Science Literature. (2020, January 10). Retrieved from https://ieeexplore.ieee.org/document/7048202

12. Rao, I. K. Ravichandra. (1983). *Quantitative Methods for* Library *and Information Science.* New Delhi, Wiley Eastern Limited.

13. Sen, B. K. et.al. (1998). Zipf's Law and Writings on LIS. *Malaysian Journal of Library & Information Science*, *3*(2), 93-98.

14. Sigurd, Bengt; Eeg-Olofsson, Mats and Weijer, Joost Van de (2004). Word Length, Sentence Length and Frequency - Zipf's Revisited. *Studia Lingustica, 58* (1), 37-52.

15. Su, Kuichun (2001). Comparing Frequency of Word Occurrence in Abstracts and Texts Using Two Stop Word Lists. (2020, March 12). Retrieved from https://www.researchgate.net/publication/11535557_Comparing_frequency_of_word_occurrences_in_abstracts_and_texts_using_two_stop_word_lists

16. Chen, Ye- Sho and Leimkuhler, Ferdinand F. (1984). Analysis of Zipf's law: an index Approach" Information processing & management. Great Britain, Vol. 23, pp. 1-2.