25 years of Excellence

DHĀRANA

Volume: 17 / Issue # 1
(January - June 2026)
Print ISSN: 0974-0082

INTERNATIONAL JOURNAL OF BUSINESS FROM M. P. BIRLA INSTITUTE OF MANAGEMENT
ASSOCIATE BHARATIYA VIDYA BHAVAN, BENGALURU

Chairman's Desk

1-9 VISHWAROOP– Concerted Strategy for Export Marketing of Machine Tools — N Ramanuja

Research Articles

10-37 Path to Fulfilment: Achieving Work-Life Balance with Social Support, Resilience, Self-Efficacy, and Job Satisfaction — M. R. Dhanush and C. Shoba

38-71 Transformational Leadership and Sustainable Innovation: Psychological Pathways and Organisational Outcomes — S. Sathyanarayana, Hema Harsha and B. V. Pushpa

72-106 Social Media Marketing, Brand Engagement, and Brand Equity: Building Brand Equity in Trusted Digital Environments — S. Sathyanarayana, R.Pallavi and S. Vijayalakshmi

107-123 Do Green Hospitals EARN More? A Study on ESG Scores and Profitability — Aishwarya Rao Lalige and T. K. Venkatesh

124-139 Transforming Higher-Education Libraries in India: Digital Integration, AI, and Strategic Knowledge Management — Manjula M. and Vasanth N.

140-137 Human-Machine-Interface (HMI) in Human Capital Management (HCM) - A Strategic Transformer for the Future of Work — Kovvali Bhanu Prakash

148-159 Artificial Intelligence Integration in Strategic Human Resource Management: An Empirical Investigation of Human-Centric Sustainability Perceptions in the Industry 5.0 Era — S. Ashwini and S. P. Sunitha

160-173 Bridging Innovation and Patent Law: Need for a Sui Generis Regime for Software Patents in India — M. G. Kodandaram

M P BIRLA INSTITUTE OF MANAGEMENT, Bengaluru

INFORMATICS
A Passage to Knowledge

आ नो भद्रा : क्रतवो यन्तु ववोश्वत : ।
"Let Noble Thoughts Come To Us From Every Side"
-Rig Veda 1.89.1-

DHARANA a bi-annual journal, published in January and July, every year, by M P Birla Institute of Management, # 43, Race Course Road, Bengaluru 560 001, India

Phone: 4277 2000
E-mail: dharana@mpbim.com

Disclaimer

Views expressed in the articles are those of the author(s) only. All articles in this journal have undergone a blind review process.

Review

Interested reviewers can find the review guidelines at the end of this issue.

Submission

Prospective authors should follow the guidelines provided at the end of this issue while preparing the manuscripts.

Copyright

Contents of this journal are the copyright of M P Birla Institute of Management, Bengaluru, whose permission is necessary for reproduction in any form, in whole or in part.

DHĀRANA

INTERNATIONAL JOURNAL OF BUSINESS FROM M. P. BIRLA INSTITUTE OF MANAGEMENT
ASSOCIATE BHARATIYA VIDYA BHAVAN, BENGALURU
Volume 17, Issue 1, June 2026 ISSN: 0974-0082

Patron

N. Ramanuja
Chairman – M P Birla Institute of Management, Bengaluru
Mail: deephari2003@yahoo.co.in

V. Muralidhar
Vice Chairman - M P Birla Institute of Management, Bengaluru
Mail: muralidharvmpbim@gmail.com

EDITOR-IN-CHIEF

S. Sathyanarayana
Professor & Principal
M P Birla Institute of Management
Bengaluru
Mail: principal@mpbim.com

JOINT EDITOR-IN-CHIEF

William E. Nganje
Professor
North Dakota State University
Fargo, USA
Mail: william.nganje@ndsu.edu

Editors

Pushpa B. V.
Associate Professor
M P Birla Institute of Management
Bengaluru
Mail: pushpabv@mpbim.com

Vijayalakshmi S
Assistant Professor
MP Birla Institute of Management
Bengaluru
Mail: vijayalakshmi.s@mpbim.com

Assistance Subscription:

Manjula. M
Librarian
M P Birla Institute of Management
Bengaluru
Mail: manjulam@mpbim.com

Editorial Board

N. R. Parasuraman
Director Emeritus & Professor
Shri Dharmasthala Manjunatheshwara Institute
for Management Development (SDMIMD), Mysuru
Mail: nrparasuraman@sdmimd.ac.in

Bhashyam. A T
Director Academics
B. P. Birla Institute of Management, Mysuru
Mail: atbhashyam@yahoo.com

Bisaliah. S
Professor & Former Vice-Chancellor
University of Agricultural Sciences, Bengaluru
Mail: sbisaliah@yahoo.com

Chandra Akkihal
Professor Emeritus of Economics
Marshall University, Huntington, USA
Mail: akkihal1@yahoo.com

Jacob Alexander
Professor
SIBM, Bengaluru

Kodandaram M. G . (IRS)
Asst. Director – Customs and Central
Excise (Retired)

Sudhir Sharan
Founder
Dr. Sharan Consulting, California

Emon Kalyan Chowdhury
Professor & Chair
CIU Business School
Chittagong Independent University
Chattogram, Bangladesh
Mail: emonkalyanchy@gmail.com

Veena Shenoy
Founder @ Inclusiv
Bengaluru

M. Abdullah Al Mamun
Associate Professor & Dean
South Asian School of Business
Department of Commerce,
Bangladesh

Dr. M. Nirmala
Chairperson and Professor
CBSMS, Bengaluru City University,
Central College Campus, Dr. Ambedkar Veedhi,
Bengaluru – 560001, Karnataka, India
Mail: nirmala.cbsms@gmail.com

Dr. Rithika Sinha
Professor
CBSMS, Bengaluru City University,
Central College Campus, Dr. Ambedkar Veedhi,
Bengaluru – 560001, Karnataka, India
Mail: ritika.snh@gmail.com

Dr. K. R. Jalaja
Deputy Registrar Evaluation,
Dean & Chairperson,
Department of Studies and Research in Commerce,
Bengaluru City University, Central College Campus, Dr.
Ambedkar Veedhi,
Bengaluru – 560001, Karnataka, India
Mail: jalaja_kr@rediffmail.com

Dr. Sujata Mangaraj
Director cum Dean Academics
Bhavan's Centre for Communication & Management,
Plot No.9, Kharvel Nagar, Unit 3, Bhubaneswar,
Behind RBI and Keshari Talkies, Odisha-75100
Mail: drsujatamangaraj@gmail.com

Dr. G. V. Subramanian
Director
Bharatiya Vidya Bhavan, Kolkata Kendra,
Block-FA, Sector-III, Salt Lake City, Kolkata-700097
Mail: bvbhavan@gmail.com

Dr. K. Bhanu Prakash
Professor Adjunct & CFO
Elsevier, WOS, Emerald Certified Author & Peer-Reviewer
UGC, ICSSR, NABARD Project Director

CONTENTS

	Chairman's Desk	
1-9	VISHWAROOP– Concerted Strategy for Export Marketing of Machine Tools	N Ramanuja
	Research Articles	
10-37	Path to Fulfilment: Achieving Work-Life Balance with Social Support, Resilience, Self-Efficacy, and Job Satisfaction	M. R. Dhanush and C. Shoba
38-71	Transformational Leadership and Sustainable Innovation: Psychological Pathways and Organisational Outcomes	S. Sathyanarayana, Hema Harsha and B. V. Pushpa
72-106	Social Media Marketing, Brand Engagement, and Brand Equity: Building Brand Equity in Trusted Digital Environments	S. Sathyanarayana, R.Pallavi and S. Vijayalakshmi
107-123	Do Green Hospitals EARN More? A Study on ESG Scores and Profitability	Aishwarya Rao Lalige and T. K. Venkatesh
124-139	Transforming Higher-Education Libraries in India: Digital Integration, AI, and Strategic Knowledge Management	Manjula M. and Vasanth N.
140-137	Human-Machine-Interface (HMI) in Human Capital Management (HCM) - A Strategic Transformer for the Future of Work	Kovvali Bhanu Prakash
148-159	Artificial Intelligence Integration in Strategic Human Resource Management: An Empirical Investigation of Human-Centric Sustainability Perceptions in the Industry 5.0 Era	S. Ashwini and S. P. Sunitha
160-173	Bridging Innovation and Patent Law: Need for a Sui Generis Regime for Software Patents in India	M. G. Kodandaram

Editorial

Navigating Change with Purpose

We live in an era where change is no longer an occasional disruption but a constant reality.

Every day presents new opportunities and unprecedented challenges that redefine the way we live, learn, and lead. From the rapid advancement of artificial intelligence and digital transformation to climate change, geopolitical uncertainties, economic volatility, and evolving workplace expectations, the world is witnessing a profound shift that demands thoughtful leadership and informed decision-making.

Artificial intelligence has emerged as one of the most transformative forces of our time. While AI is revolutionizing industries by enhancing productivity, innovation, and efficiency, it also raises important questions about ethics, employment, privacy, and responsible governance. The future belongs not merely to those who understand technology but to those who can apply it with wisdom, integrity, and a human-centric perspective.

Sustainability has likewise become a defining imperative rather than a strategic choice. Organizations across the globe are embracing environmental, social, and governance (ESG) principles, circular economy practices, and responsible business models to ensure long-term resilience. Climate-related challenges remind us that economic progress must coexist with environmental stewardship, making sustainable innovation a shared responsibility for businesses, governments, and citizens alike.

The global economy continues to experience significant transitions. Inflationary pressures, supply chain disruptions, evolving trade dynamics, and technological competition have reshaped markets and business strategies. At the same time, entrepreneurship, digital commerce, financial technology, and startup ecosystems are creating exciting avenues for innovation and employment. These developments reinforce the importance of adaptability, continuous learning, and strategic thinking in an increasingly interconnected world.

India stands at a remarkable juncture in its developmental journey. Initiatives such as Digital India, Startup India, Make in India, and the rapid expansion of digital public infrastructure have positioned the country as one of the world's fastest-growing economies. Simultaneously, the National Education Policy is transforming higher education by encouraging interdisciplinary learning, research, innovation, and skill development. These initiatives provide immense opportunities for young professionals to become catalysts for inclusive growth and sustainable development.

In this evolving landscape, management education carries a responsibility that extends far beyond classrooms. It must nurture not only competent professionals but also ethical leaders capable of balancing profitability with purpose, innovation with inclusivity, and ambition with accountability. Success in the twenty-first century will increasingly depend

on emotional intelligence, analytical reasoning, collaborative leadership, resilience, and a lifelong commitment to learning.

Dharana has always sought to provide a platform for thoughtful reflection, scholarly inquiry, and intellectual exchange. The diverse contributions in this edition represent the curiosity, creativity, and academic rigor of our students and faculty. They encourage meaningful dialogue on contemporary business, technology, society, and public policy while inspiring readers to think critically about emerging opportunities and challenges.

As we present this edition, we reaffirm our belief that knowledge acquires its greatest value when it contributes to society. Let this issue of *Dharana* inspire each reader to question conventional wisdom, embrace innovation responsibly, and lead with integrity and compassion. The future will undoubtedly belong to those who combine knowledge with character, vision with action, and excellence with empathy.

I extend my sincere appreciation to the editorial team, faculty members, contributors, reviewers, and everyone whose dedication has made this publication possible. May *Dharana* continue to serve as a beacon of knowledge, inspiring minds to create meaningful impact in an ever-changing world.

DHARANA
International Journal of Business
DOI: 10.18311/DBIJB/v17_i1_2026_01
INFORMATICS JOURNALS
ISSN: 0974-0082 | Vol 17(1), 2026 | pp. 1–9

VISHWAROOP– Concerted Strategy for Export Marketing of Machine Tools

N Ramanuja

Chairman, M.P. Birla Institute of Management, Bengaluru – 560001, Karnataka, India
Former Chairman and Managing Director HMT Limited; deephari2003@yahoo.co.in

1. Introduction

Synergy is when two or more things—organizations, departments, or even teams—work together to produce something of value. A Rigveda mantra beautifully encapsulates this synchronization in the mantra:

'समानी व आकृतिः समाना हृदयानि वः ।

समानमस्तु वो मनो यथा वः सुसहासति"

"May your resolves be one; May your hearts feel alike in harmony; may your thinking be one; and thus, may all of you live happily with thorough Union".

-Rig Veda 10.191.4

- Let your aims be common and your hearts of one accord; and all of you be of one mind. So, you may live well together-

This mantra from the Rig Veda beautifully encapsulates the ancient Indian spirit of unity in action—the harmonization of thoughts, efforts, and aspirations. It reflects a profound vision of collective progress, where collaboration across individuals and communities became the bedrock of growth in Bharatavarsha, the Indian subcontinent. This ethos manifested across diverse fields—from spiritual philosophers and saintly scientists to technologists, educators, medical practitioners, and chroniclers—each contributing, innovating, and sharing for the greater good. It sowed the seeds of synergy, nurturing the ideal of a borderless global family— वसुधैव कुटुम्बकम् "Vasudhaiva Kutumbakam." This vision extended to knowledge sharing and wealth creation on a global scale -"Vishwa Mahajana." Global Citizen!

Interestingly, the modern term "synergy" echoes this ancient wisdom. Rooted in Ancient Greek philosophy, synergy embraces the idea that "the whole is greater than the sum of its parts." The word traces its lineage from Latin synergia, derived from the Greek synergos, meaning "to work together" or "to collaborate."

Over a period of time, territorial co-operative focus evolved continuously – shrinking in to countries, states, and companies (Rashtra, Rajya & Samstha). Concept of competitive approach to operate business in domestic and international arena emerged. Competitive co-operations through collaborative and consortium efforts provided the powerful connect. The concept of synergy in business achieved popularity in the 1990s, when corporate executives and

Article Received on: 24-02-2026 Revised on: 02-03-2026 Accepted on: 17-03-2026

investment bankers used corporate synergy to gain by mergers and acquisitions (M&As). Corporate synergy doesn't only mean the M&A process. It's also used when a company or group of companies come together for cross-business product development or marketing.

2. Evolving Cooperation: From Community to Competition

Over time, cooperative efforts evolved across different scales—territories, countries (Rashtra), states (Rajya), and organizations (Samstha). Eventually, a more competitive approach emerged, balancing cooperation with competition in domestic and international arenas.

This transition fostered competitive cooperation—where collaboration and consortium efforts coexisted with competition, creating powerful networks of mutual benefit. The concept of synergy in business gained prominence in the 1990s, particularly with the rise of mergers and acquisitions (M&As) as a means to create value through integration. However, synergy in business extends beyond M&As— it encompasses cross-functional collaborations, joint product development, and integrated marketing efforts across divisions or firms.

3. Synergy in the Manufacturing Domain

In the manufacturing sector, this spirit of synergy took concrete shape through the pivotal role of machine tools and allied systems, providing time-tested, timely, and appropriate support solutions. The diversity and complexity of manufacturing technologies initially necessitated global collaborations with leading machine tool manufacturers.

Gradually, through robust in-house R&D efforts, industries built self-reliant, indigenous alternatives. This journey of assimilation spanned design, manufacturing, assembly practices, applications engineering, and the training of engineers and technicians.

A vibrant supply chain of components and subsystems emerged, comprising machine tool manufacturers and their supporting ancillary small and medium enterprises (SMEs). Leading machine tool manufacturers also established world- class training centers and structured educational programs, thereby fostering knowledge dissemination and skill development at par with global standards.

4. HMT and adaptation of synergy

I began my career at Hindustan Machine Tools which was established in 1953 with an intention to manufacture Machine Tools aimed at promoting indigenous manufacturing solutions and integrated systems in India. This initiative called for the absorption and indigenization of a wide range of technologies, initially through collaborations with Internationally acclaimed machine tool manufacturers, predominantly from Europe, particularly Germany, Switzerland, and France on the platform of आ नो भद्राः क्रतवो यन्तु ववश्वताः'Aa No Bhadrah

Kratavo Yantu Vishvatah' Let knowledge come to us from all sides. Thus, the Organization had to manage multi-product portfolio, multi-technologies, with manufacturing plants located at multiple locations and was subsequently aptly renamed HMT Ltd. This change was made to reflect company's multi-faceted, product-technology focus. A key driver of this transformation was the absorption of technologies through in- house capabilities to manufacture all components for final assembly. Over time, the organization established a wide ancillary network and supply chain to support the growing market demands and enhance cost control too. The concept of synergy thus took seed at HMT which exfoliated in the coming times as a large conglomerate. The supply chain also helped other large and medium Indian machine tool manufacturers.

Wide dispersion of manufacturing facilities of major machine tool user sectors like defence production, automobile, auto-ancillaries, power generation, industrial products etc. necessitated HMT Ltd to establish country wide manufacturing facilities and customer centric marketing network. I had the opportunity of operating in the vibrant marketing network to understand and needs and thus supporting major use sector.

My introduction to our scriptures which believed in united efforts in various facets of life have influenced me enormously in my thought process in my personal life and also my corporate career. This prompted me work for concerted efforts in both watches and machine tools, I had realised that harmony is the key to realize the objectives of Vision, and Mission for the journey and destination too as defined in the "Aikyatha Mantras" in the Rigveda, often translated as "mantra of unity," which emphasize the importance of harmony, cooperation, and shared purpose. These mantras highlight the need for collective effort and shared understanding in achieving common goals.

It has always been my mission to instil the teachings from the Rig Veda in all initiatives of mine. I took it upon myself to infuse this spirit among my colleagues in the organization, not just limiting myself to the company but also fellow manufacturers in the country for contemporary development of Machine Tools.

5. Indian Experience in collaboration

Country's consumption was supported by domestic production and sales, as well as imports. Exports were marginal-around 10% of country's production, with a focus on product exports was getting initiated which developed into project exports which included many other machine tools manufactured by Indian industries. On the export front, CNC machine tools, particularly from Taiwan, Korea, and the higher end technology machines from Germany, and Japan. There were two significant challenges. The first challenge is the competition among CNC machine tools to compete against cost-competitive models. The second challenge is to identify and offer a diverse range of product groups that can be tailored to meet specific market demands.

6. Background

Towards the end of 1990s decade, I had taken to international exhibition at MCMORMICK CONVENTION HALL CHICAGO a big team from HMT machine tools various divisions & from various disciplines like Design R&D, Proto type development, Refurbishment division, international division, planning& data Center, corporate group Product development corporate planning& project management, Metal forming division & General managers of various machine tools units. I had the pleasure of interacting with major machine tools manufacturers & CNC system manufacturers like Fanuc, Siemens.

I also had the privilege of meeting fellow INDIAN machine tools exhibitors like Batliboi, PMT, BFW, and ACE. Etc. All of us were putting lot of efforts time & money in exhibiting our products. It is at that time at that time I felt if we are able to pool up this great efforts & technical skills & jointly put up a show exhibiting a product consisting of the best skill of each in building up a cost effective CNC Machine Tools for the global market. Then it will be a great movement Compete internally but jointly together face outside international competition — then we can justify our ancient thought of the Rigveda's समरनी व आकूतत: समरनर ह्रदयरतन व:।

The idea of synergy was mooted at meeting we had at HMT board room with members of major machine tool makers of our country invited by HMT after my return from international exhibition at Chicago.

In tune with international CNC Machine Tools development and the eventual increase of domestic user demands, at that time, met largely by imports an idea germinated in our minds. The concept of VISHWAROOP as a strategy for marketing Indian Machine Tools jointly took shape here.

7. How the idea grew?

As a competitively positioned international brand, we needed to address the 4 P's of marketing - The four Ps are product, price, place, and promotion. Why not have all Indian leading machine tools manufacturers come together to address the exports collectively and still compete in domestically? During IMIEX 1998, the domestic manufacturers showcased a slew of CNC Machine tools with HMT leading the pride. Based on the encouragement of Indian manufacturing machine tool manufactures. As the chairman and Managing Director of HMT, I took a bold initiative of announcing this concept which would address international markets during the press conference, which was jointly supported by late Sri Shailesh Seth, one of the stalwart and think-tank of IMTAM. This was endorsed by other manufacturers at large. After the conclusion of IMTEX exhibition 1998, leading Indian machine tools manufacturers were invited by the HMT.

For the first time in the history of IMTMA, most of the machine tool manufacturers accepted the invitation and participated in this unique meeting. After brief introduction by the author concept of working together to address the export initiative was accepted in general.

8. Concept of VISHWAROOP

A Concept paper presented by HMT covered major aspects of cooperation and joint working:

- Product: product basket to meet the specific requirements of the select markets. It was generally agreed that the participating machine tool manufacturers Committee to evolve.
- Suitable product basket based on their experience in select market. The product basket to encompass general purpose Machine and CNC Machines. In case of offering cost effective technologies new CNC machine tools to be jointly developed.
- Price. In order to be price competitive ways and means have to be explored to contain the cost of manufactures Right from the materials management, manufacturing strategies and to reengineer a product for cost control.
- As deliberated above, jointly develops the competitively positioned CNC Machine tools the machine tool manufacturers to identify the major components and subsystems which can be vended out among themselves so that the installed capacity can be optimally used. Such pooling of resources enable cost reduction and reduce lead time for production Increase to be examined by committee.
- Place market to be identified based on past experienced of the participating company.
- Promotion: Essential to be present continuously in Select International Markets in addition to Display at Machine Tool Fairs and Shows.
- To participate jointly under one banner - to promote "Made in India" Brand with a cost effective solution.
- To Explore a Single Source Marketing Dealer/ Agency in select Markets to handle the total Business Development - from Prospecting to Commissioning dedicated with Customer Centric Approach.
- Preparation of a Composite Product with Literature under "VISHWAROOP" Brand, Pooling of Resources to evolve Cost-Effective Networking

It was my privilege to name this Unique Export Initiative proposed as - "PROJECT VISHWAROOP".

All the elite members of Indian Machine Tool Industry, IMTMA and Others, present in this Conclave, endorsed Concept as the Frame Work of and well as the project name proposed – VISHWAROOP

The author, concluded the Confluence of the Export Fora, thanking for their Flair and Fervour and their enthusiastic Zeal to forge ahead draw up Strategies to initiate activities in their Organisations.

To commemorate the Occasion HMT special edition watch 'Vasudhaiva Kutumbakam' dedicated to the nation in 1997 (50 years of independence) presented to all present.

On behalf of the Select Machine Tool Fraternity and IMTMA, Shri Shailesh. R. Sheth, admired the gesture of and steering the unique

comprehensive concept by the author. He endorsed and assured this movement would be imbibed in the plans of the manufacturers and Indian machine Tool Manufacturers Association in true spirits and all earnestness.

At this juncture, to-day, I am deeply distressed to say, Shri Shailesh Sheth, is not any more with us, as he joined the Lotus Feet of Almighty recently.

9. Efforts of IMTMA in the synergy

Indian machine tool manufacturers association (IMTMA) was conceived 75+ years ago, to extend support the manufacturers of machine tools in India to increase competitiveness, enhance efficiency, improve productivity, and ensure growth. The aim of IMTMA is to assist the members to become cost-effective, technology-driven, and ever responsive to customers' changing needs. In addition, IMTMA has supported the user industries facilitating for getting better and more modern technology of machine tools to provide them with competitive manufacturing solutions.

IMTMA spearheads the advancements in industry addressing various facets of interphases – with government, academicians, and industry associations – domestic as well as international etc. Besides, IMTMA organises its annual flag ship event, Indian Machine Tools Exhibition IMTEX – A kaleidoscopic promotional scape that showcases dynamic unlimited views, opportunities and release of hidden creativity through display of shape of solutions on the horizon – vision/mission BRAIN STORMS – to foresee and formulate the short-term and long-term growth strategies.

IMTMA also provides 'Technology Centre' to impart continuously comprehensive and intensive training to develop technicians and engineers – on current state-of- the-art technologies.

10. Some milestones of VISHWAROOP Synergy

- HMT and Ace Designers mentored and initiated the process of formation of Core Member Companies - five companies from Bangalore, Hyderabad and Coimbatore.
- In 1998, monthly meetings were initiated at venues, at different locations near the core member companies, in order to facilitate visit to manufacturing plants of participating companies.
- Issues deliberated during the period 1998 to 2002:

1. Identification of Product Basket non-Competing models types of Machines and including Cost Competitiveness.
2. Identification of Select Markets to enter; with appropriate Product Baskets. First Step Identification of Marketing Agency
3. Promotional Steps to showcase the "VISHWAROOP" product Baskets.
4. Participation in International Machine Tool Shows in Germany, as a First Step, to evolve brand development and dealer networking strategies.

Inward mission of prospective marketing agencies to visit India to explore the modalities for market development.

Explore the establishment of Permanent Display cum Demo Centre with Customer Centric Support initially in Germany.

11. VISHWAROOP at IMTEX 2001

VISHWAROOP companies participated in IMTEX 2001 with Display focus on Showcasing competitive home-grown technological capabilities, Projection of R&D Efforts and achievements through Strategic Restructuring.

During inaugural Speech at the exhibnition, Union Minister of State for Commerce and Industry, Mr. Omar Abdullah emphasised focus on Globalisation and an export target of 25% of total Turnover was proposed. Emphasis on Training and Retraining of work force was emphasized, which was the very objective of Project VISHWAROOP.

In his valedictory address later, Mr. George Fernandes Union Minister of Defence praised the industry's display of Quality Technology Machine Tools. He re-emphasised focus on Export Markets. He also suggested a consortium approach to tap export markets.

It is worth noting that following Project VISHWAROOP companies displayed their own in-house developmental efforts and were awarded with CMTI- PMY and FIE Foundation:

1. HMT Ltd.,
2. Ace Micromatic Group
3. Galaxy machinery Pvt. Ltd.
4. Uday Computer Aided Mfg. Pvt. Ltd. Machinist Award to Bharat Fritz Werner Ltd.

Project VISHWAROOP Companies displayed State-of-the-art CNC Machine Tools, developed through own in-house capabilities. Thus, to facilitate preparing a suitable Product Basket to be offered as per deliberations during strategy meetings.

12. Evolution of VISHWAROOP

As I approached the end of my tenure as Chairman and Managing Director of HMT Ltd. in April 2002, a landmark development emerged through the progress of the Project VISHWAROOP initiative. It was deeply heartening to witness the formation of a Product Basket that included CNC Machine Tools and complementary General- Purpose Machines specifically targeted for the German and broader European markets.

The Indian Machine Tool Manufacturers' Association (IMTMA) played a pivotal role in this effort by supporting and facilitating participation in EMO 2001 and subsequent initiatives. Under the VISHWAROOP banner, participating companies began to share resources strategically, particularly in the manufacture of critical components and subsystems.

During the National Machine Tool Show (NMTS) held in September 2002, selected dealers from Germany and Italy—fully supported by IMTMA—were engaged in an inward mission. This engagement led to meaningful interactions with machine tool marketing experts from

these countries. Notably, Mr. Walter Germann, a seasoned machine tool expert from Germany, took a keen interest and helped initiate plans for VISHWAROOP partners to formally enter the German market.

Subsequently, five leading Indian machine tool manufacturers collaborated to establish a permanent "India Machine Tool Show Centre" (IMTSC) in Friesenheim, near Lahr in South Western Germany. These founding participants included:

1. Ace Micromatic
2. HMT Ltd.
3. Lakshmi Machinery Works – Machine Tools
4. Uday Computer Aided Manufacturing
5. Fenwick and Ravi

These companies collectively contributed financially and logistically, exporting select machines for permanent display and demonstration to prospective customers in the European market. This joint initiative marked the realization of Project VISHWAROOP's vision: establishing a sustainable platform for pre-marketing, after-sales service, and brand building in international markets, all under the unified identity of "India Team."

By 2003, the IMTSC had become a testament to co-operative collaboration of Indian Machine Tool sector - to usher in Technologically Competitive Machine Tools in Germany. It is interesting to note that there was an experimental effort by a few manufacturers to set the VISHWAROOP Concept to roll on.

13. Conclusion

Looking back, it gives me an immense satisfaction of ushering in an era of cooperation of Indian Machine Tool Manufacturers under the VISHWAROOP initiative piloted by me. The credit for the success of the idea must go to all the participating companies and IMTMA for making this possible. In a nutshell, I firmly believe that the VISHWAROOP must be the prime strategy for successful marketing of Indian machine tools in target countries.

I must acknowledge help of Sri T K Ramesh Managing Director of Ace Micromatic Group in finalising this article, by way of inputs which have elevating the impact of this article. I must also acknowledge his shared vision of VISHWAROOP, which he continues till date. I am thankful to Sri. P.J. Mohanram, former Managing Director of HMT (International) Ltd., for valuable inputs on project VISHWAROOP. I appreciate the contribution of Sri V K Subramanya, who was with me at HMT, an associate of IMTMA and UNIDO – ICAMT (International Centre for Advancement of Manufacturing Technology) for a long time. He was instrumental in taking much needed steps in giving shape to VISHWAROOP at HMT and helping me presently in encapsulating various aspects of this vision in this article. I must also acknowledge contribution of Sri Sudhindra Gargesa, who was with me at HMT (International) and former Director, MPBIM, in putting together the compiled information as an article.

In conclusion. I would like to remember the Aikyatamantras of Rigveda

संगच्छध्वं संवदध्वं सं वो मनरंसस जरनतरम्

देवर भरगं यथर पूवे सञ्जरनरनर उपरसते ||

saṃgacchadhwaṃ saṃvadadhwaṃ saṃ vo manāṃsi jānatām

devā bhāgaṃ yathā pūrve sañjānānā upāsate ||

May you move in harmony, speak in one voice; let your minds be in agreement; just as the ancient gods shared their portion of sacrifice.

समरनो मन्रस्ससमततस्समरनी समरनं मनाः सहचत्तिमेषरं ।।

समरनं मन्रमसभमन्रये वाः समरनेन वो हववषर जुहोसम ।।

The place is common, common the assembly,

common the mind, so be their thought united.

A common purpose do I lay before you,

and worship with your general oblation

समरनी व आकूतत: समरनर हृदयरतन व: | समरनमस्तु वो मनो यथर व: सुसहरसतत ||

samanī va ākūtiḥ samānā hrdayāni vaḥ |

samānamastu vo mano yathā vaḥ susahāsati ||

May our intentions and aspirations be alike, so that a common objective unifies us all.

DHARANA
International Journal of Business

INFORMATICS JOURNALS

DOI: 10.18311/DBIJB/v17_i1_2026_02

ISSN: 0974-0082 | Vol 17(1), 2026 | pp. 10-37

Path to Fulfilment: Achieving Work-Life Balance with Social Support, Resilience, Self-Efficacy, and Job Satisfaction

M. R. Dhanush[1] and C. Shobha[2]

[1]Research Scholar, Department of Studies and Research in Commerce, Tumkur University, Tumakuru - 572103, Karnataka, India; mrdhanush1298@gmail.com

[2]Professor, Department of Commerce and Management, University College of Arts, Tumkur University, Tumakuru - 572103, Karnataka, India; shobha@tumkuruniversity.ac.in

Abstract

This study examines the relationship between social support and work-life balance, with self-efficacy, resilience, and job satisfaction serving as mediating variables. The proposed research model specifically evaluates the serial mediation effect of resilience, self-efficacy, and job satisfaction on work-life balance among police personnel in the Bengaluru Urban District. A cross-sectional survey design was adopted using stratified random sampling across eight zonal divisions. Data were collected from 538 respondents, and 500 valid responses were retained for analysis. Structural Equation Modelling (SEM) using AMOS was employed to test the proposed five-factor model. The findings indicate that social support significantly influences resilience, self-efficacy, and job satisfaction. While the direct relationship between social support and work-life balance was not significant, strong indirect effects were observed through resilience and job satisfaction, as well as through self-efficacy and job satisfaction, indicating full serial mediation. The model demonstrated strong explanatory power ($R^2 = 0.774$). The study contributes to the literature by highlighting the role of psychological resources in enhancing work-life balance among law enforcement professionals.

Keywords: Job Satisfaction, Police Personnel, Self-efficacy, Resilience, Social Support, Work-life Balance

JEL Classification Code: J28, J24, M12, D23

Cite this article as: Dhanush, M. R. & Shobha, C. (2026). Path to Fulfilment: Achieving Work-Life Balance with Social Support, Resilience, Self-Efficacy, and Job Satisfaction. *DHARANA - International Journal of Business*, *17*(1), 10-37. https://doi.org/10.18311/DBIJB/v17_i1_2026_02

1. Introduction

Policing happens in a complex work environment that includes stressful events, irregular working hours, minimal public support, and much more (Dhanush & Shobha, 2023; Viegas & Henriques, 2020; Gächter *et al.*, 2013). The duty line of any law enforcement agency is designed to handle

Article Received on: 19-08-2025 Revised on: 05-12-2025 Accepted on: 14-03-2026

emergencies, which compels the personnel to be available at any point should the need arise. Such irregularities in duty lines and abrupt schedules of work can create conflicts between work and non-work commitments (Kaur, 2025). Consequently, such conflicts might lead to stress, emotional strain, and dissatisfaction with work. A study by Dhanush and Shobha (2023) states that policing accumulates a significant workload due to multiple assignments assigned regularly, while the completion rate of the assigned workload is moderately low due to limited manpower and time frame. Several studies reveal that consistent Work-Life Balance (WLB) practices are majorly affected by stressful work and hence prove that stressful work negatively impacts the WLB of employees (Edwards & Rothbard, 2000; Hosboyar, 2012). The prime challenge in policing is consistent time allocation between work and family, which is the prime source of negative influence on the WLB practices of policemen (Susanto *et al.*, 2022). Research studies suggest that healthy WLB practices can serve as a tool to handle the negative spillover effect of stressful work on the family as well as the negative spillover effect of family responsibilities on work (Pradhan, 2016; Rincy & Panchanatham, 2014). Concerning the above context, WLB can be defined as the art of effectively managing professional and personal commitments without affecting the stance in either of the domains. WLB is not a one-time achievement but a practice that depends on the ability or skillset of an individual, such as time management, problem-solving, critical thinking, diplomacy, work management, family management, and more. WLB in policing is a multidimensional factor that depends on several factors, such as social support, organisational support, family support, and individual willpower. The development of healthy WLB practices is essential to safeguarding the psychological health and well-being of police personnel (Dhanush & Shobha, 2024). Hosain (2024) found through their study that officers who managed their professional responsibilities and family life reflected higher job satisfaction, better engagement (Quick & Wolff, 2025), better performance, and signs of better mental strength (Rathi & Barath, 2013; Davies *et al.*, 2024).

A work environment that includes a culture of supportive behaviour develops a healthier workforce and engagement among employees, resulting in better WLB practices (Jyoti & Kaur, 2024). WLB is essential to improve job satisfaction (Hosain, 2024), job performance (Rathi & Barath, 2013), job commitment (Momin & Rolla, 2024), and psychological well-being (Davies *et al.*, 2024). A study by Imran *et al.* (2025) suggests that police officers who experienced less stress revealed better WLB abilities and a greater likelihood of remaining with the organisation for the long term. Therefore, the balance between work and life is essential for long-term sustainability. Positive outcomes of a healthy WLB benefit both individual officers and the department (Quartey, 2025). Professions with stressful environments, such as policing, need the implementation of WLB-supporting policies to protect the long-term sustainability of their workforce (Kaur, 2025). Police departments are more likely to witness significant improvements in their operations by ensuring their workforce gets adequate family time to have a healthy WLB (Ferreiras *et al.*, 2025). This facility is highly likely to report lower absenteeism, reduced turnover, and higher engagement (Cox *et al.*, 2025).

2. Theoretical Foundations

This study integrates conservation of resources theory, social cognitive theory, work-family enrichment theory, and self-determination theory to explain how social and psychological resources interact to influence work-life balance.

Stress can refer to various factors that instigate the feeling of stress or anxiety among workers (Karasek & Theorell, 1996). The Conservation of Resources (COR) theory is a framework that explains the human psychology of how individuals build, protect, and maintain their psychological resources to cope with stressors (Hobfoll, 1989). According to the COR theory, individuals are propelled to obtain various resources like emotional intelligence, time, motivation, resilience, social support, efficiency, health, financial stability, and more. Hobfoll suggests that stress is an indicator of the loss of such resources, and individuals protect their resources or develop new ones from time to time to alleviate stress. Social support is defined as any form of support from external sources like supervisors, colleagues, friends, spouses, children, and even pets that helps reduce stress (Hobfoll, 2001). A network of social resources that assists employees in handling challenges at the workplace and home can be addressed as social support (Cohen & Wills, 1985). The COR theory also disclosed that individuals who gained more social support at the workplace reported higher job satisfaction, better WLB (Halbesleben, 2006), less work-life conflict (Lapierre & Allen, 2006), and low turnover intentions (Ng & Sorensen, 2008). Hence, efficient management of social resources is highly essential to enhance job satisfaction and WLB.

The Work-Family Enrichment (WFE) theory extends the explanation of COR theory and states that social or psychological resources gained in one domain can significantly influence the other domain (Greenhaus & Powell, 2006). A study by Wayne *et al.* (2006) argues that social support received in the workplace carries a positive influence on the personal lives of individuals by enhancing role management. While family support offers emotional reinforcement that improves work engagement, supervisor and coworker support help individuals manage work demands more skillfully (Tang *et al.*, 2014). Strong social support networks help employees feel less role-stressed and more well-rested, which has a positive knock-on impact that improves WLB (McNall *et al.*, 2010). Organisations can improve workers' overall satisfaction and capacity to successfully balance their personal and professional responsibilities by creating a supportive work environment (Carlson *et al.*, 2011).

The Social Cognitive Theory (SCT) (Bandura, 1989) places a strong emphasis on how human behaviour is shaped by contextual factors, personal action, and self-efficacy. Work-related attitudes and results are significantly influenced by self-efficacy, or the conviction that one can succeed in particular tasks. High self-efficacy workers are more assured in handling obstacles at work, which improves their general well-being and job satisfaction (Stajkovic & Luthans, 1998). People with high levels of self-efficacy are better at time management, boundary setting, and adjusting to both personal and professional pressures when it comes to WLB (Bandura, 2001). A better WLB is facilitated by individuals experiencing less stress and more job satisfaction when they believe they can manage

their work and personal obligations (Luthans *et al.*, 2006). Moreover, companies that create supportive work environments contribute to the improvement of employees' self-efficacy, which raises motivation, engagement, and job satisfaction in general (Judge & Bono, 2001).

The Self-Determination Theory (SDT) suggests that individuals are motivated, well-adjusted, and satisfied with their jobs with the help of psychological needs. These psychological needs included autonomy in the job, competence in skills, and relevance to passion (Deci & Ryan, 1985). Healthy interactions and social support at work improve relatedness, which in turn develops self-efficacy among individuals that makes them successfully manage the demands of the job (Ryan & Deci, 2000). Employees who feel more competent and in charge of their work are more satisfied with their jobs (Gagné & Deci, 2005). Strong social support from peers, family, and supervisors also helps employees feel appreciated and empowered to effectively manage their personal and professional responsibilities, which reduces stress and improves WLB (Baard *et al.*, 2004). Higher motivation, job satisfaction, and better WLB are all attributed to organisations that meet employees' psychological needs through autonomy and supportive environments (Deci *et al.*, 2017).

3. Literature Review

3.1 Social Support and Resilience

Social support is an essential element in human existence as it is linked to overall health and well-being (Holt-Lunstad *et al.*, 2010). Social support is a feeling that an individual believes to exist in the form of social resources (Cohen & Wills, 1985). It is defined as an individual's experience of being cared for or considered by others (Wills, 1991). Allen *et al.* (2002) suggest that social support can be derived from any person, such as a spouse, siblings, colleagues, friends, or relatives, or even from an animal like a devoted pet. Support from coworkers and managers can help reduce feelings of burnout, whereas the absence of this support can contribute to work-related stress that greatly affects the syndrome (Collings & Murray, 1996). Individuals perform better when they have strong coping skills, self-esteem, and a purpose in life (Stewart *et al.*, 2012; Øyeflaten *et al.*, 2010). Resilience can be defined as the capacity of a system to endure and recover from disturbances while simultaneously adjusting its structure to manage both immediate and long-term stressors and uncertainties (van der Vegt *et al.*, 2010; Marques & Berry, 2021). Resilience is a complex construct that includes personal characteristics as well as environmental and interpersonal resources. It allows people to successfully manage difficulties and achieve positive outcomes even when faced with stressful situations (Masten, 2001; Smith *et al.*, 2008). In the modern workplace, resilience is acknowledged as a critical quality of a successful worker (Rook *et al.*, 2018). Personal resilience positively mediates the relationship between social support and life quality among nursing students (Pineda *et al.*, 2022). Social support serves as an external resilience factor under stress, where resilience promotes protection, harm reduction, and mitigates mental health problems. Support from dear ones increased personal resilience in college students during COVID-19 lockdowns (Xie *et*

al., 2024). People with disabilities become more resilient to training for athletic activities when they have social support from their parents, friends, mentors, and close friends (Mira *et al.*, 2023). Social support and resilience influence the link between satisfaction with life and stress, where resilience is positively influenced by social support (Yang *et al.*, 2018; Wu *et al.*, 2022; Cao *et al.*, 2024). There is a research gap currently existing to prove the mediation effect of resilience in the connection between social support and WLB (Sandhya, 2024).

Therefore, we hypothesise:

H_1: Social support has a positive effect on resilience

3.2 Social Support and Self-efficacy

Self-efficacy is a person's faith in effectively executing necessary actions to achieve a desired result (Bandura, 1977). Important factors that enhance self-efficacy include confidence, skill mastery, adaptability, personal effectiveness, a positive attitude, and a strong sense of individuality (Pethe *et al.*, 2000). Self-efficacy is shaped by multiple factors, including the accessibility of resources, the perceived challenge of the task, and the difficulties present in the context (Fathi *et al.*, 2020). It is an individual's reliance on their abilities, which is essential for personal development (Pethe *et al.*, 2000). Social support is positively associated to self-efficacy (Coffman & Gilligan, 2002; Karademas, 2006; Maddy *et al.*, 2015) among female psychiatrists (Wang *et al.*, 2015). Self-efficacy mediates the association of social support and resilience, while social support has a direct impact on both (Wang *et al.*, 2018) among teacher assistance teams (Kruger, 1997). Therefore, the following association is hypothesized:

H_2: Social support has a positive effect on self-efficacy

3.3 Social Support and Job Satisfaction

Job satisfaction is a psychological feeling that reflects an employee's sense of contentment with his/her respective job roles (Van Gelderen *et al.*, 2017). Locke (1976) described it as a positive emotional state or a feeling of pleasure that stems from favourable experiences in the work environment. Social support has a valuable influence on satisfaction in the job while enhancing the active coping skills and strategies of employees. Individuals who typically employ active coping methods tend to report greater job satisfaction when they receive increased social support from their colleagues (Shimazu & Shimazu, 2004). In the research carried out by Johnsen *et al.* (2017), the findings indicated a strong correlation between nondirective social support and job satisfaction, while a moderate correlation was observed between directive social support and job satisfaction. According to Hombrados-Mendieta and Cosano-Rivas (2013), social support in the workplace greatly improves job satisfaction and overall life satisfaction. Social support from coworkers and supervisors is a significant predictor of job satisfaction (Orgambídez-Ramos & Almeida, 2017; Zhang *et al.*, 2015). Hence, social support has a significant direct impact on job satisfaction.

H_3: Social support has a positive effect on job satisfaction

3.4 Social Support and Work-life Balance

WLB is a dynamic concept that must be updated to cater to the needs of changing times (Powell *et al.*, 2019). WLB is defined as the ability to manage work and non-work responsibilities without affecting the stance in either domain (Dhanush & Shobha, 2023, 2024, 2026). Research studies suggest that social support is deeply connected to reducing work-life conflicts and consequently improves the WLB (Oludayo & Omonijo, 2020; Santiago *et al.*, 2023). Moreover, social support exhibits assistance in coping with stressors (Thilagavathy & Geetha, 2023; Kurtuluş *et al.*, 2023; Acoba, 2024; Susanto *et al.*, 2024). Several literature evaluations have often cited social support as a key contributor to WLB (Lawrence *et al.*, 2015; Annink, 2017; Rashmi & Kataria, 2022). Further, a broad spectrum of factors is influenced by social support (Annink, 2017), which makes it a key contributor to WLB. Hence, a direct relationship exists between social support and WLB.

H_4: Social support has a positive effect on Work-life-balance.

3.5 Resilience and Job Satisfaction

From the COR theory, it can be inferred that individuals gain psychological resources like motivation, stability, confidence, resilience, and self-efficacy during different experiences throughout work and non-work activities. Hobfoll (2011) in his study suggested that individuals who possessed high resilience reflected better job satisfaction and effective stress-handling skills with minimal emotional depletion. Several studies suggest that employees with high resilience exhibit a positive approach toward challenges by viewing hurdles as a learning process (Burke & Reitzes, 1991; Brislin, 1993; Lok & Crawford, 2001; Rynes *et al.*, 2004; Rahmawati, 2013). Resilience highly influences job satisfaction and work engagement (Ibrahim & Hussein, 2024). It is positively associated with career satisfaction (Srivastava & Madan, 2020; Beuren *et al.*, 2022). Additionally, resilience serves as a protective factor against burnout and fosters a deeper commitment to their work (Bakker & Demerouti, 2017). These scholarly articles serve as a basis for the following hypothesis:

H_5: Resilience positively influences job satisfaction.

3.6 Self-efficacy and Job Satisfaction

A research study conducted in Turkey by Bicer (2023) indicates that general self-efficacy scores serve as predictors of job satisfaction among Turkish teaching faculty. The findings suggest that an individual's self-efficacy positively impacts their job satisfaction. In the field of nursing, self-efficacy is considered a crucial element that directly impacts patient outcomes and plays a significant role in experiencing higher levels of job satisfaction (Aiken *et al.*, 2002; Chang & Edwards, 2015). It serves as a vital personal asset that affects both work performance and job satisfaction. Employees who exhibit high levels of self-efficacy tend to have enhanced psychological resources, enabling them to effectively manage job demands (Xanthopoulou *et al.*, 2007). People with great self-efficacy are capable of actively channelling their resources toward their professional advancement, resulting in heightened work engagement and increased job

satisfaction (Salanova *et al.*, 2010). Therefore, the following connection is hypothesised:

H_6: Self-efficacy positively influences job satisfaction.

3.7 Job Satisfaction and WLB

Ensuring job satisfaction is vital, as feelings of dissatisfaction can lead to intentions to leave the organisation and increased absenteeism among staff (Van Gelderen *et al.*, 2017). An employee who experiences job satisfaction is more likely to engage fully in their work, enhance their performance, and assist both colleagues and themselves (Dziuba *et al.*, 2020). Job satisfaction significantly influences the performance, commitment (Momin & Rolla, 2024), and interactions of police personnel (Yadav *et al.*, 2024). Job satisfaction moderates the relationship between WLB, conflicts between work and family and vice versa. The research found that people with higher job satisfaction levels experienced lower conflicts between work and personal lives (Soomro *et al.*, 2018). Several studies showcase the positive relationship between job satisfaction and WLB (Dhanush & Shobha, 2024, 2026). However, there are very few studies focused on the examination of job satisfaction on WLB among police personnel (Yadav *et al.*, 2024; Lambert *et al.*, 2018; Buker & Dolu, 2010).

H7: Job satisfaction positively influences work-life balance

3.8 Social Support, Job Satisfaction, and WLB

Social support is essential for enhancing individual well-being and promoting job satisfaction among employees, which subsequently influences WLB indirectly (Sandhya, 2024). Research conducted by Aruldoss *et al.* (2020) found that job satisfaction mediates the association of social support and WLB for police officers. Their results showed that officers with higher job satisfaction reported greater happiness at work, which helped them transition more easily from work to personal time (Lambert *et al.*, 2021). Many researchers have observed that the state of WLB, whether positive or negative, can lead to different levels of job satisfaction or dissatisfaction. However, Sandhya (2024) states about the lack of research illustrating the effect of job satisfaction on WLB, especially among police personnel, indicating a significant gap in our understanding of this relationship. As a result, we have developed the following hypothesis:

H_8: Job satisfaction mediates the relationship between social support and Work-life balance.

3.9 Social Support, Self-efficacy, Job Satisfaction, and WLB

The Social Cognitive Theory (Bandura, 1989) highlights how psychological resources affect human behaviour. It indicates that individual self-efficacy plays a crucial role in work-related outcomes. A study by Stajkovic and Luthans (1998) supports this, showing that individuals with high self-efficacy have better problem-solving abilities and greater job satisfaction. Similarly, Bandura (2001) found that those with high self-efficacy excel in time management and maintaining boundaries between work and personal life. Judge and Bono (2001) also noted that higher self-efficacy boosts motivation, engagement, and job satisfaction among workers. Additionally, the SDT (Deci & Ryan,

1985) states that fulfilling the psychological needs of a person can keep them motivated and satisfied. Competent people exhibit a positive attitude in their work and obtain higher job satisfaction (Ryan & Deci, 2000; Gagné & Deci, 2005). Research indicates that strong social support enhances job satisfaction (Wu *et al.*, 2020) and improves WLB (Fayaz & Gulzar, 2025). However, there is limited research on how self-efficacy and job satisfaction together influence WLB, highlighting a gap in the literature. Therefore, this study proposes a hypothesised the following connections:

H_9: Self-efficacy and job satisfaction serially mediate the relationship between social support and WLB.

3.10 Social Support, Resilience, Job Satisfaction, and WLB

The COR theory (Hobfoll, 1989) describes how people acquire, keep, and safeguard their mental resources. Hobfoll argues that stress occurs when individuals feel their resources are threatened or lost, which can result in burnout and unhappiness. Social support, which is a network of social resources (Cohen & Wills, 1985), is crucial for employees facing personal and work-related challenges. Those with greater resilience usually have a strong reserve of resources that help them manage job stress effectively, preventing emotional exhaustion (Hobfoll, 2011). The WFE theory (Greenhaus & Powell, 2006) suggests that resources and experiences gained in one area can enhance performance and well-being in another. Resilience significantly impacts job satisfaction and work engagement (Ibrahim & Hussein, 2024) and is positively linked to career satisfaction (Srivastava & Madan, 2020; Beuren *et al.*, 2022). Furthermore, resilience helps protect against burnout and encourages a stronger commitment to work (Bakker & Demerouti, 2017). While studies confirm the link between resilience and job satisfaction, there is no research showing how resilience alongside job satisfaction mediates the association of social support and WLB. Based on theoretical insights, a serial mediation effect of resilience and job satisfaction can be suggested.

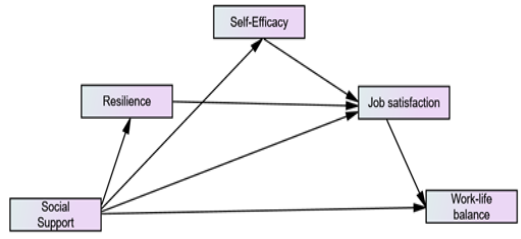


Figure 1. Conceptual Framework

Source: Original work

H_{10}: Resilience and job satisfaction serially mediate the relationship between social support and Work-life balance

4. Research Design

4.1 Statement of the Problem

There is limited empirical evidence explaining how psychological resources mediate the relationship between social support and work-life balance among police personnel in high-stress urban contexts.

4.2 Objectives of the Study

1. To examine direct effects of social support on resilience, self-efficacy, job satisfaction, and work-life balance.

2. To test mediation and serial mediation mechanisms.

3. To evaluate the explanatory power of the integrated model.

4.3 Methodology

A cross-sectional survey was conducted among police personnel with at least three years of experience. Stratified random sampling ensured representation from eight zonal divisions of Bengaluru Urban District. After data cleaning, 500 responses were analysed. All constructs were measured using validated scales on a 7-point Likert scale.

4.4 Sample and Procedure

The research utilised a structured questionnaire following a cross-sectional survey approach. The sample comprised police personnel with a minimum of three years of experience, representing all eight zonal subdivisions of Bengaluru Urban District. Bengaluru Urban is segmented into eight zonal subdivisions, with each zone consisting of at least eight police station jurisdictions. Stratified random

Table 1. Demographic characteristics of respondents

Characteristics	Particulars	Frequency	%	Characteristics	Particulars	Frequency	%
Gender	Male	348	69.6	Qualification	Graduation	215	43.0
	Female	152	30.4		Post-Graduation	146	29.2
Age (years)	21 - 30	121	24.2		Others	139	27.8
	31 - 40	199	39.8	Zone	Central	59	11.8
	41 - 50	153	30.6		North	53	10.6
	51 - 60	27	5.4		South	68	13.6
Marital status	Married	366	73.2		East	70	14.0
	Unmarried	134	26.8		West	59	11.8
Service (years)	<5	153	30.6		North-East	59	11.8
	6 - 10	112	22.4		South-East	66	13.2
	11 - 15	107	21.4		Whitefield	66	13.2
	16 - 20	65	13.0	Branch	Law & Order	354	70.8
	>20	63	12.6		Traffic	146	29.2

Source: Author's work (Primary data)

sampling was applied by treating each zonal division as a stratum, and the data were collected from each stratum. This method allowed for a consistent representation of respondents throughout the target area. Data was gathered through personal interviews, resulting in 538 responses, of which 500 were retained after data cleaning to ensure reliability and validity. The data represents police personnel from eight zonal divisions - Central, North, South, East, West, North-East, South-East, and Whitefield. The number of representations from each stratum is approximately uniform to avoid bias in the results. Table 1 presents the information on the demographic profile of the respondents.

4.5 Constructs, Scales, and Measures

This study includes the evaluation of five factors, namely social support, resilience, self-efficacy, job satisfaction, and WLB, to present a different perspective on enhancing WLB. In this study, Social support was measured using a four-item scale for which the sample item is There are people in my life who pay attention to my feelings and problems' (Santiago *et al.*, 2023). It achieved an alpha value of 0.853. Resilience was measured using a three-item scale for which the sample item is 'I tend to bounce back quickly after hard times' (Sandhya, 2024). Resilience obtained an alpha value of 0.875. Self-efficacy was measured using a six-item scale developed by Chen *et al.* (2001), and the sample item is 'I will be able to achieve most of the goals that I have set for myself'. Self-efficacy emerged with an alpha value of 0.970. Job satisfaction was measured using a five-item scale with the sample item being 'I am satisfied with the nature of my job' (Sandhya, 2024) with an alpha value of 0.841. WLB was measured using a three-item scale that reflected the overall balance between work and non-work domains. The sample item is 'I currently have a good balance between the time I spend on work and non-work activities' (Brough *et al.*, 2014) with an alpha value of 0.810. To avoid the issues of Common Method

Table 2. Scales, items, and Alpha values

Construct	Scale	No. of items	Likert scale	Cronbach's Alpha
Social support	(Santiago *et al.*, 2023)	Four	7-point scale (1 = Strongly disagree, 7 = Strongly agree)	0.853
Resilience	(Sandhya, 2024)	Three		0.875
Self-efficacy	(Chen *et al.*, 2001)	Six		0.970
Job satisfaction	(Sandhya, 2024)	Five		0.841
Work-life balance	(Brough *et al.*, 2014)	Three		0.810

Source: Desk research (Authors' work)

Bias (CMB), shortened scale items were used in the study that are established and reliable. To avoid neutral entries from the respondents, data were recorded using a 7-point Likert scale. All constructs demonstrate an alpha value >0.80, indicating strong reliability for the analysis. The details of the scale and alpha values are presented in Table 2.

4.6 Assessment of the Measurement Model

The proposed research model was initially evaluated using the Confirmatory Factor Analysis (CFA) to assess the model fit. Model fit assessment of the proposed model can be confirmed based on indices like CMIN/df, GFI, TLI, CFI, RMSEA, and SRMR. According to Hair *et al.* (2010), the recommended model fit measures meet the following criteria: CMIN/df must be <5; GFI, TLI, and CFI > 0.9; SRMR and RMSEA <0.08. The model fit indices of the proposed model reported the following: CMIN/df = 2.380, GFI = 0.926, TLI = 0.967, CFI = 0.972, SRMR = 0.0252, and RMSEA = 0.053. All the model fit measures fell within the acceptable range and indicated a good fit (Table 3).

Based on the model fit measure, the proposed model indicated a good fit. The constructs used in the proposed model must demonstrate adequate reliability and validity to proceed with the structural model. All constructs used in the study must exhibit an alpha value of >0.7 to establish reliability (Nunnally & Bernstein, 1994). Construct reliability was measured through Cronbach's alpha using SPSS. Accordingly, the alpha values of constructs were as follows: Social support = 0.853; Resilience = 0.875; Self-efficacy = 0.970; Job satisfaction = 0.841; and WLB = 0.810. Alpha values of the constructs ranging beyond the threshold value of 0.7 indicate that they are reliable. Additionally, the Composite Reliability for the constructs ranged from 0.822 to 0.970 (Table 3), exceeding the established benchmark (Hair *et al.*, 2010), as detailed in Table 4. The convergent validity of the scale items was approved by the obtained Average Variance Extracted (AVE). The AVE of all constructs was >0.5 to approve the convergent validity of the scale items (Fornell & Larcker, 1981).

The discriminant validity was evaluated using the Heterotrait-Monotrait (HTMT) Ratio. Constructs are deemed to possess discriminant validity if all HTMT ratios are below 0.85 (Henseler *et al.*, 2015). Therefore,

Table 3. Fit indices of the measurement model

Fit indices	Recommended value	Obtained value
p-value	>0.05	0.000
CMIN/df	<5	2.380
GFI	>0.90	0.926
TLI	>0.90	0.967
CFI	>0.90	0.972
SRMR	<0.08	0.0252
RMSEA	<0.08	0.053

Notes(s): CMIN/df: Minimum discrepancy; GFI: Goodness-of-Fit Index; TLI: Tucker and Lewis Index; CFI: Comparative Fit Index; SRMR: Standardized Root Mean Square Residual; RMSEA: Root Mean Square Error of Approximation

Source: Desk research (Author's original work using AMOS)

Table 4. Loadings, composite reliability, and convergent validity

Items	Loadings	Composite Reliability	AVE
Social support		0.867	0.621
SS1 There are people in my life who pay attention to my feelings and problems	0.818		
SS2 There are people in my life who appreciate what I do	0.819		
SS3 There are people in my life who I can get help from if I need it	0.764		
SS4 There are people in my life whom I can talk to about how to handle things	0.747		
Resilience		0.875	0.700
RS1 I tend to bounce back quickly after hard times.	0.829		
RS2 It does not take me long to recover from a stressful event.	0.850		
RS3 I usually come through difficult times with little trouble.	0.830		
Self-efficacy		0.970	0.845
SE1 I will be able to achieve most of the goals that I have set for myself.	0.922		
SE2 In general, I think that I can obtain outcomes that are important to me	0.924		
SE3 I believe I can succeed at almost any endeavour to which I set my mind.	0.913		
SE4 I will be able to successfully overcome any challenges.	0.921		
SE5 I am confident that I can perform effectively on many different tasks.	0.918		
SE6 Compared to other people, I can do most tasks very well	0.919		
Job satisfaction		0.842	0.516
JS1 I am satisfied with the nature of my job	0.700		

JS2 I am satisfied with my co-workers	0.754		
JS3 I am satisfied with the supervision	0.693		
JS4 I am satisfied with my pay/salary	0.706		
JS5 I am satisfied with the promotional opportunities	0.736		
Work-life balance		0.822	0.606
WLB1 I currently have a good balance between the time I spend on work and non-work activities	0.795		
WLB2 I feel that the balance between my work demands and non-work activities is currently about right	0.776		
WLB3 Overall, I believe that my work and non-work life are balanced	0.764		

Note(s): SS: Social support; RS: Resilience; SE: Self-efficacy; JS: Job satisfaction; WLB: Work-life balance

Source: Authors' work

Table 5. Discriminant validity and collinearity statistics

	Heterotrait-Monotrait ratio					Collinearity statistics	
	WLB	**SS**	**RS**	**SE**	**JS**	**Tolerance**	**VIF**
WLB	1.000					-	-
SS	0.545	1.000				0.292	3.428
RS	0.550	0.677	1.000			0.397	2.516
SE	0.505	0.728	0.572	1.000		0.368	2.721
JS	0.671	0.644	0.650	0.644	1.000	0.383	2.611

Note(s): SS: Social support; RS: Resilience; SE: Self-efficacy; JS: Job satisfaction; WLB: Work-life balance

Source: SPSS output

the discriminant validity was confirmed based on this established HTMT ratio criterion. The result of discriminant validity is presented in Table 5. A structural model can be constructed once it is established that multicollinearity is not a concern, which was supported by analysis results indicating tolerance values greater than 0.2 and a Variance Inflation Factor (VIF) of less than 5.0, suggesting no significant multicollinearity issues within the data. The

statistical values for tolerance and VIF are presented in Table 5.

4.7 Assessment of the Structural Model

An SEM analysis was employed to assess the relationships using IBM AMOS. Bootstrapping was performed with 5,000 resamples using a bias-corrected 95% confidence interval. The fit indices revealed acceptable measures: CMIN/df = 2.402, GFI = 0.924, TLI = 0.967, CFI = 0.971, SRMR = 0.0274, and RMSEA = 0.053. The R-squared values indicated that social support accounted for 68% of the variance in self-efficacy and 67.2% of the variance in resilience, with values of 0.680 and 0.672, respectively. Additionally, job satisfaction exhibited an R-squared value of 0.756, signifying that 75.6% of the variance is explained by social support, resilience, and self-efficacy. Furthermore, WLB had an R-squared value of 0.774, indicating that 77.4% of the variance in WLB is collectively explained by social support, resilience, self-efficacy, and job satisfaction. The overall model fit statistics and squared multiple correlations suggest that the model demonstrates a satisfactory fit and effectively predicts WLB outcomes based on individual characteristics such as resilience, self-efficacy, and job satisfaction.

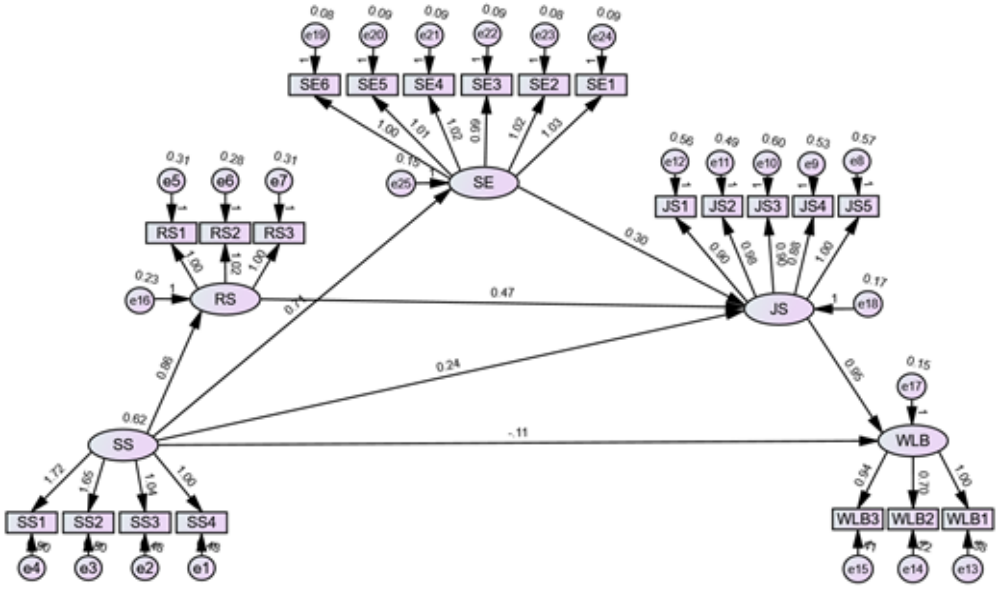


Figure 2. Unstandardized structural model.

Note(s): SS: Social Support; RS: Resilience; SE: Self-Efficacy; JS: Job Satisfaction; WLB: Work-life Balance

Source: Author's work (using AMOS)

4.8 Hypotheses Testing - Direct Effects

The direct effects among constructs were analysed using AMOS, based on theoretical assumptions. The initial findings revealed a positive connection between social support and resilience (β = 0.864, t = 18.383, p < 0.01), thereby confirming H_1. Additionally, social support demonstrated a positive relationship with both self-efficacy (β = 0.708, t = 17.700, p < 0.01) and job satisfaction (β = 0.241, t =

Table 6. Mediation analysis summary

Hypotheses	Relation-ship	Direct effect	Indirect effect	CI		p-value	Conclusion
				LLCI	ULCI		
H_8	SS->JS->WLB		0.228***	0.018	0.539	0.003	Full mediation
H_9	SS->SE->JS->WLB	-0.107 (0.201)	0.384***	0.258	0.524	0.000	Full serial mediation
H_{10}	SS->RS->JS->WLB		0.200***	0.092	0.303	0.001	Full serial mediation

Note(s): ***is significant at 1% level; SS: Social Support; RS: Resilience; SE: Self-Efficacy; JS: Job Satisfaction; WLB: Work-life Balance

Source: Author's work (using AMOS)

Table 7. Regression effect-direct effects

Hypotheses	Paths	Direct effect				Conclusion
		Estimates	Std. Error	LLCI	ULCI	
H_1	SS->RS	0.864	0.047	0.776	0.961	Supported
H_2	SS->SE	0.708	0.040	0.633	0.791	Supported
H_3	SS->JS	0.241	0.120	0.020	0.503	Supported
H_4	SS->WLB	-0.107	0.095	-0.319	0.054	Not supported
H_5	RS->JS	0.469	0.080	0.315	0.632	Supported
H_6	SE->JS	0.297	0.081	0.130	0.453	Supported
H_7	JS->WLB	0.948	0.096	0.781	1.157	Supported

Note(s): SS: Social Support; RS: Resilience; SE: Self-Efficacy; JS: Job Satisfaction; WLB: Work-life Balance; LLCI: Lower limit of Confidence Interval; ULCI: Upper Limit of Confidence Interval

Source: Author's work (using AMOS)

2.008, p = 0.017), which supports H_2 and H_3, respectively. Conversely, H_4, which posited a direct effect between social support and WLB, was deemed insignificant (β = -0.107, t = -1.126, p = 0.223), likely due to the substantial impact of mediators on this relationship (Table 6). The subsequent analysis of direct effects included resilience with job satisfaction, self-efficacy with job satisfaction, and job satisfaction with WLB. The results indicated a positive correlation between resilience and job satisfaction (β = 0.469, t = 5.863, p < 0.01), thereby supporting H_5. Furthermore, the relationship of self-efficacy and job satisfaction was validated through statistical measures (β = 0.297, t = 3.667, p < 0.01), confirming H_6. Finally, a strong positive association was found between job satisfaction and WLB (β = 0.948, t = 9.875, p < 0.01), which supports H_7. A summary of direct effects is presented in Table 7.

4.9 Hypothesis Testing - Indirect Effects

4.9.1 Mediation Analysis

The study assessed the mediation effect of job satisfaction in the association between social support and WLB. The findings revealed a significant indirect influence of social support on WLB through job satisfaction (β = 0.228, t = 3.677, p = 0.003), thus confirming hypothesis H8. Additionally, the direct impact of social support on WLB, when accounting for the mediators, was found to be non-significant (β = -0.107, t = -1.126, p = 0.201). Therefore, job satisfaction revealed a full mediation in the link between social support and WLB (Table 6).

4.9.2 Serial Mediation

The current study also examined the serial mediation effects of self-efficacy and job satisfaction on the connection between social support and WLB. The findings indicated a significant indirect effect of social support on WLB through self-efficacy and job satisfaction (b = 0.200, t = 3.774, p = 0.001), thereby confirming H_9. Additionally, the study evaluated the serial mediation effect of resilience and job satisfaction on the social support and WLB relationship, revealing a significant indirect effect of social support on WLB (b = 0.384, t = 5.731, p = 0.000), which supports H_{10}. Moreover, the direct association of social support on WLB was not significant (β = -0.107, t = -1.126, p = 0.201). Hence, the analysis suggests a complete serial mediation effect of both self-efficacy and job satisfaction, as well as resilience and job satisfaction, on the link between social support and WLB.

5. Discussion

The research investigates the significant impact of job satisfaction on the relationship between social support and WLB. It further explores how job satisfaction serves as a mediator in the connection between social support and WLB (Dhanush & Shobha, 2026), incorporating resilience and self-efficacy as key factors (Figure 2). The direct effects measured include social support on resilience at 0.864, social support on self-efficacy at 0.708, social support on job satisfaction at 0.241, resilience on job satisfaction at 0.469, self-efficacy on job satisfaction at 0.297, job satisfaction on WLB at 0.948, and social support on WLB at

-0.107 (Table 7). All direct relationships were statistically significant, as indicated by their path coefficients, except for the direct effect of social support on WLB, which was not significant when mediators were accounted for. These findings support the SCT theory proposed by Bandura (1989), highlighting the role of individual characteristics in improving WLB. The reliability coefficients (Cronbach's alpha) for the constructs indicate strong internal consistency: social support = 0.853; resilience = 0.875; self-efficacy = 0.970; job satisfaction = 0.841; WLB = 0.810. This suggests that the analysis has successfully captured the impact of these independent constructs on the WLB of police personnel. Further, the mediation analysis highlights the significant mediating role of job satisfaction in the indirect relationship between social support and WLB (Indirect effect = 0.228, 99% CI, LLCI = 0.018, ULCI = 0.539) as presented in Table 6. In addition to the direct effects and the mediation analysis, the study aimed to evaluate two serial mediation effects of social support on WLB through self-efficacy and job satisfaction, as well as resilience and job satisfaction. Accordingly, the former showcased a significant indirect effect of social support on WLB (β = 0.384, CI = 99%, LLCI = 0.258, ULCI = 0.524) through self-efficacy and job satisfaction. This indicates that individual self-efficacy influences the job satisfaction levels and eventually enhances the WLB among policemen. The serial mediation effect through self-efficacy extends practical implications of the SDT (Ryan & Deci, 2000), proving that people are motivated, adjusted, and satisfied with their jobs through autonomy, competence, and relatedness. In this study, the respondents revealed a notable level of self-efficacy, which enabled them to adjust and attain satisfaction in their work. On the other hand, the latter revealed a significant indirect effect of social support on WLB (β = 0.200, CI = 99%, LLCI = 0.092, ULCI = 0.303) through resilience and job satisfaction. This indicates that individuals with higher resilience experienced better job satisfaction, which eventually led to better WLB. The serial mediation effect through resilience provides practical evidence on the COR theory (Hobfoll, 1989), where a person builds social resources to cope with stressors. In this study, the respondents indicated high levels of resilience and a decent level of social support. The findings of the serial mediation suggest that the resilience level in the policemen is assisting them in finding satisfaction at their job from the available social support. Through sheer resilience and job satisfaction levels, the policemen are able to manage the balance between work and family commitments. The overall findings of the study demonstrate a new perspective on how WLB among policemen can be enhanced through psychological resources.

6. Conclusion

This study showcases how the psychological and social resources obtained by an individual assist in acquiring important resources in a stressful work environment, such as policing. Previous studies have showcased established connections and flow of influence from WLB to job satisfaction (Ellickson & Logsdon, 2001; Brough *et al.*, 2014; Aruldoss *et al.*, 2020; De Clercq *et al.*, 2021). However, some studies prove that job satisfaction has a role to play in influencing the WLB (Staines, 1980; Guest, 2002; Sandhya, 2024). This study highlights the role of job satisfaction with the support

of psychological resources in influencing the WLB of police personnel. The results indicated that resources like self-efficacy and resilience are highly influenced by social support. The findings reveal that the strong mediation between social support and WLB through resilience, self-efficacy, and job satisfaction neutralises the direct influence of social support on WLB. The mediation analysis discloses the weightage of resilience as well as self-efficacy in influencing the level of job satisfaction and eventually improving the WLB. The mediation analysis summary (Table 6) highlights the role of psychological resources in strengthening social resources. In addition, the high reliability of the constructs used in the study validates the measurement and reinforces the assumptions of the proposed research model. The overall findings contribute to the existing literature by providing a perspective on the influence of psychological resources in developing social resources.

6.1 Theoretical Implications

The study aimed to evaluate the relationship between social support, self-efficacy, resilience, job satisfaction, and WLB. The study focused on exploring the influence of psychological resources like self-efficacy and resilience in enhancing job satisfaction as well as WLB among law enforcement officers. Therefore, the current study emphasises three major theories that are the Conservation of Resources (COR) theory, the Social Cognitive Theory (SCT), and the Self-Determination Theory (SDT). The study primarily extends into the explanations of the COR theory (Hobfoll, 1989), which reveals the impact of social support in reducing stress and improving the overall social resources. In addition, by explaining the role of self-efficacy as a mediator between the relationship of social support and job satisfaction, the research emphasises the SCT (Bandura, 1989), thereby highlighting the role of self-belief in handling workplace challenges. Moreover, this study also follows the WFE theory (Greenhaus & Powell, 2006) by showcasing the positive spillover effects of social resources on work and personal life. The findings of the study also broaden the scope of SDT (Deci & Ryan, 1985) by showcasing how social support enhances competence, autonomy, and commitment, which in turn boosts motivation and WLB. Additionally, this study presents a different perspective on how social support from external sources influences job satisfaction and lower turnover intentions.

6.2 Practical Implications

Policing involves a complex work environment with irregular duty hours, emergency and unpredictable situations, dilemmas between work and family responsibilities, and more (Dhanush & Shobha, 2024, 2025). Frequent irregular schedules at work, high job demands, and role conflicts will lead to stress (Bakker & Demerouti, 2017). Through personal interviews, it was evident that the policemen across Bengaluru experienced minimal family time for activities such as spending time with children, monitoring children's education, and caring for old parents. Most of the respondents shared their opinions on the existing shift hours, which made it difficult for them to have adequate family time. However, it was also noted that spouses took care of the family responsibilities and all household chores in the absence of their partner. All this information revealed

that the policemen in Bengaluru fetched the required support from their families, friends, and colleagues. It is the personal resources and skills of the policemen that have enabled them to maintain the minimum balance between their work and personal lives. Through the primary data, it was evident that very few were able to separate their personal and professional lives, wherein the majority of respondents experienced the spill-over effects of work and family on each other. The findings of the study suggest that there should be strategic policies to enhance social support within the workplace, such as flexibility in timing, periodical counselling, smart mentorship programs, and peer support activities to boost comradeship among policemen (Dhanush & Shobha, 2025). In addition, appropriate resilience training programs and stress management workshops would greatly help the officials in the line of police duty. The introduction of flexible timing is a great challenge to this type of work, but this change would improve the overall family satisfaction among the employees in policing. Finally, promoting a supportive culture in the workplace would boost the social resources within the employees, which would lead to better satisfaction with the job and WLB.

6.3 Limitations and Directions for Future Research

Extending on the theories of COR, SCT, and SDT, this study sheds light on the relationship between social support, resilience, self-efficacy, job satisfaction, and WLB. This study has particularly focused on police personnel within the Bengaluru Urban District. The overall findings of the study reveal the significant role of self-efficacy and resilience in a stressful profession such as policing. It also suggests that these individual traits assist in reducing work-life conflicts, stress, and emotional exhaustion. However, there are a few limitations to the study which must be noted. Firstly, the sample of the study comprises police personnel exclusively from the Law and Order and Traffic divisions across Bengaluru. In addition, Bengaluru is a Tier 1 city, and therefore, features such as density of population, workload, work timings, transfer conditions, job rotations, cost of living, and geographical conditions might influence the responses. Therefore, the scope of the study may not be generalised across all cities, especially with Tier 2 and Tier 3 cities. It should also be noted that there is a scope for further research across other branches of the department like Crime, Narcotics, Cyber forensics, and more.

The results of the study suggest potential keynotes for policymakers on how social support can be influential in protecting the motives of policemen. Therefore, emphasising a healthy work environment supporting social backup among peers will significantly influence employee morale to achieve better results. A stressful work environment, such as policing, can be improved by building on social support to develop social resources among the workforce and reduce the possibilities of resource losses. The current study has focused on the mechanisms of COR and SDT on police personnel with a quantitative approach. There is a wider scope for future research to examine the practical application of the work-family enrichment theory on police personnel in Bengaluru. Therefore, future research could employ mixed-method approaches

to provide deeper insights into contextual understanding. From the extensive literature review and current studies, a significant research gap exists in identifying the influence of technological advancements on improving WLB practices among policemen. Hence, future research could explore the implications of technological advancements on the policing work environment.

7. References

Acoba, E. F. (2024). Social support and mental health: The mediating role of perceived stress. *Frontiers in Psychology, 15*, 1-12. https://doi.org/10.3389/fpsyg.2024.1330720

Aiken, L. H., Clarke, S. P., Sloane, D. M., Sochalski, J., & Silber, J. H. (2002). Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. *Journal of the American Medical Association, 288*(16), 1987-1993. ttps://doi.org/10.1001/jama.288.16.1987

Allen, K., Blascovich, J., & Mendes, W. B. (2002). Cardiovascular reactivity and the presence of pets, friends, and spouses: The truth about cats and dogs. *Psychosomatic Medicine, 64*, 727-739.

Annink, A. (2017). From social support to capabilities for the work-life balance of independent professionals. *Journal of Management and Organization, 23*(2), 258-276. https://doi.org/10.1017/jmo.2016.53

Aruldoss, A., Kowalski, K. B., & Parayitam, S. (2020). The relationship between quality of work life and work-life balance: Mediating role of job stress, job satisfaction, and job commitment. *Journal of Advances in Management Research, 18*(1), 36-62. https://doi.org/10.1108/JMR-05-2020-0082

Baard, P. P., Deci, E. L., & Ryan, R. M. (2004). Intrinsic need satisfaction: A motivational basis of performance and well-being in two work settings. *Journal of Applied Social Psychology, 34*(10), 2045-2068. https://doi.org/10.1111/j.1559-1816.2004.tb02690.x

Bakker, A. B., & Demerouti, E. (2017). Job demands-resources theory: Taking stock and looking forward. *Journal of Occupational Health Psychology, 22*(3), 273-285.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*, 191-215. https://doi.org/10.1037/0033-295X.84.2.191

Bandura, A. (1989). Human agency in social cognitive theory. *American Psychologist, 44*(9), 1175-1184. https://doi.org/10.1037/0003-066X.44.9.1175

Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology, 52*(1), 1-26. https://doi.org/10.1146/annurev.psych.52.1.1

Beuren, I. M., dos Santos, V., & Theiss, V. (2022). Organizational resilience, job satisfaction and business performance. *International Journal of Productivity and Performance Management, 71*(6), 2262-2279. https://doi.org/10.1108/IJPPM-03-2021-0158

Bicer, N. (2023). Evaluation of self-efficacy and job satisfaction of teachers teaching Turkish as a foreign language. *SAGE Open, 13*(3). https://doi.org/10.1177/21582440231196993

Brislin, R. (1993). *Understanding culture's influence on behavior*. Harcourt Brace College Publishers.

Brough, P., Timms, C., O'Driscoll, M. P., Kalliath, T., Siu, O.-L., Sit, C., & Lo, D. (2014). Work-life balance: A longitudinal evaluation of

a new measure across Australia and New Zealand workers. *International Journal of Human Resource Management, 25*(19), 2724-2744. https://doi.org/10.1080/09585192.2014.899262

Buker, H., & Dolu, O. (2010). Police job satisfaction in Turkey: Effects of demographic, organizational, and jurisdictional factors. *International Journal of Comparative and Applied Criminal Justice, 34*(1), 25-51

Burke, P. J., & Reitzes, D. C. (1991). An identity approach to commitment. *Social Psychology Quarterly, 54*, 239-251.

Cao, F., Li, J., Xin, W., & Cai, N. (2024). Impact of social support on the resilience of youth: Mediating effects of coping styles. *Frontiers in Public Health, 12*, Article 1331813. https://doi.org/10.3389/fpubh.2024.1331813

Carlson, D. S., Kacmar, K. M., Wayne, J. H., & Grzywacz, J. G. (2011). The work-family interface: An integrative review. *Journal of Management, 37*(1), 104-132.

Chang, Y., & Edwards, J. K. (2015). Examining the relationships among self-efficacy, coping, and job satisfaction using social career cognitive theory: An SEM analysis. *Journal of Career Assessment, 23*(1), 35-47. https://doi.org/10.1177/1069072714523083

Chen, G., Gully, S. M., & Eden, D. (2001). Validation of a new general self-efficacy scale. *Organizational Research Methods, 4*(1), 62-83. https://doi.org/10.1177/109442810141004

Coffman, D. L., & Gilligan, T. D. (2002). Social support, stress, and self-efficacy: Effects on students' satisfaction. *Journal of College Student Retention: Research, Theory and Practice, 4*(1), 53-66. https://doi.org/10.2190/BV7X-F87X-2MXL-2B3L

Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin, 98*(2), 310-357.

Collings, J., & Murray, P. (1996). Predictors of stress amongst social workers: An empirical study. *British Journal of Social Work, 26*(3), 375-387. https://doi.org/10.1093/oxfordjournals.bjsw.a011101

Cox, C., Blockley, T., Hagan, R., & James, A. (2025). Is the police service still a long-term career choice? Perspectives of new recruits. *Policing: An International Journal*, *48*(2), 384-400. https://doi.org/10.1108/PIJPSM-09-2024-0147

Davies, A. J., Stephenson, A., Briggs, B., & Allan, D. (2024). What do we know about key influences on police attrition and retention rates? A literature review. *Policing: An International Journal, 47*(5), 725-769. https://doi.org/10.1108/PIJPSM-11-2023-0149

De Clercq, D., Brieger, S., & Welzel, C. (2021). Leveraging the macro-level environment to balance work and life: An analysis of female entrepreneurs' job satisfaction. *Small Business Economics, 56*(4), 1361-1384. https://doi.org/10.1007/s11187-019-00287-x

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. Springer. https://doi.org/10.1007/978-1-4899-2271-7

Deci, E. L., Olafsen, A. H., & Ryan, R. M. (2017). Self-determination theory in work organizations: The state of a science. *Annual Review of Organizational Psychology and Organizational Behavior, 4*, 19-43. https://doi.org/10.1146/annurev-orgpsych-032516-113108

Dhanush, M. R., & Shobha, C. (2023). Impact of excessive workload on the work-life balance of police personnel in Karnataka. *Dharana*

- *Bhavan's International Journal of Business, 14*(Combined issue), 71-78. https://doi.org/10.18311/dbijb/2023/34337

Dhanush, M. R., & Shobha, C. (2024). Perspectives on work-life integration: A descriptive study on theoretical frameworks. *Indian Journal of Psychology, 2024*(1), 106-114. https://doi.org/10.2139/ssrn.5129222

Dhanush, M. R., & Shobha, C. (2024). Measurement and Validation of the Interrelationships Between Job Satisfaction, Social Support, and Work-life Balance Among Police Personnel. *SEMCOM Management & Technology Review, 12*(1), 15-20. https://doi.org/10.2139/ssrn.6406678

Dhanush, M. R., & Shobha, C. (2025). The uniform ripple effect: Work-family spillover and crossover dynamics among policemen. *The Academic, 3*(Special Issue 1), 515-526. https://doi.org/10.5281/zenodo.17306784

Dhanush, M. R., & Shobha, C. (2026). The Wellbeing Equation: Work-Life, Support, and Satisfaction in Policing. *Artha - Journal of Social Sciences, 25*(1), 25-40. https://doi.org/10.12724/ajss.76.2

Dziuba, S., Ingaldi, M., & Zhuravskaya, M. (2020). Employees' job satisfaction and their work performance as elements influencing work safety. *System Safety Human - Technical Facility - Environment, 2*(1), 18-25. https://doi.org/10.2478/czoto-2020-0003

Edwards, J. R., & Rothbard, N. P. (2000). Mechanisms linking work and family: Clarifying the relationship between work and family constructs. *Academy of Management Review, 25*(1), 178-199.

Ellickson, M., & Logsdon, K. (2001). Determinants of job satisfaction of municipal government employees. *State and Local Government Review, 33*(3), 173-184.

Fathi, J., Derakhshan, A., & Arabani, A. S. (2020). Investigating a structural model of self-efficacy, collective efficacy, and psychological well-being among Iranian EFL teachers. *Iranian Journal of Applied Language Studies, 12*(1), 123-150. https://doi.org/10.22111/ijals.2020.572

Fayaz, I., & Gulzar, F. (2025). Thrive, don't survive: Building work-life balance with family support, grit, and self-efficacy. *IIMT Journal of Management*, *2*(1), 114-138. https://doi.org/10.1108/IIMTJM-05-2024-0057

Ferreiras, P., Gomes, S., & Lopes, J. M. (2025). Workplace practices and work-life balance in Europe: The role of gender and home and family care. *Corporate Governance*, *25*(5), . https://doi.org/10.1108/CG-04-2024-0251

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39-50. https://doi.org/10.2307/3151312

Gächter, M., Savage, D. A., & Torgler, B. (2013). Retaining the thin blue line: What shapes workers' intentions not to quit the current work environment. *International Journal of Social Economics, 40*(5), 479-503. https://doi.org/10.1108/03068291311315359

Gagné, M., & Deci, E. L. (2005). Self-determination theory and work motivation. *Journal of Organizational Behavior, 26*(4), 331-362. https://doi.org/10.1002/job.322

Greenhaus, J. H., & Powell, G. N. (2006). When work and family are allies: A theory of work-family enrichment. *Academy of Management Review, 31*, 72-92.

Guest, D. (2002). Human resource management, corporate performance, and employee well-being: Building the worker into HRM. *Journal of Industrial Relations, 44*(3), 335-358. https://doi.org/10.1111/1472-9296.00053

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis: A global perspective*. Pearson.

Halbesleben, J. R. (2006). Sources of social support and burnout: A meta-analytic test of the conservation of resources model. *Journal of Applied Psychology, 91*(5), 1134-1145.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science, 43*, 115-135. https://doi.org/10.1007/s11747-014-0403-8

Hobfoll, S. E. (1989). Conservation of resources: A new attempt at conceptualizing stress. *American Psychologist, 44*(3), 513-524. https://doi.org/10.1037/0003-066X.44.3.513

Hobfoll, S. E. (2001). The influence of culture, community, and the nested-self in the stress process: Advancing conservation of resources theory. *Applied Psychology, 50*(3), 337-421. https://doi.org/10.1111/1464-0597.00062

Hobfoll, S. E. (2011). Conservation of resources theory: Its implication for stress, health, and resilience. In S. Folkman (Ed.), *The Oxford Handbook of Stress, Health, and Coping* (pp. 127-147). Oxford University Press.

Holt-Lunstad, J., Smith, T. B., & Layton, J. B. (2010). Social relationships and mortality risk: A meta-analytic review. *PLoS Medicine, 7*(7). https://doi.org/10.1371/journal.pmed.1000316

Hombrados-Mendieta, I., & Cosano-Rivas, F. (2013). Burnout, workplace support, job satisfaction, and life satisfaction among social workers in Spain: A structural equation model. *International Social Work, 56*(2), 228-246. https://doi.org/10.1177/0020872811421620

Hosain, M. S. (2024). The dilemma of work-family balance for dual-career couples with children: Qualitative evidence from Bangladesh based on family systems theory. *International Journal of Organizational Analysis, 33*(1), 25-42. https://doi.org/10.1108/IJOA-11-2023-4096

Hosboyar, M. (2012). *A quasi-experimental study on flexible work arrangements and job satisfaction: The moderational and mediational roles of work social support, work-family conflict, and work-life balance* [Doctoral dissertation, California School of Professional Psychology].

Ibrahim, B. A., & Hussein, S. M. (2024). Relationship between resilience at work, work engagement, and job satisfaction among engineers: A cross-sectional study. *BMC Public Health, 24*, Article 1077. https://doi.org/10.1186/s12889-024-18507-9

Imran, M. K., Sarwar, A., Fatima, T., & Shabeer, S. (2025). Am I depleting from work or life? A nexus among work-life balance, self-efficacy, emotional exhaustion, and performance. *Asia-Pacific Journal of Business Administration*, *17*(4), 1165-1184. https://doi.org/10.1108/APJBA-05-2024-0253

Johnsen, T. L., Eriksen, H. R., Indahl, A., & Tveito, T. H. (2017). Directive and nondirective social support in the workplace: Is this distinction important for subjective health complaints and job satisfaction? *Scandinavian Journal of Public Health, 46*(3), 358-367. https://doi.org/10.1177/1403494817726617

Judge, T. A., & Bono, J. E. (2001). Relationship of core self-evaluations traits—self-esteem,

generalized self-efficacy, locus of control, and emotional stability—with job satisfaction and job performance: A meta-analysis. *Journal of Applied Psychology, 86*, 80-92. https://doi.org/10.1037/0021-9010.86.1.80

Jyoti, & Kaur, R. B. (2024). Exploring family supportive supervisor behaviors from a police perspective to ensure life satisfaction. *Rajagiri Management Journal, 18*(4), 305-322. https://doi.org/10.1108/RAMJ-10-2023-0278

Karademas, E. C. (2006). Self-efficacy, social support, and well-being: The mediating role of optimism. *Personality and Individual Differences, 40*(6), 1281-1290. https://doi.org/10.1016/j.paid.2005.10.019

Karasek, R. A., & Theorell, T. (1996). Current issues relating to psychosocial job strain and cardiovascular disease research. *Journal of Occupational Health Psychology, 1*(1), 9-26. https://doi.org/10.1037/1076-8998.1.1.9

Kaur, R. (2025). Influences of work stressors and family support: The mediating role of job performance. *Vilakshan - XIMB Journal of Management*, *22*(1), 100-115. https://doi.org/10.1108/xjm-09-2023-0196

Kruger, L. J. (1997). Social support and self-efficacy in problem solving among teacher assistance teams. *The Journal of Educational Research, 90*(3). https://doi.org/10.1080/00220671.1997.10543772

Kurtuluş, E., Kurtuluş, H. Y., Birel, S., & Batmaz, H. (2023). The effect of social support on work-life balance: The role of psychological well-being. *International Journal of Contemporary Educational Research, 10*(1), 239-249. https://doi.org/10.33200/ijcer.1152323

Lambert, E. G., Qureshi, H., & Frank, J. (2021). The good life: Exploring the effects of job stress and job satisfaction on life satisfaction of police officers. *International Journal of Police Science & Management, 23*(3), 279-292. https://doi.org/10.1177/14613557211016494

Lambert, E. G., Qureshi, H., Frank, J., Klahm, C., & Smith, B. (2018). Job stress and job satisfaction among Indian police personnel. *Journal of Police and Criminal Psychology, 33*(3), 85-99. https://doi.org/10.1007/s11896-017-9236-y

Lapierre, L. M., & Allen, T. D. (2006). Work-supportive family and family-supportive supervision. *Journal of Occupational Health Psychology, 11*(2), 169-181.

Lawrence, S. A., Jordan, P. J., & Callan, V. J. (2015). Initial validation of the support mobilization for work stressors inventory. *Australian Journal of Management, 40*(4), 587-612. https://doi.org/10.1177/0312896214528186

Locke, E. A. (1976). The nature and causes of job satisfaction. In M. D. Dunnette (Ed.), *Handbook of industrial and organizational psychology* (pp. 1297-1349), Rand McNally.

Lok, P., & Crawford, J. (2001). Antecedents of organizational commitment and the mediating role of job satisfaction. *Journal of Managerial Psychology, 16*(7), 594-613.

Luthans, F., Vogelgesang, G. R., & Lester, P. (2006). Developing the psychological capital of resiliency. *Human Resource Development Review, 5*(1), 25-44. https://doi.org/10.1177/1534484305285335

Maddy, L. M., Cannon, J. G., & Lichtenberger, E. J. (2015). The effects of social support on self-esteem and job search efficacy. *Journal of Employment Counseling, 52*(2), 87-95. https://doi.org/10.1002/joec.12007

Marques, V. C., & Berry, G. R. (2021). Enhancing work-life balance using a resilience framework.

Business and Society Review, 126(3), 1-19. https://doi.org/10.1111/basr.12237

Masten, A. S. (2001). Ordinary magic: Resilience processes in development. *American Psychologist, 56*(3), 227-238. https://doi.org/10.1037/0003-066X.56.3.227

McNall, L. A., Nicklin, J. M., & Masuda, A. D. (2010). A meta-analytic review of work-family enrichment. *Journal of Business and Psychology, 25*(3), 381-396

Mira, J., Jacinto, M., Costa, A. M., Monteiro, D., Diz, S., Matos, R., & Antunes, R. (2023). Exploring the relationship between social support, resilience, and subjective well-being in athletes of adapted sport. *Frontiers in Psychology, 14*, Article 1266654. https://doi.org/10.3389/fpsyg.2023.1266654

Momin, M., & Rolla, K. P. (2024). Alliance or association? Exploring the effect of work-family balance on workplace well-being and the mediating effect of work attitudes. *IIM Kozhikode Society and Management Review*, *15*(1). https://doi.org/10.1177/22779752241242247

Ng, T. W. H., & Sorensen, K. L. (2008). Toward a further understanding of the relationships between perceptions of support and work attitudes: A meta-analysis. *Group and Organization Management, 33*(3), 243-268. https://doi.org/10.1177/1059601107313307

Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). McGraw-Hill.

Oludayo, A. O., & Omonijo, D. O. (2020). Work-life balance: The relevance of social support. *Academy of Strategic Management Journal, 19*(3).

Orgambídez-Ramos, A., & Almeida, H. de. (2017). Work engagement, social support, and job satisfaction in Portuguese nursing staff: A winning combination. *Applied Nursing Research, 36*, 37-41. https://doi.org/10.1016/j.apnr.2017.05.012

Øyeflaten, I., Gabriele, J. M., Fisher, E. B., & Eriksen, H. R. (2010). Social support and subjective health complaints in occupational rehabilitation. *International Journal of Therapy and Rehabilitation, 17*, 424-434. https://doi.org/10.12968/ijtr.2010.17.8.49291

Pethe, S., Choudhari, S., & Dhar, U. (2000). Occupational self-efficacy: Constituent factors. *Management and Labour Studies, 25*(2), 81-151. https://doi.org/10.1177/0258042X0002500202

Pineda, C. N., Naz, M. P., Ortiz, A., Ouano, E. L., Padua, N. P., Paronable, J., Jr., & Torres, G. C. (2022). Resilience, social support, loneliness, and quality of life during COVID-19 pandemic: A structural equation model. *Nurse Education in Practice, 64*, Article 103419. https://doi.org/10.1016/j.nepr.2022.103419

Powell, G. N., Greenhaus, J. H., Allen, T. D., & Johnson, R. E. (2019). Introduction to special topic forum: Advancing and expanding work-life theory from multiple perspectives. *Academy of Management Review, 44*(1), 54-71.

Pradhan, G. (2016). Conceptualising work-life balance. https://tinyurl.com/55ez9m8f

Quartey, S. H. (2025). Career development experiences of policewomen: Insights from Ghana. *Career Development International, 30*(1), 75-90. https://doi.org/10.1108/CDI-04-2024-0138

Quick, K. M., & Wolff, K. T. (2025). Mass exodus? Police officer turnover intention and organizational commitment in New York City. *Policing: An International Journal*, *48*(5), 897-922. https://doi.org/10.1108/PIJPSM-06-2024-0097

Rahmawati, S. W. (2013). Employee resiliencies and job satisfaction. *Journal of Educational, Health and Community Psychology, 2*(1), 30-37.

Rashmi, K., & Kataria, A. (2022). Work-life balance: A systematic literature review and bibliometric analysis. *International Journal of Sociology and Social Policy, 42*(11/12), 1028-1065. https://doi.org/10.1108/IJSSP-06-2021-0145

Rathi, N., & Barath, M. (2013). Work-family conflict and job and family satisfaction: Moderating effect of social support among police personnel. *Equality, Diversity and Inclusion, 32*(4), 438-454. https://doi.org/10.1108/EDI-10-2012-0092

Rincy, V. M., & Panchanatham, N. (2014). Work-life balance: A short review of theoretical and contemporary concepts. *Continental Journal of Social Sciences, 7*(1), 1-24. https://doi.org/10.5707/cjsocsci.2014.7.1.1.24

Rook, C., Smith, L., Johnstone, J., López Sánchez, G. F., Díaz Suárez, A., & Roberts, J. (2018). Reconceptualising workplace resilience: A cross-disciplinary perspective. *Anales de Psicología, 34*.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68-78. https://doi.org/10.1037/0003-066X.55.1.68

Rynes, S. L., Gerhart, B., & Minette, K. A. (2004). The importance of pay in employee motivation: Discrepancies between what people say and what they do. *Human Resource Management, 43*, 381-394.

Salanova, M., Bakker, A. B., & Llorens, S. (2010). Flow at work: Evidence for the construct validity of a model of positive job-related state. *Journal of Vocational Behavior, 75*(2), 147-157.

Sandhya, D. S. (2024). A conceptual framework for the work-life balance of police officers: A post-COVID-19 perspective. *Cogent Business and Management, 11*(1). https://doi.org/10.1080/23311975.2024.2304429

Santiago, P. H., Smithers, L. G., Roberts, R., & Jamieson, L. (2023). Psychometric properties of the social support scale in two Aboriginal samples. *PLOS ONE, 18*(1). https://doi.org/10.1371/journal.pone.0279954

Shimazu, A., & Shimazu, M. (2004). Job control and social support as coping resources in job satisfaction. *Psychological Reports, 94*(2), 449-456. https://doi.org/10.2466/pr0.94.2.449-456

Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., & Bernard, J. (2008). The brief resilience scale: Assessing the ability to bounce back. *International Journal of Behavioral Medicine, 15*(3), 194-200. https://doi.org/10.1080/10705500802222972

Soomro, A. A., Breitenecker, R. J., & Shah, S. A. (2018). Relation of work-life balance, work-family conflict, and family-work conflict with employee performance: Moderating role of job satisfaction. *South Asian Journal of Business Studies, 7*(1), 129-146. https://doi.org/10.1108/SAJBS-02-2017-0018

Srivastava, S., & Madan, P. (2020). The relationship between resilience and career satisfaction: Trust, political skills, and organizational identification as moderators. *Australian Journal of Career Development, 29*(1), 44-53. https://doi.org/10.1177/1038416219886317

Staines, G. L. (1980). Spillover versus compensation: A review of the literature on the relationship between work and nonwork.

Human Relations, 33(2), 111-129. https://doi.org/10.1177/001872678003300203

Stajkovic, A. D., & Luthans, F. (1998). Self-efficacy and work-related performance: A meta-analysis. *Psychological Bulletin, 124*(2), 240-261. https://doi.org/10.1037/0033-2909.124.2.240

Stewart, D. W., Gabriele, J. M., & Fisher, E. B. (2012). Directive support, nondirective support, and health behaviors in a community sample. *Journal of Behavioral Medicine, 35*, 492-499. https://doi.org/10.1007/s10865-011-9377-x

Susanto, P., Hoque, M. E., Jannat, T., Emely, B., Zona, M. A., & Islam, M. A. (2022). Work-life balance, job satisfaction, and job performance of SMEs employees. *Frontiers in Psychology, 13*. https://doi.org/10.3389/fpsyg.2022.906876

Tang, S. F., Siu, O. L., & Cheung, F. (2014). A study of work-family enrichment among Chinese employees. *Applied Psychology: Health and Well-Being, 6*(2), 213-231.

Thilagavathy, S., & Geetha, S. N. (2023). Work-life balance: A systematic review. *Vilakshan - XIMB Journal of Management, 20*(2), 258-276. https://doi.org/10.1108/xjm-10-2020-0186

van der Vegt, G. S., Bunderson, J. S., & Kuipers, B. (2010). Why turnover matters in self-managing work teams. *Journal of Management, 36*, 1168-1191. https://doi.org/10.1177/0149206309344117

Van Gelderen, B. R., Konijn, E. A., & Bakker, A. B. (2017). Emotional labor among police officers: A diary study. *Journal of Criminal Justice, 51*, 64-73.

Viegas, V., & Henriques, J. (2020). Job stress and work-family conflict as correlates of job satisfaction among police officials. *Journal of Police and Criminal Psychology, 36*(2), 227-235. https://doi.org/10.1007/s11896-020-09388-w

Wang, C.-M., Qu, H.-Y., & Xu, H.-M. (2015). Relationship between social support and self-efficacy in women psychiatrists. *Chinese Nursing Research, 2*(4), 103-106. https://doi.org/10.1016/j.cnre.2015.10.002

Wang, L., Tao, H., Bowers, B. J., Brown, R., & Zhang, Y. (2018). Influence of social support and self-efficacy on resilience of early career registered nurses. *Western Journal of Nursing Research, 40*(5), 648-664. https://doi.org/10.1177/0193945916685712

Wayne, J. H., Grzywacz, J. G., Carlson, D. S., & Kacmar, K. M. (2006). Work-family facilitation: A theoretical explanation and model of primary antecedents and consequences. *Human Resource Management Review, 16*(1), 63-76.

Wills, T. A. (1991). Social support. In E. A. Blechman & K. D. Brownell (Eds.), *Behavioral medicine and women: A comprehensive handbook* (pp. 118-128). Guilford Press.

Wu, N., Ding, F., Zhang, R., Cai, Y., & Zhang, H. (2022). The relationship between perceived social support and life satisfaction. *International Journal of Environmental Research and Public Health, 19*. https://doi.org/10.3390/ijerph192416646

Wu, S., Zhou, S., Yu, X., Chen, W., Zheng, W., Huang, M., & Zhang, K. (2020). Association between social support and job satisfaction among mainland Chinese ethnic minority kindergarten teachers. *Frontiers in Psychology, 11*. https://doi.org/10.3389/fpsyg.2020.581397

Xanthopoulou, D., Bakker, A. B., Demerouti, E., & Schaufeli, W. B. (2007). The role of personal resources in the job demands-resources model. *International Journal of Stress Management,*

14(2), 121-141. https://doi.org/10.1037/1072-5245.14.2.121

Xie, F., Wu, X., Deng, C., Li, X., & Yi, Z. (2024). How social support and resilience impact mental health. *Heliyon, 10*(11). https://doi.org/10.1016/j.heliyon.2024.e31783

Yadav, M., Naim, M. F., Poluru, N. V., Joshi, Y., & Srivastava, A. P. (2024). The impact of LMX and job stress on service quality of police personnel. *FIIB Business Review*. https://doi.org/10.1177/23197145241244596

Yang, C., Xia, M., Han, M., & Liang, Y. (2018). Social support and resilience as mediators between stress and life satisfaction. *Frontiers in Psychiatry, 9*, Article 436. https://doi.org/10.3389/fpsyt.2018.00436

Zhang, L., Lin, Y., & Wan, F. (2015). Social support and job satisfaction: Elaborating the mediating role of work-family interface. *Current Psychology, 34*, 781-790.https://doi.org/10.1007/s12144-014-9290-x

DHARANA
International Journal of Business

INFORMATICS JOURNALS

DOI: 10.18311/DBIJB/v17_i1_2026_03

ISSN: 0974-0082 | Vol 17(1), 2026 | pp. 38–71

Transformational Leadership and Sustainable Innovation: Psychological Pathways and Organisational Outcomes

S. Sathyanarayana[1] Hema Harsha[2] and B. V. Pushpa[3]

[1]Professor, MP Birla Institute of Management, Race Course road, Bengaluru,-560001, Karnataka, India; principal@mpbim.com

[2]Associate Professor, M P Birla Institute of Management, Race Course road, Bengaluru,-560001, Karnataka, India; hemaharsha@mpbim.com

[3]Associate Professor, M P Birla Institute of Management, Race Course road, Bengaluru,-560001, Karnataka, India; pushpabv@mpbim.com

Abstract

Aims and Objectives: The study aims to examine the multidimensional nature of Transformational Leadership (TLT) and its cascading effects on psychological, behavioural, and organisational outcomes. Specifically, it seeks to investigate the mediating and moderating mechanisms through which leadership influences innovative behaviour, performance, and retention-related outcomes. **Research Design and Key Findings:** The study adopted a quantitative research design using survey methodology and Structural Equation Modelling (SEM), complemented by PROCESS Model 14 to test Moderated mediation effects. The findings indicate that transformational leadership significantly enhances psychological empowerment and innovative behaviour, with perceived organisational support strengthening the indirect effects. The results further confirm that psychological and behavioural mechanisms collectively contribute to firm-level outcomes. **Managerial Implications:** The findings highlight the importance of fostering transformational leadership behaviours to cultivate empowerment, innovation, and employee retention. Organisations should strengthen perceived organisational support systems to amplify the positive effects of leadership on innovation and performance. Investing in leadership development and supportive organisational climates can yield sustainable competitive advantages. **Originality and Contribution:** This study contributes to the leadership literature by integrating dimensional, psychological, behavioural, and performance outcomes into a single comprehensive model. Employing a Moderated mediation framework, it advances understanding of the conditional mechanisms through which transformational leadership drives innovation and firm performance.

Keywords: Firm Performance, Innovative Behaviour, Knowledge Sharing Intention, Team Efficacy, Transformational Leadership

JEL Classification Code: M12, O31, O32, Q56, D23

Article Received on: 24-11-2025 Revised on: 06-01-2026 Accepted on: 20-03-2026

Cite this article as: Sathyanarayana, S., Harsha, H. & Pushpa B. V., (2026). Transformational Leadership and Sustainable Innovation: Psychological Pathways and Organisational Outcomes. *DHARANA - International Journal of Business, 17*(1), 38-71. https://doi.org/10.18311/DBIJB/v17_i1_2026_03

1. Introduction

In today's knowledge-driven economy, innovation has become a central determinant of organisational competitiveness and long-term sustainability. Organisations increasingly depend on employees' capacity to generate, promote, and implement novel ideas that enhance processes, products, and services (Anderson *et al*., 2014). Within this context, leadership plays a pivotal role in shaping the psychological and structural conditions that foster innovative behaviour. Among various leadership approaches, transformational leadership has emerged as one of the most influential frameworks for understanding how leaders inspire followers to exceed expectations and embrace change (Bass, 1985; Bass & Avolio, 1994). Transformational leaders articulate a compelling vision, intellectually stimulate employees, provide individualised consideration, and serve as role models. Prior research consistently links transformational leadership to creativity and innovation (Gumusluoglu & Ilsev, 2009; Wang *et al*., 2011). However, while the direct relationship between transformational leadership and innovative behaviour is well established, the underlying psychological and contextual mechanisms through which this influence unfolds remain insufficiently integrated. Scholars have emphasised psychological empowerment as a key motivational pathway (Spreitzer, 1995; Zhang & Bartol, 2010), yet the boundary conditions under which empowerment strengthens or weakens innovation are less clearly understood.

A critical issue confronting contemporary organisations is not merely how to stimulate innovation, but how to sustain innovative work behaviour over time and translate it into tangible organisational outcomes such as firm performance, organisational commitment, and employee retention. Despite extensive research on leadership and innovation, few studies have simultaneously examined transformational leadership, psychological empowerment, perceived organisational support, knowledge sharing, self-efficacy, sustainable innovative work behaviour, and downstream organisational outcomes within a unified structural framework. Moreover, limited empirical attention has been given to Moderated mediation mechanisms that clarify how contextual support systems influence the empowerment-innovation linkage (Hayes, 2018). Accordingly, the present study addresses three core gaps. First, it integrates psychological (empowerment, self-efficacy), relational (identification, shared values), and contextual (perceived organisational support) mechanisms into a comprehensive model linking transformational leadership to innovative and sustainable outcomes. Second, it examines a Moderated mediation structure to determine whether perceived organisational support conditions the indirect effect of transformational leadership on innovative behaviour as depicted in Figure 2. Third, it extends prior research by tracing innovation's cascading impact on

organisational commitment, organisational citizenship behaviour, firm performance, and intention to stay. By offering a multidimensional and process-oriented explanation of leadership-driven innovation, this study contributes to both leadership theory and innovation research. It advances understanding of how internal psychological resources and external organisational support jointly shape employee behaviour and long-term organisational sustainability.

The remainder of this paper is structured as follows. The next section reviews the relevant literature and develops the study hypotheses. This is followed by a detailed description of the research methodology, including sample characteristics, measurement instruments, and analytical procedures. Subsequently, the results of the structural model and Moderated mediation analyses are presented. The paper concludes with a discussion of theoretical contributions, managerial implications, research limitations, and directions for future research.

2. Literature Review

Transformational leadership theory (Bass, 1985; Bass & Avolio, 1994) provides the primary foundation for understanding how leaders influence innovative behaviour. Transformational leaders articulate a compelling vision, provide intellectual stimulation, demonstrate individualised consideration, and serve as role models. Unlike transactional leadership, which emphasises exchanges and rewards, transformational leadership inspires followers to transcend self-interest and pursue collective goals. Empirical evidence consistently links transformational leadership with creativity and innovation (Gumusluoglu & Ilsev, 2009; Wang *et al.*, 2011), yet the psychological and contextual mechanisms underlying this relationship require further integration. Psychological empowerment represents a key motivational pathway. Rooted in intrinsic motivation theory (Deci & Ryan, 1985) and conceptualised by Spreitzer (1995), empowerment reflects employees' perceptions of meaning, competence, autonomy, and impact. Transformational leaders enhance these perceptions by fostering trust, confidence, and participation. Self-determination theory further suggests that when autonomy and competence needs are satisfied, individuals are more likely to engage in proactive and innovative behaviours (Ryan & Deci, 2000). Complementing this perspective, social cognitive theory (Bandura, 1997) highlights the importance of self-efficacy. By modelling confidence and reframing challenges, transformational leaders strengthen followers' efficacy beliefs, which promote persistence and creative problem-solving (Chen & Bliese, 2002).

Relational and contextual dynamics further shape innovation. Social exchange theory (Blau, 1964) explains how supportive leadership and organisational environments encourage reciprocity through discretionary behaviours such as knowledge sharing and innovation. Perceived organisational support reinforces this exchange relationship (Eisenberger *et al.*, 2001). However, conservation of resources theory (Hobfoll, 1989) suggests that contextual resources may substitute for or interact with psychological resources, providing theoretical grounding for examining Moderated mediation effects. From a knowledge-based perspective (Grant, 1996), innovation depends on effective knowledge integration. Transformational

leadership fosters trust and shared values that promote knowledge sharing (Bryant, 2003), thereby strengthening innovative capacity. Finally, organisational commitment theory (Meyer & Allen, 1997) and research on citizenship behaviour (Organ, 1988) explain how innovation-related experiences translate into broader organisational outcomes, including performance and retention (Janssen, 2000; Anderson *et al.*, 2014). Collectively, these theoretical perspectives suggest that transformational leadership activates psychological empowerment, strengthens efficacy beliefs, enhances knowledge sharing, and fosters commitment mechanisms that ultimately drive innovative behaviour and sustainable organisational outcomes. Building on this integrated framework, the following section develops hypotheses of the study.

2.1 Four Dimensions of Transformational Leadership

Transformational Leadership (TLT) is conceptualised as a multidimensional construct encompassing idealised influence, inspirational motivation, intellectual stimulation, and individualised consideration (Bass, 1985; Bass & Avolio, 1994). These dimensions operate collectively to elevate followers' motivation, align values, and foster performance beyond transactional exchanges. Rather than isolated behaviours, they represent interdependent mechanisms through which transformational leaders shape follower attitudes and outcomes.

Idealised Influence (IFT) reflects leaders' ethical conduct, credibility, and role-modelling behaviour. By demonstrating integrity and commitment to shared values, leaders earn admiration and trust, forming the moral foundation of transformational leadership (Judge & Piccolo, 2004). Inspirational Motivation (IMT) refers to leaders' ability to articulate an inspiring vision and instil optimism, thereby enhancing intrinsic motivation and collective commitment (Shamir *et al.*, 1993). Intellectual Stimulation (IST) captures leaders' encouragement of creativity and critical thinking, enabling followers to challenge conventional assumptions and engage in innovative problem-solving (Bass, 1985). Individualised Consideration (ICT) involves personalised mentoring and developmental support, strengthening leader–follower relationships and fostering growth (Bass & Avolio, 1994). Together, these four dimensions represent the behavioural core of transformational leadership. Each contributes uniquely through ethical modelling, inspirational communication, cognitive activation, and individualised development, yet collectively they form the higher-order construct of TLT. Based on the above arguments, the researchers have posited the following hypothesis:

H1a, H1b, H1c, and H1d: The dimensions of transformational leadership, like IFT, IMT, IST, and ICT, are positively associated with TLT.

2.2 Transformational Leadership and Psychological Safety, Identification with Leaders, Shared Vision, and Self-Efficacy

TLT represents a value-based and motivational leadership approach that shapes followers' psychological states and collective orientations (Bass, 1985; Bass & Avolio, 1994; Burns,

1978). Beyond performance outcomes, transformational leaders influence how followers perceive safety, identity, shared purpose, and personal capability (Avolio, Walumbwa, & Weber, 2009; Wang *et al*., 2011). Drawing on social identity theory, social cognitive theory, and positive organisational scholarship, TLT can be theoretically linked to Psychological Safety (PST), Identification with Leader (IWLT), Shared Vision (SVT), and Self-Efficacy (SFT). First, TLT fosters Psychological Safety (PST) by creating climates characterised by trust, openness, and supportive interpersonal exchange. Leaders who encourage voice, tolerate mistakes, and model respect reduce fear of negative evaluation (Edmondson, 1999; Detert & Burris, 2007). Transformational behaviours, particularly intellectual stimulation and individualised consideration, have been empirically associated with enhanced psychological safety and team learning (Kark & Carmeli, 2009; Nembhard & Edmondson, 2006). Second, TLT strengthens IWLT. Through idealised influence and value congruence, followers internalise the leader's vision and integrate it into their self-concept (Kark *et al*., 2003). Social identity theory suggests that charismatic leadership enhances relational and collective identification (Shamir *et al*., 1993; van Knippenberg, van Knippenberg, De Cremer, & Hogg, 2004). Empirical studies confirm that transformational leadership significantly predicts follower identification and commitment (Wang *et al*., 2011). Third, TLT cultivates Shared Vision (SVT) by articulating an inspiring and meaningful future. Vision communication aligns individual and organisational goals, fostering collective efficacy and strategic cohesion (Bass & Riggio, 2006). Research indicates that inspirational motivation enhances shared understanding and collective commitment across organisational levels (Kirkpatrick & Locke, 1996; Pearce & Ensley, 2004). Finally, TLT enhances Self-Efficacy (SFT). Drawing from social cognitive theory, leaders influence followers' efficacy beliefs through mastery experiences, verbal persuasion, and confidence signalling (Bandura, 1997). Transformational leaders who provide intellectual stimulation and developmental support significantly strengthen followers' performance-related self-efficacy (McColl-Kennedy & Anderson, 2002; Walumbwa, Avolio, & Zhu, 2008). Taken together, transformational leadership operates through psychological, relational, and motivational mechanisms that elevate follower functioning beyond transactional exchange. Based on the above arguments, the researchers have posited the following hypothesis:

H2a, H2b, H2c, and H2d: TLT is positively associated with follower outcomes, such as PST, IWLT, SVT, and SFT.

2.3 Self- Efficacy with Team Efficacy

SFT refers to an individual's belief in their capability to perform specific tasks (Bandura, 1997) successfully. When individuals with strong self-efficacy interact within collaborative settings, their confidence, persistence, and problem-solving orientation can extend beyond personal performance and influence collective functioning. Through processes such as social modelling, verbal persuasion, and mastery experiences, individual efficacy beliefs contribute to the development of Team Efficacy, defined as a shared belief among team members regarding their collective capability to achieve goals (Bandura, 2000; Gully,

Incalcaterra, Joshi, & Beaubien, 2002). High self-efficacy individuals tend to communicate confidence, take initiative, and support peers, thereby strengthening collective confidence and performance expectations. Empirical research suggests that individual-level efficacy beliefs aggregate and interact to shape team-level efficacy perceptions, particularly in interdependent work contexts (Chen, Gully, & Eden, 2001). Accordingly, the researchers posit the following hypothesis:

H5: SFT is positively associated with TFT.

2.4 Organisational Commitment with Sustainable Innovative Work Behaviour

Sustainable Innovative Work Behaviour (SIWB) reflects employees' continuous engagement in generating, promoting, and implementing novel ideas that contribute to long-term organisational sustainability (Janssen, 2000; Scott & Bruce, 1994). Such sustained innovation requires not only creativity but also persistence and emotional investment. Organisational Commitment, particularly affective commitment, captures employees' emotional attachment and identification with the organisation (Meyer & Allen, 1991). From a social exchange perspective (Blau, 1964), employees who feel strongly committed are more likely to reciprocate through proactive and future-oriented behaviours that benefit the organisation. Empirical evidence suggests that committed employees are more willing to invest sustained effort, embrace change, and engage in discretionary innovation activities (Meyer *et al*., 2002). Accordingly, the researchers posit the following hypothesis:

H4: Organisational Commitment (OCT) is positively associated with Sustainable Innovative Work Behaviour (SIWB).

2.5 Team Efficacy with Firm Performance and Knowledge Sharing Intention with Firm Performance

Team Efficacy and Knowledge Sharing Intention are widely recognised as critical collective drivers of Firm Performance. Team Efficacy reflects a shared belief among team members in their collective capability to organise and execute actions required to achieve desired outcomes (Bandura, 2000). When teams possess strong collective confidence, they demonstrate greater coordination, persistence, and adaptive problem-solving, which translates into higher productivity and goal attainment. Empirical evidence shows that team efficacy is positively related to team effectiveness and organisational performance outcomes (Gully *et al*., 2002; Tasa, Taggar, & Seijts, 2007). Similarly, Knowledge Sharing Intention refers to employees' willingness to share information, expertise, and insights with colleagues (Bock *et al*., 2005). In knowledge-intensive environments, performance increasingly depends on the effective exchange and integration of knowledge resources. Drawing from the knowledge-based view of the firm (Grant, 1996), organisations that foster knowledge sharing enhance innovation, decision quality, and operational efficiency. Studies consistently demonstrate that knowledge-sharing behaviours positively influence organisational innovation capability and overall firm performance (Wang & Wang, 2012; Cabrera & Cabrera, 2005).

Collectively, team efficacy strengthens coordinated effort and collective execution, while knowledge sharing intention enhances intellectual capital utilisation. Both mechanisms contribute to improved strategic outcomes, competitive advantage, and sustained firm performance. Based on these arguments, the researchers posit the following hypotheses:

H6: Team Efficacy (TFT) is positively associated with Firm Performance (FPT).

H7: Knowledge Sharing Intention is positively associated with Firm Performance (FPT).

2.6 Shared Vision with Innovative Behaviour

Shared Vision (SV) reflects a collectively understood and emotionally endorsed image of the organisation's future that aligns individual aspirations with organisational goals (Bass & Riggio, 2006). When employees internalise a shared vision, they develop a sense of purpose and direction that transcends routine task execution. From a motivational perspective, shared vision enhances intrinsic motivation and goal commitment, both of which are essential drivers of innovative behaviour (Shamir *et al.*, 1993). Innovation often involves uncertainty and risk; a clearly articulated and collectively supported vision reduces ambiguity and encourages employees to invest effort in creative idea generation and implementation.

Drawing on goal-setting theory and social identity theory, shared vision strengthens collective focus and fosters psychological ownership, thereby promoting proactive and innovation-oriented actions (Kirkpatrick & Locke, 1996; van Knippenberg *et al.*, 2004). Empirical research suggests that vision clarity and alignment significantly enhance creativity and innovative work behaviours by fostering commitment and strategic coherence (Pearce & Ensley, 2004; Wang *et al.*, 2011). When employees perceive that their innovative contributions align with a broader organisational purpose, they are more likely to sustain innovative efforts over time. Accordingly, the researchers posit the following hypothesis:

H8: Shared Vision is positively associated with Innovative Behaviour.

2.7 Organisational Outcomes

Intention to Stay (ITS) reflects an employee's conscious and deliberate willingness to remain with an organisation over time, serving as a key indicator of retention and workforce stability. OCT, particularly affective commitment, has consistently been identified as one of the strongest predictors of intention to stay, as emotionally attached employees are more likely to maintain long-term organisational membership (Meyer & Allen, 1991; Meyer *et al.*, 2002). Similarly, Organisational Citizenship Behaviour (OCB), which involves discretionary and prosocial behaviours that support organisational functioning, is often exhibited by employees who feel psychologically connected to the organisation and therefore demonstrate lower turnover intentions (Organ, 1988; Podsakoff *et al.*, 2009). Employees who voluntarily go beyond formal role requirements typically exhibit stronger attachment and loyalty, reinforcing their intention to remain. Firm Performance also plays a critical role in shaping employees' intention to stay. When organisations demonstrate strong performance outcomes such as growth, profitability, and strategic success, employees perceive stability, career prospects, and organisational prestige, all

of which enhance retention intentions (Huselid, 1995; Shaw, Duffy, Johnson, & Lockhart, 2005). High-performing firms often provide better rewards, developmental opportunities, and job security, thereby strengthening employees' desire to continue their association. Collectively, attitudinal attachment (commitment), discretionary contribution (OCB), and perceived organisational success (firm performance) function as reinforcing mechanisms that enhance employees' intention to stay. Based on these arguments, the researchers posit the following hypotheses:

H9a: Firm Performance is positively associated with Intention to Stay.

H9b: Organisational Commitment is positively associated with Intention to Stay.

H9c: Organisational Citizenship Behaviour is positively associated with Intention to Stay.

2.7.1 Moderated Mediation

TLT has consistently been associated with enhanced Employee Innovative Behaviour (EIB), as transformational leaders articulate a compelling vision, stimulate intellectual curiosity, and encourage autonomy (Bass, 1985; Wang *et al.*, 2011). By fostering intrinsic motivation and challenging existing assumptions, TLT creates a context conducive to idea generation and implementation (Gumusluoglu & Ilsev, 2009). Thus, leadership serves as a foundational driver of innovative work behaviour. However, the mechanism through which TLT translates into innovation can be better understood through Psychological Empowerment (PEP). Psychological empowerment reflects employees' perceptions of meaning, competence, self-determination, and impact in their work roles (Spreitzer, 1995). Transformational leaders enhance these cognitions by providing autonomy, expressing confidence in followers' abilities, and linking tasks to broader organisational goals (Avolio *et al.*, 2004). Empowered employees are more likely to engage in proactive and innovative behaviours because they perceive greater control and capability (Zhang & Bartol, 2010). Hence, psychological empowerment functions as a mediating psychological mechanism between leadership and innovation. At the same time, the effectiveness of empowerment in fostering innovation may depend on contextual resources, particularly Perceived Organisational Support (POS). POS reflects employees' beliefs that the organisation values their contributions and cares about their well-being (Eisenberger *et al.*, 1986). Drawing from social exchange theory, when employees perceive high organisational support, they are more likely to reciprocate through enhanced performance and innovation (Rhoades & Eisenberger, 2002). High POS strengthens the positive impact of empowerment on innovative behaviour by reinforcing employees' confidence that their innovative efforts will be recognised and supported. Conversely, low POS may weaken this relationship, as employees may hesitate to take risks despite feeling empowered. Accordingly, this framework in Fig2 suggests both mediation and moderation effects, forming a conditional indirect (Moderated mediation) model.

2.7.2 Direct Effect

H1: Transformational Leadership (TLT) is positively associated with Employee Innovative Behaviour (EIB).

2.7.3 Mediation Effect

H2: Transformational Leadership (TLT) is positively associated with Psychological Empowerment (PEP).

H3: Psychological Empowerment (PEP) is positively associated with Employee Innovative Behaviour (EIB).

H4: Psychological Empowerment (PEP) mediates the relationship between Transformational Leadership (TLT) and Employee Innovative Behaviour (EIB).

2.7.4 Moderation Effect

H5: Perceived Organisational Support (POS) moderates the relationship between Psychological Empowerment (PEP) and Employee Innovative Behaviour (EIB), such that the relationship is stronger when POS is high.

2.7.5 Moderated Mediation Effect

H6: The indirect effect of Transformational Leadership (TLT) on Employee Innovative Behaviour (EIB) through Psychological Empowerment (PEP) is conditional upon Perceived Organisational Support (POS), such that the mediated relationship is stronger at higher levels of POS.

3. Research Design

Drawing on the integrated conceptual framework and the gaps identified in prior literature, particularly the need to examine transformational leadership as a higher-order construct and its cascading psychological and behavioural outcomes, the following research questions are proposed. These questions capture the full structural model, including dimensional, relational, psychological, and behavioural linkages.

RQ1: How do the dimensions of transformational leadership, IFT, IMT, IST, and ICT collectively contribute to the formation of TLT as a higher-order construct?

RQ2: How does TLT influence key follower psychological outcomes, namely PST, IWLT, SVT, and SFT?

RQ3: How do these follower-level psychological mechanisms (PST, IWLT, SVT, and SFT) translate into behavioural and organisational outcomes such as SIWB, OCB, Team Efficacy, Knowledge Sharing Intention, Firm Performance, and Intention to Stay?

RQ4: To what extent do psychological and contextual mechanisms (e.g., Psychological Empowerment and Perceived Organisational Support) mediate or condition the relationship between TLT and employee innovative and performance-related outcomes?

Together, these research questions provide a comprehensive inquiry into the structural, psychological, behavioural, and conditional pathways embedded within the proposed model.

The researchers employed a structured questionnaire using a five-point Likert scale, where 1 represented the lowest level of agreement, and 5 represented the highest. The instrument was pre-tested to ensure clarity, reliability, and content validity before large-scale administration (Sathyanarayana *et al.*, 2024).

The survey was distributed to 1,514 respondents, of which 1,312 completed questionnaires were received, yielding a response rate of 86.66%. After data screening for missing values, outliers, and response consistency, 1,127 usable responses were retained for the final analysis, representing 74.44% of the total distributed questionnaires and 85.90% of the returned responses.

The constructs included in the final model as shown in Fig1 were: IFT, IMT, IST, ICT, TLT, PST, IWLT, SVT, KST, SIWT, SFT, OCT, OCB, and FPT. Measurement items for these constructs were adapted from well-established and validated scales to ensure construct validity and reliability. Specifically, transformational leadership dimensions were adopted from the Multifactor Leadership Questionnaire (Bass & Avolio, 1995); psychological empowerment and self-efficacy scales were derived from Spreitzer (1995) and Bandura (1997); psychological safety from Edmondson (1999); identification constructs from Kark *et al.* (2003); knowledge sharing intention from Bock *et al.* (2005); innovative work behaviour from Janssen (2000); organisational commitment from Meyer and Allen (1991); OCB from Podsakoff *et al.* (2000); and firm performance measures were adapted from established strategic management research (Venkatraman & Ramanujam, 1986). The use of validated instruments enhances measurement rigour and supports the robustness of the empirical analysis.

The study employed a simple random sampling technique, ensuring that each member of the target population had an equal probability of selection, thereby reducing selection bias and enhancing the representativeness of the sample (Creswell, 2014).

Before hypothesis testing, the collected data were examined for the fundamental assumptions of regression analysis. These included tests of normality (skewness and kurtosis), linearity, homoscedasticity, independence of errors (Durbin–Watson statistic), and absence of multicollinearity (Variance Inflation Factor and tolerance values) (Hair *et al.*, 2019; Tabachnick & Fidell, 2013; Sathyanarayana S., 2026). The results indicated that the data met acceptable threshold values, confirming suitability for multivariate analysis.

Reliability of the constructs was assessed using Cronbach's alpha, where values above 0.70 indicate acceptable internal consistency (Nunnally & Bernstein, 1994). In addition, Composite Reliability (CR) was computed to provide a more robust estimate of construct reliability within a Structural Equation Modelling (SEM) framework (Hair *et al.*, 2019). All constructs demonstrated reliability values exceeding recommended thresholds, confirming measurement consistency.

To establish construct validity, Confirmatory Factor Analysis (CFA) was conducted using SEM procedures. Convergent validity was assessed through factor loadings (>0.60), Average Variance Extracted (AVE >0.50), and CR (>0.70), while discriminant validity was evaluated using the Fornell–Larcker criterion (Fornell & Larcker, 1981). Model fit indices such as CFI, TLI, RMSEA, and SRMR were examined to ensure adequate model fit (Hu & Bentler, 1999).

Given the self-reported nature of the data, Common Method Bias (CMB) was tested using Harman's single-factor test. The unrotated factor

solution revealed that the first factor accounted for 32.33% of the total variance, which is below the critical threshold of 50%, indicating that common method variance was not a serious concern (Podsakoff *et al*., 2003).

Subsequently, SEM was employed to test the hypothesised relationships among constructs, as SEM allows simultaneous estimation of multiple direct and indirect effects while accounting for measurement error (Kline, 2016). Furthermore, the Moderated mediation effect was examined using PROCESS Model 14 (Hayes, 2018), which tests conditional indirect effects where the mediator-to-outcome path is moderated. Bootstrapping procedures with bias-corrected confidence intervals were used to assess the significance of indirect and Moderated mediation effects, as recommended in contemporary mediation analysis literature (Hayes, 2018; Preacher, Rucker, & Hayes, 2007).

4. Data Analysis

Table 1 reflects the demographic profile of the respondents provides a comprehensive overview of the sample characteristics and reflects a reasonably diverse representation across gender, age, income, education, designation, and work experience. A total of 1,127 valid responses were considered for the analysis. With respect to gender distribution, the sample is moderately male-dominated. Out of the total respondents, 683 individuals, constituting 60.60 per cent, are male, while 444 respondents, accounting for 39.40 per cent, are female. Although the proportion of male respondents is higher, the representation of female participants is substantial, enabling meaningful gender-based analytical comparisons if required. In terms of age composition, the majority of respondents fall within the younger age brackets. A significant 54.21 per cent (611 respondents) are below 30 years of age, followed by 37.27 per cent (420 respondents) in the 31-35 age group. Only a small proportion of respondents are in the higher age categories, with 4.26 per cent (48 respondents) each in the 36-40 and above 40 age groups. This indicates that more than 91 per cent of the sample comprises individuals below 35 years, suggesting that the dataset predominantly captures perspectives from early- and mid-career professionals. Regarding marital status, the distribution is relatively balanced. Married respondents constitute 52.17 per cent (588 individuals), whereas unmarried respondents represent 47.83 per cent (539 individuals). The near-equal representation ensures that marital status-based behavioural or perceptual variations can be examined without significant sampling bias. Monthly Household Income (MHI) levels reveal that a substantial portion of respondents belong to lower and middle-income brackets. Nearly 46.85 per cent (528 respondents) report an income of less than ₹50,000 per month. The next largest segment, comprising 23.34 per cent (263 respondents), falls within the ₹50,001-₹1,00,000 range. Higher income brackets are comparatively less represented, with 9.58 per cent (108 respondents) earning between ₹1,00,001-₹1,50,000, 5.32 per cent (60 respondents) in the ₹1,50,001-₹2,00,000 category, and 14.91 percent (168 respondents) reporting income above ₹2,00,000. The income distribution thus suggests a concentration in the lower-to-middle income segments, which may have implications for financial behaviour or perception-based constructs in subsequent analysis. Academic qualifications indicate a highly educated sample. A majority of

Table 1. Demographic profile of the respondents

VARIABLE	CATEGORY	NO OF RESPONDENTS	PERCENT
Gender	Male	683	60.60
	Female	444	39.40
Age	<30	611	54.21
	31-35	420	37.27
	36-40	48	4.26
	>40	48	4.26
Marital Status	Married	588	52.17
	Unmarried	539	47.83
MHI	<50000	528	46.85
	50001-100000	263	23.34
	100001-150000	108	9.58
	150001-200000	60	5.32
	>200000	168	14.91
Academic Details	Degree	420	37.27
	Masters	683	60.60
	Others	24	2.13
Position	Non-management / Technical	372	33.01
	Technical Support	108	9.58
	Service	180	15.97
	Managerial	299	26.53
	Supervisory	36	3.19
	Others	132	11.71
Work Experience	<5 Years	479	42.50
	5-10 Years	540	47.91
	>10 Years	108	9.58

respondents, 60.60 per cent (683 individuals), possess a Master's degree, while 37.27 per cent (420 respondents) hold a Bachelor's degree. A small fraction, 2.13 per cent (24 respondents), fall under other educational categories. The dominance of postgraduate respondents strengthens the intellectual and professional credibility of the data, particularly for studies

Table 2. Confirmatory factor analysis results

Items	Cronbach's Alpha	Loadings	AVE		CR	SqrtAVE
IC1	0.889	0.854	0.652	0.854***	0.845	0.807
IC2		0.743		0.743***		
IC3		0.814		0.814***		
IC4		0.791		0.791***		
IC5		0.83		0.83***		
IS1	0.879	0.851	0.678	0.851***	0.839	0.823
IS2		0.835		0.835***		
IS3		0.808		0.808***		
IS4		0.786		0.786***		
IS5		0.834		0.834***		
IM1	0.911	0.887	0.629	0.887***	0.843	0.793
IM2		0.659		0.659***		
IM3		0.806		0.806***		
IM4		0.879		0.879***		
IM5		0.709		0.709***		
IF1	0.896	0.84	0.627	0.84***	0.834	0.792
IF2		0.83		0.83***		
IF3		0.842		0.842***		
IF4		0.721		0.721***		
IF5		0.716		0.716***		
TL1	0.923	0.82	0.633	0.82***	0.888	0.796
TL2		0.774		0.774***		
TL3		0.825		0.825***		
TL4		0.806		0.806***		
TL5		0.812		0.812***		
TL6		0.766		0.766***		
TL7		0.764		0.764***		

IFT: Idealised Influence; IMT: Inspirational motivation; IST: Intellectual Stimulation; IC: Individualised Consideration; TLT: Transformational Leadership.

CMIN=513.325; DF=205; P=0.000(<0.01); CMIN/DF =2.504; RMSEA = 0.032; GFI = 0.891; AGFI = 0.892; PGFI = 0.936; NFI = 0.972; IFI = 0.944; TLI = 0.931; CFI = 0.912

involving managerial perceptions or strategic decision-making constructs. The distribution of respondents by position reflects heterogeneity across organisational hierarchies. Non-management or technical roles account for 33.01 per cent (372 respondents), forming the largest category. Managerial positions represent 26.53 per cent (299 respondents), followed by service roles at 15.97 per cent (180 respondents). Technical support staff constitute 9.58 per cent (108 respondents), supervisory roles account for 3.19 per cent (36 respondents), and 11.71 per cent (132 respondents) fall under other categories. The presence of respondents across different functional and hierarchical levels enhances the robustness of perceptual and behavioural analyses. Finally, work experience data show that the majority of respondents are relatively experienced professionals. While 42.50 per cent (479 respondents) have less than five years of experience, a larger proportion, 47.91 per cent (540 respondents), possess between five and ten years of experience. Only 9.58 per cent (108 respondents) have more than ten years of experience. This indicates that nearly 58 per cent of the respondents have more than five years of professional experience, suggesting adequate industry experience to provide informed responses.

The CFA results in Table2 indicate that the measurement model demonstrates an overall acceptable to good fit with the observed data. The chi-square statistic was significant, χ^2 (205) = 513.325, $p < .01$. Although a significant chi-square traditionally suggests some discrepancy between the model and the data, it is well established in structural equation modelling literature that the chi-square test is highly sensitive to sample size and model complexity (Sathyanarayana & Mohanasundaram, 2024). Therefore, researchers typically rely on additional fit indices to evaluate model adequacy. The relative chi-square (CMIN/DF) value of 2.504 falls within the commonly accepted threshold of less than 3.00, indicating a reasonable level of model fit. More importantly, the Root Mean Square Error of Approximation (RMSEA) is 0.032, which is well below the recommended cutoff of 0.06. This suggests a very good approximation of the model to the population covariance matrix and reflects minimal residual error. Incremental fit indices further support the adequacy of the model. The Normed Fit Index (NFI = 0.972), Incremental Fit Index (IFI = 0.944), Tucker–Lewis Index (TLI = 0.931), and Comparative Fit Index (CFI = 0.912) all exceed the conventional threshold of 0.90. In particular, the NFI and IFI values approaching or exceeding 0.95 indicate strong comparative fit relative to the null model. These indices collectively suggest that the proposed factor structure substantially improves upon a baseline model with no relationships among variables. The absolute fit indices present a slightly more nuanced picture. The Goodness-of-Fit Index (GFI = 0.891) and Adjusted Goodness-of-Fit Index (AGFI = 0.892) are marginally below the traditional 0.90 benchmark. However, these indices are known to be sensitive to sample size and model complexity, and values approaching 0.90 are generally considered acceptable in applied research contexts. The Parsimony Goodness-of-Fit Index (PGFI = 0.936) indicates that the model achieves good explanatory power while maintaining parsimony. Taken together, the combination of a low RMSEA, acceptable CMIN/DF ratio, and strong incremental fit indices provides convincing evidence that the measurement model fits the data well.

Although the chi-square test is significant and GFI/AGFI fall slightly below 0.90, the overall pattern of fit statistics supports the adequacy of the factor structure. Therefore, it can be reasonably concluded that the constructs in the study demonstrate satisfactory construct validity, and the measurement model is suitable for proceeding to structural model testing. The measurement model demonstrates strong reliability and validity across all five dimensions of transformational leadership. Cronbach's alpha coefficients range from .879 to .923, indicating high internal consistency for Individualised Consideration (α = .889), Intellectual Stimulation (α = .879), Inspirational Motivation (α = .911), Idealised Influence (α = .896), and Transformational Leadership (α = .923). All values substantially exceed the recommended threshold of .70, confirming that the items within each construct consistently measure their respective latent dimensions. The standardised factor loadings for all items are statistically significant at $p < .001$ and range from .659 to .887. Specifically, Individualised Consideration items load between .743 and .854; Intellectual Stimulation between .786 and .851; Inspirational Motivation between .659 and .887; Idealised Influence between .716 and .842; and Transformational Leadership between .764 and .825. The majority of loadings exceed .70, indicating strong item reliability, while the lowest loading (.659) remains within acceptable limits for confirmatory factor analysis. Overall, the strength and consistency of the factor loadings indicate that each observed variable contributes meaningfully to its intended construct. Convergent validity is supported by Average Variance Extracted (AVE) values ranging from .627 to .678, all exceeding the recommended cutoff of .50. This indicates that each construct explains more than half of the variance in its respective indicators, demonstrating adequate shared variance between items and their latent factors. Composite Reliability (CR) values range from .834 to .888, further confirming strong internal consistency and aligning closely with Cronbach's alpha results (Sathyanarayana, S., 2026b). Overall, the pattern of reliability coefficients, significant factor loadings, adequate AVE, strong composite reliability, and satisfactory discriminant validity indicates that the measurement model is psychometrically

Table 3. Discriminant validity of the measurement model

	IC	IS	IM	IF	TL	Mean	SE	SD
IC	**0.807**	0.312	0.413	0.345	0.211	3.91	0.051	0.891
IS		**0.823**	0.194	0.279	0.432	3.98	0.034	0.698
IM			**0.793**	0.189	0.298	4.01	0.029	1.012
IF				**0.792**	0.209	4.07	0.047	0.945
TL					**0.796**	3.93	0.061	0.911

IFT: Idealised Influence; IMT: Inspirational motivation; IST: Intellectual Stimulation; IC: Individualised Consideration; TLT: Transformational Leadership.

robust. The constructs demonstrate solid internal consistency and construct validity, providing strong empirical support for proceeding to structural model analysis (Sathyanarayana & Mohanasundaram, 2024).

The discriminant validity results in Table 3 provide strong evidence that the five constructs, IC, IS, IM, IF, and TL, are empirically distinct from one another. Using the Fornell-Larcker criterion, discriminant validity is established when the square root of the AVE for each construct is greater than its correlations with other constructs. In the present results, the diagonal values (square root of AVE) range from .792 to .823, specifically IC (.807), IS (.823), IM (.793), IF (.792), and TL (.796). Each of these values is higher than the corresponding inter-construct correlations in its row and column, confirming adequate discriminant validity. The inter-construct correlations range from .189 to .432. The highest observed correlation is between IS and TL at .432, which remains well below the square root of AVE values for both constructs (.823 and .796, respectively). Similarly, the correlations between Individualised Consideration and Inspirational Motivation (.413) and between Individualised Consideration and Idealised Influence (.345) are moderate in magnitude but remain lower than their respective diagonal values. The lowest correlations appear between Inspirational Motivation and Idealised Influence (.189), indicating a clear conceptual separation between these dimensions. Overall, none of the correlations approaches problematic levels (e.g., above .85), suggesting the absence of multicollinearity concerns. Descriptive statistics further contextualise the constructs. The mean values range from 3.91 (IC) to 4.07 (IF), indicating generally high perceptions of transformational leadership dimensions among respondents. Standard errors are relatively small (ranging from .029 to .061), reflecting stable mean estimates, while standard deviations range from .698 to 1.012, suggesting moderate variability in responses. Inspirational Motivation exhibits the highest variability (SD = 1.012), whereas

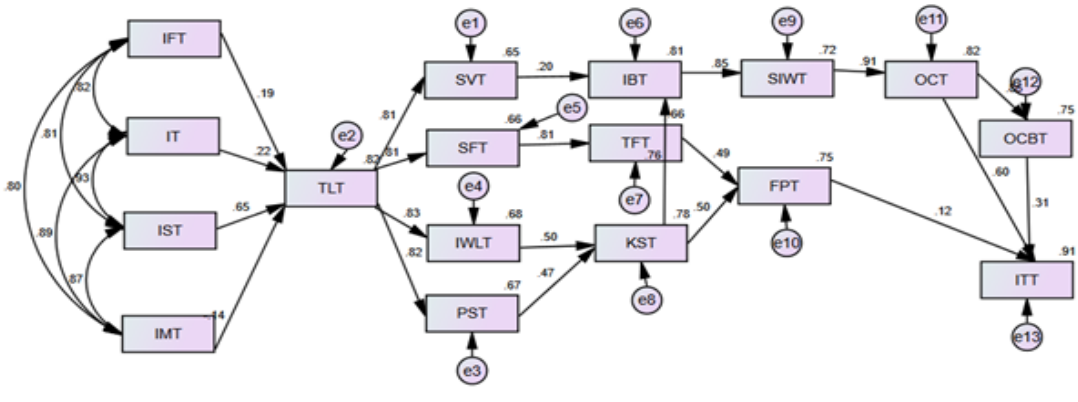


Figure 1. Graph showing the structural relationship of the final model.

Table 4. Testing of hypotheses

Path	U Coeff.	S Coeff.	S.E.	C.R.	P	Label
IFT → TLT	0.256	0.193	0.031	8.197	***	Supported
IMT → TLT	0.178	0.138	0.039	4.597	***	Supported
IST → TLT	0.797	0.647	0.044	18.231	***	Supported
ICT → TLT	0.306	0.225	0.053	5.761	***	Supported
TLT→ IWLT	0.562	0.526	0.011	49.101	***	Supported
TLT → PST	0.631	0.821	0.013	48.233	***	Supported
TLT→ SVT	0.642	0.805	0.014	45.605	***	Supported
PST→ KST	0.558	0.465	0.032	17.261	***	Supported
IWLT→KST	0.678	0.501	0.036	18.599	***	Supported
SVT→IBT	0.178	0.196	0.029	6.199	***	Supported
KST→IBT	0.6	0.762	0.024	25.126	***	Supported
TLT→SFT	0.642	0.815	0.014	47.156	***	Supported
IBT→SIWT	0.735	0.848	0.013	57.475	***	Supported
SIWT→OCT	1.127	0.907	0.015	76.033	***	Supported
SFT→TFT	0.967	0.811	0.021	46.475	***	Supported
OCT→OCB	0.809	0.864	0.014	59.933	***	Supported
TFT→FP	0.383	0.486	0.033	11.435	***	Supported
KST→FP	0.404	0.503	0.033	12.31	***	Supported
OCBT→IT	0.237	0.314	0.014	17.351	***	Supported
FPT→IT	0.088	0.118	0.014	6.257	***	Supported
OCT→IT	0.425	0.6	0.017	24.671	***	Supported

IFT: Idealised Influence; IMT: Inspirational motivation; IST: Intellectual Stimulation; ICT: Individual Consideration; TLT: Transformational Leadership; PST: Psychological Safety; IWLT: Identification with leader; SVT: Shared vision; KST: Knowledge sharing intention; SIWT: Sustainable innovative work behaviour; SFT: Self Efficacy; TFT: Team Efficacy; OCT: Organisational commitment; OCB: Organisational Citizenship Behaviour; FPT: Firm Performance. CMIN=501.774; DF=259; P0.000(<0.01); CMIN/DF =1.937; RMSEA = 0.021; GFI = 0.899; AGFI = 0.877; PGFI = 0.927; NFI = 0.962; IFI = 0.964; TLI = 0.905; CFI = 0.964

Intellectual Stimulation shows comparatively lower dispersion (SD = .698). Taken together, the comparison between the square root of AVE values and inter-construct correlations strongly supports discriminant validity. Each construct demonstrates greater shared variance with its own indicators than with other constructs in the model. These findings confirm that the chosen variables represent related yet distinct dimensions within the broader transformational leadership framework, thereby strengthening the credibility of the measurement model.

5. Analysis

The above data presented in Table 4 relates to model fit with respect to structural equation modelling (SEM) model fit assessment. These statistics help evaluate how well the model fits the observed data. CMIN/DF (Chi-Square Divided by Degrees of Freedom): The value is 1.937, which should ideally be less than 3 for a good fit. A value significantly greater than 1 may indicate a less-than-ideal fit. Root Mean Square Error of Approximation (RMSEA): The RMSEA value is 0.021, which is well below the typical threshold of 0.05, suggesting a good fit to the data. GFI (Goodness of Fit Index): The GFI is 0.899, which is close to 1. A GFI value above 0.90 is considered indicative of a good model fit. Adjusted Goodness of Fit Index (AGFI): The AGFI is 0.877, which, while slightly lower than GFI, is still relatively close to 1. An AGFI value above 0.90 is generally considered acceptable. PGFI (Parsimony Goodness of Fit Index): The PGFI is 0.927, which reflects the trade-off between model parsimony and fit. A value above 0.50 is often deemed satisfactory. NFI (Normal Fit Index): The NFI is 0.962, well above the threshold of 0.90, indicating a good fit. RFI (Relative Fit Index): The RFI is 0.903, also above the acceptable threshold of 0.90. IFI (Incremental Fit Index): The IFI is 0.964, indicating a good fit to the data. TLI (Tucker-Lewis Index): The TLI is 0.905, which is above the recommended threshold of 0.90. CFI (Comparative Fit Index): The CFI is 0.964, showing a good model fit. The model fit statistics generally suggest a good fit for your model. The RMSEA value of 0.021, which is well below 0.05, indicates a close fit between the model and the observed data. Additionally, indices like GFI, AGFI, NFI, RFI, IFI, TLI, and CFI all surpass their respective recommended thresholds, supporting the notion that the model fits the data well. Overall, the results suggest that the specified model is a good representation of the underlying relationships among the variables.

The first hypothesis tested the relationship between IFT and TLT. The analysis revealed a significant positive path coefficient (B=0.256, β = 0.193, SE=0.031, t=8.197, $p < 0.001$), indicating a strong and positive association between IFT and TLT. This suggests that higher levels of idealised influence are associated with higher levels of transformational leadership. This hypothesis is strongly supported. The second hypothesis examined the link between IMT and TLT. The analysis found a significant path coefficient (B=0.178, β = 0.138, SE=0.039, t=4.597, $p < 0.001$), indicating a direct relationship between IMT and TLT. Higher levels of Inspirational Motivation are associated with higher levels of Transformational Leadership. The third hypothesis investigated the association between IST and TLT. The analysis uncovered a significant positive path coefficient (B= 0.797, β = 0.647, SE=0.044, t=18.231, $p < 0.001$), indicating a strong positive

relationship between IST and TLT. Higher levels of Intellectual Stimulation are strongly linked to higher levels of Transformational Leadership. The fourth hypothesis explored the connection between ICT and TLT. The analysis demonstrated a significant positive path coefficient (B=0.306, β = 0.225, SE=0.053, t=5.761, p < 0.001), suggesting a strong and positive relationship between ICT and TLT. Higher levels of Individualized consideration are associated with higher levels of Transformational Leadership. The analysis revealed a significant positive path coefficient (B=0.562, β =0.526, SE=0.011, t=49.101, p < 0.001), indicating a strong and positive association between TLT and IWLT. Higher levels of transformational leadership are associated with higher levels of identification with leaders. The sixth hypothesis tested the connection between TLT and PST. The analysis demonstrated a significant positive path coefficient (B = 0.631, β = 0.821, SE=0.013, t=48.233, p < 0.001), indicating a strong and positive relationship between TLT and PST. Higher levels of transformational leadership are strongly associated with higher levels of psychological safety. The seventh hypothesis explored the relationship between TLT and SVT. The analysis found a significant positive path coefficient (B = 0.642, β = 805, SE=0.014, t=45.605, p < 0.001), indicating a strong and positive association between TLT and SVT. Higher levels of transformational leadership are strongly linked to higher levels of shared values. The eighth hypothesis examined the association between PST and KST. The analysis revealed a significant positive path coefficient (B = 0.558, β = 465, SE=0.032, t=17.261, p < 0.001), indicating a strong and positive relationship between PST and KST. Higher levels of psychological safety are associated with higher levels of knowledge sharing. The ninth hypothesis examined the relationship between IWLT and KST. The analysis revealed a significant positive path coefficient (B=0.678, β =501, SE=0.036, t=18.559, p < 0.001), indicating a strong and positive association between IWLT and KST. Higher levels of identification with leaders are associated with higher levels of knowledge sharing. The tenth hypothesis tested the connection between SVT and IBT. The analysis demonstrated a significant positive path coefficient (B = 0.178, β = 0.196, SE=0.029, t=6.199, p < 0.001), indicating a positive relationship between SVT and IBT. Higher levels of shared values are associated with higher levels of innovative behaviour. The eleventh hypothesis explored the association between KST and IBT. The analysis found a significant positive path coefficient (B = 0.6, β = 0.762, SE=0.024, t=25.126, p < 0.001), indicating a strong and positive relationship between KST and IBT. Higher levels of knowledge sharing are strongly linked to higher levels of innovative behaviour. The twelfth hypothesis examined the relationship between TLT and SFT. The analysis revealed a significant positive path coefficient (B=0.642, β = 0.815, SE=0.014, t=47.156, p < 0.001), indicating a strong and positive association between TLT and SFT. Higher levels of transformational leadership are strongly associated with higher levels of self-efficacy. The thirteenth hypothesis examined the relationship between IBT and SIWT. The analysis revealed a significant positive path coefficient (B=0.735, β = 0.848, SE=0.013, t=57.475, p < 0.001), indicating a strong and positive association between IBT and SIWT. Higher levels of innovative behaviour are strongly associated with higher levels of sustainable innovative work behaviour. The fourteenth hypothesis

tested the connection between SIWT and OCT. The analysis demonstrated a significant positive path coefficient (B=1.127, β =0.907, SE=0.015, t=76.033, p < 0.001), indicating a strong and positive relationship between SIWT and OCT. Higher levels of sustainable innovative work behaviour are strongly linked to higher levels of organisational commitment. The fifteenth hypothesis examined the association between SFT and TFT. The analysis found a significant positive path coefficient (B = 0.967, β = 0.811, SE=0.021, t=46.475, p < 0.001), indicating a strong and positive relationship between SFT and TFT. Higher levels of self-efficacy are strongly associated with higher levels of team efficacy. The sixteenth hypothesis explored the relationship between OCT and OCB. The analysis revealed a significant positive path coefficient (B= 0.809, β = 0.864, SE=0.014, t=59.933, p < 0.001), indicating a strong and positive association between OCT and OCB. Higher levels of organisational commitment are strongly linked to higher levels of organisational citizenship behaviour. The seventeenth hypothesis examined the relationship between TFT and FP. The analysis revealed a significant positive path coefficient (B= 0.383, β = 0.486, SE=0.033, t=11.483, p < 0.001), indicating a strong and positive association between TFT and FP. Higher levels of team efficacy are associated with better firm performance. The eighteenth hypothesis tested the connection between KST and FP. The analysis demonstrated a significant positive path coefficient (B=0.404, β = 0.503, SE=0.033, t=12.31, β = p < 0.001), indicating a strong and positive relationship between KST and FP. Higher levels of knowledge sharing are strongly linked to better firm performance. The nineteenth hypothesis examined the association between OCB and IT. The analysis found a significant positive path coefficient (B=0.237, β = 0.314, SE=0.014, t=17.351, p < 0.001), indicating a positive relationship between OCB and IT. Higher levels of organisational citizenship behaviour are associated with a stronger intention to stay within the organisation. The twentieth hypothesis explored the relationship between FP and IT. The analysis revealed a

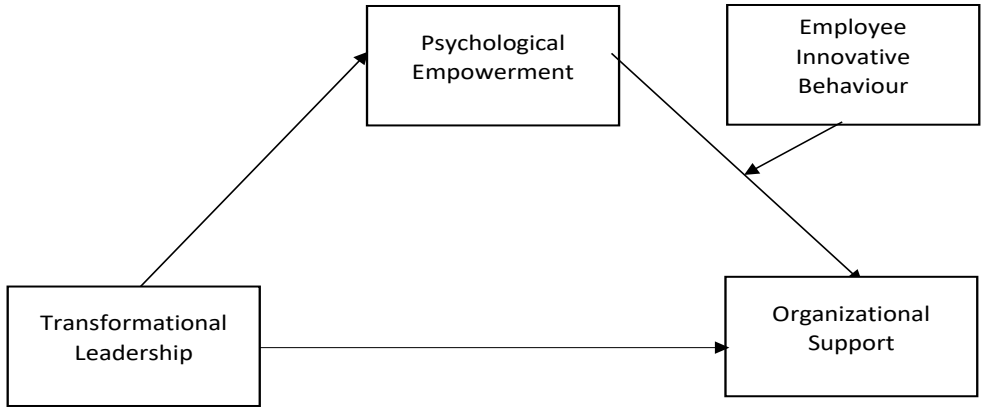


Figure 2. Mediated moderation.

significant positive path coefficient (B=0.088, β =0.188, SE=0.014, t=17.351, p < 0.001), indicating a positive relationship between FP and IT. Higher firm performance is associated with a stronger intention to stay within the organisation. The twenty-first hypothesis examined the relationship between OCT and IT. The analysis found a significant positive path coefficient (B=0.425, β = 0.6, SE=0.017, t=24.671, p < 0.001), indicating a strong and positive association between OCT and IT. Higher levels of organisational commitment are strongly linked to a stronger intention to stay within the organisation.

A Moderated mediation analysis was conducted using PROCESS Model 14 (Hayes, 2018) to examine whether PEP mediates the relationship between TLT and EIB, and whether this mediating mechanism is contingent upon POS. The sample consisted of 1,128 respondents (Sathyanarayana & Mohanasundaram, 2025).

Table 5. Model summary: Moderated mediation

	DV: Psych Emp			DV: EIB		
Path	**Coeff.**	**SE**	**LLCI (ULCI)**	**Coeff.**	**SE**	**LLCI (ULCI)**
C	1.4946	0.3655	0.7774 (2.2118)	0.4285	0.6352	-1.6748(0.8179)
X	0.811	0.0153	0.7811(0.8410)	0.2029	0.0195	0.1645 (0.2412)
M				0.4944	0.0463	0.4035 (0.5854)
W				0.2619	0.0384	0.1864 (0.3373)
M*W				-0.0062	0.0017	-0.0096 (-0.0029)
	R^2	0.7148		R^2	0.788	
		28241.48		F (4, 1123)	1043.46	

Table 6. Index of Moderated mediation

	Index	**BootSE**	**BootLLCI**	**BootULCI**
POS	-0.0051	0.0011	-0.0073	-0.0029

Table 7. Conditional effects of the focal predictor at values of the moderator

POS	**Effect**	**se**	**t**	**p**	**LLCI**	**ULCI**
11.6769	0.4215	0.0329	12.8097	0.0000	0.3569	0.4860
19.2926	0.3739	0.0286	13.0766	0.0000	0.3178	0.4300
26.9082	0.3263	0.0299	10.9276	0.0000	0.2677	0.3849

Table 5 reflects the outcome of regression analysis conducted to examine whether TLT predicts PEP. The overall model was statistically significant, $F(1, 1126) = 2821.48$, $p < .001$, explaining a substantial proportion of variance in psychological empowerment ($R^2 = .715$). This indicates that transformational leadership accounts for approximately 71.5% of the variability in employees' psychological empowerment, reflecting a very strong explanatory effect. Transformational leadership emerged as a strong and positive predictor of psychological empowerment, $b = .811$, $SE = .015$, $t(1126) = 53.12$, $p < .001$, 95% CI [.781, .841]. The confidence interval does not include zero, confirming the robustness of this effect. Substantively, this finding suggests that higher levels of transformational leadership are associated with significantly higher levels of psychological empowerment among employees. In practical terms, leaders who articulate a compelling vision, provide intellectual stimulation, and offer individualised consideration appear to enhance employees' perceptions of meaning, competence, autonomy, and impact within their roles. The magnitude of the regression coefficient (.811) indicates a strong positive relationship, implying that even incremental increases in transformational leadership are associated with meaningful increases in psychological empowerment. This result satisfies the first condition of mediation in the PROCESS Model 14 framework, demonstrating that transformational leadership significantly predicts the mediator (psychological empowerment). Given the strength and significance of this path, psychological empowerment serves as a viable psychological mechanism through which transformational leadership may influence employee innovative behaviour in subsequent analyses.

A multiple regression analysis was conducted to examine the effects of TLT, PEP, POS, and their interaction (PEP × POS) on employee innovative behaviour (EIB). The overall model was statistically significant, $F(4, 1123) = 1043.46$, $p < .001$, explaining 78.8% of the variance in innovative behaviour ($R^2 = .788$). This indicates that the set of predictors provides substantial explanatory power in understanding employee innovation.

Transformational leadership had a significant positive direct effect on employee innovative behaviour, $b = .203$, $SE = .020$, $t(1123) = 10.38$, $p < .001$, 95% CI [.165, .241]. This finding indicates that even after accounting for psychological empowerment and organisational support, transformational leadership independently contributes to higher levels of innovative behaviour. The persistence of this effect suggests partial mediation rather than full mediation. Psychological empowerment was also a strong positive predictor of innovative behaviour, $b = .494$, $SE = .046$, $t(1123) = 10.67$, $p < .001$, 95% CI [.404, .585]. Employees who feel empowered, experiencing autonomy, competence, and meaningfulness in their roles, are significantly more likely to engage in idea generation and implementation. Perceived organisational support similarly demonstrated a significant positive main effect, $b = .262$, $SE = .038$, $t(1123) = 6.81$, $p < .001$, 95% CI [.186, .337]. This indicates that employees who perceive their organisation as supportive are more inclined toward innovative behaviours, independent of leadership and empowerment effects.

Importantly, the interaction between psychological empowerment and perceived organisational support was negative and statistically significant, b = -.006, SE = .002, $t(1123)$ = -3.65, p < .001, 95% CI [-.010, -.003]. The confidence interval excludes zero, confirming a reliable moderation effect. The negative coefficient indicates that perceived organisational support weakens the positive relationship between psychological empowerment and innovative behaviour. In other words, while empowerment promotes innovation across all levels of organisational support, its influence becomes less pronounced when employees perceive high levels of support. This pattern suggests a substitution dynamic: in highly supportive organisational contexts, structural and contextual resources may compensate for individual psychological empowerment, thereby reducing its relative impact on innovative behaviour. Conversely, when perceived organisational support is low, employees rely more heavily on their internal sense of empowerment to engage in innovative actions. Taken together, these findings indicate that employee innovative behaviour is shaped by both leadership and psychological mechanisms, but the strength of these mechanisms depends on the organisational context. Transformational leadership directly enhances innovation and indirectly does so by fostering psychological empowerment. However, the empowerment innovation link is contingent upon perceived organisational support, such that empowerment plays a stronger role in less supportive environments. The results, therefore as shown in Table 6, provide evidence of a Moderated mediation structure in which contextual organisational factors shape the effectiveness of internal psychological states in driving innovative behaviour.

The interaction between PEP and POS was examined to determine whether POS moderates the relationship between PEP and EIB. The test of the highest-order unconditional interaction was statistically significant, ΔR^2 = .0025, $F(1, 1123)$ = 13.35, p < .001. This indicates that the inclusion of the interaction term (PEP × POS) significantly improved the explanatory power of the model beyond the main effects alone.

Although the increase in explained variance (0.25%) appears modest, it is statistically meaningful given the large sample size (N = 1,128) and the already high baseline R^2 of the model. In moderation analysis, particularly within well-specified models, even small changes in R^2 can reflect theoretically meaningful interaction effects. The significant interaction confirms that the strength of the relationship between psychological empowerment and innovative behaviour depends on the level of perceived organisational support.

To better understand the nature of this interaction, conditional effects of psychological empowerment on innovative behaviour were examined at low (-1 SD), mean, and high (+1 SD) levels of perceived organisational support as shown in Table7. At low levels of POS, the effect of psychological empowerment on innovative behaviour was strongest, b = .422, SE = .033, t = 12.81, p < .001, 95% CI [.357, .486]. At mean levels of POS, the effect remained positive and significant, b = .374, SE = .029, t = 13.08, p < .001, 95% CI [.318, .430]. At high levels of POS, the effect was weaker but still statistically significant, b = .326, SE = .030, t = 10.93, p < .001, 95% CI [.268, .385]. Importantly, the relationship between psychological empowerment and innovative behaviour remained positive and statistically significant across all observed levels

of perceived organisational support. However, the magnitude of this relationship systematically decreased as perceived organisational support increased.

The pattern of conditional effects reveals a negative moderation effect. Specifically, as perceived organisational support increases, the strength of the positive association between psychological empowerment and innovative behaviour declines. This suggests that psychological empowerment plays a more critical role in stimulating innovative behaviour when organisational support is relatively low. In such environments, employees appear to rely more heavily on their internal sense of autonomy, competence, and meaning to engage in innovative actions. Conversely, in highly supportive organisational contexts, the incremental contribution of empowerment becomes smaller, possibly because structural and contextual support mechanisms already facilitate innovation. Thus, perceived organisational support does not eliminate the influence of empowerment; rather, it attenuates its strength.

The significant interaction effect, combined with the systematic reduction in simple slopes across levels of POS, provides clear evidence that perceived organisational support moderates the empowerment–innovation relationship. These findings reinforce the importance of considering contextual organisational factors when examining psychological mechanisms underlying employee innovative behaviour. If you would like, I can now integrate this section seamlessly with your conditional indirect effects and index of Moderated mediation into one fully polished, journal-ready results section.

The direct effect of TLT on employee EIB, controlling for PEP, POS, and their interaction, was statistically significant, $b = .203$, $SE = .020$, $t(1123) = 10.38$, $p < .001$, 95% CI [.165, .241]. Because the confidence interval does not include zero, the direct effect is robust. This indicates that transformational leadership contributes to innovative behaviour independently of the mediating mechanism of psychological empowerment. In other words, even after accounting for empowerment and contextual support, transformational leadership still exerts a meaningful positive influence on employees' innovative actions. This pattern is consistent with partial mediation, rather than full mediation. Below is a detailed, APA-style interpretation of the direct, indirect, and Moderated mediation effects from your PROCESS Model 14 analysis.

The direct effect of TLT on EIB, controlling for PEP, POS, and their interaction, was statistically significant, $b = .203$, $SE = .020$, $t(1123) = 10.38$, $p < .001$, 95% CI [.165, .241]. Because the confidence interval does not include zero, the direct effect is robust. This indicates that transformational leadership contributes to innovative behaviour independently of the mediating mechanism of psychological empowerment. In other words, even after accounting for empowerment and contextual support, transformational leadership still exerts a meaningful positive influence on employees' innovative actions. This pattern is consistent with partial mediation, rather than full mediation. Bootstrapping procedures with 5,000 resamples were used to estimate the conditional indirect effects of transformational leadership on innovative behaviour through psychological empowerment at different levels of perceived organisational support. At low levels of POS (-1 SD), the indirect effect was

strongest, b = .342, BootSE = .025, 95% CI [.294, .390]. At the mean level of POS, the indirect effect was moderate, b = .303, BootSE = .023, 95% CI [.257, .347]. At high levels of POS (+1 SD), the indirect effect was weaker, though still statistically significant, b = .265, BootSE = .024, 95% CI [.216, .311].

Importantly, none of the confidence intervals include zero, indicating that the indirect effect remains statistically significant across all observed levels of perceived organizational support. However, the magnitude of the indirect effect systematically decreases as POS increases. This pattern demonstrates that the mediating role of psychological empowerment is stronger when perceived organizational support is low and becomes progressively weaker as support increases. The index of Moderated mediation was statistically significant, Index = −.0051, BootSE = .0011, 95% CI [−.0073, −.0029]. Because the confidence interval does not include zero, this provides formal evidence that the indirect effect of transformational leadership on innovative behaviour via psychological empowerment varies as a function of perceived organizational support. The negative value of the index indicates that the strength of the indirect effect decreases as perceived organizational support increases. This confirms the presence of negative Moderated mediation.

Pairwise contrasts further revealed significant differences between the conditional indirect effects at different levels of POS. For instance, the indirect effect at mean POS was significantly lower than at low POS (contrast = -.039, 95% CI [-.056, -.022]). Similarly, the indirect effect at high POS was significantly lower than at low POS (contrast = -.077, 95% CI [-.111, -.044]), and lower than at mean POS (contrast = -.039, 95% CI [-.056, -.022]). These comparisons confirm that the reduction in the indirect effect across increasing levels of perceived organizational support is statistically meaningful. Taken together, the findings reveal a Moderated mediation structure. Transformational leadership enhances innovative behaviour both directly and indirectly through psychological empowerment. However, the strength of this mediating pathway depends on perceived organizational support. Specifically,

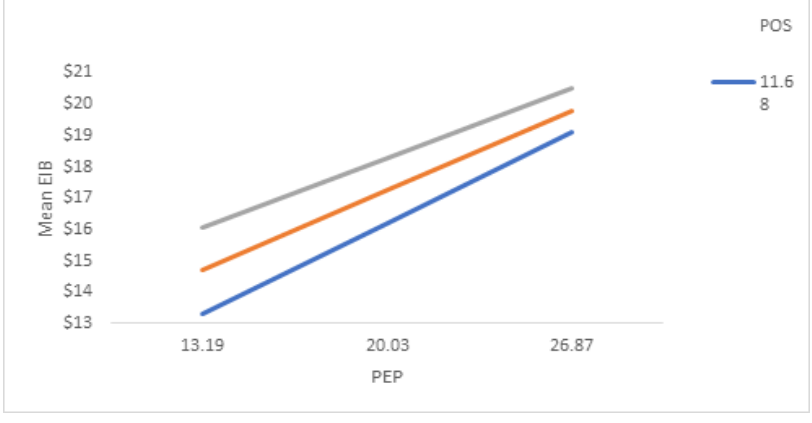


Figure 3. Graph showing interaction effect.

psychological empowerment serves as a stronger mechanism linking transformational leadership to innovative behaviour in contexts where organizational support is relatively low. When organizational support is high, the mediating role of empowerment becomes weaker, although it remains significant. This pattern suggests a substitution dynamic in which organizational support partially compensates for or substitutes the motivational function of psychological empowerment. In supportive environments, employees may rely less on internal empowerment to engage in innovation because external structural resources already facilitate such behaviours.

The interaction graph in Figure 3 offers a clear and intuitive picture of how psychological empowerment and perceived organisational support jointly influence employee innovative behaviour. Across all three levels of organisational support, the upward-sloping lines show that employees who feel more psychologically empowered consistently display higher levels of innovative behaviour. This indicates that empowerment remains an important driver of innovation irrespective of the level of support provided by the organisation. However, the graph also reveals meaningful differences in the strength of this relationship. When perceived organisational support is low, the line is steepest, suggesting that empowerment plays a particularly critical role in motivating employees to generate and implement new ideas. In contrast, as organisational support increases, the slope of the line gradually flattens. This visual pattern indicates that although empowered employees continue to be innovative in highly supportive environments, the additional contribution of empowerment becomes less pronounced. In practical terms, the graph suggests that employees rely more heavily on their internal sense of autonomy, competence, and control to engage in innovative behaviour when organisational support is limited. When support is abundant, structural resources, encouragement, and organisational systems appear to compensate for lower reliance on individual empowerment. Importantly, the absence of any crossover in the lines confirms that empowerment never becomes unimportant; rather, its influence is moderated by the level of organisational support. Overall, the graph visually reinforces the substitution effect observed in the statistical analysis, demonstrating that organisational support attenuates but does not eliminate the positive impact of psychological empowerment on employee innovative behaviour.

6. Discussion and Conclusion

The present study offers a comprehensive examination of TLT as a foundational driver of EIB, SIWB, and broader organisational outcomes. The findings confirm that transformational leadership significantly predicts multiple psychological, behavioural, and organisational variables, including psychological empowerment, identification with leaders, shared values, knowledge sharing, self-efficacy, team efficacy, organisational commitment, OCB, firm performance, and intention to stay. These results strongly align with the foundational theory of transformational leadership proposed by Bass (1985) and later refined by Bass and Avolio (1994), which posits that transformational leaders elevate followers' motivation, cognition, and performance beyond transactional exchanges.

Consistent with prior research (Judge & Piccolo, 2004; Wang *et al*., 2011), transformational leadership demonstrated strong direct effects on innovative behaviour. This supports the argument that transformational leaders foster intellectual stimulation, encourage risk-taking, and promote creative problem-solving (Gumusluoglu & Ilsev, 2009). In particular, the strong path from intellectual stimulation to transformational leadership underscores the cognitive mechanism through which leaders cultivate innovation-oriented climates. Previous studies have similarly found that leaders who challenge assumptions and promote new perspectives significantly enhance employee creativity (Shin & Zhou, 2003; Pieterse *et al*., 2010).

The mediation analysis provides robust evidence that psychological empowerment serves as a key explanatory mechanism linking transformational leadership to innovative behaviour. This finding aligns with Spreitzer's (1995) conceptualisation of empowerment as comprising meaning, competence, autonomy, and impact. Transformational leaders appear to strengthen these dimensions by articulating vision, demonstrating confidence in employees, and encouraging participative decision-making (Ahearne *et al*., 2005). Prior empirical work has similarly demonstrated that empowerment mediates leadership–innovation relationships (Zhang & Bartol, 2010; Aryee *et al*., 2012). The magnitude of the effect observed in this study suggests that empowerment is not merely a peripheral mechanism but a central psychological conduit through which leadership translates into innovation. Importantly, the Moderated mediation findings introduce a nuanced understanding of contextual dynamics. The negative interaction between psychological empowerment and POS indicates a substitution effect: empowerment exerts a stronger influence on innovation when organisational support is relatively low. This pattern is theoretically consistent with social exchange theory (Blau, 1964) and conservation of resources theory (Hobfoll, 1989). In environments where structural support is limited, employees may rely more heavily on internal psychological resources to sustain innovative efforts. Conversely, when organisational support is high, structural resources partially compensate for lower levels of personal empowerment. Similar substitution patterns have been observed in leadership and resource-based models (Eisenberger *et al*., 2001; Erdogan & Enders, 2007).

The significant direct effect of transformational leadership on innovative behaviour, even after accounting for empowerment, indicates partial mediation. This suggests that transformational leadership operates through multiple mechanisms, including affective commitment (Meyer & Allen, 1997), identification processes (Kark *et al*., 2003), and knowledge-sharing climates (Bryant, 2003). The strong relationships found between transformational leadership and knowledge sharing further reinforce this perspective. Knowledge sharing has been widely recognised as a precursor to innovation (Carmeli *et al*., 2013; Lin, 2007), and the present findings confirm its central mediating role in driving innovative and sustainable work behaviour. Moreover, the sequential pathways extending from innovative behaviour to sustainable innovative work behaviour, organisational commitment, OCB, firm performance, and intention to stay reflect a cascading performance model. These results are

consistent with prior research linking innovation to long-term organisational outcomes (Janssen, 2000; Anderson *et al*., 2014). Organisational commitment's strong association with intention to stay aligns with established meta-analytic evidence (Mathieu & Zajac, 1990; Meyer *et al*., 2002), reinforcing the idea that innovation and psychological engagement contribute to employee retention.

The findings regarding self-efficacy and team efficacy also align with Bandura's (1997) social cognitive theory. Transformational leadership enhances followers' confidence, which translates into collective efficacy and improved firm performance. Previous research has similarly demonstrated that collective efficacy mediates leadership-performance relationships (Walumbwa *et al*., 2008; Chen & Bliese, 2002). Thus, the present study extends this body of knowledge by integrating psychological, behavioural, and organisational outcomes into a unified structural framework. Overall, the study contributes to the leadership and innovation literature by demonstrating a complex yet coherent mechanism in which transformational leadership influences innovation through both psychological empowerment and contextual support structures. It also advances Moderated mediation research by empirically validating a negative index of Moderated mediation, thereby clarifying how contextual support reshapes the potency of internal motivational states.

This study provides comprehensive empirical evidence that transformational leadership is a foundational driver of innovative behaviour and long-term organisational outcomes. Transformational leadership not only directly enhances employee innovation but also indirectly influences it through psychological empowerment. However, this mediating process is contingent upon perceived organisational support, confirming the presence of Moderated mediation. The findings suggest that innovation is not driven solely by leadership behaviours or organisational systems in isolation. Rather, innovation emerges from the interplay between leadership inspiration, psychological empowerment, and contextual support mechanisms. When organisational support is limited, employees rely more strongly on their internal sense of empowerment. When support is abundant, structural mechanisms supplement individual motivation, reducing but not eliminating the role of empowerment. Beyond innovation, the study demonstrates downstream effects linking innovative behaviour to sustainable innovation, commitment, citizenship behaviour, firm performance, and retention intentions. These cascading relationships reinforce the strategic importance of leadership-driven innovation in achieving long-term organisational sustainability. In essence, transformational leadership functions as both a psychological catalyst and a structural enabler of innovation and performance. Organisations seeking sustainable competitive advantage must therefore invest not only in leadership development but also in empowerment climates and supportive infrastructures.

7. Managerial Implications

The findings provide several actionable implications for organisational leaders and Human Resources (HR) practitioners. First, leadership development programs should prioritise transformational competencies,

particularly intellectual stimulation and individualised consideration. Training initiatives should equip managers with skills to articulate compelling visions, challenge conventional thinking, and provide personalised developmental support. Evidence suggests that transformational behaviours can be cultivated through structured interventions (Barling *et al.*, 1996). Second, organisations should actively foster psychological empowerment by increasing autonomy, participative decision-making, and role clarity. Empowerment-enhancing practices such as delegation of authority, recognition systems, and feedback mechanisms can significantly elevate innovative engagement (Spreitzer, 1995; Zhang & Bartol, 2010). Third, while strengthening perceived organisational support remains essential, managers must recognise its interactive effects. Excessive structural support may unintentionally dilute the motivational salience of empowerment. Therefore, organisations should balance systemic support with opportunities for employees to exercise autonomy and self-direction. Fourth, knowledge-sharing systems should be institutionalised through collaborative platforms, cross-functional teams, and incentive structures. Given its strong link to innovation and performance, knowledge sharing should be treated as a strategic capability rather than an informal practice. Fifth, to enhance retention, organisations should align innovation initiatives with career progression pathways. Employees who perceive that innovative contributions translate into recognition and advancement are more likely to demonstrate organisational commitment and long-term engagement (Meyer & Allen, 1997). Finally, the cascading effect from innovation to firm performance underscores the importance of embedding innovation into performance management systems. Metrics should capture not only financial outcomes but also behavioural indicators such as idea generation, experimentation, and collaborative problem-solving.

8. Research Limitations and Directions for Future Research

Despite its theoretical and empirical contributions, this study has several limitations. First, the cross-sectional research design restricts causal inference, as temporal precedence cannot be firmly established (Podsakoff *et al.*, 2003). Although the structural paths are statistically significant, longitudinal or time-lagged designs would provide stronger evidence of directional effects among transformational leadership, psychological empowerment, and innovative behaviour (Cole & Maxwell, 2003). Second, the reliance on self-reported measures may introduce common method variance and social desirability bias, potentially inflating parameter estimates (Podsakoff *et al.*, 2003). Future research should incorporate multi-source data, including supervisor ratings or objective performance indicators, to enhance methodological rigour (Conway & Lance, 2010). Third, although the sample size is substantial (N = 1,128), generalizability may be limited by contextual factors such as industry, culture, or national setting. Leadership and innovation processes may vary across institutional environments (House *et al.*, 2004). Cross-cultural and multi-industry replications would strengthen external validity. Fourth, while the model integrates key mediators and moderators, other theoretically relevant constructs such as psychological capital

(Luthans *et al*., 2007), learning climate (Jansen *et al*., 2006), and innovation climate (Scott & Bruce, 1994) were not examined. Future research could incorporate these variables to expand explanatory depth. Finally, the Moderated mediation framework examined only perceived organisational support as a boundary condition. Additional contextual moderators such as environmental dynamism (Dess & Beard, 1984) or HR systems (Jiang *et al*., 2012) should be explored. Longitudinal, multilevel, and experimental studies would further refine the understanding of leadership-driven innovation dynamics.

9. References

Ahearne, M., Mathieu, J., & Rapp, A. (2005). To empower or not to empower. Journal of Applied Psychology, 90(5), 945-955. https://doi.org/10.1037/0021-9010.90.5.945 PMid:16162066.

Anderson, N., Potočnik, K., & Zhou, J. (2014). Innovation and creativity in organizations: A state-of-the-science review and guiding framework. Journal of Management, 40(5), 1297-1333. https://doi.org/10.1177/0149206314527128

Aryee, S., Walumbwa, F. O., Zhou, Q., & Hartnell, C. A. (2012). Transformational leadership and innovative behavior. Journal of Applied Psychology, 97(2), 368-382.

Avolio, B. J., Walumbwa, F. O., & Weber, T. J. (2009). Leadership: Current theories, research, and future directions. Annual Review of Psychology, 60, 421-449.

Avolio, B. J., Zhu, W., Koh, W., & Bhatia, P. (2004). Transformational leadership and organizational commitment. Journal of Organisational Behaviour, 25(8), 951-968. https://doi.org/10.1002/job.283

Bandura, A. (1997). Self-efficacy: The exercise of control. W. H. Freeman.

Bandura, A. (2000). Exercise of human agency through collective efficacy. Current Directions in Psychological Science, 9(3), 75-78. https://doi.org/10.1111/1467-8721.00064

Barling, J., Weber, T., & Kelloway, E. K. (1996). Effects of transformational leadership training. Journal of Applied Psychology, 81(6), 827-832. https://doi.org/10.1037/0021-9010.81.6.827

Bass, B. M. (1985). Leadership and performance beyond expectations. Free Press.

Bass, B. M., & Avolio, B. J. (1994). Improving organizational effectiveness through transformational leadership. Sage.

Bass, B. M., & Avolio, B. J. (1995). MLQ Multifactor Leadership Questionnaire. Mind Garden. https://doi.org/10.1037/t03624-000

Bass, B. M., & Riggio, R. E. (2006). Transformational leadership (2nd ed.). Lawrence Erlbaum Associates. https://doi.org/10.4324/9781410617095

Blau, P. (1964). Exchange and power in social life. Wiley.

Bock, G. W., Zmud, R. W., Kim, Y. G., & Lee, J. N. (2005). Behavioral intention formation in knowledge sharing. MIS Quarterly, 29(1), 87-111. https://doi.org/10.2307/25148669

Bryant, S. E. (2003). The role of transformational and transactional leadership in creating, sharing and exploiting organizational knowledge. Journal of Leadership and Organisational Studies, 9(4), 32-44. https://doi.org/10.1177/107179190300900403

Burns, J. M. (1978). Leadership. Harper & Row.

Cabrera, Á., & Cabrera, E. F. (2005). Fostering knowledge sharing through people management practices. The International Journal of Human Resource Management, 16(5), 720-735. https://doi.org/10.1080/09585190500083020

Carmeli, A., Gelbard, R., & Reiter-Palmon, R. (2013). Leadership, creative problem-solving capacity. The Leadership Quarterly, 24(1), 95-109. https://doi.org/10.1002/hrm.21514

Chen, G., & Bliese, P. D. (2002). The role of different levels of leadership. Journal of Applied Psychology, 87(3), 549-556. https://doi.org/10.1037/0021-9010.87.3.549 PMid:12090612.

Chen, G., Gully, S. M., & Eden, D. (2001). Validation of a new general self-efficacy scale. Organizational Research Methods, 4(1), 62-83. https://doi.org/10.1177/109442810141004

Cole, D. A., & Maxwell, S. E. (2003). Testing mediational models with longitudinal data. Journal of Abnormal Psychology, 112(4), 558-577. https://doi.org/10.1037/0021-843X.112.4.558 PMid:14674869.

Conway, J. M., & Lance, C. E. (2010). What reviewers should expect regarding common method bias. Organizational Research Methods, 13(3), 325-334. https://doi.org/10.1007/s10869-010-9181-6

Creswell, J. W. (2014). Research design: Qualitative, quantitative, and mixed methods approaches (4th ed.). Sage.

Deci, E. L., & Ryan, R. M. (1985). Intrinsic motivation and self-determination in human behavior. Plenum Press. https://doi.org/10.1007/978-1-4899-2271-7

Dess, G. G., & Beard, D. W. (1984). Dimensions of organizational task environments. Administrative Science Quarterly, 29(1), 52-73. https://doi.org/10.2307/2393080

Detert, J. R., & Burris, E. R. (2007). Leadership behavior and employee voice. Academy of Management Journal, 50(4), 869-884. https://doi.org/10.5465/amj.2007.26279183

Edmondson, A. (1999). Psychological safety and learning behavior in work teams. Administrative Science Quarterly, 44(2), 350-383. https://doi.org/10.2307/2666999

Eisenberger, R., Armeli, S., Rexwinkel, B., Lynch, P. D., & Rhoades, L. (2001). Reciprocation of perceived organizational support. Journal of Applied Psychology, 86(1), 42-51. https://doi.org/10.1037/0021-9010.86.1.42 PMid:11302232.

Eisenberger, R., Huntington, R., Hutchison, S., & Sowa, D. (1986). Perceived organizational support. Journal of Applied Psychology, 71(3), 500-507. https://doi.org/10.1037/0021-9010.71.3.500

Erdogan, B., & Enders, J. (2007). Support from the top. Journal of Applied Psychology, 92(2), 321-330. https://doi.org/10.1037/0021-9010.92.2.321 PMid:17371081.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models. Journal of Marketing Research, 18(1), 39-50. https://doi.org/10.2307/3151312

Grant, R. M. (1996). Toward a knowledge-based theory of the firm. Strategic Management Journal, 17(S2), 109-122. https://doi.org/10.1002/smj.4250171110

Gully, S. M., Incalcaterra, K. A., Joshi, A., & Beaubien, J. M. (2002). A meta-analysis of team-efficacy, potency, and performance. Journal of Applied Psychology, 87(5), 819-832. https://doi.org/10.1037/0021-9010.87.5.819 PMid:12395807.

Gumusluoglu, L., & Ilsev, A. (2009). Transformational leadership and organizational innovation. Journal of

Business Research, 62(4), 461-473. https://doi.org/10.1016/j.jbusres.2007.07.032

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). Multivariate data analysis (8th ed.). Cengage.

Hayes, A. F. (2018). Introduction to mediation, moderation, and conditional process analysis (2nd ed.). Guilford Press.

Hobfoll, S. E. (1989). Conservation of resources. American Psychologist, 44(3), 513-524. https://doi.org/10.1037/0003-066X.44.3.513 PMid:2648906.

House, R. J., et al. (2004). Culture, leadership, and organizations: The GLOBE study of 62 societies. Sage.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis. Structural Equation Modelling, 6(1), 1-55.

Huselid, M. A. (1995). The impact of human resource management practices on turnover, productivity, and corporate financial performance. Academy of Management Journal, 38(3), 635-672. https://doi.org/10.2307/256741

Jansen, J. J. P., et al. (2006). Exploratory innovation and exploitative innovation. Management Science, 52(11), 1661-1674. https://doi.org/10.1287/mnsc.1060.0576

Janssen, O. (2000). Job demands, perceptions of effort-reward fairness and innovative work behaviour. Journal of Occupational and Organizational Psychology, 73(3), 287-302. https://doi.org/10.1348/096317900167038

Jiang, K., et al. (2012). How does human resource management influence organizational outcomes? Academy of Management Journal, 55(6), 1264-1294. https://doi.org/10.5465/amj.2011.0088

Judge, T. A., & Piccolo, R. F. (2004). Transformational and transactional leadership: A meta-analytic test of their relative validity. Journal of Applied Psychology, 89(5), 755-768. https://doi.org/10.1037/0021-9010.89.5.755 PMid:15506858.

Kark, R., & Carmeli, A. (2009). Alive and creating. Journal of Organisational Behaviour, 30(6), 785-804.

Kark, R., Shamir, B., & Chen, G. (2003). The two faces of transformational leadership. Journal of Applied Psychology, 88(2), 246-255. https://doi.org/10.1037/0021-9010.88.2.246 PMid:12731708.

Kirkpatrick, S. A., & Locke, E. A. (1996). Direct and indirect effects of leadership. Journal of Applied Psychology, 81(1), 36-51. https://doi.org/10.1037/0021-9010.81.1.36

Kline, R. B. (2016). Principles and practice of structural equation modelling (4th ed.). Guilford Press.

Lin, H. F. (2007). Knowledge sharing and firm innovation capability. International Journal of Manpower, 28(3/4), 315-332. https://doi.org/10.1108/01437720710755272

Luthans, F., et al. (2007). Psychological capital. Personnel Psychology, 60(3), 541-572.

Mathieu, J. E., & Zajac, D. M. (1990). Organizational commitment. Psychological Bulletin, 108(2), 171-194. https://doi.org/10.1037/0033-2909.108.2.171

Meyer, J. P., & Allen, N. J. (1991). A three-component conceptualization of organizational commitment. Human Resource Management Review, 1(1), 61-89.

Meyer, J. P., & Allen, N. J. (1997). Commitment in the workplace: Theory, research, and application. Sage Publications. https://doi.org/10.4135/9781452231556

Meyer, J. P., et al. (2002). Affective commitment meta-analysis. Journal of Vocational Behavior, 61(1), 20-52. https://doi.org/10.1006/jvbe.2001.1842

Meyer, J. P., Stanley, D. J., Herscovitch, L., & Topolnytsky, L. (2002). Affective, continuance, and normative commitment to the organization: A meta-analysis. Journal of Vocational Behaviour, 61(1), 20-52. https://doi.org/10.1006/jvbe.2001.1842

Nembhard, I. M., & Edmondson, A. C. (2006). Making it safe. Journal of Organisational Behaviour, 27(7), 941-966. https://doi.org/10.1002/job.413

Nunnally, J. C., & Bernstein, I. H. (1994). Psychometric theory (3rd ed.). McGraw-Hill.

Organ, D. W. (1988). Organizational citizenship behavior: The good soldier syndrome. Lexington Books.

Pearce, C. L., & Ensley, M. D. (2004). A reciprocal and longitudinal investigation of the innovation process. Journal of Organisational Behaviour, 25(2), 259-278.

Pieterse, A. N., et al. (2010). Transformational and transactional leadership and innovation. Journal of Organisational Behaviour, 31(4), 609-623. https://doi.org/10.1002/job.650

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research. Journal of Applied Psychology, 88(5), 879-903.

Podsakoff, P. M., Whiting, S. W., Podsakoff, N. P., & Blume, B. D. (2009). Individual- and organizational-level consequences of organizational citizenship behaviors. Journal of Applied Psychology, 94(1), 122-141. https://doi.org/10.1037/a0013079 PMid:19186900.

Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Addressing moderated mediation hypotheses. Multivariate Behavioral Research, 42(1), 185-227. https://doi.org/10.1080/00273170701341316 PMid: 26821081.

Rhoades, L., & Eisenberger, R. (2002). Perceived organizational support. Journal of Applied Psychology, 87(4), 698-714. https://doi.org/10.1037/0021-9010.87.4.698 PMid: 12184574.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation. American Psychologist, 55(1), 68-78. https://doi.org/10.1037/0003-066X.55.1.68 PMid:11392867.

Sathyanarayana, S. (2026). Assessing normality in quantitative analysis: Diagnostics, consequences and remedies. Asian Journal of Probability and Statistics, 28(1), 31-57. https://doi.org/10.9734/ajpas/2026/v28i1853

Sathyanarayana, S. (2026b). Reliability measure in social science research: Some conceptual issues. Asian Journal of Economics, Business and Accounting, 26(2), 472-483. https://doi.org/10.9734/ajeba/2026/v26i22192

Sathyanarayana S., Mohanasundaram, T., & Hema Harsha, Pushpa B.V. (2024). Selecting the right sample size: Methods and considerations for social science researchers. International Journal of Business and Management Invention. 13(7). 152-167.

Sathyanarayana, S., & Mohanasundaram, T. (2024). Fit indices in structural equation modelling and confirmatory factor analysis: reporting guidelines. Asian Journal of Economics, Business and Accounting, 24(7), 561-577. https://doi.org/10.9734/ajeba/2024/v24i71430

Sathyanarayana, S., & Mohanasundaram, T. (2025). Moderation Analysis in Business Research: Concepts, Methodologies, Applications and Emerging Trends. Asian Journal of Economics, Business and Accounting, 25(3), 357-378.

Scott, S. G., & Bruce, R. A. (1994). Determinants of innovative behavior. Academy of Management Journal, 37(3), 580-607. https://doi.org/10.2307/256701

Shamir, B., House, R. J., & Arthur, M. B. (1993). The motivational effects of charismatic leadership. Organisation Science, 4(4), 577-594. https://doi.org/10.1287/orsc.4.4.577

Shaw, J. D., Duffy, M. K., Johnson, J. L., & Lockhart, D. E. (2005). Turnover, social capital losses, and performance. Academy of Management Journal, 48(4), 594-606. https://doi.org/10.5465/amj.2005.17843940

Shin, S. J., & Zhou, J. (2003). Transformational leadership and creativity. Academy of Management Journal, 46(6), 703-714. https://doi.org/10.2307/30040662

Spreitzer, G. M. (1995). Psychological empowerment in the workplace. Academy of Management Journal, 38(5), 1442-1465. https://doi.org/10.2307/256865

Tabachnick, B. G., & Fidell, L. S. (2013). Using multivariate statistics (6th ed.). Pearson.

Tasa, K., Taggar, S., & Seijts, G. H. (2007). The development of collective efficacy in teams. Academy of Management Journal, 50(1), 17-35. https://doi.org/10.1037/0021-9010.92.1.17 PMid:17227148.

van Knippenberg, D., van Knippenberg, B., De Cremer, D., & Hogg, M. A. (2004). Leadership, self, and identity. Academy of Management Review, 29(3), 825-841. https://doi.org/10.1016/j.leaqua.2004.09.002

Venkatraman, N., & Ramanujam, V. (1986). Measurement of business performance. Academy of Management Review, 11(4), 801-814. https://doi.org/10.2307/258398

Walumbwa, F. O., Avolio, B. J., & Zhu, W. (2008). How transformational leadership impacts performance. Personnel Psychology, 61(4), 793-825. https://doi.org/10.1111/j.1744-6570.2008.00131.x

Walumbwa, F. O., et al. (2008). Authentic leadership. Journal of Management, 34(1), 89-126. https://doi.org/10.1177/0149206307308913

Wang, G., Oh, I. S., Courtright, S. H., & Colbert, A. E. (2011). Transformational leadership and performance across criteria and levels. Journal of Applied Psychology, 96(3), 534-550.

Wang, S., & Wang, N. (2012). Knowledge sharing, innovation and firm performance. Expert Systems with Applications, 39(10), 8899-8908. https://doi.org/10.1016/j.eswa.2012.02.017

Zhang, X., & Bartol, K. M. (2010). Linking empowering leadership and employee creativity. Academy of Management Journal, 53(1), 107-128. https://doi.org/10.5465/amj.2010.48037118

DHARANA
International Journal of Business

INFORMATICS JOURNALS

DOI: 10.18311/DBIJB/v17_i1_2026_04

ISSN: 0974-0082 | Vol 17(1), 2026 | pp. 72-106

Social Media Marketing, Brand Engagement, and Brand Equity: Building Brand Equity in Trusted Digital Environments

S. Sathyanarayana[1], R. Pallavi[2] and S. Vijayalakshmi[3]

[1]Professor, M P Birla Institute of Management, Race Course Road, Bengaluru- 560001, India; principal@mpbim.com

[2]Assistant Professor, M P Birla Institute of Management, Race Course Road, Bengaluru- 560001, India; pallavi.ramesh.32@gmail.com

[3]Assistant Professor, M P Birla Institute of Management, Bengaluru – 560001, Karnataka, India; lamysster@gmail.com

Abstract

Aim: The primary aim of this study is to examine how social media marketing activities influence brand equity, both directly and indirectly through brand engagement, under varying levels of consumer trust in social media platforms. **Methodology:** The study adopted a quantitative research design using a structured questionnaire administered to 465 respondents selected through simple random sampling. Data were analysed using Structural Equation Modelling (SEM) to test direct and mediating effects, and PROCESS Macro (Model 7) with bootstrapping to examine the moderated mediation relationships. **Key Findings:** The findings reveal that social media marketing activities significantly enhance brand engagement and brand equity. Brand engagement partially mediates the relationship between social media marketing activities and brand equity. Additionally, consumer trust in social media platforms negatively moderates the indirect effect, indicating that the mediating influence of brand engagement weakens as consumer trust increases. **Managerial Implications:** The findings suggest that firms should prioritise engagement-driven social media strategies, as brand engagement is a key mechanism through which social media marketing enhances brand equity. Managers should adopt innovative, interactive, and personalised content approaches, particularly in high-trust digital environments where traditional marketing efforts yield diminishing returns. **Originality and Research Contribution:** This study contributes to the literature by proposing and empirically validating a moderated mediation model in which consumer trust in social media platforms acts as a boundary condition on the engagement-driven pathway between social media marketing activities and brand equity, offering novel theoretical and managerial insights.

Keywords: Brand Equity, Brand Image, Brand Loyalty, Brand Trust, Perceived Value, Social Media Marketing

JEL Classification Code: M31, M37, D91, L81, O33

Article Received on: 24-02-2026 Revised on: 26-02-2026 Accepted on: 28-02-2026

Cite this article as: Satyanarayana, S., Pallavi, R. & Vijayalakshmi, S. (2026). Social Media Marketing, Brand Engagement, and Brand Equity: Building Brand Equity in Trusted Digital Environments. *DHARANA - International Journal of Business*, *17*(1), 72-106. https://doi.org/10.18311/DBIJB/v17_i1_2026_04

1. Introduction

Social media has fundamentally transformed how brands communicate, interact, and build long-term relationships with consumers. Unlike traditional one-way promotional channels, social media platforms enable continuous, interactive, and personalised engagement, allowing consumers to actively participate in brand narratives rather than merely receiving messages (Kaplan & Haenlein, 2010). As a result, Social Media Marketing Activities (SMMAs) including entertainment, informativeness, interaction, personalisation, and trendiness have become central to contemporary branding strategies aimed at strengthening brand equity and consumer loyalty (Kim & Ko, 2012; Godey *et al.*, 2016).

Despite the widespread adoption of social media marketing, firms increasingly face a critical challenge: not all social media marketing efforts translate into sustained brand engagement or enhanced brand equity. Consumers today are exposed to overwhelming volumes of branded content, leading to selective attention, content fatigue, and skepticism toward marketing messages (Voorveld *et al.*, 2018). While prior research consistently shows that social media marketing can positively influence brand-related outcomes such as engagement, brand image, perceived value, and purchase intention (Cheung *et al.*, 2020b; Yadav & Rahman, 2018), empirical findings remain mixed regarding when and under what conditions these effects are strongest. This inconsistency highlights an important unresolved problem in the literature.

One critical yet underexplored factor in this context is consumer trust in social media platforms. Trust has long been recognised as a foundational element in relationship marketing and digital interactions, shaping how consumers interpret, evaluate, and respond to marketing stimuli (Morgan & Hunt, 1994; Gefen *et al.*, 2003). While existing studies largely conceptualise trust as a direct antecedent that strengthens engagement and brand outcomes, they implicitly assume that higher trust uniformly amplifies the effectiveness of social media marketing (Hajli, 2014). However, as social media platforms mature, high levels of trust may reduce consumers' reliance on overt marketing cues, leading to diminishing marginal effects of marketing activities. Empirical research examining this boundary condition role of trust as a moderator remains limited.

Moreover, although brand engagement is widely acknowledged as a key psychological mechanism linking social media marketing to brand equity (Brodie *et al.*, 2013; Hollebeek *et al.*, 2014), prior studies have predominantly examined simple mediation models, overlooking the possibility that the mediating role of engagement itself may vary across levels of consumer trust. This represents a significant theoretical gap, as it neglects the conditional nature of engagement processes in highly trusted digital environments.

Addressing this gap requires an integrated moderated mediation framework that captures both the mechanism (brand engagement) and the boundary condition (consumer trust).

In response, the present study develops and empirically tests a first-stage moderated mediation model (PROCESS Model 7) to examine how social media marketing activities influence brand equity through brand engagement, and how this indirect effect is conditioned by consumer trust in social media platforms. By demonstrating a negative interaction effect, the study extends engagement theory by showing that trust does not always amplify marketing effectiveness; instead, it can attenuate the impact of marketing efforts under high-trust conditions. This nuanced perspective contributes to a more realistic understanding of consumer behaviour in saturated digital ecosystems.

The remainder of the paper is structured as follows. Section 1 reviews the relevant literature and develops the theoretical framework and hypotheses. Section 2 describes the research methodology, including sample characteristics, measurement instruments, and data analysis procedures. Section 3 presents the empirical results of the measurement and structural models, including moderated mediation analysis. Section 4 discusses the findings in light of prior research and outlines managerial implications. Finally, Section 5 concludes the study by summarising key contributions, limitations, and directions for future research.

2. Literature Review

Understanding how social media marketing activities translate into brand-related outcomes requires a strong theoretical grounding that explains both why consumers engage with brands in digital environments and how such engagement leads to value creation. The present study draws upon an integrated set of theoretical perspectives Uses and Gratifications Theory, Stimulus-Organism-Response (S-O-R) Theory, Relationship Marketing Theory, and Consumer Engagement Theory to explain the complex and conditional mechanisms linking social media marketing activities, brand engagement, consumer trust, and brand equity.

Uses and Gratifications Theory (UGT) provides an essential starting point for explaining consumers' voluntary participation in social media brand interactions. UGT posits that individuals actively select media and content that satisfy specific cognitive, affective, and social needs, such as information seeking, entertainment, social interaction, and self-expression (Katz *et al.*, 1973; Whiting & Williams, 2013). In the context of social media marketing, content that is entertaining, informative, interactive, personalised, and trendy is more likely to fulfil these needs, thereby motivating consumers to engage with brand-related content (Park *et al.*, 2009; Kim & Ko, 2012). This perspective helps explain why well-designed social media marketing activities can stimulate higher levels of consumer engagement rather than passive exposure.

Building on this motivational lens, Stimulus-Organism-Response (S-O-R) Theory offers a process-based explanation of how social media marketing influences consumer outcomes. According to S-O-R theory, external stimuli (S), such as social media marketing activities, affect consumers' internal psychological states (O), which subsequently shape behavioural

responses (R) (Mehrabian & Russell, 1974). In this study, social media marketing activities function as environmental stimuli, brand engagement represents the internal organismic state reflecting consumers' cognitive, emotional, and behavioural investment, and brand equity outcomes serve as the ultimate response. This framework is particularly suitable for digital contexts, where marketing stimuli are continuous and interactive, and consumer responses are shaped through ongoing psychological engagement rather than isolated transactions (Eroglu *et al.*, 2001; Cheung *et al.*, 2020b).

To explain the relational dynamics underpinning sustained engagement and brand value creation, the study further draws on Relationship Marketing Theory. This theory emphasises trust, commitment, and long-term relational exchanges as central mechanisms through which firms build enduring customer relationships (Morgan & Hunt, 1994). In social media environments, consumer trust in platforms plays a pivotal role in shaping how marketing messages are evaluated and internalised (Gefen *et al.*, 2003; Hajli, 2014). While trust generally facilitates engagement by reducing perceived risk and uncertainty, relationship marketing theory also suggests that strong relational bonds can alter consumers' sensitivity to marketing stimuli, potentially reducing reliance on overt promotional cues. This theoretical logic supports the examination of consumer trust as a boundary condition that moderates the effectiveness of social media marketing activities.

Finally, Consumer Engagement Theory provides the conceptual bridge connecting social media marketing activities to brand equity outcomes. Consumer engagement is defined as a multidimensional construct encompassing cognitive processing, emotional connection, and behavioural participation in brand interactions (Brodie *et al.*, 2011; Hollebeek *et al.*, 2014). Prior research consistently identifies engagement as a key psychological mechanism through which marketing actions translate into favourable brand outcomes, including brand equity, loyalty, and advocacy (Vivek *et al.*, 2012; Dessart *et al.*, 2015). However, emerging studies suggest that engagement is not a static mediator; rather, its strength and influence may vary depending on contextual factors such as trust, platform credibility, and consumer saturation. This insight provides a strong theoretical rationale for investigating moderated mediation, where the mediating role of brand engagement is contingent upon levels of consumer trust in social media platforms. Taken together, these theoretical perspectives offer a coherent and complementary foundation for the proposed research model. By integrating motivational (UGT), process-oriented (S-O-R), relational (Relationship Marketing), and psychological (Engagement) theories, the study moves beyond linear explanations and adopts a conditional process approach. This integrative framework not only explains how social media marketing activities influence brand equity through engagement, but also when and under what conditions these effects are strengthened or attenuated. On this basis, the following section develops the study's hypotheses.

2.1 Social Media Marketing Activities and Perceived Value

Perceived value represents consumers' overall evaluation of the benefits they receive relative

to the costs they incur when interacting with a brand (Zeithaml, 1988). In social media contexts, value is not derived solely from functional or economic benefits, but also from experiential, emotional, and relational outcomes created through brand-consumer interactions (Sweeney & Soutar, 2001; Holbrook, 2006). Drawing on Uses and Gratifications Theory (UGT) and Value Co-Creation Theory, social media marketing activities can be understood as value-generating mechanisms that satisfy consumers' informational, emotional, and social needs, thereby enhancing perceived value (Katz *et al.*, 1973; Prahalad & Ramaswamy, 2004).

2.2 Entertainment and Perceived Value

Entertainment reflects the extent to which brand-related content on social media is enjoyable, fun, and emotionally engaging. According to Uses and Gratifications Theory, entertainment gratification is a primary driver of media consumption, particularly in hedonic digital environments (Whiting & Williams, 2013). Entertaining content enhances positive affect, reduces cognitive effort, and creates pleasurable brand experiences, which in turn elevate consumers' perceptions of value (Holbrook, 2006). Prior studies consistently demonstrate that entertaining social media content strengthens consumers' perceived benefits by enhancing enjoyment and emotional satisfaction (Kim & Ko, 2012; Yadav & Rahman, 2018). Therefore, entertainment serves as a critical experiential cue that transforms brand communication into a value-adding experience.

H1: Entertainment has a positive and significant effect on perceived value.

2.3 Informativeness and Perceived Value

Informativeness refers to the degree to which social media content provides accurate, useful, and timely information about products and brands. From a cognitive evaluation perspective, consumers derive value when marketing communication reduces uncertainty and facilitates informed decision-making (Zeithaml, 1988). UGT posits that information-seeking is a core motivation for engaging with media, especially in purchase-related contexts (Katz *et al.*, 1973). Empirical research shows that informative social media content enhances perceived functional value by helping consumers compare alternatives, evaluate quality, and justify purchase decisions (Ducoffe, 1996; Liu *et al.*, 2019). As such, informativeness contributes directly to consumers' perceptions of value by increasing transparency and decision confidence.

H2: Informativeness has a positive and significant effect on perceived value.

2.4 Interaction and Perceived Value

Interaction captures the extent to which social media platforms enable two-way communication, dialogue, and participation between brands and consumers. Rooted in Relationship Marketing Theory, interactive communication fosters relational benefits such as responsiveness, involvement, and mutual exchange, which extend beyond transactional value (Morgan & Hunt, 1994). Interactive features such as comments, live chats, and feedback mechanisms allow consumers to co-create experiences, thereby enhancing

psychological ownership and relational value (Prahalad & Ramaswamy, 2004). Prior studies confirm that higher interactivity in social media marketing positively influences perceived value by increasing engagement, trust, and emotional attachment (Labrecque, 2014; Cheung *et al.*, 2020b).

H3: Interaction has a positive and significant effect on perceived value.

2.5 Personalisation and Perceived Value

Personalisation, or customisation, refers to the degree to which social media content and offers are tailored to individual consumers' preferences, needs, and behaviours. Drawing on Self-Congruity Theory and Value-in-Use Logic, personalised communication enhances relevance and reduces information overload, thereby increasing perceived benefits (Sirgy, 1982; Vargo & Lusch, 2008). When consumers perceive that brand messages are personally relevant, they experience greater utilitarian and emotional value (Bleier & Eisenbeiss, 2015). Empirical evidence suggests that personalisation in digital marketing strengthens perceived value by enhancing convenience, perceived control, and emotional connection (Komiak & Benbasat, 2006; Zhang *et al.*, 2022).

H4: Personalisation has a positive and significant effect on perceived value.

2.6 Trendiness and Perceived Value

Trendiness reflects the extent to which social media content is up-to-date, fashionable, and aligned with current market trends. From a symbolic consumption perspective, trendy content provides social and expressive value by enabling consumers to stay informed and socially relevant (Belk, 1988). In fast-paced digital environments, brands that consistently share trendy and timely content are perceived as innovative and forward-looking, which enhances perceived value (Kim & Ko, 2012). Prior research indicates that trendiness positively influences perceived value by increasing excitement, perceived modernity, and social approval associated with brand consumption (Godey *et al.*, 2016; Yadav & Rahman, 2018).

H5: Trendiness has a positive and significant effect on perceived value.

2.7 Social Media Marketing Activities and Brand Image

Brand image refers to the set of perceptions, associations, and meanings that consumers hold in their memory about a brand (Keller, 1993). In digital environments, brand image is increasingly shaped through repeated and symbolic interactions occurring on social media platforms rather than through traditional one-way advertising (Schivinski & Dabrowski, 2016). Drawing on Brand Equity Theory, Signaling Theory, and Uses and Gratifications Theory, social media marketing activities act as informational and experiential signals that help consumers interpret brand personality, credibility, and relevance, thereby shaping brand image over time (Keller, 2009; Spence, 1973; Katz *et al.*, 1973).

2.8 Entertainment and Brand Image

Entertainment reflects the extent to which social media content is enjoyable, amusing,

and emotionally engaging. According to Uses and Gratifications Theory, entertaining content satisfies hedonic needs and generates positive affect, which is then transferred to the brand through affective conditioning (Holbrook, 2006; Whiting & Williams, 2013). When consumers repeatedly encounter entertaining brand content, they associate the brand with enjoyment, creativity, and positivity, strengthening favourable brand image perceptions (Kim & Ko, 2012). Prior research confirms that entertainment-oriented social media marketing enhances brand image by creating emotional resonance and memorability (Godey *et al.*, 2016).

H6: Entertainment has a positive and significant effect on brand image.

2.9 Informativeness and Brand Image

Informativeness refers to the degree to which brand-related social media content provides accurate, relevant, and useful information. From a signaling perspective, informative content signals brand competence, transparency, and reliability, which are essential components of a strong brand image (Spence, 1973; Keller, 2009). Informative communication reduces ambiguity and enhances consumers' cognitive evaluations of the brand, leading to more favourable brand associations (Ducoffe, 1996). Empirical studies show that informativeness significantly strengthens brand image by reinforcing perceptions of expertise and trustworthiness (Schivinski & Dabrowski, 2016; Liu *et al.*, 2019).

H7: Informativeness has a positive and significant effect on brand image.

2.10 Interaction and Brand Image

Interaction captures the extent of two-way communication, dialogue, and responsiveness between brands and consumers on social media platforms. Grounded in Relationship Marketing Theory, interactive engagement fosters relational bonds, responsiveness, and mutual understanding, which positively influence brand perceptions (Morgan & Hunt, 1994). Interactive exchanges enable consumers to feel heard and valued, thereby humanising the brand and enhancing perceptions of warmth and authenticity (Labrecque, 2014). Prior research consistently demonstrates that higher interactivity strengthens brand image by promoting relational trust and emotional closeness (Cheung *et al.*, 2020b).

H8: Interaction has a positive and significant effect on brand image.

2.11 Personalisation and Brand Image

Personalisation, or customisation, refers to tailoring content, messages, and offerings to individual consumer preferences. Drawing on Self-Congruity Theory, personalised communication enhances alignment between brand image and consumers' self-concepts, leading to more favourable brand evaluations (Sirgy, 1982). Personalised social media content signals customer orientation and attentiveness, which enhances perceptions of brand relevance and care (Bleier & Eisenbeiss, 2015). Empirical evidence suggests that personalisation strengthens brand image by making brands appear more customer-centric, adaptive, and emotionally intelligent (Zhang *et al.*, 2022).

H9: Personalisation has a positive and significant effect on brand image.

2.12 Trendiness and Brand Image

Trendiness reflects the extent to which brand content is up-to-date, fashionable, and aligned with current social and market trends. From a symbolic consumption perspective, trendy brands are perceived as modern, innovative, and socially relevant, which enhances their overall image (Belk, 1988). In dynamic digital environments, brands that consistently share timely and trend-oriented content signal market leadership and cultural awareness (Kim & Ko, 2012). Prior studies confirm that trendiness significantly enhances brand image by reinforcing perceptions of innovation and contemporariness (Godey *et al.*, 2016; Yadav & Rahman, 2018).

H10: Trendiness has a positive and significant effect on brand image.

2.13 Social Media Marketing Attributes and Brand Engagement

Brand engagement refers to consumers' cognitive, emotional, and behavioural investment in brand-related interactions, particularly within interactive digital environments such as social media platforms (Hollebeek *et al.*, 2014). From the perspective of Uses and Gratifications Theory, consumers actively engage with brand content on social media when such content satisfies their informational, emotional, and social needs (Katz *et al.*, 1973). Complementarily, Stimulus-Organism-Response (S-O-R) theory suggests that specific social media marketing stimuli shape consumers' internal states, which subsequently drive engagement behaviours (Mehrabian & Russell, 1974).

Entertainment is a critical hedonic stimulus that enhances users' intrinsic motivation to interact with brand content. Entertaining content evokes enjoyment and emotional arousal, making consumers more likely to like, share, comment, and spend time with brand-related posts (Dessart *et al.*, 2015). Prior research consistently shows that entertaining brand communications strengthen emotional engagement and foster voluntary participation on social media platforms (Ashley & Tuten, 2015).

Informativeness reflects the extent to which social media content provides accurate, useful, and timely brand-related information. Informative content enhances consumers' cognitive engagement by reducing uncertainty and increasing perceived competence in brand-related decision-making (Ducoffe, 1996). When brands effectively communicate value-relevant information, consumers are more inclined to actively process content and interact with it, thereby deepening engagement (Cheung *et al.*, 2020a).

Interaction captures the dialogic nature of social media, enabling two-way communication between brands and consumers. Interactive features such as comments, polls, and real-time responses promote a sense of involvement and relational closeness, which are foundational to sustained brand engagement (Brodie *et al.*, 2013). Social interaction theory suggests that such reciprocal exchanges enhance psychological immersion and behavioural participation (Labrecque, 2014).

Personalisation, or customisation, refers to the degree to which brand content is tailored to individual preferences and needs. Personalised communication enhances perceived relevance and self-congruence, leading consumers to feel personally connected to the brand (Bleier & Eisenbeiss, 2015). This perceived personal relevance acts as a strong driver of emotional and behavioural engagement in social media contexts (Pansari & Kumar, 2017).

Finally, Trendiness reflects the extent to which brands share up-to-date, fashionable, and cutting-edge information. Trendy content positions brands as innovative and socially relevant, motivating consumers to stay connected and participate in ongoing brand conversations (Kim & Ko, 2012). Such content enhances social signaling value, thereby stimulating engagement behaviours, particularly among digitally active consumers (Godey *et al.*, 2016).

H_{11}, H_{12}, H_{13}, H_{14}, and H_{15}: Entertainment, Informativeness, Interaction, Personalisation, and Trendiness in social media marketing positively influences brand engagement.

2.14 Brand Engagement, Brand Image, Perceived Value, Purchase Intention, and Brand Loyalty

In contemporary marketing literature, consumer-brand relationships are increasingly viewed as dynamic processes that evolve from psychological engagement to attitudinal and behavioural loyalty. Drawing on relationship marketing theory and attitude-behaviour frameworks, prior studies suggest that consumers' engagement with brands, perceptions of brand image and value, and purchase-related cognitions jointly shape loyalty outcomes (Oliver, 1999; Keller, 2013).

2.15 Brand Engagement and Brand Loyalty

Brand engagement reflects consumers' cognitive, emotional, and behavioural investment in interactions with a brand (Hollebeek *et al.*, 2014). According to relationship marketing theory, repeated and meaningful brand interactions strengthen emotional bonds, trust, and commitment, which are core antecedents of brand loyalty (Morgan & Hunt, 1994). Engaged consumers are more likely to develop enduring preferences, resist switching, and advocate for the brand, thereby translating engagement into loyalty over time (Brodie *et al.*, 2013; Vivek *et al.*, 2012).

H16: Brand engagement has a positive effect on brand loyalty.

2.16 Brand Image and Purchase Intention

Brand image represents consumers' overall perceptions and associations toward a brand (Keller, 1993). From the lens of signaling theory, a favourable brand image acts as a quality signal that reduces perceived risk and enhances confidence in purchase decisions (Erdem & Swait, 2004). Empirical evidence consistently shows that brands with strong, positive images are more likely to be considered and chosen, thereby increasing consumers' purchase intentions (Wu *et al.*, 2011; Chen *et al.*, 2020).

H17: Brand image positively influences purchase intention.

2.17 Perceived Value and Purchase Intention

Perceived value is defined as consumers' overall assessment of the benefits received relative to the costs incurred (Zeithaml, 1988). Grounded in equity theory and value-based decision-making, consumers are more inclined to purchase when they perceive that a brand offers superior functional, emotional, or social value (Sweeney & Soutar, 2001). Prior studies confirm that higher perceived value significantly enhances purchase intention across products and services, particularly in competitive markets (Dodds *et al.*, 1991; Konuk, 2018).

H18: Perceived value positively influences purchase intention.

2.18 Purchase Intention and Brand Loyalty

Purchase intention represents a consumer's conscious plan or willingness to buy a particular brand (Ajzen, 1991). According to the Theory of Planned Behaviour, intention is the most immediate predictor of actual behaviour. Repeated purchase intentions often translate into repeat purchase behaviour, habit formation, and long-term commitment, which collectively constitute brand loyalty (Oliver, 1999; Hellier *et al.*, 2003).

H19: Purchase intention positively influences brand loyalty.

2.19 Moderated Mediation

The increasing reliance on social media platforms has reshaped how organisations build and sustain brand equity by enabling continuous, interactive, and value-driven engagement with consumers. SMMA including entertaining, informative, interactive, personalised, and trendy content allow brands to move beyond one-way communication and foster deeper relational exchanges with consumers (Kim & Ko, 2012; Yadav & Rahman, 2017). From the perspective of relationship marketing theory, such activities strengthen long-term relational bonds by enhancing consumer involvement and emotional attachment to brands, which are essential precursors to brand equity development (Morgan & Hunt, 1994). Brand equity represents the incremental value endowed to a product or service by the brand name and is shaped through consumer perceptions, associations, and experiences accumulated over time (Keller, 2013). Prior studies suggest that social media marketing positively contributes to brand equity by increasing brand visibility, reinforcing favourable brand associations, and strengthening perceived quality (Bruhn *et al.*, 2012). However, contemporary research emphasises that this influence is rarely direct or automatic; rather, it unfolds through psychological and behavioural mechanisms such as brand engagement (Hollebeek, 2011).

Brand engagement reflects consumers' cognitive, emotional, and behavioural investment in brand-related interactions (Brodie *et al.*, 2011). Grounded in service-dominant logic, engagement is viewed as a value co-creation process in which consumers actively participate in shaping brand meaning and value (Vargo & Lusch, 2008). Empirical evidence consistently demonstrates that higher levels of engagement enhance brand equity by strengthening brand awareness, trust, and loyalty while fostering advocacy behaviours

(Hollebeek *et al.*, 2014; Vivek *et al.*, 2012). Accordingly, brand engagement functions as a critical mediating mechanism through which social media marketing activities translate into brand equity outcomes.

Nevertheless, the strength of this mediation may depend on contextual factors related to the communication environment. Consumer trust in social media platforms has emerged as a pivotal boundary condition influencing how consumers interpret and respond to marketing stimuli (Pavlou, 2003). Trust reflects consumers' beliefs about the credibility, reliability, and integrity of social media platforms as information sources. Drawing on uncertainty reduction theory and signaling theory, higher trust reduces perceived risk and skepticism, allowing consumers to process brand-related content more efficiently and attribute greater value to their engagement experiences (Spence, 1973; Gefen, 2003). In social media contexts, trust does not merely amplify marketing effectiveness; it may also alter the relative importance of marketing cues. When trust in the platform is low, consumers rely more heavily on brand engagement cues generated through marketing activities to form evaluations of brand value. Conversely, when trust is high, consumers may already feel confident navigating brand information, thereby diminishing the marginal impact of engagement-driven marketing efforts. This perspective aligns with emerging research suggesting that trust can act as a negative moderator, attenuating the strength of marketing effects under high-trust conditions (Zhang *et al.*, 2020). Integrating these insights, this study proposes a moderated mediation framework in which brand engagement mediates the relationship between social media marketing activities and brand equity, while consumer trust in social media platforms moderates the first stage of this indirect effect. This framework advances existing literature by demonstrating that trust operates as a boundary condition that shapes how engagement mechanisms convert marketing efforts into brand equity, offering a more nuanced understanding of brand value creation in digital environments. Based on the above arguments, the researchers have posited the following hypotheses to be tested:

H1: Social media marketing activities have a positive effect on brand engagement.

H2: Brand engagement has a positive effect on brand equity.

H3: Social media marketing activities have a positive direct effect on brand equity.

H4: Brand engagement mediates the relationship between social media marketing activities and brand equity.

H5: Consumer trust in social media platforms moderates the relationship between social media marketing activities and brand engagement, such that the effect weakens as consumer trust increases.

H6: Consumer trust in social media platforms moderates the indirect effect of social media marketing activities on brand equity through brand engagement, such that the mediated relationship is weaker at higher levels of consumer trust.

3. Research Design

In an era where social media has become a dominant interface between brands and consumers, understanding how social media

marketing activities translate into brand equity is both theoretically and managerially critical. This study investigates the psychological mechanism of brand engagement and the contingent role of consumer trust in social media platforms in shaping this relationship.

Research Questions

RQ1: How do social media marketing activities influence brand equity directly and indirectly through brand engagement?

RQ2: To what extent does brand engagement function as a mediating mechanism in converting social media marketing activities into brand equity outcomes?

RQ3: How does consumer trust in social media platforms condition the strength of the mediated relationship between social media marketing activities and brand equity through brand engagement?

3.1 Measurement Instrument and Scale Development

To collect primary data from the respondents, the researchers designed a structured questionnaire, grounded firmly in an extensive review of prior literature and relevant theoretical frameworks. Before the final administration, the research instrument was pre-tested through a pilot study to ensure clarity, relevance, and content validity of the items. Minor wording refinements were made based on the feedback received, thereby enhancing the comprehensibility and reliability of the questionnaire. The finalised questionnaire was then administered to the respondents for data collection. All perceptual items were measured using a five-point Likert scale, where 1 represented "strongly disagree" and 5 represented "strongly agree." This scale format was chosen due to its widespread acceptance in behavioural and marketing research and its ability to capture respondents' attitudes, perceptions, and evaluative judgments effectively.

Based on a thorough review of the literature and the theoretical foundations underpinning the study, the researchers identified the key latent constructs relevant to social media marketing and branding outcomes. To ensure measurement validity and comparability, the items used to operationalise each construct were adopted from previously validated and widely cited measurement scales. For consistency and robustness, five items were used to measure each latent construct, aligning with best practices in structural equation modelling and PROCESS-based analysis. Specifically, SMMA including entertainment, informativeness, interaction, personalisation, and trendiness were measured using five items adapted from the seminal works of Kim and Ko (2012) and Yadav and Rahman (2018). These scales have been extensively validated in digital marketing and social media branding research. Consumer Trust in Social Media Platforms (CTSMP) was measured using five items adapted from Gefen *et al.* (2003) and Hajli (2014), which conceptualise trust as consumers' confidence in the reliability, integrity, and credibility of online platforms. Brand Engagement (BREN) was operationalised using five items drawn from Hollebeek *et al.* (2014), capturing consumers' cognitive, emotional, and behavioural engagement with brands in social media environments. Brand Equity (BET) was measured using five items adapted from Yoo and Donthu (2001) and Keller (2001),

reflecting consumers' overall value perception, brand strength, and differentiation in the marketplace. All adopted scales demonstrated strong psychometric properties in prior studies, thereby supporting content validity, construct validity, and reliability. The use of established scales also enhances the generalisability and credibility of the findings and ensures alignment with existing theoretical and empirical research in branding and social media marketing.

3.2 Data Collection and Sample Description

A total of 675 questionnaires were distributed to the targeted respondents using a simple random sampling technique, ensuring that each member of the population had an equal probability of selection and thereby minimising selection bias (Sathyanarayana *et al.*, 2024a). Of these, 595 usable questionnaires were returned, representing a response rate of 88.15%, which is considered robust for survey-based behavioural research. Following data screening procedures, 465 responses were retained for the final analysis, accounting for 78.15% of the received questionnaires. The remaining responses were excluded due to reasons such as incomplete questionnaires, excessive missing values, straight-lining, and response inconsistencies. The final sample size exceeded the minimum thresholds recommended for multivariate techniques such as structural equation modelling and PROCESS-based moderated mediation analysis (Hair *et al.*, 2019).

3.3 Preliminary Data Screening and Assumption Testing

Prior to hypothesis testing, the collected data were subjected to a series of diagnostic checks to ensure compliance with the assumptions of regression and SEM analysis. Specifically, the data were examined for normality, linearity, homoscedasticity, multicollinearity, and independence of errors. Skewness and kurtosis values were assessed to evaluate normality, while Variance Inflation Factors (VIF) and tolerance values were examined to rule out multicollinearity. The results indicated that all assumptions were satisfactorily met, supporting the suitability of the dataset for further multivariate analysis (Hair *et al.*, 2019; Tabachnick & Fidell, 2019; Sathyanarayana, 2026a).

3.4 Reliability Analysis

The internal consistency reliability of the measurement instrument was assessed using Cronbach's alpha, a widely accepted reliability coefficient that evaluates the degree to which items measuring the same construct are interrelated. Cronbach's alpha values of 0.70 or higher are generally considered acceptable for confirmatory research (Nunnally & Bernstein, 1994). All constructs in the study exhibited alpha values exceeding the recommended threshold, indicating satisfactory reliability and internal consistency.

3.5 Validity Assessment and Confirmatory Factor Analysis

To establish the construct validity of the measurement model, Confirmatory Factor Analysis (CFA) was conducted using structural equation modelling techniques. CFA was employed to assess convergent and discriminant validity by examining factor loadings, composite reliability, and Average Variance Extracted (AVE). CFA is particularly appropriate in

theory-driven research, as it allows researchers to confirm whether the observed variables adequately represent their underlying latent constructs (Hair *et al.*, 2019). The CFA results demonstrated good model fit and confirmed the validity of the research instrument.

3.6 Assessment of Common Method Bias

Given that the data were collected using a single-source, self-reported questionnaire, the potential presence of Common Method Bias (CMB) was assessed using Harman's single-factor test. The results revealed that the first unrotated factor accounted for 31.25% of the total variance, which is well below the recommended threshold of 50%, indicating that common method bias is unlikely to be a serious concern in this study (Podsakoff *et al.*, 2003; Fuller *et al.*, 2016).

3.7 Hypothesis Testing and Model Estimation

Following the validation of the measurement model, SEM was employed to test the proposed direct and indirect relationships among the constructs. SEM was selected due to its ability to simultaneously estimate multiple relationships while accounting for measurement error. To examine the moderated mediation effects, PROCESS Macro (Model 7) developed by Hayes (2018) was used. This approach enabled the assessment of conditional indirect effects and the index of moderated mediation using bootstrapping techniques, which provide more accurate confidence intervals for indirect effects. The combined use of SEM and PROCESS Macro enhanced the analytical rigor of the study and provided a comprehensive evaluation of the hypothesised relationships.

4. Data Analysis

The sample comprised 465 respondents, with males constituting 54.4% (n = 253) and females 45.6% (n = 212), indicating a relatively balanced gender distribution. With respect to educational qualifications, the majority of respondents were graduates (65.4%), followed by postgraduates (33.3%), while only 1.3% had secondary-level education or below. This indicates that the sample is predominantly well-educated. In terms of monthly household income (MHI), 50.8% reported income below ₹50,000, 27.1% fell within ₹50,001–₹100,000, and nearly 22% earned above ₹100,000, suggesting moderate income representation with a concentration in the lower-middle income category. Regarding employment status, 51.83% were salaried employees, 21.08% were self-employed, 6.67% homemakers, 5.59% professionals, and 14.84% belonged to other categories. This reflects a workforce-dominated sample. Age-wise, the majority of respondents were between 31-40 years (48.4%) and 41-50 years (46.2%), indicating that over 94% of participants were in the economically active middle-age group. Concerning preferred social media platforms, LinkedIn (25.6%) and Snapchat (23.9%) were the most preferred, followed by YouTube (17%), TikTok (14%), and Twitter/X (5.8%), while Instagram accounted for 2.6%. In terms of daily social media usage, nearly half of the respondents (49.5%) reported spending 4-5 hours per day, 25.2% spent more than 5 hours, and 22.8% used social media for 2-3 hours,

Table 1. Demographic profile of the respondents

Variable	Category	Frequency	Percent
Gender	Male	253	54.4
	Female	212	45.6
Academic details	Secondary school or below	6	1.3
	Graduation	304	65.4
	Postgraduate degree	155	33.3
MHI	<50000	236	50.8
	50001-100000	126	27.1
	100001-150000	51	11.0
	>150000	52	11.2
Employment status	Salaried	241	51.83
	Home makers	31	6.67
	Self-employed	98	21.08
	Professionals	26	5.59
	Others	69	14.84
Age	<30	6	1.3
	31-40	225	48.4
	41-50	215	46.2
	51-60	16	3.4
	70>	3	0.6
Preferred Social Media Platform	Insta	12	2.6
	Twitter (X)	27	5.8
	YouTube	79	17
	LinkedIn	119	25.6
	Snapchat	111	23.9
	Tiktok	65	14
	Others	52	11.2
Social Media Usage	< 1 Hour	12	2.6
	2-3 Hurs	106	22.8
	4-5 Hours	230	49.5
	> 5 Hours	117	25.2

Table 2. CFA results showing Cronbach's alpha, loadings, AVE, CR, and SGRT of AVE

Item	Cronbach's Alpha	Loadings	AVE	CR		SqrtAVE
E1	0.825	0.825	0.854	0.940	0.825***	0.924
E2		0.804			0.804***	
E3		0.720			0.72***	
E4		0.987			0.987***	
E5		0.936			0.936***	
I1	0.917	0.917	0.888	0.961	0.917***	0.943
I2		0.909			0.909***	
I3		0.775			0.775***	
I4		0.942			0.942***	
I5		0.899			0.899***	
IA1	0.908	0.908	0.878	0.947	0.908***	0.937
IA2		0.815			0.815***	
IA3		0.786			0.786***	
IA4		0.895			0.895***	
IA5		0.988			0.988***	
PC1	0.848	0.848	0.914	0.963	0.848***	0.956
PC2		0.950			0.95***	
PC3		0.858			0.858***	
PC4		0.950			0.95***	
PC5		0.963			0.963***	
T1	0.753	0.753	0.860	0.953	0.753***	0.928
T2		0.898			0.898***	
T3		0.850			0.85***	
T4		0.878			0.878***	
T5		0.923			0.923***	

E = Entertainment, I = Informativeness, IA = Interaction, PC = personalisation/customisation T = Trendiness CMIN = 823.914, DF = 295, P = 0.000, CMIN/DF = 2.793, CRMR = 0.027, RMSEA = 0.013, GFI = 0.943, NFI = 0.939, RFI = 0.915, IFI = 0.968, TLI = 0.936, CFI = 0.967

indicating high digital engagement within the sample.

The model fit indices presented above provide a comprehensive understanding of how well the hypothesised structural model fits the observed data. The Chi-Square (CMIN) value is 823.914 with 295 Degrees of Freedom (DF) and a pvalue of 0.000, indicating that the model is statistically significant. Although a significant chi-square typically suggests some difference between the model and the data, in large samples, chi-square tends to be highly sensitive to sample size. Therefore, researchers often look at relative fit indices such as CMIN/DF, RMSEA, CFI, GFI, and others for a more reliable interpretation of model adequacy. The CMIN/DF ratio, which is the chi-square value divided by the degrees of freedom, stands at 2.793. According to model fit standards proposed by Hair *et al.* (2019), a ratio less than 3 indicates an acceptable model fit, while values below 2 suggest a very good fit. Hence, the current model falls well within the acceptable range, implying that the data fit the hypothesised model reasonably well. The Root Mean Square Error of Approximation (RMSEA) is 0.013, which is well below the recommended threshold of 0.08 for acceptable fit and even below 0.05, which indicates an excellent fit (Byrne, 2016; Sathyanarayana & Mohanasundaram, 2024b). This extremely low RMSEA value signifies minimal approximation error between the model and the population covariance matrix, confirming that the model captures the underlying structure of the data very effectively. The Goodness of Fit Index (GFI) is 0.943, exceeding the commonly accepted threshold of 0.90, indicating that the model explains a substantial proportion of the variance in the data. Similarly, the Normed Fit Index (NFI) of 0.939 and the Relative Fit Index (RFI) of 0.915 both surpass the recommended benchmark of 0.90, confirming that the model performs significantly better than a null model with no relationships among variables. Further, the Incremental Fit Index (IFI) of 0.968, Tucker-Lewis Index (TLI) of 0.936, and Comparative Fit Index (CFI) of 0.967 all exceed the conventional cut-off value of 0.90, and are even close to or above 0.95, suggesting that the model achieves an excellent fit when compared to a baseline model. The Comparative Fit Index (CFI) is one of the most robust indicators, and a value above 0.95 typically signifies that the proposed model represents the observed data exceptionally well (Hu & Bentler, 1999). Therefore, it can be inferred that the hypothesised model is both statistically sound and theoretically robust, providing a reliable basis for interpreting the causal paths and mediating or moderating relationships examined in the study.

The construct Entertainment (E) achieved a Cronbach's Alpha of 0.825, indicating good internal consistency since values above 0.70 are considered acceptable (Nunnally & Bernstein, 1994; Sathyanarayana, 2026b). The standardised factor loadings for the five items (E1–E5) ranged from 0.720 to 0.987, all of which exceed the minimum threshold of 0.70, suggesting that each item significantly contributes to the latent construct. The Average Variance Extracted (AVE) is 0.940, and the Composite Reliability (CR) is 0.825, both surpassing the recommended cut-offs of 0.50 (for AVE) and 0.70 (for CR) (Hair *et al.*, 2019). The Square Root of AVE (√AVE) is 0.924, which is substantially greater than the inter-construct correlations, confirming discriminant validity. The construct Informativeness (I)

reported a Cronbach's Alpha of 0.917, which denotes excellent internal consistency. The standardised loadings range between 0.775 and 0.942, indicating that all items have strong contributions to the construct. The AVE (0.961) and CR (0.917) both exceed the ideal thresholds, suggesting that the items collectively capture more than 96% of the construct's variance, which is exceptionally high. The √AVE (0.943) confirms discriminant validity, indicating that informativeness is statistically distinct from other related constructs. The Interaction (IA) dimension also reflects strong psychometric robustness with a Cronbach's Alpha of 0.908, signifying very good internal consistency. The item loadings range from 0.786 to 0.988, all comfortably above 0.70. The AVE (0.947) and CR (0.908) again exceed recommended levels, ensuring convergent validity. The √AVE (0.937) indicates that the construct maintains discriminant validity from others. The Personalisation/Customisation (PC) construct exhibits excellent reliability with a Cronbach's Alpha of 0.848. The standardised loadings range between 0.858 and 0.963, confirming that all items contribute meaningfully to the construct. The AVE (0.963) and CR (0.848) exceed the minimum cut-offs, while the √AVE (0.956) shows strong discriminant validity. Together, these results indicate that the measurement model for personalisation is statistically sound and conceptually valid. The construct Trendiness (T) achieved a Cronbach's Alpha of 0.753, meeting the acceptable reliability threshold (≥0.70). The factor loadings range from 0.850 to 0.923, indicating strong item performance and internal consistency. The AVE (0.953) and CR (0.753) are both well above acceptable levels, confirming convergent validity. The √AVE (0.928) shows that the construct is empirically distinct from the others, ensuring discriminant validity. The results of the Confirmatory Factor Analysis confirm that all constructs Entertainment, Informativeness, Interaction, Personalisation, and Trendiness exhibit strong psychometric properties, validating the measurement model. Each construct demonstrates internal consistency, convergent validity, and discriminant validity, indicating that the observed indicators reliably measure the intended latent variables without overlap or redundancy.

Table 3. Discriminant validity of the measurement model

	ET	IT	IT_A	PCT	TT	EST	Mean	SE	ST
ET	**0.924**	0.34**	0.405**	0.447**	0.204**	0.408**	3.568	0.0548	1.1886
IT		**0.943**	0.311**	0.453**	0.348**	0.412**	3.644	0.0546	1.1758
IT_A			**0.937**	0.351**	0.311**	0.384**	3.61	0.0542	1.171
PCT				**0.956**	0.459**	0.287**	3.63	0.0542	1.1682
TT					**0.928**	0.326**	3.59	0.0538	1.1606
EST						**0.941**	3.592	0.0546	1.177

E = Entertainment, I = Informativeness, IA = Interaction, T = Trendiness, ES = E-WOM/social sharing

The discriminant validity of the measurement model was assessed using the Fornell–Larcker criterion, which compares the square root of the Average Variance Extracted (√AVE) values on the diagonal with the inter-construct correlation coefficients presented below the diagonal. According to Fornell and Larcker (1981), discriminant validity is established when the √AVE of each construct exceeds its correlations with other constructs, confirming that the construct captures unique variance not shared with other latent variables. As shown in the table 3, all √AVE values ranging from 0.924 for Entertainment (ET) to 0.956 for Personalisation/Customisation (PCT) are greater than the corresponding inter-construct correlations, which range between 0.204 and 0.459. This clearly satisfies the Fornell–Larcker criterion and confirms that each construct is empirically distinct from the others. Specifically, the construct ET demonstrates a √AVE of 0.924, which exceeds its highest inter-correlation value of 0.447 with Personalisation/Customisation (PCT), indicating strong discriminant validity. Similarly, Informativeness (IT) shows a √AVE of 0.943, surpassing all its correlations (maximum = 0.453 with PCT). Interaction (IT_A) also exhibits excellent discriminant validity, with a √AVE of 0.937 and relatively low correlations (maximum = 0.384 with E-WOM/ Social Sharing (EST)). PCT construct, with a √AVE of 0.956, demonstrates clear discriminant separation, as none of its inter-construct correlations exceed 0.459. Likewise, Trendiness (TT) and E-WOM/Social Sharing (EST), with √AVE values of 0.928 and 0.941 respectively, also display clear independence from other constructs, with the highest correlations being

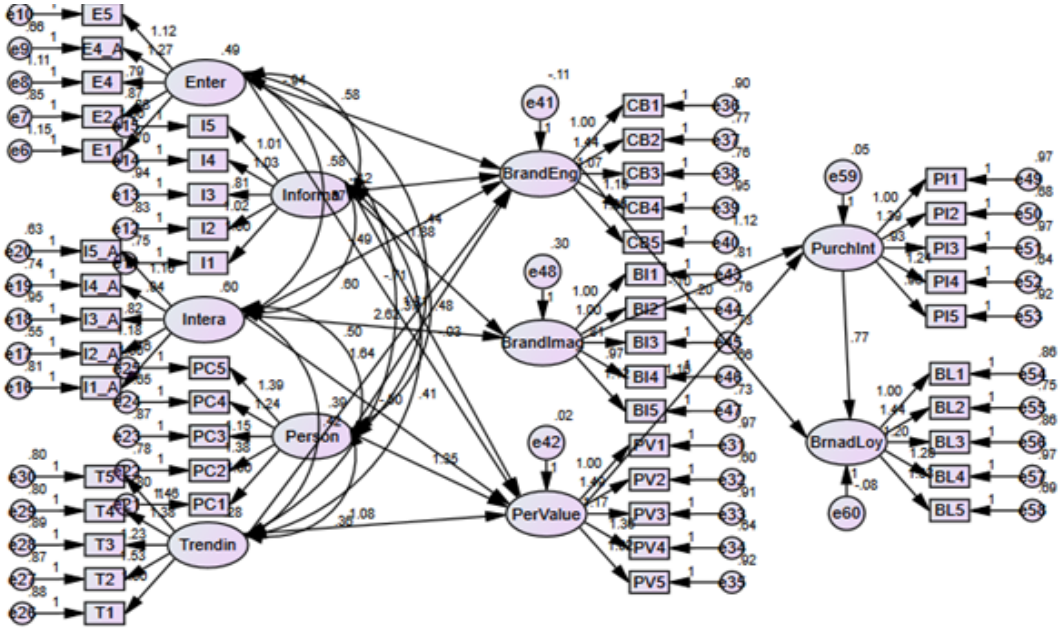


Figure 1. Structural relationship among the latent constructs.

Table 4. Path coefficient and (testing of hypothesis)

PATH	Estimate	Estimate	S.E.	C.R.	P	Label
Enter→PerValue	0.714	0.861	0.064	11.16	***	Supported
Informa→PerValue	0.071	0.071	0.0252	2.82	0.021	Supported
Intera→PerValue	0.497	0.659	0.047	10.57	***	Supported
Person→PerValue	0.348	0.338	0.073	4.77	***	Supported
Trendin→PerValue	1.077	0.978	0.063	17.1	***	Supported
Informa→BrandImag	0.876	0.845	0.094	9.32	***	Supported
Intera→BrandImag	0.624	0.61	0.0511	12.21	***	Supported
Informa→BrandEng	0.122	0.164	0.028	4.36	***	Supported
Enter→BrandEng	0.937	1.153	0.073	12.84	***	Supported
Intera→BrandEng	0.492	0.666	0.092	5.35	***	Supported
Person→BrandEng	0.311	0.928	0.019	16.37	***	Supported
Trendin→BrandEng	0.644	0.625	0.042	15.33	***	Supported
BrandImag→PurchInt	0.104	0.124	0.031	3.35	0.002	Supported
PerValue→PurchInt	1.161	0.94	0.142	8.18	***	Supported
BrandEng→BrnadLoy	0.203	0.209	0.039	5.21	***	Supported
PurchInt→BrnadLoy	0.772	0.908	0.083	9.3	***	Supported

Enter = Entertainment, Informa = Informativeness, Intera = Interaction, Person = Personalisation/customisation, Trendin = Trendiness, Brandimag = Brand image, Pervalue = perceived value, Branding = brand loyalty, Purchint = purchase intention

CMIN = 3348.762, DF = 1149, P = 0.000, CMIN/DF = 2.91450, RMR = 0.019, RMSEA = 0.016, GFI = 0.932, NFI = 0.958, RFI = 0.929, IFI = 0.994, TLI = 0.965, CFI = 0.992

0.459 and 0.408, respectively. The mean scores for all constructs range between 3.56 and 3.64, indicating a generally positive perception among respondents toward the evaluated social media content attributes. The Standard Errors (SE) vary between 0.0538 and 0.0548, reflecting consistency and stability in the responses, while the Standard Deviations (SD) are moderate (around 1.16-1.18), showing acceptable variation in perception.

The results of the SEM reveal that the overall model demonstrates excellent goodness of fit, suggesting that the hypothesised structural model is consistent with the observed data. The Chi-square statistic (CMIN = 3348.762, DF =

1149, p = 0.000) indicates a statistically significant result, which is common for large sample sizes (n > 200) as the test is highly sensitive to sample size (Byrne, 2016). Therefore, rather than relying solely on the chi-square significance, the relative chi-square ratio (CMIN/DF = 2.91) is a more appropriate indicator. This value is well within the acceptable range of ≤ 3.00, as recommended by Kline (2016), indicating a good model fit. The Root Mean Square Residual (RMR = 0.019) falls below the conventional cut-off value of 0.05, implying minimal average residuals between the observed and predicted covariances. Similarly, the Root Mean Square Error of Approximation (RMSEA = 0.016) is substantially below the recommended threshold of 0.06 (Hu & Bentler, 1999), suggesting a very close fit between the hypothesised model and the population covariance structure. The low RMSEA also reflects high model parsimony and strong explanatory power. In terms of incremental fit indices, the model achieved a Goodness of Fit Index (GFI) of 0.932, which exceeds the acceptable threshold of 0.90, indicating strong overall model adequacy (Hair *et al.*, 2019). The Normed Fit Index (NFI = 0.958), Relative Fit Index (RFI = 0.929), Incremental Fit Index (IFI = 0.994), Tucker-Lewis Index (TLI = 0.965), and Comparative Fit Index (CFI = 0.992) all exceed the commonly accepted benchmark of 0.90, and most surpass the excellent fit level of 0.95 (Hu & Bentler, 1999). This indicates that the hypothesised model explains a substantial proportion of variance compared to an independent or null model, and that the data fit the model significantly better than chance (Sathyanarayana & Mohanasundaram, 2024b).

The structural path from Entertainment (Enter) to Perceived Value was found to be positive and significant (β = 0.861, S.E. = 0.064, C.R. = 11.16, p<0.001). According to the threshold recommended by Hair *et al.* (2019), a critical ratio (C.R.) greater than 1.96 and a *p*-value less than 0.05 indicate statistical significance. Therefore, the result confirms that Entertainment has a significant positive influence on Perceived Value, and the proposed hypothesis is supported.

The path from Informativeness (Informa) to Perceived Value was found to be positive and statistically significant (β = 0.071, S.E. = 0.0252, C.R. = 2.82, p = 0.021). According to the standard guidelines suggested by Hair *et al.* (2019), a Critical Ratio (C.R.) above 1.96 and a p-value less than 0.05 indicate a significant relationship. Thus, the hypothesis proposing a positive association between informativeness and perceived value is supported. The structural path from Interaction (Intera) to Perceived Value yielded a strong positive influence (β = 0.659, S.E. = 0.047, C.R. = 10.57, p<0.001). The high critical ratio and significant probability value confirm that the relationship is statistically robust and well above the recommended thresholds (Hair *et al.*, 2019). Hence, the proposed hypothesis is supported. The path from Personalisation (Person) to Perceived Value was also found to be positive and significant (β = 0.338, S.E. = 0.073, C.R. = 4.77, p<0.001). Since the C.R. exceeds the 1.96 benchmark and the p-value is well below 0.05, the hypothesised relationship is statistically supported. The path from Trendiness (Trendin) to Perceived Value showed a very strong and statistically significant effect (β = 0.978, S.E. = 0.063, C.R. = 17.10, p<0.001), indicating robust support for the proposed hypothesis. Since the critical ratio far exceeds the threshold value of 1.96 and the

p-value is well below 0.05, the result confirms that perceived trendiness exerts a substantial positive influence on perceived value (Hair *et al.*, 2019). The structural path from Informativeness (Informa) to Brand Image (BrandImag) was found to be positive and highly significant (β = 0.845, S.E. = 0.094, C.R. = 9.32, p<0.001). The magnitude of the standardised coefficient and the high critical ratio confirm the strength of the relationship. This supports the hypothesis that informativeness directly enhances brand image. The path from Interaction (Intera) to Brand Image also demonstrated a strong and statistically significant relationship (β = 0.610, S.E. = 0.0511, C.R. = 12.21, p<0.001), indicating robust support for the hypothesis. The results suggest that interactive social media engagement where consumers can comment, share feedback, and participate in discussions plays a crucial role in shaping positive brand perceptions. The path from Informativeness (Informa) to Brand Engagement revealed a significant positive effect (β = 0.164, S.E. = 0.028, C.R. = 4.36, p<0.001), indicating that the relationship is both statistically and practically meaningful. The structural path from Entertainment (Enter) to Brand Engagement exhibited a strong and highly significant effect (β = 1.153, S.E. = 0.073, C.R. = 12.84, p<0.001). The strength of this relationship highlights that entertainment is a key driver of consumer engagement on digital and social media platforms.

The relationship between Interaction (Intera) and Brand Engagement was also found to be positive and statistically significant (β = 0.666, S.E. = 0.092, C.R. = 5.35, p<0.001). This demonstrates that higher interactivity in brand communication significantly enhances consumer engagement levels. Interactive features such as comments, polls, contests, and two-way discussions allow consumers to actively participate in brand activities and co-create experiences. The path from Personalisation (Person) to Brand Engagement yielded a very strong and statistically significant relationship (β = 0.928, S.E. = 0.019, C.R. = 16.37, p<0.001). This implies that personalised and customised social media communication substantially enhances consumers' connection and involvement with the brand. Finally, the path from Trendiness (Trendin) to Brand Engagement demonstrated a strong, positive, and highly significant effect (β = 0.625, S.E. = 0.042, C.R. = 15.33, p<0.001). This finding reveals that trend-driven and up-to-date brand content significantly contributes to consumer engagement. The structural path from Brand Image (BrandImag) to Purchase Intention (PurchInt) revealed a positive and statistically significant effect (β = 0.124, S.E. = 0.031, C.R. = 3.35, p = 0.002). This finding indicates that a strong and favourable brand image meaningfully enhances consumers' willingness to purchase products associated with that brand. When consumers perceive a brand as trustworthy, prestigious, or consistent in delivering quality, they are more likely to form purchase intentions aligned with those positive perceptions. The relationship between Perceived Value (PerValue) and Purchase Intention (PurchInt) demonstrated a strong, positive, and highly significant influence (β = 0.94, S.E. = 0.142, C.R. = 8.18, p<0.001). This indicates that when consumers perceive a brand as offering superior value balancing quality, price, emotional satisfaction, and functional benefits they are more inclined to intend or decide to purchase the brand's products.

The path from Brand Engagement (BrandEng) to Brand Loyalty (BrnadLoy) was found to be positive and statistically significant (β = 0.209, S.E. = 0.039, C.R. = 5.21, p<0.001). This demonstrates that higher consumer engagement with brand content, activities, and online communities translates into stronger attitudinal and behavioral loyalty. Engaged customers often feel a personal connection with the brand, which leads to repeated interactions, advocacy, and emotional attachment. The structural relationship between Purchase Intention (PurchInt) and Brand Loyalty (BrnadLoy) exhibited a very strong and highly significant effect (β = 0.908, S.E. = 0.083, C.R. = 9.30, p<0.001). This highlights

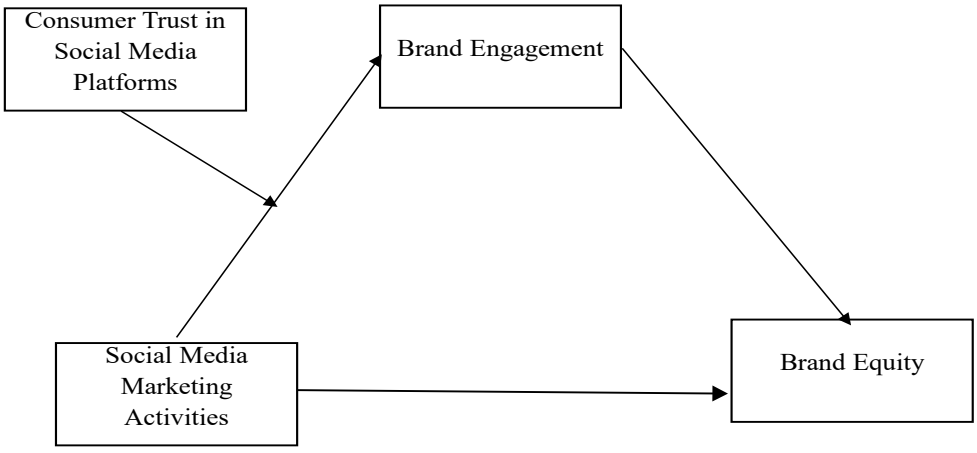


Figure 2. Moderated mediation: Moderation effect of consumer trust in social media platforms on the relationship between social media marketing activities on brand equity mediated through brand engagement.

Table 5. Model summary

	Outcome variable: Brand Engagement			Outcome Variable: Brand Equity		
	coeff	**se**	**LLCI(ULCI)**	**coeff**	**se**	**LLCI(ULCI)**
constant	6.0977	1.363	8.7763(3.4192)	2.6206	0.6221	1.3981(3.8431)
X	0.8814	0.1007	0.6834(1.0793)	0.1145	0.047	0.0221(0.2068)
M				0.7416	0.0484	0.6464 (0.8367)
W	1.1195	0.0846	0.9532(1.2858)			
X*W	-0.0347	0.0052	-0.045 (-0.0245)			
	R^2	0.7444			R^2	0.5988
	F(3,461) =	447.63			F(2,462)=	344.727

Table 6. Conditional effect of the focal predictor at various levels of moderator

CTSMP	Effect	se	t	p	LLCI	ULCI
14.4365	0.3798	0.041	9.2613	0.0000	0.2992	0.4604
18.4323	0.241	0.0368	6.5432	0.0000	0.1686	0.3133
22.428	0.1021	0.0437	2.3399	0.0197	0.0164	0.1879

Table 7. Index of moderated mediation

	Index	BootSE	BootLLCI	BootULCI
CTSMP	-0.0258	0.0043	-0.0341	-0.0175

that consumers who express strong purchase intentions are highly likely to progress toward brand loyalty, translating their intentions into consistent repurchase behavior and long-term commitment. Purchase intention thus acts as a behavioral antecedent to loyalty, bridging consumers' cognitive evaluation and actual repeat purchase actions.

4.1 First-stage Regression Results (Outcome Variable: Brand Engagement)

The regression model predicting Brand Engagement (BREN) was statistically significant, $R = 0.86$, $R^2 = 0.74$, $F(3, 461) = 447.63$, $p<0.001$, indicating that 74.4% of the variance in brand engagement was explained by SMMA, CTSMP, and their interaction. Social media marketing activities exhibited a strong positive effect on brand engagement ($\beta = 0.88$, SE = 0.10, $t = 8.75$, $p<0.001$), suggesting that increased intensity and quality of marketing efforts on social media significantly enhance consumer engagement with brands. Consumer trust in social media platforms also had a significant positive influence on brand engagement ($\beta = 1.12$, SE = 0.08, $t = 13.23$, $p<0.001$). This indicates that higher trust in social media platforms fosters greater willingness among consumers to interact with and engage with brand-related content. Importantly, the interaction between social media marketing activities and consumer trust was negative and statistically significant ($\beta = -0.035$, SE = 0.005, $t = -6.64$, $p<0.001$). This finding confirms the presence of first-stage moderation, indicating that although social media marketing positively influences brand engagement, its effectiveness diminishes as consumer trust in social media platforms increases. These results suggest that social media marketing is most impactful in driving brand engagement when consumer trust is relatively lower, whereas at higher trust levels, additional marketing efforts yield smaller marginal gains in engagement. This pattern reflects a diminishing returns effect, highlighting consumer selectivity in highly trusted digital environments. Consistent with prior research, the positive main effects of social media marketing and trust align with relationship marketing and engagement theory,

which emphasise interaction and trust as key drivers of consumer engagement. However, the observed negative interaction effect extends existing literature by demonstrating that trust can function as a boundary condition, moderating the strength of marketing stimuli rather than uniformly amplifying their impact (Sathyanarayana & Mohanasundaram, 2025).

4.2 Interaction Effect between Social Media Marketing and Consumer Trust

The interaction between SMMA and CTSMP was statistically significant. The inclusion of the interaction term resulted in a significant increase in explained variance in brand engagement, $\Delta R^2 = 0.024$, $F(1, 461) = 44.07$, $p<0.001$. This finding confirms that consumer trust significantly moderates the relationship between social media marketing activities and brand engagement, thereby satisfying the core requirement of first-stage moderation in PROCESS Model 7.

4.3 Conditional Effects of Social Media Marketing on Brand Engagement

Simple slope analysis was conducted to examine the effect of social media marketing activities on brand engagement at low, medium, and high levels of consumer trust. At low levels of consumer trust (CTSMP = 14.44), social media marketing had a strong positive effect on brand engagement ($\beta = 0.38$, SE = 0.04, $t = 9.26$, $p<0.001$). This indicates that when consumers are relatively less trusting of social media platforms, marketing efforts play a crucial role in stimulating engagement. At moderate levels of consumer trust (CTSMP = 18.43), the effect of social media marketing on brand engagement remained positive but was weaker in magnitude ($\beta = 0.24$, SE = 0.04, $t = 6.54$, $p<0.001$). At high levels of consumer trust (CTSMP = 22.43), the positive effect of social media marketing on brand engagement was further attenuated, though still statistically significant ($\beta = 0.10$, SE = 0.04, $t = 2.34$, $p = 0.020$).

The decreasing magnitude of the conditional effects across increasing levels of consumer trust provides clear evidence of a dampening moderation effect. While social media marketing consistently enhances brand engagement, its effectiveness declines as consumer trust in social media platforms increases. This suggests that when trust is already well established, consumers rely less on marketing cues to form engagement, reflecting a saturation or diminishing-returns mechanism.

4.4 Second-Stage Regression Results (Outcome Variable: Brand Equity)

The regression model predicting Brand Equity (BET) was statistically significant, $R = 0.77$, $R^2 = 0.60$, $F(2, 462) = 344.73$, $p<0.001$, indicating that 59.9% of the variance in brand equity was explained by SMMA and Brand Engagement (BREN). Brand engagement emerged as a strong and positive predictor of brand equity ($\beta = 0.74$, SE = 0.05, $t = 15.32$, $p<0.001$). This result suggests that higher levels of consumer engagement with a brand driven by interaction, emotional connection, and participation significantly enhance overall brand value. Social media marketing activities also exerted a positive and statistically significant direct effect on brand equity ($\beta = 0.11$, SE = 0.05,

t = 2.44, p = 0.015). The persistence of this effect after accounting for brand engagement indicates that social media marketing influences brand equity both directly and indirectly, supporting a partial mediation framework.

4.5 Test of Interaction between SMMA and Brand Engagement

The test of the SMMA × BREN interaction was statistically significant, F (1, 461) = 24.87, p<0.001. This finding suggests that the relationship between social media marketing activities and brand equity varies depending on the level of brand engagement, reinforcing the central role of engagement in translating marketing efforts into brand value. These findings confirm that brand engagement is a critical psychological mechanism through which social media marketing activities enhance brand equity. While social media marketing independently contributes to brand equity, its impact is substantially amplified when consumers are actively engaged with the brand. This underscores the importance of moving beyond exposure-based marketing metrics toward engagement-centered strategies.

4.6 Direct Effect of Social Media Marketing on Brand Equity

The direct effect of SMMA on brand equity (BET) was positive and statistically significant (β = 0.11, SE = 0.05, t = 2.44, p = 0.015, 95% CI [0.02, 0.21]). This result indicates that social media marketing contributes to brand equity independently of its effect through brand engagement. Thus, even after accounting for the mediating role of engagement, social media marketing activities continue to exert a meaningful influence on brand equity, supporting a partial mediation model.

4.7 Conditional Indirect Effects of Social Media Marketing on Brand Equity

The conditional indirect effects analysis examined whether the indirect relationship between SMMA and BET through BREN varied across levels of CTSMP. At low levels of consumer trust (CTSMP = 14.44), the indirect effect of social media marketing on brand equity via brand engagement was strong and positive (Effect = 0.28, BootSE = 0.05, 95% CI [0.19, 0.37]). This indicates that when trust in social media platforms is relatively low, social media marketing activities substantially enhance brand equity by actively fostering consumer engagement. At moderate levels of consumer trust (CTSMP = 18.43), the indirect effect remained statistically significant, though reduced in magnitude (Effect = 0.18, BootSE = 0.04, 95% CI [0.11, 0.25]). This suggests that while brand engagement continues to transmit the influence of social media marketing to brand equity, its mediating strength weakens as trust increases. At high levels of consumer trust (CTSMP = 22.43), the indirect effect was further attenuated, yet still statistically significant (Effect = 0.08, BootSE = 0.03, 95% CI [0.01, 0.14]). This finding indicates that even under high trust conditions, brand engagement remains a viable pathway, but its contribution is comparatively limited. Across all levels of consumer trust, the bootstrap confidence intervals did not include zero, confirming the robustness of the conditional indirect effects. The monotonic decline in effect sizes across increasing trust levels provides clear evidence

that consumer trust negatively conditions the mediating role of brand engagement.

4.8 Index of Moderated Mediation

The index of moderated mediation was negative and statistically significant (Index = -0.026, BootSE = 0.004, 95% CI [-0.034, -0.018]). This provides definitive evidence that consumer trust in social media platforms conditions the indirect relationship between social media marketing activities and brand equity via brand engagement. The negative sign of the index indicates that the mediating role of brand engagement weakens as consumer trust increases.

4.9 Pairwise Contrasts of Conditional Indirect Effects

Pairwise contrasts were examined to assess whether the magnitude of the indirect effect of social media marketing activities on brand equity through brand engagement differed significantly across levels of CTSMP. The contrast between the moderate-trust condition (Effect = 0.179) and the low-trust condition (Effect = 0.282) was statistically significant (Contrast = -0.103, BootSE = 0.017, 95% CI [-0.136, -0.070]). This indicates that the indirect effect under moderate trust was significantly weaker than under low trust. Similarly, the contrast between the high-trust condition (Effect = 0.076) and the low-trust condition (Effect = 0.282) was also statistically significant and larger in magnitude (Contrast = -0.206, BootSE = 0.034, 95% CI [-0.273, -0.140]). This result demonstrates a substantial reduction in the indirect effect of social media marketing on brand equity via brand engagement when consumer trust is high. Finally, the contrast between the high-trust condition and the moderate-trust condition was statistically significant (Contrast = -0.103, BootSE = 0.017, 95% CI [-0.136, -0.070]), indicating that even the shift from moderate to high trust results in a meaningful weakening of the mediation pathway.

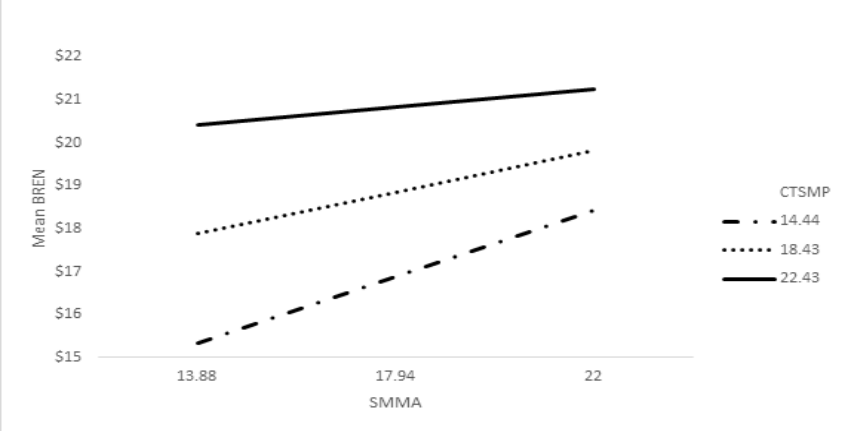


Figure 3. The conditional effect of the focal predictor - Interpretation of the interaction plot (SMMA × CTSMP → Brand Engagement)

Across all comparisons, the bootstrap confidence intervals did not include zero, confirming that differences in the indirect effects across trust levels are statistically reliable. The consistently negative contrasts provide strong evidence that consumer trust systematically attenuates the strength of the engagement-based mediation mechanism. These findings suggest that brand engagement plays a progressively smaller mediating role as trust in social media platforms increases. When trust is low, consumers appear to rely more heavily on social media marketing cues to develop engagement, which in turn enhances brand equity. As trust strengthens, consumers become less dependent on marketing stimuli, resulting in diminishing indirect effects. This pattern advances prior branding and digital marketing research by moving beyond average indirect effects to demonstrate significant heterogeneity in mediation strength. The results highlight consumer trust not merely as a facilitating condition, but as a contextual substitute that reduces the incremental value of social media marketing in building brand equity through engagement.

The interaction plot illustrates the relationship between SMMA and BREN at low, moderate, and high levels of CTSMP. Across all three levels of consumer trust, brand engagement increases as social media marketing activities intensify, indicating a consistently positive main effect of social media marketing on engagement. However, the steepness of the slopes differs noticeably across trust conditions, reflecting a moderation effect. At low levels of consumer trust, the slope of the line is the steepest, showing that increases in social media marketing activities lead to substantial gains in brand engagement. This suggests that when trust in social media platforms is limited, marketing efforts play a critical role in stimulating consumer interaction with brands. At moderate levels of consumer trust, the slope remains positive but is less steep, indicating a moderate increase in brand engagement with rising marketing activities. At high levels of consumer trust, the slope is the flattest, demonstrating that additional social media marketing activities result in relatively smaller increases in brand engagement. This visual pattern aligns with the statistically significant negative interaction effect, indicating a dampening influence of trust on the SMMA–BREN relationship. The graph visually confirms that consumer trust in social media platforms attenuates the effect of social media marketing on brand engagement. While marketing remains effective across all trust levels, its incremental impact diminishes as trust increases, supporting the presence of a diminishing returns mechanism.

5. Discussion and Conclusion

The present study provides a comprehensive examination of how SMMA influence brand equity, integrating brand engagement as a key mediating mechanism and consumer trust in social media platforms as a critical boundary condition. By combining structural equation modelling and PROCESS-based moderated mediation analysis, the findings offer both theoretical advancement and practical relevance in digital marketing and branding research. The results demonstrate that entertainment, informativeness, interaction, personalisation, and trendiness all exert significant positive effects on perceived value, with trendiness and entertainment emerging as particularly strong drivers. These findings align with the

uses and gratifications theory, which posits that consumers derive value from media content that is enjoyable, informative, interactive, and personally relevant (Katz *et al.*, 1973). Consistent with prior research, entertainment enhances hedonic value and emotional gratification (Ashley & Tuten, 2015), while informativeness supports utilitarian value by reducing uncertainty and improving decision quality (Ducoffe, 1996). The strong role of interaction corroborates studies emphasising two-way communication and consumer participation as central to value co-creation in digital environments (Vargo & Lusch, 2008). Personalisation and trendiness further reinforce perceived value by increasing relevance and social currency, echoing earlier findings by Godey *et al.* (2016) and Keller (2016).

The study reveals that informativeness and interaction significantly enhance brand image, supporting branding theory that emphasises clarity, consistency, and dialogue in shaping favourable brand perceptions (Keller, 2013). Interactive social media environments allow consumers to co-create meaning, thereby strengthening brand associations and credibility. More importantly, entertainment, interaction, personalisation, informativeness, and trendiness all significantly predict brand engagement, with entertainment and personalisation showing especially strong effects. These findings are consistent with engagement theory, which conceptualises engagement as a multidimensional construct encompassing cognitive, emotional, and behavioural investment in a brand (Hollebeek *et al.*, 2014). Personalised and entertaining content appears particularly effective in fostering emotional attachment and active participation, a result consistent with recent digital branding studies (Dessart *et al.*, 2015). The results confirm that perceived value and brand image significantly enhance purchase intention, reinforcing established consumer behaviour models that position value and image as proximal antecedents of buying decisions (Zeithaml, 1988; Keller, 2013). Furthermore, brand engagement significantly predicts brand loyalty, supporting relationship marketing theory, which suggests that engaged consumers develop stronger relational bonds that translate into loyalty and advocacy (Morgan & Hunt, 1994). The strong effect of purchase intention on brand loyalty highlights the sequential nature of consumer decision-making, wherein favourable evaluations and intentions evolve into sustained behavioural commitment. This finding aligns with prior studies demonstrating that intention serves as a critical bridge between attitudes and repeat purchase behaviour (Oliver, 1999).

One of the most important contributions of this study lies in uncovering a negative moderated mediation effect. While social media marketing positively influences brand engagement, and brand engagement enhances brand equity, the strength of this indirect pathway declines as consumer trust in social media platforms increases. This finding is theoretically significant. Prior literature largely portrays trust as an amplifier of marketing effectiveness (Gefen *et al.*, 2003). However, the present results suggest a substitution effect, whereby high trust reduces consumers' reliance on marketing cues to form engagement. When trust is already established, consumers may become more selective and less responsive to incremental marketing stimuli, reflecting persuasion knowledge and digital maturity (Friestad & Wright, 1994).

The significant index of moderated mediation and the systematic differences revealed in the pairwise contrasts provide robust evidence that trust operates as a boundary condition, weakening the engagement-based transmission of marketing effects to brand equity. This extends existing research by moving beyond linear assumptions and demonstrating that more trust does not always translate into stronger marketing outcomes. The findings broadly align with earlier studies that highlight the importance of social media marketing in building engagement and brand equity (Godey *et al.*, 2016; Keller, 2016). However, the observed negative moderation by trust diverges from traditional trust-centric models, offering a more nuanced understanding of consumer behaviour in contemporary digital environments. Recent studies have begun to suggest similar saturation effects, noting that highly experienced and digitally literate consumers process marketing messages more critically (Campbell & Kirmani, 2000). Thus, the present study contributes to an emerging stream of literature that emphasises contextual and contingent effects rather than universal marketing principles.

5.1 Managerial Implications

The findings offer several actionable insights for practitioners: Managers should prioritise entertainment, personalisation, and interactivity in social media campaigns, as these attributes are the strongest drivers of brand engagement and perceived value. Since marketing effectiveness diminishes at higher trust levels, firms should adopt differentiated strategies. Low-trust segments may require intensive engagement-driven communication, while high-trust segments may benefit more from relationship maintenance and experiential value. Traditional metrics such as reach and impressions are insufficient. Managers should track engagement quality, personalisation effectiveness, and interactive depth to better assess brand-building outcomes. The strong link between engagement, purchase intention, and loyalty underscores the need for long-term engagement strategies rather than short-term promotional tactics.

This study advances digital marketing and branding literature by demonstrating that social media marketing activities influence brand equity through a complex, conditional process. Brand engagement serves as a central mediating mechanism, while consumer trust in social media platforms acts as a critical boundary condition that attenuates this mediation. By integrating structural modelling with moderated mediation analysis, the study provides a more realistic and nuanced account of consumer responses in digital environments. The findings challenge the assumption that trust uniformly enhances marketing effectiveness and instead reveal a diminishing returns dynamic in high-trust contexts. Overall, the study offers meaningful theoretical contributions and practical guidance, emphasising that effective social media marketing requires not only creative content but also a deep understanding of consumer trust and engagement dynamics.

5.2 Limitations and Directions for Future Research

Despite the theoretical and empirical contributions of this study, several limitations should be acknowledged, which also offer avenues for future research. First, the study employed a cross-sectional research design, which restricts the ability to draw strong causal

inferences among social media marketing activities, brand engagement, consumer trust, and brand equity. Although the hypothesised relationships were grounded in established theory and tested using robust statistical procedures (Hayes, 2018), future studies may adopt longitudinal or experimental designs to better capture temporal dynamics and causal mechanisms underlying moderated mediation effects. Second, the data were collected using self-reported measures, which may be susceptible to common method bias and social desirability effects. Although statistical significance and theoretical consistency mitigate this concern to some extent, future research could incorporate multi-source data, such as behavioural analytics, click-through rates, or platform-level engagement metrics, to enhance measurement objectivity (Podsakoff *et al.*, 2003). Third, the study focused on consumer trust in social media platforms as the sole moderator at the first stage. While the findings reveal a meaningful dampening (negative) moderation effect, other theoretically relevant boundary conditions such as privacy concerns, algorithm transparency, perceived intrusiveness, or digital fatigue, may also condition the effectiveness of social media marketing. Future studies could test multiple or comparative moderators to develop a more nuanced understanding of engagement dynamics. Fourth, the sample context limits the generalisability of the findings. Consumer perceptions of trust, engagement, and brand equity may vary across countries, cultures, industries, and platform types. Future research should explore cross-cultural or cross-platform comparisons (*e.g.*, Instagram vs. LinkedIn vs. TikTok) to assess the robustness of the moderated mediation model in different digital ecosystems (Vrontis *et al.*, 2021). Finally, while brand engagement was examined as a unidimensional mediator, engagement is increasingly conceptualised as a multidimensional construct encompassing cognitive, emotional, and behavioural components. Future research may decompose engagement dimensions to examine whether trust differentially moderates specific engagement pathways (Hollebeek *et al.*, 2014). In summary, addressing these limitations through diversified methodologies, broader contextual settings, and enriched theoretical models will further advance research on social media marketing effectiveness and brand equity formation in digital environments.

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179-211. https://doi.org/10.1016/0749-5978(91)90020-T

Ashley, C., & Tuten, T. (2015). Creative strategies in social media marketing: An exploratory study of branded social content and consumer engagement. *Psychology and Marketing*, *32*(1), 15-27. https://doi.org/10.1002/mar.20761

Belk, R. W. (1988). Possessions and the extended self in consumer behavior. *Journal of Consumer Research*, *15*(2), 139-168. https://doi.org/10.1086/209154

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107*(2), 238–246. https://doi.org/10.1037/0033-2909.107.2.238

Bentler, P. M. (1999). Comparative fit indexes in structural models. Psychological Bulletin, 107(2), 238-246. https://doi.org/10.1037/0033-2909.107.2.238 PMid: 2320703 PMCid:PMC7846036

Bleier, A., & Eisenbeiss, M. (2015). Personalized online advertising effectiveness. *Journal of Retailing*, *91*(3), 390-407. https://doi.org/10.1016/j.jretai.2015.04.001

Brodie, R. J., Hollebeek, L. D., Juric, B., & Ilic, A. (2011). Customer engagement: Conceptual domain, fundamental propositions, and implications. *Journal of Service Research*, *14*(3), 252-271. https://doi.org/10.1177/1094670511411703

Brodie, R. J., Hollebeek, L. D., Jurić, B., & Ilić, A. (2013). Customer engagement in a virtual brand community. *Journal of Business Research*, *66*(1), 105-114. https://doi.org/10.1016/j.jbusres.2011.07.029

Bruhn, M., Schoenmueller, V., & Schäfer, D. B. (2012). Are social media replacing traditional media in terms of brand equity creation? *Management Research Review*, *35*(9), 770-790. https://doi.org/10.1108/01409171211255948

Byrne, B. M. (2010). *Structural equation modeling with AMOS: Basic concepts, applications, and programming* (2nd ed.). Routledge.

Byrne, B. M. (2016). *Structural equation modeling with AMOS: Basic concepts, applications, and programming* (3rd ed.). Routledge. https://doi.org/10.4324/9781315757421

Campbell, M. C., & Kirmani, A. (2000). Consumers' use of persuasion knowledge. *Journal of Consumer Research*, *27*(1), 69-83. https://doi.org/10.1086/314309 PMid:25967220

Chen, Y. S., Lin, C. L., & Weng, C. S. (2020). The influence of environmental friendliness on brand image and purchase intention. *Journal of Business Ethics*, *163*(2), 307-322. https://doi.org/10.1007/s10551-009-0223-9

Cheung, M. L., Pires, G. D., & Rosenberger, P. J. (2020a). The influence of perceived social media marketing elements on consumer-brand engagement. *Journal of Business Research*, *121*, 247-259.

Cheung, M. L., Pires, G., Rosenberger, P. J., Leung, W. K., & Ting, H. (2020b). Investigating the role of social media marketing on value co-creation and engagement. *Journal of Business Research*, *114*, 222-234.

Dessart, L., Veloutsou, C., & Morgan-Thomas, A. (2015). Consumer engagement in online brand communities. *Journal of Product and Brand Management*, *24*(1), 28-42. https://doi.org/10.1108/JPBM-06-2014-0635

Dodds, W. B., Monroe, K. B., & Grewal, D. (1991). Effects of price, brand, and store information on buyers' product evaluations. *Journal of Marketing Research*, *28*(3), 307-319. https://doi.org/10.1177/002224379102800305 https://doi.org/10.2307/3172866

Ducoffe, R. H. (1996). Advertising value and advertising on the web. *Journal of Advertising Research*, *36*(5), 21-35. https://doi.org/10.1080/00218499.1996.12466626

Erdem, T., & Swait, J. (2004). Brand credibility and its role in brand choice. *Journal of Consumer Research*, *31*(1), 191-198. https://doi.org/10.1086/383434 PMid:29604005

Eroglu, S. A., Machleit, K. A., & Davis, L. M. (2001). Atmospheric qualities of online retailing. *Journal of Business Research*, *54*(2), 177-184. https://doi.org/10.1016/S0148-2963(99)00087-9

Friestad, M., & Wright, P. (1994). The persuasion knowledge model. *Journal of Consumer Research*, *21*(1), 1-31. https://doi.org/10.1086/209380 PMid:21263645

Fuller, C. M., Simmering, M. J., Atinc, G., Atinc, Y., & Babin, B. J. (2016). Common methods variance detection in business research. *Journal of Business Research*, *69*(8), 3192-3198. https://doi.org/10.1016/j.jbusres.2015.12.008

Gefen, D., Karahanna, E., & Straub, D. W. (2003). Trust and TAM in online shopping: An integrated model. *MIS Quarterly*, *27*(1), 51-90. https://doi.org/10.2307/30036519

Godey, B., Manthiou, A., Pederzoli, D.(2016). Social media marketing efforts of luxury brands. *Journal of Business Research*, *69*(12), 5833-5841. https://doi.org/10.1016/j.jbusres.2016.04.181

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2019). *A primer on partial least squares structural equation modeling (PLS-SEM)*. Sage. https://doi.org/10.3926/oss.37 PMid:31345112

Hajli, N. (2014). A study of the impact of social media on consumers. *International Journal of Market Research*, *56*(3), 387-404. https://doi.org/10.2501/IJMR-2014-025

Hayes, A. F. (2018). Introduction to mediation, moderation, and conditional process analysis: A regression-based approach (2nd ed.). Guilford Press.

Hellier, P. K., Geursen, G. M., Carr, R. A., & Rickard, J. A. (2003). Customer repurchase intention. *European Journal of Marketing*, *37*(11/12), 1762-1800. https://doi.org/10.1108/03090560310495456

Holbrook, M. B. (2006). Consumption experience and customer value. *Journal of Consumer Behaviour*, *5*(1), 1-8.

Hollebeek, L. D. (2011). Demystifying customer brand engagement. *Journal of Marketing Management*, *27*(7-8), 785-807. https://doi.org/10.1080/0267257X.2010.500132

Hollebeek, L. D., Glynn, M. S., & Brodie, R. J. (2014). Consumer brand engagement in social media: Conceptualization, scale development and validation. *Journal of Interactive Marketing*, *28*(2), 149-165. https://doi.org/10.1016/j.intmar.2013.12.002

Kaplan, A. M., & Haenlein, M. (2010). Users of the world, unite! *Business Horizons*, *53*(1), 59-68. https://doi.org/10.1016/j.bushor.2009.09.003

Katz, E., Blumler, J. G., & Gurevitch, M. (1973). Uses and gratifications research. *Public Opinion Quarterly*, *37*(4), 509-523. https://doi.org/10.1086/268109

Keller, K. L. (1993). Conceptualizing, measuring, and managing customer-based brand equity. *Journal of Marketing*, *57*(1), 1-22. https://doi.org/10.1177/002224299305700101

Keller, K. L. (2001). *Building customer-based brand equity: A blueprint for creating strong brands*. Marketing Science Institute Working Paper, pp. 1-107.

Keller, K. L. (2009). Building strong brands in a modern marketing communications environment. *Journal of Marketing Communications*, *15*(2-3), 139-155. https://doi.org/10.1080/13527260902757530

Keller, K. L. (2013). *Strategic brand management* (4th ed.). Pearson.

Keller, K. L. (2016). Reflections on customer-based brand equity. *Journal of Consumer Research*, *43*(4), 595-600. https://doi.org/10.1086/346254 PMid:27420540

Kim, A. J., & Ko, E. (2012). Do social media marketing activities enhance customer equity? *Journal of Business Research*, *65*(10), 1480-1486. ttps://doi.org/10.1016/j.jbusres.2011.10.014

Komiak, S. Y., & Benbasat, I. (2006). The effects of personalization on trust. *MIS Quarterly*, *30*(4), 941-960. https://doi.org/10.2307/25148760

Konuk, F. A. (2018). The role of store image, perceived quality, trust and perceived value in predicting consumers' purchase intentions towards organic private label food. *Journal of Retailing and Consumer Services,*

43, 304–310. https://doi.org/10.1016/j.jretconser.2018.04.011

Labrecque, L. I. (2014). Fostering consumer-brand relationships. *Journal of Interactive Marketing*, *28*(2), 134-148. https://doi.org/10.1016/j.intmar.2013.12.003

Liu, X., Shin, H., & Burns, A. C. (2019). Examining the impact of luxury brand social media marketing. *Journal of Business Research*, *102*, 55-68.

Mehrabian, A., & Russell, J. A. (1974). *An approach to environmental psychology*. MIT Press.

Morgan, R. M., & Hunt, S. D. (1994). The commitment-trust theory of relationship marketing. *Journal of Marketing*, *58*(3), 20-38. https://doi.org/10.1177/002224299405800302

Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). McGraw-Hill.

Oliver, R. L. (1999). Whence consumer loyalty? *Journal of Marketing*, *63*(Special Issue), 33-44. https://doi.org/10.2307/1252099 PMid:38259779

Pansari, A., & Kumar, V. (2017). Customer engagement: The construct, antecedents, and consequences. *Journal of the Academy of Marketing Science, 45*(3), 294–311. https://doi.org/10.1007/s11747-016-0485-6

Park, N., Kee, K. F., & Valenzuela, S. (2009). Being immersed in social networking environment. *Computers in Human Behavior*, *25*(3), 729-739. https://doi.org/10.1089/cpb.2009.0003 PMid:19619037

Pavlou, P. A. (2003). Consumer acceptance of electronic commerce. *International Journal of Electronic Commerce*, *7*(3), 101-134. https://doi.org/10.1080/10864415.2003.11044275

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, *88*(5), 879-903. https://doi.org/10.1037/0021-9010.88.5.879 PMid:14516251

Prahalad, C. K., & Ramaswamy, V. (2004). Co-creating unique value with customers. *Harvard Business Review*, *82*(7-8), 109-121. https://doi.org/10.1108/10878570410699249

Sathyanarayana, S. (2026). Assessing normality in quantitative analysis: Diagnostics, consequences and remedies. *Asian Journal of Probability and Statistics*, *28*(1), 31-57. https://doi.org/10.9734/ajpas/2026/v28i1853

Sathyanarayana, S. (2026b). Reliability measure in social science research: Some conceptual issues. *Asian Journal of Economics, Business and Accounting*, *26*(2), 472-483. https://doi.org/10.9734/ajeba/2026/v26i22192

Sathyanarayana S., Mohanasundaram, T., & Hema Harsha, Pushpa B.V. (2024a). Selecting the right sample size: Methods and considerations for social science researchers. *International Journal of Business and Management Invention, 13*(7). 152-167.

Sathyanarayana, S., & Mohanasundaram, T. (2024b). Fit indices in structural equation modeling and confirmatory factor analysis: Reporting guidelines. *Asian Journal of Economics, Business and Accounting*, *24*(7), 561-577. https://doi.org/10.9734/ajeba/2024/v24i71430

Sathyanarayana, S., & Mohanasundaram, T. (2025). Moderation analysis in business research: Concepts, methodologies, applications and emerging trends. *Asian Journal of Economics, Business and Accounting*, *25*(3), 357-378. https://doi.org/10.9734/ajeba/2025/v25i31716

Schivinski, B., & Dabrowski, D. (2016). The effect of social media communication on brand equity. *Journal of Marketing Communications*, *22*(2), 189-214. https://doi.org/10.1080/13527266.2013.871323

Sirgy, M. J. (1982). Self-concept in consumer behavior. *Journal of Consumer Research*, *9*(3), 287-300. https://doi.org/10.1086/208924 PMid:31410021

Spence, M. (1973). Job market signaling. *Quarterly Journal of Economics*, *87*(3), 355-374. https://doi.org/10.2307/1882010

Sweeney, J. C., & Soutar, G. N. (2001). Consumer perceived value. *Journal of Retailing*, *77*(2), 203-220. https://doi.org/10.1016/S0022-4359(01)00041-0

Tabachnick, B. G., & Fidell, L. S. (2019). *Using multivariate statistics* (7th ed.). Pearson.

Vargo, S. L., & Lusch, R. F. (2008). Service-dominant logic. *Journal of the Academy of Marketing Science*, *36*(1), 1-10. https://doi.org/10.1007/s11747-007-0069-6

Vivek, S. D., Beatty, S. E., & Morgan, R. M. (2012). Customer engagement. *Journal of Marketing Theory and Practice*, *20*(2), 122-146. https://doi.org/10.2753/MTP1069-6679200201

Voorveld, H. A. M., van Noort, G., Muntinga, D. G., & Bronner, F. (2018). Engagement with social media and social media advertising. *Journal of Advertising*, *47*(1), 38-54. https://doi.org/10.1080/00913367.2017.1405754

Vrontis, D., Makrides, A., Christofi, M., & Thrassou, A. (2021). Social media influencer marketing: A systematic review, integrative framework and future research agenda. *International Journal of Consumer Studies*, *45*(4), 617-644. https://doi.org/10.1111/ijcs.12647

Whiting, A., & Williams, D. (2013). Why people use social media. *Qualitative Market Research*, *16*(4), 362-369. https://doi.org/10.1108/QMR-06-2013-0041

Wu, P. C., Yeh, G. Y. Y., & Hsiao, C. R. (2011). The effect of store image and service quality on brand image and purchase intention for private label brands. Australasian Marketing Journal, 19(1), 30-39. https://doi.org/10.1016/j.ausmj.2010.11.001

Yadav, M., & Rahman, Z. (2017). Measuring consumer perception of social media marketing activities. *Telematics and Informatics*, *34*(7), 1294-1307. https://doi.org/10.1016/j.tele.2017.06.001

Yadav, M., & Rahman, Z. (2018). The influence of social media marketing activities. *Telematics and Informatics*, *35*(4), 958-972.

Yoo, B., & Donthu, N. (2001). Developing and validating a multidimensional consumer-based brand equity scale. *Journal of Business Research*, *52*(1), 1-14. https://doi.org/10.1016/S0148-2963(99)00098-3

Zeithaml, V. A. (1988). Consumer perceptions of price, quality, and value. *Journal of Marketing*, *52*(3), 2-22. https://doi.org/10.1177/002224298805200302

Zhang, J., *et al.* (2022). Personalization and brand perception in digital marketing. *Journal of Interactive Marketing*, *57*, 1-15.

Zhang, K. Z. K., Wang, X., & Zhou, M. (2020). Trust dynamics in social media marketing. *Information and Management*, *57*(2), 103-198.

DHARANA
International Journal of Business

INFORMATICS JOURNALS

DOI: 10.18311/DBIJB/v17_i1_2026_05

ISSN: 0974-0082 | Vol 17(1), 2026 | pp. 107-123

Do Green Hospitals EARN More? A Study on ESG Scores and Profitability

Aishwarya Rao Lalige[1] and T. K. Venkatesh[2]

[1]Research Scholar, Department of Commerce, Bangalore City University, Bengaluru - 560001, Karnataka, India; aishwarya.rao8@gmail.com

[2]Associate Professor, M.P. Birla institute of Management, Bengaluru - 560001, Karnataka, India; venkateshatk1983@gmail.com

Abstract

The incorporation of Environmental, Social, and Governance (ESG) principles into the healthcare industry has become a vital strategy for promoting sustainable and ethical healthcare services. Complying with ESG standards in healthcare organisations enhances operational transparency and accountability while also leading to improved patient outcomes, better alignment with regulations, and stronger long-term financial performance. Despite the healthcare sector's integral role in public health, adherence to ESG practices is often inconsistent, frequently confined to voluntary reporting rather than systematic implementation. This research examines the current state of ESG compliance in the healthcare sector, with a particular focus on healthcare institutions in India. By examining ESG reports, regulatory policies, and sustainability metrics, the study uncovers the main drivers and obstacles to complying with ESG standards. An analytical method, correlation analysis, was applied to evaluate compliance levels among public and private hospitals. The results demonstrate that while governance-related elements, including board diversity and ethical conduct, are being embraced more widely, environmental aspects such as waste management and energy use remain underdeveloped. Social dimensions, such as patient equity and staff welfare, exhibit moderate compliance rates. The research concludes that the absence of standardised ESG frameworks, limited awareness, and weak regulatory enforcement impede consistent ESG compliance in healthcare. Enhancing ESG policies and instituting healthcare-specific ESG benchmarks could promote faster adoption and contribute to more resilient and sustainable healthcare systems.

Keywords: ESG, ESG Policies, Health Care Sectors, Standardised ESG Framework

JEL Classification Code: M14, I12, Q56, G32, L30

Cite this article as: Rao Lalige, A., & Venkatesh, T. K. (2026). Do Green Hospitals EARN More? A Study on ESG Scores and Profitability. *DHARANA - International Journal of Business, 17*(1), 107-123. https://doi.org/10.18311/DBIJB/v17_i1_2026_05

'Aarogyam Paramam Bhagyam, Swasthyam sarvarthasadhanam'
Health is the greatest wealth, and well-being is the means to achieve everything

Article Received on:27-11-2025 Revised on: 25-12-2025 Accepted on: 25-02-2026

1. Introduction

In recent years, the concept of Environmental, Social, and Governance (ESG) has evolved from a voluntary corporate initiative into a critical framework for assessing sustainability, ethical responsibility, and long-term business resilience. The post–COVID-19 era has highlighted the interdependence between public health, environmental stability, and corporate governance. As a result, many pharmaceutical companies, hospitals, and diagnostic laboratories have voluntarily adopted ESG frameworks to enhance their credibility, stakeholder trust, and operational efficiency.

In India, following the Securities and Exchange Board of India (SEBI) mandate in 2023, the top 1,000 listed companies are now required to disclose their sustainability practices through the Business Responsibility and Sustainability Report (BRSR). While this move has significantly improved transparency and accountability in large corporations, the healthcare industry, comprising over 80% Small and Medium-sized Enterprises (SMEs), is still at a nascent stage of ESG adoption. Nevertheless, many medium-sized hospitals and private clinics are proactively aligning with ESG principles, anticipating mandatory compliance in the near future.

Adopting and integrating ESG practices is not just a matter of compliance, but also a symbol of status, standard, and reputation among stakeholders, including investors, regulators, and patients. Although there is no standardised reporting format specifically for the healthcare sector, several hospitals have begun following the NSE–BRSR guidelines and preparing internal sustainability reports. This shift reflects a broader global trend of integrating social responsibility with economic growth and environmental stewardship.

ESG information is increasingly being required by organisations to:

- Ensure long-term financial performance and institutional resilience
- Strengthen risk management and crisis preparedness
- Promote ethical and transparent corporate behaviour
- Meet the growing investor demand for sustainable assets
- Comply with regulatory frameworks and global reporting standards
- Align with personal and societal values that prioritise people and the planet

For the healthcare sector, ESG principles serve as a vital foundation for how institutions address climate change, promote social equity, maintain data security, and uphold corporate governance standards. Hospitals are major consumers of energy and generators of biomedical waste, making environmental responsibility crucial. Similarly, the social dimension, including patient care quality, workforce diversity, and accessibility, directly influences a hospital's reputation and service sustainability. The governance aspect ensures accountability, transparency, and adherence to ethical medical practices.

Globally, ESG-driven healthcare transformation is being accelerated through initiatives such as

the United Nations Sustainable Development Goals (SDGs), the World Health Organisation's (WHO) Green Hospitals Initiative, and the Global Reporting Initiative (GRI) healthcare standards. The ultimate goal is to achieve sustainable healthcare delivery systems by 2030, systems that balance patient well-being, operational efficiency, and environmental protection.

While regions such as Europe, the United States, and the United Kingdom have made significant strides in establishing measurable ESG benchmarks and sustainability-linked financing mechanisms, countries like India and China are still in the early stages of consistent implementation. However, growing investor interest, patient awareness, and regulatory evolution are driving Indian healthcare institutions to embrace ESG as not only a compliance requirement but a strategic necessity for long-term success.

In recent years, Environmental, Social, and Governance (ESG) principles have gained significant importance as a framework for evaluating corporate sustainability, ethical responsibility, and long-term financial performance. Organisations across various industries are increasingly adopting ESG practices to enhance transparency, improve stakeholder trust, and ensure sustainable growth. The healthcare sector, which plays a critical role in public welfare, is expected to demonstrate high standards of social responsibility, environmental protection, and ethical governance. However, healthcare institutions are also among the most resource-intensive organisations due to continuous operations, high energy consumption, biomedical waste generation, and dependence on complex technologies. This creates a need for effective ESG adoption to balance operational efficiency with environmental and social responsibility. Despite the growing importance of ESG, the level of adoption in the healthcare sector remains uneven, particularly in developing countries like India. While large private hospitals and pharmaceutical companies have started disclosing ESG information to comply with regulatory requirements and attract investors, many healthcare institutions still lack standardised sustainability reporting practices. Public healthcare organisations, in particular, show limited ESG disclosure due to the absence of mandatory frameworks, lack of awareness, and resource constraints. As a result, it becomes difficult to evaluate the actual level of sustainability performance across the healthcare sector. Another important issue is the lack of empirical evidence regarding whether ESG adoption actually improves financial performance in healthcare organisations. Although several studies in other industries suggest that higher ESG performance is associated with better profitability, lower risk, and stronger investor confidence, limited research has been conducted specifically in the healthcare sector, especially in the Indian context. Healthcare organisations operate with both social and financial objectives, and therefore, the relationship between ESG practices and profitability may differ from other industries. Furthermore, most existing studies focus on ESG disclosure rather than analysing the statistical relationship between ESG scores and financial outcomes. The absence of sector-specific ESG benchmarks for healthcare institutions also makes it difficult to measure and compare sustainability performance accurately. Therefore, there is a need to examine

whether healthcare organisations that adopt higher ESG standards actually perform better financially and whether ESG integration contributes to long-term organisational sustainability. In this context, the present study attempts to address this problem by analysing the level of ESG adoption among selected Indian healthcare companies and examining the relationship between ESG scores and profitability using statistical tools. The study aims to provide empirical evidence on whether adopting green and responsible practices leads to better financial performance in the healthcare sector.

A comparative study of how public and private sector hospitals adapt ESG practices and what are the challenges in the ESG framework:

Literature Review

Healthcare organisations play a pivotal role in promoting public health and social welfare; however, they also contribute significantly to environmental degradation through high energy consumption, biomedical waste generation, water usage, and reliance on resource-intensive technologies. According to Health Care Without Harm (2023), hospitals operate continuously and require large amounts of electricity, medical plastics, pharmaceuticals, and sterilisation equipment, making the healthcare sector one of the most resource-intensive service industries. This dual responsibility as both protectors of health and contributors to environmental pollution highlights the urgent need for sustainability-

Aspect	Public Sector Hospitals	Private Sector Hospitals
Environmental	Limited ESG frameworks - Basic biomedical waste handling - Low energy efficiency adoption	Green building certifications (*e.g.*, Apollo, Fortis) - Solar, water reuse projects - Energy-efficient infrastructure
Social	Universal care mandate - Free/ subsidised treatment- Overcrowding issues	Better patient experience - Employee well-being programs- Health equity through CSR
Governance	Bureaucratic structure - Weak disclosure standards- Low board independence	Stronger internal controls - ESG disclosures in annual reports - Formal ethics committees
Reporting	Minimal ESG disclosures - No independent ESG ratings	Sustainalytics, CRISIL, SES ESG scores- Independent assurance for ESG reports
Regulatory Push	Compliance-focused (Pollution Control Board, NMC)	Proactive ESG policy alignment with SEBI mandates
Technology Use	Limited digital infrastructure - Less energy monitoring	Smart hospitals (Apollo, Aster) - Digital waste tracking

driven reforms within healthcare systems (Karliner & Slotterback, 2019). In recent years, Environmental, Social, and Governance (ESG) frameworks have emerged as a comprehensive approach to evaluate how organisations manage sustainability risks, ethical responsibilities, and long-term performance (Friede *et al.*, 2015).

The environmental dimension of ESG in healthcare focuses on reducing carbon emissions, improving energy efficiency, managing biomedical waste, and adopting renewable energy sources. Studies show that the global healthcare sector is responsible for nearly 4.4% of total greenhouse gas emissions, which is comparable to the emissions of large industrialised nations (Karliner & Slotterback, 2019). Hospitals generate significant amounts of hazardous and non-hazardous waste, and improper disposal can lead to severe environmental and health hazards (WHO, 2021). Adoption of green building standards, energy-efficient infrastructure, and sustainable procurement practices has been identified as an effective strategy to reduce the environmental footprint of healthcare institutions (UN Global Compact Network Programme, 2022). Sustainable healthcare initiatives such as the WHO Green Hospitals programme emphasise the integration of environmental responsibility into hospital management systems to ensure long-term ecological balance.

The social component of ESG in healthcare is equally important, as the sector directly affects human well-being, equity, and quality of life. Social responsibility in healthcare includes providing accessible and affordable medical services, ensuring patient safety, promoting workforce diversity, and maintaining employee welfare (Porter & Kramer, 2011). Healthcare organisations must address issues such as unequal access to treatment, staff shortages, occupational stress, and ethical use of patient data in the digital era (World Health Organization, 2021). Research indicates that hospitals with strong social responsibility practices often experience higher patient satisfaction, improved employee retention, and stronger public trust, which in turn contribute to better organisational performance (Eccles *et al.*, 2014).

Governance, the third pillar of ESG, plays a critical role in ensuring transparency, accountability, and ethical conduct in healthcare organisations. Effective governance includes strong leadership, independent board oversight, compliance with regulatory standards, and proper disclosure of financial and sustainability information (Bhatia & Jain, 2022). In the healthcare sector, governance also involves maintaining patient confidentiality, ensuring ethical clinical practices, and preventing corruption or misuse of funds. Studies suggest that organisations with strong governance structures tend to demonstrate better risk management, improved operational efficiency, and higher investor confidence (OECD, 2020). Regulatory bodies such as the Securities and Exchange Board of India (SEBI) have strengthened sustainability disclosure requirements through the Business Responsibility and Sustainability Report (BRSR), encouraging listed companies to report ESG performance in a standardised format.

Despite the growing importance of ESG, the level of adoption varies widely across countries and healthcare institutions. Developed regions such as the United States, the United Kingdom, and the European Union have established structured ESG reporting frameworks and

sustainability benchmarks, whereas developing countries, including India, are still in the early stages of consistent implementation (PwC, 2023). Large private hospitals and multinational pharmaceutical companies often adopt ESG practices to attract investors and maintain global competitiveness, while public hospitals and small healthcare providers face challenges such as limited funding, lack of awareness, and absence of standardised guidelines (GRI, 2023).

Empirical research also suggests that ESG adoption may positively influence financial performance. Firms with higher ESG scores often experience lower risk, better operational efficiency, and stronger stakeholder trust, which can lead to improved profitability (Friede *et al.*, 2015). In the healthcare sector, sustainable practices such as energy conservation, digitalisation, and efficient waste management can reduce operational costs while enhancing institutional reputation. Investors increasingly prefer organisations that demonstrate responsible business practices, making ESG compliance a strategic tool for long-term growth rather than merely a regulatory obligation (Eccles *et al.*, 2014).

Overall, existing literature indicates that ESG integration is essential for building resilient, ethical, and sustainable healthcare systems. However, the absence of sector-specific ESG standards, inconsistent reporting practices, and limited empirical studies in emerging economies highlight the need for further research. Understanding the relationship between ESG performance and financial outcomes in the healthcare sector is particularly important for policymakers, investors, and hospital administrators seeking to promote sustainable healthcare delivery aligned with the United Nations Sustainable Development Goals (GRI, 2023; WHO, 2021).

2.1 Research Gap

Although the concept of Environmental, Social, and Governance (ESG) has gained considerable attention in recent years, existing literature reveals several gaps in the context of the healthcare sector, particularly in emerging economies such as India. Most prior studies on ESG have primarily focused on manufacturing, banking, and large corporate sectors, while empirical research examining ESG adoption in healthcare organisations remains limited (Friede *et al.*, 2015). Healthcare institutions differ from other industries because they operate with dual objectives of financial sustainability and public welfare, making the impact of ESG practices more complex and less explored.

Further, many existing studies emphasise ESG disclosure practices rather than actual ESG performance, and very few have attempted to analyse the relationship between ESG scores and financial outcomes such as profitability in the healthcare industry (Bhatia & Jain, 2022). In the Indian context, ESG reporting has only recently gained importance after the introduction of the Business Responsibility and Sustainability Report (BRSR) framework by SEBI, and therefore, empirical evidence on how ESG compliance influences organisational performance in healthcare institutions is still insufficient (PwC, 2023). Moreover, previous research often concentrates on large multinational corporations, whereas small and medium-sized healthcare providers, which constitute a major portion of the Indian healthcare system, are rarely included in empirical analysis.

Another important gap is the lack of sector-specific ESG evaluation frameworks for healthcare organisations. Most ESG rating models are designed for general corporate assessment and do not adequately capture healthcare-specific factors such as patient safety, biomedical waste management, clinical ethics, and accessibility of medical services (GRI, 2023). In addition, earlier studies have largely examined ESG components separately, and limited research has investigated the combined effect of Environmental, Social, and Governance factors on financial performance using statistical tools such as correlation or regression analysis. Therefore, the present study attempts to fill these gaps by examining the level of ESG adoption in Indian healthcare companies and analysing the relationship between ESG scores and profitability using empirical data. By focusing specifically on healthcare institutions and applying statistical analysis to recent financial data, the study contributes to the growing body of literature on sustainable healthcare management and provides evidence on whether higher ESG performance is associated with better financial outcomes. Based on the above literature review, the researchers have raised the following research questions to be addressed in the current study:

RQ1: What is the extent of Environmental, Social, and Governance (ESG) adoption among selected healthcare organisations in India?

RQ2: Is there a significant relationship between ESG performance and profitability in the healthcare sector?

RQ3: Does a higher ESG score lead to better financial performance among healthcare companies?

3. Research Methodology

3.1 Objectives of the Study

- To assess the level of Environmental, Social, and Governance (ESG) adoption among selected healthcare organisations.

- To investigate the association between ESG practices and organisational performance in the healthcare sector.

- To examine the effect of ESG performance on firm profitability by applying statistical analysis using ESG scores and net profit of the preceding financial year.

3.2 Data Collection

The present study is based on secondary data collected from publicly available sources. ESG scores and financial information of healthcare organisations were obtained from sustainability reports, annual reports, ESG disclosure statements, stock exchange filings, and financial databases of listed healthcare and pharmaceutical companies in India. The data corresponds to the financial year 2023–2024 and includes information related to ESG performance indicators and net profit figures.

A total sample of 50 healthcare organisations was selected for the analysis. The sample consists primarily of listed private sector healthcare and pharmaceutical companies, as these firms are more likely to disclose ESG-related information in compliance with regulatory requirements such as the Business Responsibility and Sustainability Report (BRSR) framework introduced by SEBI. In contrast, ESG disclosure in the public healthcare sector remains limited, as many government hospitals and public

health institutions do not publish standardised sustainability or ESG reports. Due to the lack of consistent and reliable ESG data for public sector hospitals, the study mainly focuses on organisations for which verifiable ESG scores and financial information are available (Sathyanarayana *et al.*, 2024).

Private healthcare organisations tend to demonstrate relatively higher ESG compliance, largely because of investor expectations, regulatory pressure, and the need to maintain corporate reputation and stakeholder confidence. These institutions often adopt ESG reporting practices to enhance transparency, attract investment, and align with global sustainability standards. Therefore, the selected sample provides a suitable basis for examining the relationship between ESG performance and financial outcomes in the Indian healthcare sector.

3.3 Statistical Tools Used

To examine the relationship between ESG performance and profitability, correlation analysis was employed as the primary statistical tool. The Pearson correlation coefficient was calculated to measure the degree of association between ESG scores (independent variable) and Net Profit (dependent variable) of the selected healthcare organisations. Correlation analysis helps in identifying whether higher ESG scores are associated with higher profitability and whether the relationship between the two variables is positive, negative, or negligible (Sathyanarayana & Mohanasundaram, 2025). This method is appropriate for the present study as it allows the researcher to evaluate the strength and direction of the linear relationship between sustainability performance and financial outcomes. The analysis was carried out using standard statistical formulas, and the obtained correlation value was used to interpret the extent to which ESG adoption influences the financial performance of healthcare companies.

4. Results and Interpretation

Table 1. ESG scores and net profits of selected Indian healthcare companies (FY 2023–24)

S. No.	Name of the health care sector	ESG score	Results	Net profit in crores
1	Apollo Hospitals	43.04	High	3446
2	Aurobindo Pharma	59.44	High	3484
3	Cipla Limited	60	Very High	3719
4	Max Health Institute Limited	57.26	High	1075.88
5	Fortis Healthcare Limited	40	High	797.86
6	Divis Laboratories	61.51	Medium	3191
7	Alkem Laboratories	61.05	High	3215

8	Glenmark Pharmaceuticals	47.81	Medium	2047.09
9	torrent Pharmaceuticals	56	Medium	2560
10	Mankind Pharmaceuticals	40	Medium	2011
11	Zydus Lifescience	66.16	Very High	4673
12	Lupin Limited	57.48	Very High	3973
13	Piramal Pharma	58.22	High	2379
14	Sun Pharmaceuticals	42.08	Very High	2153.9
15	Dr. Lal Path Labs Limited	50	High	2254
16	Glaxo Smith Kline Pharmaceuticals Ltd	62	High	3245
17	Pfizer Ltd	58	High	3004
18	Rainbow Children's Medicare Ltd	60	High	2998
19	Sanofi India Ltd	59.97	High	2991
20	Poly Medicure Ltd	53.52	High	2544
21	Aster DM Health Care Ltd	57.26	High	2745
22	Vijaya Diagnostic Centre Ltd	46.25	High	2525
23	Narayana Hrudayalaya	47.75	High	2200
24	Metropolis Health Care Ltd	42.83	High	2158
25	Krishna Institute of Medical SCIENCES Ltd	48.28	High	2010
26	Global Health Ltd	51.54	High	2224
27	Krsnaa Diagnostics Ltd	38.68	Medium	1998
28	Tarsons Products Ltd	49.84	High	2100
29	Gland Pharma Ltd	46.2	High	1998
30	Gufic Bio Sciences Ltd	60.39	High	3245
31	FDC Ltd	56.92	High	2998
32	Gloxosmith Kline Pharmaceuticals	56.34	High	3004
33	Laurus Labs Ltd	56.31	High	3221
34	Astrazeneca Pharma India Ltd	52.89	High	2784
35	IPCA Laboratories Ltd	53.63	High	2564
36	Strides Pharma Science Ltd	53.34	High	2234
37	Suven Pharmaceuticals Ltd	53.9	High	2300

38	Eris Life Science Ltd	58.78	High	2561
39	Alembic Pharmaceuticals	60	High	3200
40	Ajanta Pharma Ltd	67.27	Very High	3565
41	P and G Health Ltd	57.32	High	2567
42	Natco Pharma Ltd	47.93	High	2667
43	Biocon Ltd	59.86	High	3112
44	Dr. Reddy's Laboratories Ltd	70.39	Very High	4112
45	Caplin pomt Laboratories Ltd	47.8	High	2477
46	Wockhardt Ltd	55.77	High	2868
47	Abbott India Ltd	53.99	High	2745
48	Jubilant Pharma Ltd	66.24	High	3112
49	Granules India Ltd	63.88	High	2789
50	Neuland Laboratories Ltd	69.59	High	3112

Source: CMIE Prowess Database

5. Data Analysis and Interpretation

The data presented in the table shows the ESG scores and net profits of 50 selected Indian healthcare and pharmaceutical companies for the financial year 2023–24. The ESG scores range from 38.68 to 70.39, indicating a moderate variation in the level of environmental, social, and governance compliance among the selected organisations. The highest ESG score is recorded by Dr. Reddy's Laboratories Ltd (70.39), followed by Neuland Laboratories Ltd (69.59) and Ajanta Pharma Ltd (67.27), which reflects a strong adoption of sustainability practices. On the other hand, Krsnaa Diagnostics Ltd (38.68) has the lowest ESG score, indicating comparatively weaker ESG disclosure and implementation. A majority of the companies fall within the range of 50 to 65, suggesting that most healthcare firms demonstrate moderate to high ESG compliance, although very few firms have reached the highest level of sustainability performance.

The profitability of the selected companies also shows considerable variation, with net profits ranging from approximately ₹797 crores to more than ₹4,600 crores. Large pharmaceutical and healthcare companies such as Zydus Lifesciences, Cipla Ltd, Dr. Reddy's Laboratories, and Aurobindo Pharma report both high ESG scores and high net profits, indicating strong financial and sustainability performance. In contrast, firms with relatively lower ESG scores, such as Krsnaa Diagnostics Ltd, Fortis Healthcare Ltd, and Mankind Pharmaceuticals, show comparatively lower

profit levels, although the relationship is not perfectly uniform due to differences in firm size and operational scale. Larger organisations generally have greater financial capacity to invest in sustainability initiatives, advanced technology, and governance systems, which may contribute to both higher ESG scores and improved profitability.

A comparison of ESG scores and net profit values suggests the presence of a positive relationship between sustainability performance and financial outcomes. This observation is supported by the Pearson correlation coefficient calculated in the study (r = 0.682), which indicates a moderately strong positive correlation between ESG scores and net profits. The result implies that companies with higher ESG performance tend to generate higher profits, possibly due to better risk management, improved operational efficiency, stronger investor confidence, and enhanced corporate reputation. It is also observed that most firms with higher ESG scores belong to the private sector and listed companies, where disclosure requirements and investor expectations are stronger, whereas public healthcare institutions show limited ESG reporting. Overall, the analysis indicates that ESG adoption in the Indian healthcare sector is increasing, particularly among large private healthcare and pharmaceutical companies. The findings suggest that integrating environmental responsibility, social commitment, and strong governance practices may contribute positively to financial performance, supporting the argument that sustainable healthcare organisations are more likely to achieve long-term profitability and stakeholder trust.

5.1 Statistical Test Applied

Tool used: Pearson's Correlation Coefficient

Formula:

$$r = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{[n\Sigma x^2 - (\Sigma x)^2][n\Sigma y^2 - (\Sigma y)^2]}}$$

Result: $r = 0.682$

The correlation analysis produced a Pearson correlation coefficient of r=0.682, which indicates a moderately strong positive relationship between ESG scores and profitability among the selected healthcare companies. A positive value of the correlation coefficient signifies that as the ESG score of a company increases, its net profit also tends to increase. This suggests that organisations with better environmental, social, and governance practices are more likely to achieve higher financial performance compared to those with lower ESG compliance. Although the correlation is not perfect ($r \neq 1$), the value of 0.682 is sufficiently high to indicate a meaningful linear association between the two variables.

The result implies that ESG adoption may contribute to improved operational efficiency, better risk management, enhanced corporate reputation, and increased investor confidence, all of which can positively influence profitability. Companies that maintain strong governance structures, adopt environmentally sustainable practices, and ensure social responsibility are often perceived as more reliable and transparent, thereby attracting more investments and stakeholder support. This may explain why firms with higher ESG scores in the sample also tend to report higher net profits.

However, the correlation value being less than 1 also indicates that profitability is not determined by ESG performance alone. Other factors such as company size, market share, technological capability, managerial efficiency, and global presence may also influence financial outcomes. Therefore, while the result confirms the existence of a positive association between ESG performance and profitability in the healthcare sector, it does not establish a perfect or causal relationship. Overall, the finding supports the argument that ESG integration is not only a sustainability requirement but also a strategic factor that can contribute to better financial performance in healthcare organisations.

A simple linear regression analysis was conducted to examine the impact of ESG score (independent variable) on the profitability (dependent variable) of selected healthcare companies. The regression results indicate a multiple correlation coefficient (R = 0.682), suggesting a moderately strong positive relationship between ESG performance and profitability. The coefficient of determination (R^2 = 0.466) shows that approximately 46.6% of the variation in profitability can be explained by changes in ESG scores. The adjusted R^2 value (0.455), which corrects for sample size, also confirms that ESG performance explains a substantial proportion of the variance in profitability, indicating that the model has good explanatory power. The overall regression model was found to be statistically significant, as indicated by the ANOVA results, $F(1, 48) = 41.84$, $p < 0.001$. The significance value (p = 4.803

Table 2. Regression model (outcome variable: Profitability)

Regression Statistics	
Multiple R	0.682453
R Square	0.465743
Adjusted R-Square	0.454612
Standard Error	515.9912
Observations	50

	df	SS	MS	F	Significance F
Regression	1	11140920	11140920	41.84432	4.8E-08
Residual	48	12779851	266246.9		
Total	49	23920771			

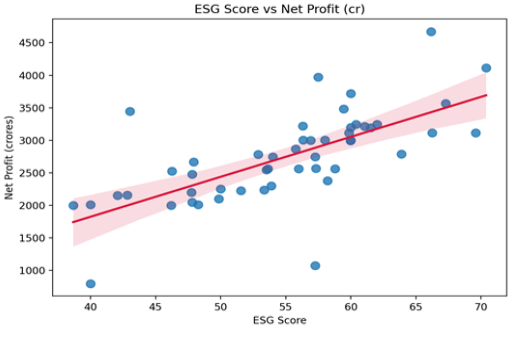
	Coefficients	Standard error	t-stat	pvalue
Intercept	-634.053	526.5426	-1.20418	0.234424
ESG score	61.4489	9.499392	6.468719	4.8E-08

$\times 10^{-8}$) is much lower than the standard alpha level of 0.05, confirming that the regression model is valid and that ESG score significantly predicts profitability. This result suggests that the independent variable (ESG score) has a meaningful influence on the dependent variable (profitability) among the selected healthcare companies.

The regression coefficient for ESG score was found to be $\beta = 61.45$, $t = 6.47$, $p < 0.001$, indicating a positive and statistically significant effect of ESG performance on profitability. This means that for every one-unit increase in ESG score, profitability increases by approximately ₹61.45 crores, holding other factors constant. The confidence interval for the coefficient (95% CI [42.35, 80.55]) does not include zero, further confirming that the effect of ESG score on profitability is significant. The intercept value was not statistically significant ($p = 0.234$), which indicates that profitability cannot be meaningfully predicted when the ESG score is zero, but this does not affect the interpretation of the overall model.

These findings suggest that healthcare companies with higher ESG scores tend to achieve higher profitability, supporting the argument that sustainability practices contribute to improved financial performance. The results are consistent with previous studies, which state that strong ESG performance enhances operational efficiency, reduces risk, improves stakeholder confidence, and attracts more investment, thereby leading to better financial outcomes (Friede *et al.*, 2015; Eccles *et al.*, 2014). In the context of the healthcare sector, organisations that adopt better governance practices, environmental management, and social responsibility initiatives may gain competitive advantages that positively influence their profitability. Overall, the regression results confirm that ESG performance is a significant predictor of profitability, and the positive coefficient indicates that adopting sustainable and responsible business practices can contribute to higher financial performance in the healthcare sector. However, since R^2 is less than 1, the results also imply that profitability is influenced by other factors such as firm size, market conditions, and operational efficiency, which were not included in the present model.

Graphical Representation



A scatter plot of ESG scores against Net Profits would display an upward trend, reinforcing the positive correlation between sustainability practices and financial performance. The clustering of high-ESG firms at higher profit margins indicates that ESG adoption aligns closely with business success in the Indian healthcare industry.

5.2 Key Inference

The findings affirm that ESG integration contributes positively to corporate reputation,

investor attraction, and operational efficiency. Healthcare organisations with comprehensive ESG frameworks exhibit stronger stakeholder trust, improved regulatory compliance, and better long-term growth prospects. These results are consistent with existing literature that identifies ESG as a strategic performance driver in both emerging and developed markets (Bhatia & Jain, 2022; PwC, 2023).

Correlation =0.682453314

There is a positive correlation that tells us that the higher the ESG scores, the higher the practices, the more investments attracted, and the higher the profits.

6. Discussion and Conclusion

The present study examined the relationship between ESG performance and profitability in the Indian healthcare sector using ESG scores and net profit data of selected healthcare and pharmaceutical companies. The findings reveal a moderately strong positive correlation (r = 0.682) between ESG scores and profitability, indicating that organisations with higher ESG compliance tend to achieve better financial performance. This result supports the growing body of literature which argues that sustainability practices are not only ethical obligations but also strategic tools for long-term organisational success (Friede *et al.*, 2015). Companies that effectively integrate environmental responsibility, social commitment, and strong governance structures are more likely to gain investor confidence, reduce operational risks, and enhance their corporate reputation, ultimately contributing to improved financial outcomes (Eccles *et al.*, 2014).

From the environmental perspective, healthcare institutions are among the most resource-intensive organisations due to continuous operations, high energy consumption, and biomedical waste generation. The findings of the study indicate that companies with higher ESG scores often demonstrate better environmental management practices such as energy efficiency, waste reduction, and adoption of green technologies. These practices not only reduce environmental impact but also help in lowering operational costs over time. Previous studies have also shown that the healthcare sector contributes significantly to global carbon emissions, and the adoption of sustainable practices can improve both environmental and financial performance (Karliner & Slotterback, 2019). Therefore, environmental responsibility should be considered an essential component of long-term healthcare management rather than merely a regulatory requirement.

The social dimension of ESG is particularly important in the healthcare sector, as organisations directly influence public health, patient safety, and employee well-being. The results suggest that firms with higher ESG scores tend to maintain better stakeholder relationships, including improved patient trust, employee satisfaction, and community engagement. Social responsibility initiatives such as equitable access to healthcare, workforce diversity, and ethical treatment practices enhance the reputation of healthcare institutions, which can indirectly influence financial performance by attracting more patients and investors (Porter & Kramer, 2011). In addition, hospitals and pharmaceutical companies that maintain strong social standards are more likely to comply with

regulatory requirements and avoid legal or ethical controversies.

Governance was found to be the most consistently adopted ESG component among the selected companies. Strong governance mechanisms, including transparent reporting, independent board oversight, and compliance with regulatory standards, help organisations maintain accountability and reduce financial and operational risks. The introduction of the Business Responsibility and Sustainability Report (BRSR) framework by the Securities and Exchange Board of India (SEBI) has encouraged listed companies to improve ESG disclosure, which may explain the higher ESG compliance observed among private healthcare organisations. Previous research also suggests that firms with strong governance structures tend to perform better financially because they are more efficient in decision-making and risk management (Bhatia & Jain, 2022).

Another important observation from the study is that ESG adoption is more prominent among large private healthcare and pharmaceutical companies, whereas public healthcare institutions show limited disclosure of sustainability practices. This difference may be due to the absence of standardised ESG reporting frameworks for public sector hospitals and the limited financial resources available for sustainability initiatives. Similar findings have been reported in earlier studies, which indicate that ESG implementation in developing countries is still at an early stage and requires stronger regulatory support and awareness (PwC, 2023). The lack of sector-specific ESG benchmarks for healthcare also makes it difficult to measure sustainability performance uniformly across institutions.

Overall, the results of the study confirm that ESG integration contributes positively to financial performance, operational efficiency, and stakeholder trust in the healthcare sector. The positive correlation between ESG scores and profitability suggests that sustainability practices can create long-term value for organisations while also supporting environmental protection and social welfare. However, the relationship is not perfect, indicating that other factors such as firm size, market position, and technological capability also influence profitability. Therefore, ESG should be viewed as an important but not the only determinant of financial success.

In conclusion, the study highlights the growing importance of ESG principles in the healthcare industry and emphasises the need for standardised ESG frameworks, stronger regulatory enforcement, and greater awareness among healthcare institutions. Encouraging the adoption of sustainable practices can help build resilient healthcare systems that balance economic performance with social responsibility and environmental protection. Future research may further explore the long-term impact of ESG adoption using advanced statistical models and larger datasets to provide deeper insights into sustainable healthcare management. Green energy options that will lower carbon emissions, improve the environment, and enable sustainable mobility include solar, wind, and electric vehicles. The statistical findings reinforce the argument that ESG integration is not just a moral imperative but also a strategic necessity. Governance was found to be the most adopted component, perhaps due to regulatory pressure. However, environmental concerns still lag, particularly in smaller institutions. The results also indicate that proactive ESG

strategies contribute positively to operational performance and stakeholder trust.

The adaptability of ESG principles in the healthcare sector is gradually increasing, especially among larger private institutions. However, widespread adoption requires awareness, regulatory enforcement, and robust ESG frameworks. Statistical analysis confirms the tangible benefits of ESG alignment in healthcare outcomes, operational efficiency, and brand equity.

7. Research Limitations and Directions for Future Research

Despite providing meaningful insights into the relationship between ESG performance and profitability in the healthcare sector, the present study has certain limitations that should be acknowledged. First, the study relies on secondary data collected from ESG disclosures, sustainability reports, and publicly available financial statements, which may vary in accuracy, completeness, and reporting standards across organisations. Since ESG reporting in India is still evolving and largely voluntary for many healthcare institutions, the lack of uniform disclosure frameworks may have influenced the reliability and comparability of ESG scores (PwC, 2023). Second, the sample consists of 50 listed healthcare and pharmaceutical companies, which may not fully represent the entire healthcare ecosystem in India, particularly small and medium hospitals, diagnostic centres, and public healthcare institutions that often do not publish ESG reports. This limits the generalizability of the findings. Third, the study employs correlation analysis, which identifies association but does not establish causality between ESG performance and profitability. Other factors such as firm size, market share, technology adoption, and managerial efficiency may also influence financial performance, but were not included in the present model (Bhatia & Jain, 2022).

Future research may overcome these limitations by using larger and more diverse samples, including unlisted hospitals, government healthcare institutions, and international healthcare organisations to improve external validity. Researchers may also apply advanced statistical techniques such as regression analysis, panel data models, or structural equation modelling to examine causal relationships between ESG dimensions and financial performance. In addition, future studies can analyse the separate effects of Environmental, Social, and Governance components individually, rather than using a combined ESG score, to identify which dimension contributes most to profitability. Longitudinal studies covering multiple years would provide deeper insights into the long-term impact of sustainability practices on healthcare performance. Furthermore, qualitative approaches such as interviews with hospital administrators and policymakers may help understand the practical challenges in ESG implementation. Strengthening research in this area will support the development of standardised ESG frameworks for the healthcare sector, which is essential for achieving sustainable and resilient healthcare systems aligned with global sustainability goals (GRI, 2023; World Health Organization, 2021).

References

Bhatia, A., & Jain, A. (2022). ESG disclosure and firm performance: Evidence from emerging markets. Journal of Sustainable Finance and Investment, 12(3), 1-15.

Eccles, R. G., Ioannou, I., & Serafeim, G. (2014). The impact of corporate sustainability on organizational processes and performance. Management Science, 60(11), 2835-2857. https://doi.org/10.1287/mnsc.2014.1984

Friede, G., Busch, T., & Bassen, A. (2015). ESG and financial performance: Aggregated evidence from more than 2000 empirical studies. Journal of Sustainable Finance and Investment, 5(4), 210-233. https://doi.org/10.1080/20430795.2015.1118917

GRI. (2023). Global Reporting Initiative Standards for Sustainability Reporting. Global Reporting Initiative.

Health Care Without Harm. (2023). Health care's climate footprint report.

Karliner, J., & Slotterback, S. (2019). Health care's climate footprint: How the health sector contributes to the global climate crisis. Health Care Without Harm. https://doi.org/10.1093/eurpub/ckaa165.843

OECD. (2020). Corporate governance and sustainability report. Organisation for economic co-operation and development.

Porter, M. E., & Kramer, M. R. (2011). Creating shared value. Harvard Business Review, 89(1-2), 62-77.

PwC. (2023). ESG in India: Emerging trends and regulatory developments. Price water house Coopers Report.

Rehman, R. u., Abidin, M. Z. u., Ali, R., Nor, S. M., Naseem, M. A., Hasan, M., & Ahmad, M. I. (2021). The integration of conventional equity indices with environmental, social, and governance indices: Evidence from emerging economies. Sustainability, 13(2), 676. https://doi.org/10.3390/su13020676

Sathyanarayana, S., Mohanasundaram, T., Puspha, B. V., & Harsha, H. (2024). Selecting the right sample size: Methods and considerations for social science researchers. International Journal of Business and Management Invention, 13(7), 152-167.

Sathyanarayana S, & Mohanasundaram T. 2025. Correlation methodologies revisited: From classical statistics to contemporary residual diagnostics. Asian Journal of Economics, Business and Accounting, 25(11), 86-103. https://doi.org/10.9734/ajeba/2025/v25i112039

UN Global Compact Network Programme. (2022). Green hospitals and sustainable healthcare report.

World Health Organization. (2021). Climate change and health: WHO report on sustainable healthcare systems. WHO Press.

DHARANA
International Journal of Business

INFORMATICS JOURNALS

DOI: 10.18311/DBIJB/v17_i1_2026_06

ISSN: 0974-0082 | Vol 17(1), 2026 | pp. 124-139

Transforming Higher-Education Libraries in India: Digital Integration, AI, and Strategic Knowledge Management

Manjula. M[1] and Vasanth. N[2]*

[1]Information Office, M.P. Birla Institute of Management, Bengaluru – 560001, Karnataka, India
[2]Deputy Librarian, National Sanskrit University (Central University) Tirupati- 517507, Andhra Pradesh, India; vasanthsanjeev10@gmail.com; manjula.mpbim@gmail.com

Abstract

Modern higher-education libraries are undergoing a profound transformation, evolving from custodians of print collections into dynamic, hybrid knowledge ecosystems that integrate digital platforms, Artificial Intelligence (AI), advanced analytics, and collaborative resource-sharing networks. Librarians are assuming expanded roles as digital curators, metadata specialists, research data managers, and instructors in information and digital literacy, reflecting a shift from routine operations to strategic knowledge stewardship. Concurrently, libraries are prioritising open access, accessibility, inclusion, and ethical use of technology, ensuring that innovations enhance equitable access to knowledge while addressing concerns about privacy, algorithmic bias, and digital equity. This study analyses how these converging trends reshape library management practices, enabling responsive service delivery, evidence-based decision-making, and enhanced research support in Indian higher-education institutions. The findings highlight the importance of aligning technology adoption, professional competencies, and ethical frameworks to sustain libraries as central, future-ready partners in the academic knowledge ecosystem. By bridging technological innovation with inclusive and strategic practices, modern libraries can advance both institutional research goals and learner success.

Keywords: Accessibility, Artificial Intelligence, Digital Libraries, Ethical Technology, Higher-Education Libraries, India, Modern Library Management, Open Access, Research Data Management

JEL Classification Code: I23, O33, D83, M15

Cite this article as: Manjula, M., & Vasanth, N. (2026). Transforming Higher-Education Libraries in India: Digital Integration, AI, and Strategic Knowledge Management. *DHARANA - International Journal of Business, 17*(1), 124-139. https://doi.org/10.18311/DBIJB/v17_i1_2026_06

1. Introduction

In the contemporary information age, the role of libraries has expanded far beyond traditional print collections and in-house reference services, evolving into digitally enabled knowledge environments that respond to users' diverse and dynamic needs (Bhardwaj,

Article Received on: 11-01-2026 Revised on: 30-01-2026 Accepted on: 27-02-2026

2024; Rajput & Pandey, 2024). This digital transformation reflects a fundamental shift in how libraries acquire, organise, deliver, and preserve information, driven by innovations such as integrated library management systems, AI-enhanced search tools, mobile accessibility, and seamless access to electronic resources like e-books, online journals, and digital repositories (ScienceDirect, 2025; Rajput & Pandey, 2024). These technologies collectively expand access and engagement, enabling patrons to discover and use information anytime and anywhere, thus reinforcing the library's relevance in a digitally connected world.

Despite the clear progress, significant challenges and persistent gaps complicate this transformation. While many libraries have adopted digital platforms, issues such as limited infrastructure, budget constraints, staff digital literacy, and uneven user adoption remain pervasive (Rajput & Pandey, 2024; Sebelas Maret University researchers, 2025). Furthermore, empirical research suggests that the integration of new technologies does not necessarily translate into optimal user experience or equitable access, particularly for communities with low digital literacy or insufficient connectivity (Sebelas Maret University *et al.*, 2025; International Journal on Digital Libraries, 2026). For example, although AI and advanced search capabilities promise enhanced discovery, questions remain about how effectively these tools are implemented and whether they truly align with users' information-seeking behaviours (ScienceDirect, 2025).

The research problem at the heart of current scholarship, therefore, is not merely whether libraries are adopting digital tools but rather how these technologies are reshaping user engagement, service efficiency, and inclusion across diverse populations. Existing studies highlight a gap in systematic, user-centric evaluations of digital library services, particularly in understanding the interplay between technological capabilities and real-world user needs, preferences, and barriers to access (International Journal on Digital Libraries, 2026; Rajput & Pandey, 2024). Addressing this gap is essential for advancing theory and practice in library and information science and for ensuring that digital transformation enhances both service quality and social equity.

Against this backdrop, research that investigates strategic implementation frameworks, assesses digital literacy interventions, or evaluates inclusive design practices will contribute significantly to the field. Such work not only deepens academic understanding but also offers actionable insights for practitioners aiming to align digital infrastructure with broader educational, cultural, and societal goals.

2. Literature Review: Digital Transformation of Library Services in Indian Higher-Education Institutions

The digital transformation of libraries has assumed particular significance within Indian Higher Education Institutions (HEI), where expanding student populations, diversified academic programs, and national digital initiatives have reshaped expectations around information access and service delivery. Traditionally centred on print collections

and in-person reference services, academic libraries in India are increasingly evolving into hybrid knowledge centres that integrate physical holdings with digital platforms to support teaching, learning, and research (Thanuskodi, 2013; Patil & Pradhan, 2021). This transformation is closely aligned with national policy frameworks such as Digital India and the National Education Policy (NEP) 2020, which emphasise technology-enabled education, open knowledge systems, and lifelong learning.

Empirical studies indicate that Indian academic libraries have made considerable progress in adopting Integrated Library Management Systems (ILMS), institutional repositories, e-resource consortia (e.g., e-ShodhSindhu), and remote access tools to expand the reach of scholarly resources (UGC, 2020; Patil & Pradhan, 2021). The use of cloud-based ILMS platforms enables libraries to manage print and electronic collections through unified interfaces while supporting circulation automation, discovery services, and usage analytics. Research suggests that these digital systems improve operational efficiency and resource visibility, particularly in large public universities where collection management and user demand are complex (Breeding, 2022).

From a theoretical standpoint, Diffusion of Innovations Theory (Rogers, 2003) has been widely applied to explain the uneven pace of digital adoption across Indian HEI libraries. According to this framework, factors such as institutional size, funding availability, leadership support, and perceived relative advantage influence whether libraries emerge as early adopters or late adopters of digital technologies. Studies in the Indian context reveal that centrally funded universities and elite institutions tend to adopt advanced digital tools earlier, whereas state universities and rural colleges often face infrastructural and financial barriers that slow the diffusion process (Thanuskodi, 2013; Patil & Pradhan, 2021).

User adoption and engagement with digital library services in India have commonly been examined using the Technology Acceptance Model (TAM). Davis's (1989) model highlights perceived usefulness and perceived ease of use as key predictors of technology acceptance. Indian studies applying TAM demonstrate that students' willingness to use e-journals, digital repositories, and online databases is strongly influenced by system usability, availability of training, and perceived academic relevance (Park, 2009; Kaur & Verma, 2018). Extending this perspective, the Unified Theory of Acceptance and Use of Technology (UTAUT) provide a more comprehensive explanation by incorporating social influence and facilitating conditions factors that are particularly relevant in Indian HEIs where peer usage, faculty encouragement, and institutional support shape technology adoption behaviours (Venkatesh *et al.*, 2003).

Beyond adoption models, recent literature increasingly frames digital transformation in Indian academic libraries through organisational and socio-technical lenses. These studies emphasise that successful digital transformation depends not only on technological infrastructure but also on librarians' digital competencies, professional development opportunities, and institutional change management practices (Corrall & Jolly, 2020). In India, challenges such as limited staff training, resistance to change, and disparities in digital literacy among users continue to

constrain the full utilisation of digital services (Kaur & Verma, 2018). Moreover, while emerging technologies such as AI-based discovery tools and analytics-driven services hold promise, their adoption in Indian HEIs remains at a nascent stage, raising concerns about sustainability, ethics, and data privacy (Breeding, 2022).

Despite a growing body of research on digital libraries in India, significant gaps remain. Much of the existing literature focuses on infrastructure and resource availability, with limited attention to user experience, inclusivity, and outcome-based assessments of digital transformation initiatives. Additionally, there is a lack of integrative studies that combine technology adoption theories with organisational readiness and policy alignment, particularly in the context of NEP 2020. Addressing these gaps is essential for developing contextually relevant strategies that ensure digital transformation in Indian higher-education libraries enhances not only efficiency but also equitable access, academic quality, and institutional relevance. The rapid digital transformation of higher-education libraries, coupled with the integration of AI, analytics, and collaborative resource-sharing, is reshaping both library operations and the roles of librarians. Simultaneously, ethical, inclusive, and data-driven practices are emerging as critical factors influencing equitable access and the strategic impact of library services in Indian universities.

RQ1: *How do digital transformation, AI, and analytics influence the roles, competencies, and strategic effectiveness of librarians in Indian HEI?*

RQ 2: *In what ways do open access, collaborative resource sharing, data management, and ethical technology practices impact equitable knowledge access and inclusive service delivery in Indian higher-education libraries?*

The remainder of this paper is organised into eight parts. Part I introduces the conceptual background and outlines the scope of modern library management. Part II reviews the relevant literature on digital transformation in higher-education libraries. Part III examines the role of artificial intelligence and analytics in enhancing library services. Part IV discusses the evolving roles and competencies of librarians in digitally enabled academic environments. Part V analyses open access initiatives and collaborative resource-sharing models. Part VI explores data management and research support services within higher-education libraries. Part VII addresses issues of accessibility, inclusion, and ethical technology use. Finally, Part VIII presents the discussion and conclusion, summarising key insights, implications for Indian higher-education libraries, and directions for future research. add : Conceptual model

3. Artificial Intelligence and Analytics in Higher-Education Libraries

AI and advanced analytics are no longer peripheral innovations in higher-education libraries; they are increasingly shaping how libraries anticipate user needs, allocate resources, and deliver services. Unlike earlier phases of automation that focused primarily on efficiency, AI introduces a qualitative shift toward intelligent and adaptive systems that influence both operational decision-making and user experience (Cox *et al*., 2019).



Figure 1. AI and analysis tool.
Source: Author

AI-enhanced search and classification systems fundamentally alter information discovery processes. Traditional catalogue systems depend on static metadata and user-driven query formulation, which often disadvantages users with limited search expertise. AI-based discovery tools, by contrast, employ semantic analysis and machine learning to infer user intent and establish conceptual relationships between resources, thereby improving retrieval accuracy and reducing search effort (Bawden & Robinson, 2020). In HEI, particularly in India, where user populations are heterogeneous in language proficiency and digital literacy, this capability has direct implications for inclusivity and academic access.

Predictive analytics further extends the strategic role of libraries by enabling evidence-based planning. By analysing usage data from circulation systems, e-resource platforms, and learning management systems, libraries can forecast demand, identify underutilised resources, and optimise collection development decisions (Oakleaf, 2010). For Indian HEI operating under financial constraints, such analytics provide a defensible basis for subscription rationalisation and budget justification. However, the effectiveness of these tools depends not merely on technological availability but on organisational readiness to integrate data insights into institutional policy and governance structures.

AI-driven chatbots and virtual assistants exemplify how analytics and automation reshape service delivery models. These tools extend support beyond physical library hours by handling routine queries related to resource access, navigation, and institutional services. Analytically, their value lies not only in scalability but in service continuity within large universities where librarian user ratios are unfavourable (Breeding, 2022). At the same time, over-reliance on automated interfaces raises concerns related to contextual accuracy, ethical transparency, and user trust, particularly when systems are not adequately trained or monitored.

Taken together, AI and analytics reposition academic libraries as proactive and anticipatory service systems rather than reactive support units. However, this transformation also introduces structural challenges, including data governance, algorithmic bias, and unequal access. Analytically, AI adoption in higher-education libraries must therefore be viewed as a strategic capability shaped by institutional culture, professional expertise, and ethical accountability, rather than as a purely technological upgrade (Cox *et al.*, 2019).

4. Evolving Roles of Librarians in Higher-Education Institutions

The integration of digital technologies and AI into library operations has precipitated a fundamental reconfiguration of the professional role of librarians within higher-education institutions. Librarians are no longer positioned primarily as custodians of physical collections; instead, they function as knowledge intermediaries, digital specialists, and strategic partners within academic ecosystems (Corrall & Jolly, 2020).

A key dimension of this role evolution is librarians' responsibility as digital curators and metadata specialists. As institutional repositories, research datasets, and digital archives expand, librarians play a critical role in ensuring content is discoverable, interoperable, and preserved over time. These functions directly affect research visibility and institutional reputation, elevating librarians' contributions from operational support to strategic academic infrastructure (Bawden & Robinson, 2020).

The instructional role of librarians has also expanded significantly. In contemporary HEI, characterised by information overload, algorithm-driven search engines, and misinformation, librarians increasingly serve as educators in digital and information literacy. This shift is particularly salient in Indian universities, where students enter higher education with varied levels of digital preparedness. Analytically, this instructional role positions librarians as agents of academic

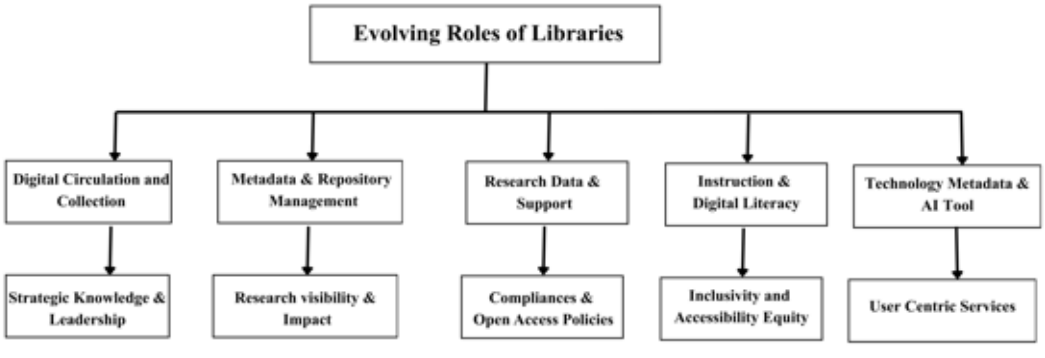


Figure 2. Evolving roles of modern libraries.
Source: Author

equity, bridging gaps in research skills and critical information evaluation (Oakleaf, 2010).

Another critical transformation lies in librarians' engagement with the research lifecycle. Librarians now support research data management, open-access compliance, institutional repositories, and virtual learning environments. These responsibilities embed librarians within the research and teaching missions of institutions, challenging traditional perceptions of librarianship as a support service detached from core academic outcomes (Corrall & Jolly, 2020).

This expansion of responsibilities necessitates a parallel shift in professional competencies. Contemporary librarians are expected to demonstrate proficiency in metadata standards, digital preservation, analytics tools, and increasingly, AI-assisted systems. From an analytical perspective, this reflects a transition from task-based roles to strategic, adaptive, and interdisciplinary competencies. Where institutional investment in training and professional development is inadequate, role expansion risks becoming symbolic rather than substantive. Overall, the evolving role of librarians signifies a structural repositioning within higher-education institutions from operational functionaries to strategic contributors in knowledge production and dissemination. The degree to which institutions recognise and institutionalise this shift will significantly influence the effectiveness and sustainability of digitally transformed library services.

5. Open Access and Resource Sharing in Higher-Education Libraries

Open Access (OA) and collaborative resource sharing have emerged as strategic responses to structural inequities in scholarly communication, particularly within higher-education libraries operating under financial and access constraints. Rather than functioning as peripheral initiatives, OA and networked resource-sharing models increasingly shape

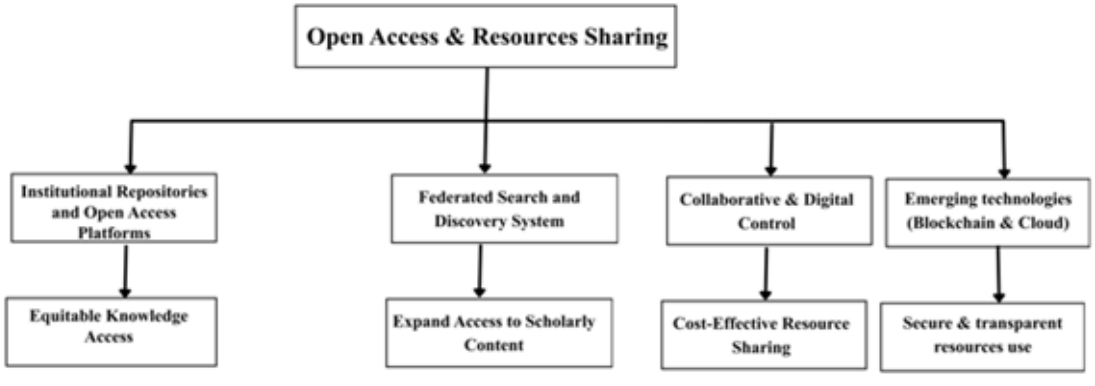


Figure 3. Open access and resource sharing.
Source: Author

how libraries sustain relevance in a globalised and digitally mediated knowledge economy. In the Indian higher-education context, these developments carry added significance due to rising subscription costs, uneven institutional capacity, and the policy-driven push toward inclusive education.

The growing emphasis on open access publishing and repositories reflects a fundamental shift in the economics of knowledge dissemination. Traditional subscription-based models often restrict access to scholarly content based on institutional purchasing power, reinforcing disparities between well-funded and resource-constrained institutions. OA models challenge this paradigm by enabling free and unrestricted access to research outputs, thereby supporting equity, visibility, and wider scholarly participation (Suber, 2012). Analytically, OA strengthens the library's role as a facilitator of knowledge democratisation rather than merely a gatekeeper of licensed resources.

From an institutional perspective, OA adoption also alters the strategic positioning of libraries within research ecosystems. By managing institutional repositories, supporting open-access mandates, and advising researchers on copyright and licensing, libraries extend their influence across the research lifecycle. In Indian universities, where national initiatives such as One Nation One Subscription and NEP 2020 emphasise open knowledge systems, OA enables libraries to align resource strategies with broader policy objectives while mitigating escalating subscription costs (UGC, 2020).

Alongside OA, collaborative resource sharing through inter-library digital networks represents a shift from ownership-based collection models to access-oriented and cooperative frameworks. Digital consortia, federated search systems, and shared repositories allow libraries to pool resources, reduce duplication, and expand access beyond institutional boundaries. Analytically, these networks transform libraries from isolated service units into nodes within distributed knowledge infrastructures, enhancing collective capacity without proportionate increases in expenditure (Breeding, 2022).

Emerging technologies such as blockchain are increasingly explored to support secure, transparent, and decentralised resource sharing. Blockchain-based systems offer potential solutions for rights management, transaction tracking, and trust-building across institutional networks. While still at an exploratory stage in higher-education settings, these tools signal a move toward trust-based digital collaboration, particularly relevant for large, multi-institutional environments such as Indian higher education (Kumar & Mostafa, 2020). Analytically, their value lies less in immediate implementation and more in their capacity to address long-standing issues of transparency, attribution, and governance in shared digital ecosystems.

OA models and federated networks collectively reduce cost barriers while expanding the reach of academic resources to learners, researchers, and institutions beyond elite or metropolitan centres. This shift supports libraries' continued relevance in an environment where information is increasingly accessed through global platforms rather than local collections. However, the success of these initiatives depends on sustained institutional commitment, policy coherence, and librarians' capacity to navigate legal, technical, and ethical complexities associated with open and shared systems. Open

access and resource sharing reposition libraries as connectors within global knowledge systems rather than passive consumers of commercial content. By enabling equitable access, fostering collaboration, and supporting institutional visibility, these models reinforce the strategic role of higher-education libraries in advancing academic inclusion and research impact. The extent to which libraries can institutionalise these practices will significantly shape their relevance and resilience in a rapidly evolving scholarly landscape.

6. Data Management and Research Support in Higher-Education Libraries

The growing prominence of data-intensive research has significantly expanded the functional boundaries of higher-education libraries, positioning data management and research support as core components of contemporary library services. Academic libraries are no longer concerned solely with facilitating access to published information; instead, they are increasingly responsible for supporting the entire research data lifecycle, from data creation and curation to preservation and reuse. This evolution reflects a broader shift from information retrieval toward knowledge stewardship, where libraries actively contribute to the sustainability and integrity of scholarly outputs. One of the most notable developments in this area is the expansion of libraries into Research Data Services (RDS). These services include data management planning, metadata creation, storage solutions, and guidance on data sharing and reuse. Analytically, this shift responds to structural changes in research practices, including funder mandates for data sharing, open science initiatives, and the growing recognition of data as a valuable scholarly asset in its own right (Tenopir *et al.*, 2020). In HEI, particularly research-oriented universities, libraries are uniquely positioned to support these requirements due to their expertise in organisation, preservation, and access management.

The establishment and management of institutional data repositories further illustrate

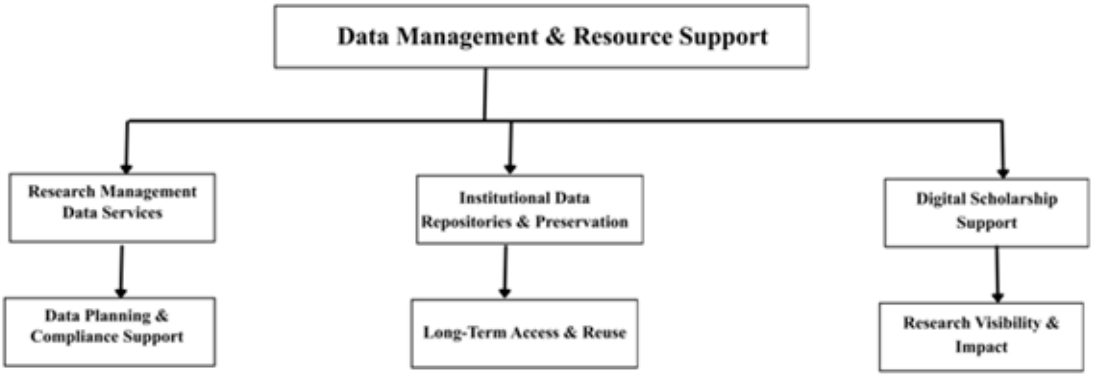


Figure 4. Data management and resource support.
Source: Author

libraries' evolving role in research ecosystems. These repositories serve as platforms for preserving datasets, ensuring compliance with open data policies, and enhancing research visibility and reproducibility. From an analytical standpoint, data repositories extend the traditional function of institutional repositories beyond publications, embedding libraries more deeply into research governance and scholarly communication infrastructures (Cox *et al.*, 2019). In the Indian higher-education context, this role is gaining relevance as universities seek to align with global open science norms while addressing local challenges related to infrastructure and policy coherence.

Concurrently, libraries are increasingly engaged in digital scholarship support, providing expertise in data visualisation, text and data mining, and computational research methods. This engagement signals a move away from transactional service models toward collaborative partnerships with researchers, where librarians contribute methodological and technical expertise. Analytically, such collaboration elevates librarians' status from service intermediaries to co-creators within the research process, reinforcing their strategic value within academic institutions.

Labour market trends within librarianship further reinforce this transformation. Job analyses and professional competency frameworks indicate a rising demand for data management specialists, research data librarians, and digital scholarship coordinators within library teams (Corrall, Kennan, & Afzal, 2022). These roles require hybrid skill sets combining traditional Library and Information Science (LIS) expertise with data science, research ethics, and digital infrastructure knowledge. This trend reflects not only technological change but also an institutional recognition that effective data stewardship is central to research quality, compliance, and impact.

Despite these advances, the integration of data management roles within higher-education libraries presents significant challenges. Limited staffing, uneven skill development, and a lack of formal recognition within institutional structures can constrain the effectiveness of research data services. Analytically, this highlights a tension between expanding expectations and organisational readiness. Without sustained investment in professional development, policy alignment, and cross-departmental collaboration, data management risks remaining a fragmented or peripheral function rather than a fully embedded library service. Overall, the growing emphasis on data management and research support underscores a decisive shift in the mission of higher-education libraries from facilitating access to information toward ensuring the long-term stewardship, integrity, and reuse of knowledge assets. This transformation strengthens libraries' relevance within contemporary research environments and reaffirms their role as essential partners in the production and preservation of scholarly knowledge.

7. Accessibility, Inclusion, and Ethical Technology Use in Higher-Education Libraries

The rapid integration of digital technologies in higher-education libraries has brought issues of accessibility, inclusion, and ethical technology use to the forefront of service design

and governance. As libraries adopt AI-driven systems, analytics platforms, and digital interfaces, they increasingly recognise that technological innovation must be accompanied by a commitment to equitable access and responsible use. In this context, accessibility is no longer treated as a supplementary feature but as a core principle shaping how library services are conceptualised and delivered.

AI-based assistive technologies have significantly expanded libraries' capacity to support users with diverse abilities. Tools such as text-to-speech, speech-to-text, adaptive interfaces, and personalised display settings enable users with visual, auditory, or cognitive impairments to engage more effectively with digital resources. Analytically, these technologies shift accessibility from a compensatory approach to a design-embedded practice, allowing inclusive access to be built directly into discovery systems, learning platforms, and digital collections (Bawden & Robinson, 2020). In higher-education settings, particularly in large and diverse institutions, this enhances participation and academic independence for users who were previously marginalised by standard interfaces.

At the same time, the expanded use of AI and data-driven systems has intensified ethical concerns related to privacy, bias, and digital equity. Libraries increasingly collect and analyse user data to personalise services and improve system performance. While such practices offer clear functional benefits, they also raise questions about informed consent, data security, and the potential for algorithmic bias to reproduce or amplify existing inequalities (Floridi *et al.*, 2018). Analytically, this places libraries in a complex position: they must balance innovation with their longstanding professional commitment to user confidentiality and intellectual freedom.

Concerns around digital equity further complicate technology adoption strategies. Although advanced systems can enhance service quality, uneven access to devices, connectivity, and digital skills means that not all users benefit equally from these innovations. In higher-education libraries, this reality underscores the need for inclusive service models that combine technological solutions with human mediation, training, and alternative access pathways. From an analytical standpoint, equity is not achieved through technology alone but through intentional institutional design and policy alignment.

The growing emphasis on ethical technology use reflects a broader shift in librarianship toward values-driven digital transformation. Libraries increasingly engage with ethical frameworks that address transparency, accountability, and fairness in AI deployment. This orientation distinguishes libraries from purely commercial information platforms and reinforces their role as trusted public and academic institutions (IFLA, 2022). Analytically, ethical stewardship becomes a strategic asset, shaping user trust and institutional legitimacy in digitally mediated environments. Overall, accessibility, inclusion, and ethical technology use represent interdependent dimensions of contemporary library practice. By embedding accessibility into service design and foregrounding ethical considerations in technology adoption, higher-education libraries reposition themselves as inclusive knowledge spaces that serve diverse user communities responsibly. This approach ensures that technological advancement enhances, rather than undermines, the core

social and educational missions of academic libraries.

8. Discussion and Conclusion

The landscape of library management has experienced a foundational transformation over the last decade, driven by converging forces that reflect broader shifts in information production, technology adoption, and user expectations. No longer solely guardians of print collections and custodians of catalogues, modern libraries, particularly in higher-education settings, are evolving into dynamic, hybrid knowledge ecosystems that bridge physical spaces with digitally mediated services. This evolution is not accidental; it arises from a specific constellation of technological, social, and institutional pressures that together reshape how libraries operate, prioritise services, and position themselves within academic missions.

At the core of this transformation is the integration of digital platforms that unify collection management, user services, and analytics. ILMS and discovery layers now support both print and electronic resources through seamless interfaces, enabling patrons to search, access, and engage with vast collections without regard to format or location (Breeding, 2022). This infrastructure shift reflects libraries' response to the demands of digital fluency and immediate information access, particularly among student populations for whom mobile and cloud-based interactions are the norm (Corrall & Jolly, 2020). These platforms not only improve operational efficiency but also provide the data foundations necessary for more advanced insights and service planning.

Building on this digital foundation is the expanding role of AI and analytics in library processes. AI-enhanced discovery and recommendation systems decrease cognitive barriers to search and allow for intelligent retrieval that interprets user intent rather than relying on rigid keyword matching (Cox, Pinfield, & Rutter, 2019). At the same time, analytics tools enable libraries to move beyond anecdotal decision-making toward evidence-based management, analysing usage patterns, forecasting demand, and optimising collections based on quantitative patterns rather than intuition (Oakleaf, 2010). These capacities mark a departure from static resource stewardship toward responsive and predictive service models that align resources with emerging research priorities and learning behaviours.

The consequences of these technological shifts extend deeply into professional roles, challenging traditional conceptions of librarianship. Modern librarians are now expected to be digital curators, metadata specialists, instructional designers, research data stewards, and technology mediators (Corrall, Kennan, & Afzal, 2022). The growth of RDS and digital scholarship support means librarians no longer merely point users to resources; they help structure, organise, and preserve the data that underpins contemporary research itself. This shift reflects a broader recognition that knowledge stewardship encompasses not just access but preservation, compliance, and reuse functions that have direct implications for academic reputation and institutional research impact.

Another profound influence on modern library management is the acceleration of OA and

collaborative resource sharing. Traditional subscription models have long constrained access based on institutional budgets, creating inequities within and across national education systems. OA models, institutional repositories, and federated networks disrupt these limitations by broadening access through cost-mitigated, networked models that emphasise collective access over individual ownership (Suber, 2012). For academic libraries in contexts such as India, where funding disparities are widespread, OA aligns library strategy with national educational objectives and reinforces the library's role as a democratiser of knowledge rather than a gatekeeper of paywalled resources.

The emerging emphasis on data management, accessibility, and ethical technology use represents both an opportunity and a responsibility. Libraries are increasingly called upon to support research data management (RDM) throughout the data lifecycle, from planning and creation to storage and curation (Cox *et al*., 2019). Such services propel libraries into core functions of research administration, requiring specialised competencies in metadata standards, repository governance, and long-term preservation. Simultaneously, the adoption of accessible technologies such as AI-assisted text-to-speech, adaptive interfaces, and assistive tools signals a shift toward inclusivity that is embedded in service design rather than treated as an afterthought (Floridi *et al*., 2018). These accessibility practices underscore the broader ethical commitments that libraries uphold, including equity of access, user privacy, and transparency in algorithmic systems.

Equally salient are the ethical challenges intertwined with modern library technologies. As libraries adopt systems that collect, analyse, and act on user data, considerations around privacy, consent, algorithmic bias, and digital equity become unavoidable (Floridi *et al*., 2018). Analytical systems and AI models, if left unchecked, can inadvertently reproduce exclusionary patterns or privilege certain groups over others. Therefore, contemporary library management must navigate not just technical functionality but the ethical frameworks that govern responsible use.

Taken together, these trends signal a paradigmatic shift in library management from static repositories of information to dynamic, hybrid knowledge ecosystems that are deeply interwoven with the research, learning, and policy goals of higher-education institutions. Libraries are no longer peripheral support units but central collaborators in knowledge creation, dissemination, and preservation. This evolution requires not only technological investments but also strategic leadership, professional development, and values-driven policy frameworks that align human capacity with institutional mission.

In conclusion, modern library management is shaped by an interplay of digital integration, intelligent systems, expanded professional roles, collaborative access models, and ethical commitments. Navigating this complex environment demands that libraries balance innovation with inclusivity, efficiency with equity, and data-driven approaches with human judgment. As higher-education ecosystems continue to evolve, libraries that successfully embody these principles will be better positioned to serve as sustainable, equitable, and impactful knowledge stewards in the 21st century.

9. Limitations of The Study and Directions For Future Research

Despite offering a comprehensive analytical synthesis of trends shaping modern library management in higher-education institutions, this study is subject to certain limitations that also point toward meaningful avenues for future research. First, the study adopts a conceptual and literature-based approach, drawing insights from existing scholarly work rather than primary empirical data. While this enables a broad and integrative understanding of emerging developments such as digital transformation, AI, open access, and evolving librarian roles, it limits the ability to capture institution-specific practices and operational realities (Corrall *et al.*, 2022). Consequently, the findings should be interpreted as indicative rather than definitive.

Second, the technologies discussed in this study, particularly AI-driven analytics, digital repositories, and data management infrastructures, are rapidly evolving. As noted by Cox *et al.* (2019), technological maturity and institutional readiness significantly influence implementation outcomes. Therefore, some applications and implications highlighted in this analysis may shift as systems evolve, policies mature, and user competencies change over time. Additionally, while the study situates its discussion within the Indian higher-education context, the heterogeneity of institutions ranging from well-funded central universities to resource-constrained colleges limits the generalisability of conclusions across the entire sector (Breeding, 2022).

Another limitation lies in the absence of stakeholder-level perspectives, such as librarian preparedness, faculty collaboration, and user experiences. Prior research suggests that organisational culture, skill development, and user trust play a crucial role in determining the success of digital and AI-enabled library services (Oakleaf, 2010; Floridi *et al.*, 2018). Without empirical evidence from these stakeholders, the study cannot fully assess the practical challenges associated with capacity building, resistance to change, or ethical governance.

Building on these limitations, future research should prioritise empirical and mixed-method studies to validate and extend the conceptual insights presented here. Surveys, interviews, and case studies involving librarians, researchers, and students would offer a richer understanding of technology adoption, competency gaps, and service effectiveness. Longitudinal research could further examine how AI, analytics, and research data management services influence library performance and research outcomes over time (Cox *et al.*, 2019).

Comparative studies across public and private institutions, or between Indian and international higher-education libraries, would help identify contextual differences and transferable best practices. Moreover, future research should explore ethical and governance frameworks related to data privacy, algorithmic bias, and accessibility, areas increasingly recognised as central to responsible library management (Floridi *et al.*, 2018). Finally, the development and empirical testing of theoretical models or measurement scales for modern library management effectiveness would strengthen evidence-based decision-making and

support strategic planning within academic libraries.

10. References

Bawden, D., & Robinson, L. (2020). Information overload: An overview. *Journal of Information Science, 46*(2), 1-15. https://doi.org/10.1093/acrefore/9780190228637.013.1360

Bhardwaj, A. (2024). The digital transformation of research libraries: Implications for scholars. *International IT Journal of Research, 2*(2), 29-34. https://itjournal.org/index.php/itjournal/article/view/95

Breeding, M. (2022). Library systems report 2022: Transformation, innovation, and sustainability. *American Libraries, 53*(5), 22-35.

Corrall, S., & Jolly, L. (2020). Innovations in libraries: Technology, professionalism and organisational change. *Journal of Librarianship and Information Science, 52*(2), 349-360.

Cox, A. M., Kennan, M. A., Lyon, L., & Pinfield, S. (2019). Developments in research data management in academic libraries: Towards an understanding of research data service maturity. *Journal of the Association for Information Science and Technology, 70*(4), 431-444.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319-340. https://doi.org/10.2307/249008

Digital transformation in academic libraries: E-resources, OPACs and AI in information discovery. (2025). *Reference Services Review, 53*(2), 238-255. https://doi.org/10.1108/RSR-12-2024-0078

Floridi, L., Cowls, J., Beltrametti, M., Chatila, R., Chazerand, P., Dignum, V., Vayena, E. (2018). AI4People: An ethical framework for a good AI society. *Minds and Machines, 28*(4), 689-707. https://doi.org/10.1007/s11023-018-9482-5 PMid: 30930541 PMCid: PMC6404626.

IFLA. (2022). Statement on libraries and artificial intelligence. *International Federation of Library Associations and Institutions*.

Kaur, K., & Verma, M. K. (2018). Use of electronic information resources by students and researchers in Indian universities. *Journal of Library & Information Technology, 38*(5), 324-331.

Kumar, A., & Mostafa, J. (2020). Blockchain technology for libraries: Applications, implications, and challenges. *Library Hi Tech, 38*(3), 404-421.

Oakleaf, M. (2010). The value of academic libraries: A comprehensive research review and report. *Association of College and Research Libraries*, 1-182.

Park, S. (2009). An analysis of the technology acceptance model in understanding university students' behavioral intention to use e-libraries. *Educational Technology & Society, 12*(3), 150-162.

Patil, S. K., & Pradhan, P. (2021). Digital library initiatives in Indian academic libraries: Issues and challenges. *Library Philosophy and Practice*, 2021, 1-15.

Rajput, A., & Pandey, P. K. (2024). Digital transformation of academic libraries in India: Exploring ICT integration for knowledge sharing and resource optimisation. ShodhKosh. *Journal of Visual and Performing Arts, 5*(5), 1277-1285. https://doi.org/10.29121/shodhkosh.v5.i5.2024.5406

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). Free Press.

Sebelas Maret University researchers. (2025). Digital library innovation and challenges in supporting sustainable development through

digital transformation. *BIS Information Technology and Computer Science*.

Suber, P. (2012). *Open access*. MIT Press. https://doi.org/10.7551/mitpress/9286.001.0001

Tenopir, C., Rice, N. M., Allard, S., Baird, L., Borycz, J., Christian, L., Sandusky, R. J. (2020). Data sharing, management, use, and reuse: Practices and perceptions of scientists worldwide. *PLOS ONE, 15*(3), e0229003. https://doi.org/10.1371/journal.pone.0229003 PMid: 32160189 PMCid: PMC7065823.

Thanuskodi, S. (2013). Electronic resources in libraries: Issues and challenges. *International Journal of Library Science, 2*(3), 31-37.

UGC. (2020). *e-ShodhSindhu: Consortium for higher education electronic resources*. University Grants Commission.

Venkatesh, V., Morris, M. G., Davis, F. D., & Davis, G. B. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425-478. https://doi.org/10.2307/30036540

DHARANA
International Journal of Business
DOI: 10.18311/DBIJB/v17_i1_2026_07

INFORMATICS JOURNALS
ISSN: 0974-0082 | Vol 17(1), 2026 | pp. 140–147

Human-Machine-Interface (HMI) in Human Capital Management (HCM) - A Strategic Transformer for the Future of Work

Kovvali Bhanu Prakash

Professor, Adjunct & CEO, LBRCE & Viswa Sri Protein Pvt., Ltd., AI, Analytics, and SAP FI/CO Consultant, Vijayawada, Andhra Pradesh, India; bhanucool@yahoo.com

Abstract

In an era where ideas are transformed into actionable insights, AI has evolved from fictional assistants like *C-3PO* to autonomous systems as depicted in *ex-machina.* The progression mirrors HCMs' move from intelligent, immersive, and adaptive system (HCI) to Humachine (Gen AI & RAG) emphasizes the need for integration of *Humans + Machine*, leveraging the strengths and opportunities, and enhancing the three components of 'Quality of Human-Machine-Interface (HMI)' *viz.,* efficiency, effectiveness, and satisfaction.

A Human-Machine-Interface (HMI) in HCM refers to a user interface or dashboard that enables ROs' to interact seamlessly with AI-powered analytics and automation that facilitate Human-AI Collaboration in Recruitment, Selection, Training, and Employee Engagement (EE).

An apple's-eye-view of HMI applications in HCM Suite (micro1 AI, IBM, Infosys, Oracle, SAP, Bamboo HR, Adidas, Reebok etc.,) is presented in concise and the automation, assistance, augmentation, and autonomous intelligence are future frontiers and agility, accuracy and transparency are the dynamics of HCI-4.0. To sum up, a work culture that espouses failing forward, encourages risk-taking, creates an environment of experimentation, learning, and fulfilled potential, gives a contentment in work-life, wellness and wellbeing in all spheres of human life i.e., the future forward of HCI-4.0. In dictum, Human-Machine Interaction (HMI) in HCM is an innovatory intervention, green shoot, and all-inclusive drive and urge for Gen-Z, Alpha, and Beta *per se*

Keywords: AI, AR, Gen-AI, EE, ELC, HCI, HCM, HMI, RAG, VR

JEL Classification: M12, M15, O33, J24.

Cite this article as: Prakash, K. B. (2026). Human-machine interface (HMI) in human capital management (HCM): A strategic transformer for the future of work. *DHARANA - International Journal of Business, 17*(1), 140–147. https://doi.org/10.18311/DBIJB/v17_i1_2026_07

Article Received on: 30-08-2025 Revised on: 08-10-2025 Accepted on: 27-02-2025

1. Human-Machine-Interface (HMI) in Human Capital Management (HCM) - A Conceptual Focus

Human Capital Management (HCM) has evolved from an administrative personnel function to a strategic organizational capability. Organisations increasingly recognize employees as strategic assets capable of generating sustained competitive advantage. Rapid advancements in Artificial Intelligence (AI), Machine Learning (ML), Predictive and Prescriptive Analytics (PA), and automation are reshaping and rewiring the Workforce Management Systems (WMS).

Human-Machine-Interface (HMI) facilitates structured interactions between humans and AI within HCI frameworks, enabling augmented decision-making. HCM strategically focuses on assessing, evaluating, and demonstrating people's competencies and capabilities in organizations through great people management. The art and science of HCM integrate data-driven algorithms with managerial judgment to enable decision-making beyond mere automation. Industry-5.0 emphasizes human-centric collaboration, where technology enhances rather than replaces human expertise. AI, Generative AI (Gen AI), and Retrieval-Augmented Generation (RAG) technologies are reshaping the '4-Worlds of Work' *viz.*, Red (innovation-driven ecosystems), Blue (corporate-dominated structures), Green (values and sustainability-oriented organizations), and Yellow (human-centric workplaces). These technological advancements reshape the future of work's architecture by redefining decision-making, collaboration, and value creation. HMI assistants enhance recruitment and selection, strengthen training and talent retention strategies, and integrate seamlessly with Learning and Development (L&D) systems. Through model-driven, data-driven, communication-driven, document-driven, and knowledge-driven simulations, HMI-enabled platforms deliver predictive insights, personalized employee experiences, and strategic workforce optimization.

2. Human-Machine Interface (HMI) - A Strategic Transformation in HCM

The universe is inherently dynamic, continuously expanding and evolving (Hawking, 2006), and HCM is no exception. Rapid technological advancements are redesigning and reshaping organizational structures and workforce dynamics. Emerging technologies such as Agentic AI, Augmented Intelligence (AuI), Retrieval-Augmented Generation (RAG), Virtual and Augmented Reality (VR/AR), and Voice over Internet Protocol (VoIP) are redefining the work, workforce, and workspace architecture. These innovations transform performed tasks and collaborations across organizational silos and paving the way for strategic human capital decisions (McRae et al., 2024).

Within this evolving landscape, HMI serves as a strategic enabler collaborating Humans + Machines. HMI enhances decision-making, improves operational efficiency, and strengthens strategic human-capital governance. AI applications in HCM are termed Human Capital Intelligence (HCI), an advanced, integrated framework that aligns people, processes, and technology across the entire Employee Life Cycle (ELC) from hire to retire. HCI enables

datadriven, evidencebased decisionmaking and generates actionable insights for decisive people management (Ernst & Young, 2023). By embedding predictive analytics, automation, and intelligent dashboards within HR eco-systems, HCI enhances workforce planning, performance evaluation, and strategic talent governance. The contemporary interactive digital platforms such as Oracle Fusion, PeopleSoft, SAP Success Factors, Zoho People, and Gusto HCM exemplify state-of-the-art HCI implementations complemented by AI-enabled sourcing accelerators. These systems empower recruiters to significantly reduce time-to-hire, enhance screening accuracy, and identify high-potential candidates, often metaphorically termed 'purple squirrels' in talent acquisition discourse (SAP, 2024).

Intelligent parsing, skillmatching algorithms, and predictive fit analysis transform recruitment from a transactional function into a strategic capability. The integration of End-To-End (E-2-E) AIenabled systems across the employee journey from recruitment to training, performance management, retention, and separation enables continuous talent optimization and datadriven HR decisionmaking as illustrated in Figure 1.

Human Capital Intelligence (HCI-4.0) extends this evolution by focusing on the design, evaluation, and implementation of interactive computing systems that facilitate seamless HMI. This paradigm emphasizes usability, transparency, and collaborative intelligence consistent with human-centred AI principles (Medium, 2024; Shneiderman, 2022). In this context, HMI becomes the operational bridge between algorithmic precision and managerial discretion, reinforcing a human-centric yet technologically empowered HCM eco-system.

Figure 2 presents the architecture of Human-Machine-Interface (HMI) symbolizing the integration of human cognition with interconnected digital systems. The central human silhouette, embedded with circuit pathways, represents Augmented Intelligence (AuI) where human reasoning and machine computation operate symbiotically. The surrounding nodes and connectors reflect data

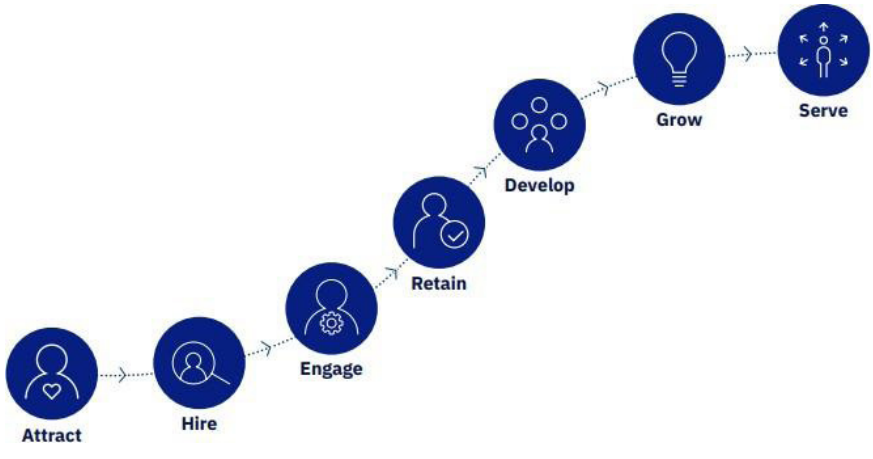


Figure 1. The HCM Life Cycle - A Snapshot View
Source: IBM, 2019

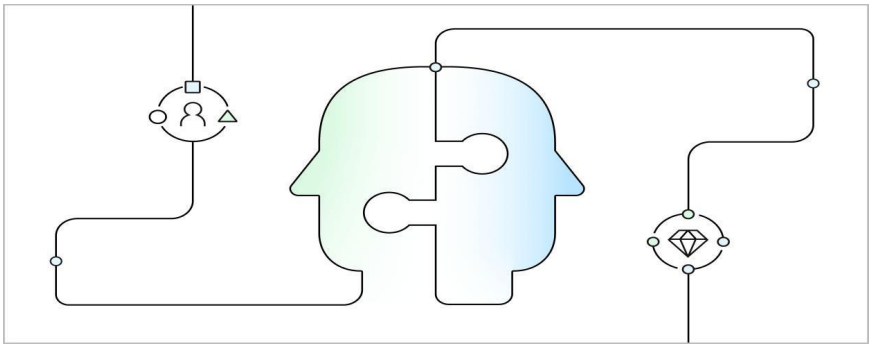


Figure 2. Human-Machine-Interface (HMI) - A Foveon View
Source: https://research.ibm.com/topics/human-centered-ai

flows, communication channels, and knowledge networks that enable collaborative intelligence. This aligns with IBM's conceptualization of human-centered AI systems that augment rather than replace human capabilities (IBM)

HMI in HCM integrates AI-driven automation with human expertise, fostering a collaborative environment that enhances decision quality, improves productivity, and streamlines HR processes. The evolution toward HCI-4.0 is based on a multi-layered analytical framework *viz.,* Descriptive (what happened), Diagnostic (why it happened), Predictive (what is likely to happen), Prescriptive (what should be done), and Integrated or Cognitive Analytics (continuous-learning systems), which together support intelligent workforce decision-making and strategic talent optimization (Duan *et al.,* 2021).

3. HMI in HCM - Empirical Tones and Evidence-Based Insights

Human Capital Theory views employees' knowledge, skills, and competencies as value-creating assets that enhance organizational performance (Baron & Armstrong, 2007). The Resource-Based View (RBV) contends that rare, valuable, and inimitable human capabilities underpin sustained competitive advantage (Barney, 1991). Socio-technical Systems Theory, in turn, emphasizes the interdependence between social and technical systems within organisations, underscoring how their alignment shapes work design and effectiveness (Trist & Bamforth, 1951). HCM underscores evidence-based workforce decision-making (Marler & Boudreau, 2017) while AI-powered HCM (HCI) spanning from recruitment, performance management, and workforce planning augmenting managerial cognition (Upadhyay & Khandelwal, 2018; Tambe *et al.,* 2019; Jarrahi, 2018).

Raisch and Krakowski (2021) expounded on the automation–augmentation paradox and opined AI would replace human tasks (automation) and enhancing them through human–machine collaboration (augmentation). These logics are not mutually exclusive but paradoxically coexist requiring organisation to balance both to sustain performance and mitigate adverse labormarket effects impacting organizational agility positioning HMI as a strategic integration layer in HCM (Vrontis *et al.* 2022).

HCM Analytics measure, monitor, and improve workforce related outcomes across the Employee Life Cycle (ELC) through data-driven decision making. Marler and Boudreau (2017) evidenced that the success of HCM Analytics depends on analytical skills (ability to interpret the data), managerial support (leadership commitment to data-driven decisions), and HRIS (robust, high-quality data infrastructure). Predictive analytics enhances recruitment forecasting, turnover prediction, and performance evaluation, moving HR from descriptive reporting to strategic insight generation.

Duan and Xu (2021) emphasize that analytics driven eco-systems enable real time decision support and operational intelligence, laying the groundwork for AI integrated HR systems. The real coup de grace of HMI is infinite imagination and possibility unlocking unlimited creativity, innovativeness, and operative potentiality.

4. Human-Machine-Interface (HMI) in HCM - An Innovatory Intervention

Human–Machine-Interface (HMI) is an innovative intervention and a strategic transformation. HMI is concerned with human-to-machine and machine-to-human communication, connections, collaboration and interfaces. Human Capital Management (HCM) integrating intuitive interfaces, realtime data feedback, and decisionsupport capabilities across the Employee Life Cycle (ELC) to enhance workforce agility, engagement and performance. The core principles of HMI revolve around AI in HCM, HR and Workforce Analytics, and Human Capital Intelligence (HCI), integrating intelligent interfaces, realtime analytics, and strategic human capital insights aligned with Industry-5.0.

The scholarly article posits HMI as a strategic enabler in HCM by integrating HCI-4.0 and Industry-5.0. HCI game and game rules are now-and-then evolving. The LLMs and SLMs are ever dynamic reshaping the HCM and making advanced and augmented intelligence more accessible and efficient. HCI-4.0 integrates descriptive, diagnostic, predictive, prescriptive, and integrated analytics enabling human validation of intelligent solutions by embedding ethical governance, transparency, and sustainability. The integration of human judgment and machine precision enhances recruitment accuracy, workforce forecasting, employee engagement, and strategic agility. HMI deals with the synergies of human and machine collaborations in managing the human capital efficiently and effectively with the advanced technological interfaces.

5. Human-Machine Interaction (HMI) in HCM - The App'ified Applications

AI-powered Intelligent Assistants (HMI) in HCM are transforming the HCM landscape by automating routine tasks, make better decisions, enhance employee experience, streamline HR Processes, and supporting data-driven decision-making from hiring to retiring while protecting sensitive and proprietary information (ORACLE, 2025). The most prominent HMI applications in 2025 *inter alia* include:

micro1 AI Humanoid Zara, the world's most advanced AI recruiter source candidates based on exact hiring requirements, interview them,

and provide all the necessary information to make hiring decisions. IBM's experience and research provide a strong benchmark for using advanced HMI (AI, automation, and intelligent interfaces) in HCM, showing clear productivity, engagement, and strategic planning gains at scale (Watsonx Orchestrate). Infosys Topaz is on the right direction and doing Responsible AI well and reducing HCM costs and damage severity. Pocket HRMS and People Strong offer intelligent automation and user-centric portals, enhancing Employee Engagement and operational efficiency.

Mi HCM, a Digi-HCM Comprehensive Suite, offers independently deployable modules of Recruitment, Selection, Training and Development and delivers real-time analytics to the organisations across the globe. HireVue (www.hirevue.com), is an AI based HCM-Suite, that analyses the interviewees video for voice inflections, micro-expressions, verb choices and more. Adidas and Reebok are adopting Skill Survey (www.skillsurvey.com), an AI Chatbot that predicts the 'Employee Turnover' and appraises the 'Performance of Workforce' in a scientific manner. Jane, the world's first intelligent AI-Powered Chatbot, is configured and customized by the Loka (www.loka.com/Jane) that predicts the behavior of workforce based on real-time analytics. The employees can get timely responses to their questions faster than ever before. Talla is an Intelligent Assistant and an HR Chatbot that advices and assisting CHROs' in the process of Recruitment, On-Boarding, Employee Engagement (EE) and Experience. Oracle Fusion Cloud HCM, ADP Workforce Now, Bamboo HR, SAP Success Factors. Work Day, and Zenphi Workflow Automation streamline HR operations with mobile apps, AI Co-Pilots, and customizable workflows enabling employees and HR Teams to manage HR-related tasks from anywhere efficiently.

6. HMI in HCM - The Future of Work

Industry -5.O is more disruptive with confluence of technologies such as AI, Block Chain, Cloud, Data, Efficiency, and Futuristic Vision (ABCDEF). The agile and disruptive Technologies have profound influence and impact on primary, secondary and tertiary sectors of the economy. The automation, assistance, augmentation, and autonomous intelligence are future frontiers and agility, accuracy and transparency are the dynamics of HCI-4.O. The future framework of HCI *inter alia* includes Human Capital Behavioural and Talentum Analytics (HCBA & HCTA), Design Thinking, Touch Point and Agile Management, Employee Experience Mapping *per se* (Lisbeth Claus, 2019).

The future focus and pace of adaption of HMI will depend on more intuitive, personalized, and efficient human-AI collaboration (Infosys). A work culture that espouses failing forward, encourages risk-taking, creates an environment of experimentation, learning, and fulfilled potential, gives a contentment in work-life, wellness and wellbeing in all spheres of human life *i.e.,* the future forward of HCI-4.O. In dictum, Human-Machine Interaction (HMI) in HCM is an innovatory intervention, green shoot, and all-inclusive drive and urge for Gen-Z, Alpha, and Beta *per se.*

Organizational readiness for AI adoption varies widely, as do ethics and regulatory frameworks

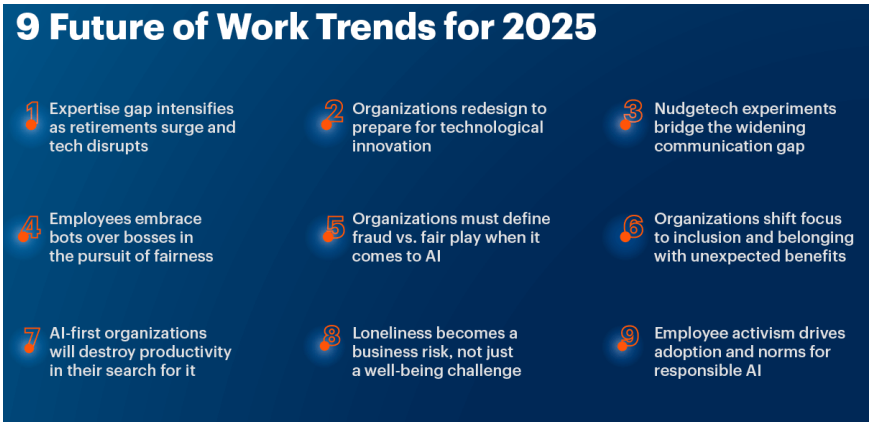


Figure 3. HMI in HCM- The Future of Work Trends and Trajectories
Source: Emily Rose McRae (2025), Gartner Report on Harnessing AI, Inclusion and Innovation to drive Organisational Success and Resilience, Jan, 8.

across jurisdictions. Future research could validate the framework sectorally, assess employee perceptions of AI-driven HCM systems, and explore governance issues for ethical AI integration.

Human-AI synergy optimizes HCM outcomes, reduces bias in hiring, personalize Employee Experiences (EE), and boosts retention across the Employee Life Cycle (ELC). The real *coup de grace* of HMI is infinite imagination and possibility unlocking unlimited creativity, innovativeness, and operative potentiality.

References

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, *17*(1), 99-120. https://doi.org/10.1177/014920639101700108

Baron, A., & Armstrong, M. (2007). Human capital management: Achieving added value through people. Kogan Page.

Duan, Y., Edwards, J., & Dwivedi, Y. (2021). Artificial intelligence for decision-making in the era of big data: Evolution, challenges and research agenda. *International Journal of Information Management*, *48*, 63-71. https://doi.org/10.1016/j.ijinfomgt.2019.01.021

Ernst & Young. (2023). *Human capital intelligence: Transforming workforce strategy in the digital era.* EY Publications.

Harvard Business Review. (2020). How to be the purple squirrel employers are looking for. *Harvard Business Review*. https://hbr.org/2020/02/how-to-be-the-purple-squirrel-employers-are-looking-for

Hawking, S. (2006). A brief history of time, Bantam. https://books.google.co.in/books/about/A_Brief_History_of_Time.html?id=E7mEnx3zE4AC&redir_esc=y

https://news.sap.com/2024/06/sap-successfactors-accelerates-ai-capabilities/

IBM. (n.d.). *Human-centred AI systems* and intelligent automation frameworks. https://www.ibm.com.

Jarrahi, M. H. (2018). Artificial intelligence and the future of work: Human-AI symbiosis in organisational decision making. *Business Horizons*, *61*(4), 577-586. https://doi.org/10.1016/j.bushor.2018.03.007

Lisbeth Claus (2019). HR Disruption - Time Already To Reinvent Talent Management, BRQ Business

Research Quarterly, 22, 207-215.

Marler, J. H., & Boudreau, J. W. (2017). An evidence-based review of HR analytics. *Journal of Management*, *43*(1), 3-26. https://doi.org/10.1177/0149206315618653

McRae, E. R., Aykens, P., Lowmaster, K., & Shepp, J. (2024). 9 Trends That Will Shape Work in 2024 and Beyond, Harvard Business Review. https://hbr.org/2024/01/9-trends-that-will-shape-work-in-2024-and-beyond

Medium. (2024). Human capital intelligence 4.0 and interactive computing systems. *https://medium.com/*

Raisch, S., & Krakowski, S. (2021). Artificial intelligence and management: The automation-augmentation paradox. *Academy of Management Review*, *46*(1), 192-210. https://doi.org/10.5465/amr.2018.0106

Shneiderman, B. (2022). Human-centred AI. *Communications of the ACM, 65*(1), 56-64. https://doi.org/10.1145/3491209

Strohmeier, S., & Parry, E. (2014). HRM in the digital age: Digital transformation and workforce management. *Human Resource Management Review*, *24*(3), 230-245. https://doi.org/10.1016/j.hrmr.2014.03.002

Tambe, P., Cappelli, P., & Yakubovich, V. (2019). Artificial intelligence in Human Resources management: Challenges and a path forward. *California Management Review*, *61*(4), 15-42. https://doi.org/10.1177/0008125619841006

The World's First Intelligent Chatbot, www.loka.com/jane

Trist, E. L., & Bamforth, K. W. (1951). Some social and psychological consequences of the longwall method of coal-getting. *Human Relations*, *4*(1), 3-38. https://doi.org/10.1177/001872675100400101

Upadhyay, A. K., & Khandelwal, K. (2018). Applying artificial intelligence: Implications for recruitment. *International Journal of Information Management*, *39*, 255-266. https://doi.org/10.1016/j.ijinfomgt.2017.11.012

Vrontis, D., Christofi, M., Pereira, V., Tarba, S., Makrides, A., & Trichina, E. (2022). Artificial intelligence, robotics, advanced technologies and human resource management: A systematic review. *Technological Forecasting and Social Change*, *176*, Article 121187. https://doi.org/10.1016/j.techfore.2021.121187

www.ibm.com/products/watsonx-orchestrate

www.infosys.com/services/data-ai-topaz.html

www.micro1.ai/zara

www.oracle.com/in/human-capital-management/ai-at-work

DHARANA
International Journal of Business

INFORMATICS JOURNALS

DOI: 10.18311/DBIJB/v17_i1_2026_08

ISSN: 0974-0082 | Vol 17(1), 2026 | pp. 148-159

Artificial Intelligence Integration in Strategic Human Resource Management: An Empirical Investigation of Human-Centric Sustainability Perceptions in the Industry 5.0 Era

S. Ashwini and S. P. Sunitha

National Institute of Technology Karnataka, Surathkal - 575025, Karnataka, India; sangrammallick1106@gmail.com

Abstract

The advent of Industry 5.0 signals a decisive reorientation of industrial strategy toward human-centricity, sustainability, and technological symbiosis. Within this paradigm, the strategic integration of Artificial Intelligence (AI) into Human Resource Management (HRM) has emerged as a pivotal organisational imperative. The present study empirically investigates how AI-enabled HRM practices shape employee perceptions of organisational sustainability, with particular emphasis on whether the capacity to balance automation with human-centric values is associated with sustainability outcomes. Grounded in a quantitative research design, primary data were gathered from 76 respondents drawn from the information technology sector in Mysuru, India, using a structured Likert-scale questionnaire (Cronbach's $\alpha = 0.942$). The study's central hypothesis posits a significant positive association between employees' perceptions of AI's automation-human balance and their assessments of organisational sustainability. Pearson correlation analysis confirmed this relationship ($r = 0.464$, $p<0.01$). Supplementary analyses further reveal that professional role significantly moderates perceptions of human-centric AI alignment ($\chi^2 = 56.105$, $p<0.001$), while demographic variables such as age, gender, and tenure exert no statistically significant influence. The findings contribute an empirical foundation to the emerging discourse on AI-enabled SHRM within the Industry 5.0 framework and carry actionable implications for HR policy, ethical AI governance, and sustainable workforce strategy.

Keywords: Artificial Intelligence, Empirical Study, Human-Centric Values, Industry 5.0, Organisational Sustainability, Strategic Human Resource Management

JEL Classification Code: M12, M15, O33, D23, Q01

Cite this article as: Ashwini, S. & Sunitha, S. P. (2026). Artificial Intelligence Integration in Strategic Human Resource Management: An Empirical Investigation of Human-Centric Sustainability Perceptions in the Industry 5.0 Era. *DHARANA - International Journal of Business, 17*(1), 148-159. https://doi.org/10.18311/DBIJB/v17_i1_2026_08

Article Received on: 24-02-2026 Revised on: 02-03-2026 Accepted on: 14-03-2026

1. Introduction

The global industrial landscape is undergoing a fundamental transformation driven by the convergence of advanced digital technologies and renewed emphasis on human welfare. Designated Industry 5.0 by the European Commission (2021), this paradigm extends beyond the automation-centric logic of its predecessor to foreground three interlocking pillars: human-centricity, sustainability, and organisational resilience. Unlike Industry 4.0, which was largely defined by the replacement of human labour with intelligent machines, Industry 5.0 envisions a collaborative ecosystem in which humans and machines act as complementary rather than competing agents in the production and management of value.

Within this evolving context, Strategic Human Resource Management (SHRM) occupies a uniquely critical position. The function of HR is no longer confined to administrative operations; it increasingly serves as the strategic interface through which organisations translate technological capability into human capital value. The integration of AI into SHRM, spanning talent acquisition, workforce analytics, performance management, and employee engagement, has accelerated markedly, enabling data-driven decision-making at a scale and precision previously unattainable. Yet the strategic value of AI in HRM extends beyond operational efficiency: it raises foundational questions about fairness, transparency, autonomy, and the preservation of human dignity within algorithmically mediated workplaces.

Despite a growing body of literature on AI in HRM, significant empirical lacunae persist, particularly with respect to how employees at various organisational levels perceive the balance between AI-driven automation and human-centric values, and whether such perceptions bear measurable associations with sustainability outcomes. This gap is especially pronounced in the context of emerging economies, where the rapid diffusion of AI-enabled HR tools has outpaced empirically grounded understanding of their human impacts.

The present study is designed to address this gap by empirically examining employee perceptions of AI integration in HRM within the IT sector of Mysuru, India, a region representative of India's thriving technology ecosystem. Specifically, the study investigates whether the perceived capacity of AI systems to balance automation with human-centric values is significantly associated with perceptions of organisational sustainability. In doing so, it contributes to both the theoretical and practical discourse on responsible AI deployment within the Industry 5.0 framework.

2. Review of Literature

The scholarly literature on AI in HRM has expanded considerably over the past decade, coalescing around three broad themes: technological capability and HR outcomes, employee experience and acceptance, and ethical and sustainability dimensions of AI deployment.

2.1 AI Capabilities and Strategic HR Outcomes

Rodriguez *et al.* (2024) advanced predictive modelling in strategic HRM, reporting 89% accuracy in turnover prediction using machine

learning applied to a dataset of 100,000 employee records, thereby demonstrating AI's potential to transform workforce retention strategies. Complementing this, Johnson *et al.* (2024) conducted a mixed-methods study involving 500 HR professionals, finding a 76% improvement in workforce planning accuracy attributable to AI-enabled forecasting tools. These studies collectively underscore AI's transformative effect on the analytical infrastructure of HR functions, enabling a shift from reactive to proactive talent management.

2.2 Employee Acceptance and Cross-cultural Dynamics

Chen *et al.* (2024) conducted a cross-cultural quantitative survey across 1,200 employees in eight countries, revealing that cultural background, age, and educational attainment are significant moderators of AI adoption attitudes in HR contexts. Their findings affirm that technology acceptance is not uniform and must be contextualised within socio-cultural frameworks. Ahmed and Singh (2024) extended this line of inquiry through a two-year action research intervention across five organisations, demonstrating a 45% improvement in learning effectiveness when AI-driven personalised training platforms were deployed in conjunction with human mentorship.

2.3 Sustainability, Ethics and Industry 5.0 Alignment

Brown *et al.* (2024) executed a mixed-methods study across 300 organisations, establishing that AI integration in HRM is positively associated with environmental impact reduction and social sustainability metrics when governed by transparent and inclusive deployment frameworks. The European Commission (2024) articulated regulatory principles for human-centric AI across 27 EU member states, emphasising that the governance of AI in workplaces must centre on dignity, non-discrimination, and ecological responsibility. The World Bank (2024) provided a complementary global perspective, projecting significant skills displacement across 180 countries and advocating for proactive policy intervention to ensure equitable workforce transition.

While these studies illuminate specific dimensions of AI's impact on HRM, they reveal a persistent gap: few empirical studies have examined the direct relationship between employees' perceptions of AI's human-centricity and their assessments of organisational sustainability, particularly within the Indian IT sector. The present study is positioned to address this lacuna.

3. Research Gap

Notwithstanding the volume and diversity of existing research, three substantive gaps merit attention. First, the majority of extant studies have been conducted in Western or East Asian organisational contexts, limiting the generalisability of their findings to emerging economy settings such as India, where AI adoption in HR is both rapid and unevenly distributed. Second, while macro-level analyses have associated AI with improved sustainability metrics at the organisational or sectoral level, micro-level empirical evidence linking individual employee perceptions of AI's human-centric orientation to sustainability

outcomes remains sparse. Third, the theoretical integration of Industry 5.0 principles, specifically human-machine collaboration, resilience, and sustainability, into SHRM research frameworks is still nascent, and few studies have operationalised these constructs in quantitatively testable hypotheses.

The present study is specifically designed to address these gaps by focusing on employee perceptions within the Mysuru IT sector, operationalising human-centricity and sustainability as measurable constructs, and situating the analysis within the Industry 5.0 framework.

4. Significance of the Study

The study's significance operates at three interrelated levels. Academically, it advances an empirically grounded understanding of the relationship between human-centric AI deployment and sustainability perceptions, contributing to the theoretical integration of Industry 5.0 principles into SHRM scholarship. Practically, the findings provide HR practitioners and organisational leaders with actionable evidence regarding the conditions under which AI integration fosters sustainable workforce outcomes, thereby informing ethical AI governance frameworks and HR technology adoption strategies. From a policy perspective, the study supports the development of regulatory guidelines that promote responsible AI deployment in Indian IT organisations, aligning with broader national and international commitments to equitable and sustainable technological development.

5. Research Hypothesis

In accordance with the theoretical framework and identified research gap, the following directional hypothesis, grounded in the sustainable human-centric AI paradigm of Industry 5.0, is advanced for empirical investigation:

H_0: There is no significant association between employees' perceptions of AI's capacity to balance automation with human-centric values and their perceptions of AI-driven improvements in organisational sustainability.

H_1: Employees' perceptions of AI's capacity to balance automation with human-centric values are significantly and positively associated with their perceptions of AI-driven improvements in organisational sustainability.

This hypothesis is theoretically anchored in the Industry 5.0 proposition that the complementarity of human agency and machine intelligence is a prerequisite for achieving sustainable organisational outcomes. A significant positive association would affirm that employees who perceive AI systems as respectful of human values are also more likely to attribute sustainability improvements to AI-enabled HRM, thus validating the human-centric design imperative articulated in the Industry 5.0 policy framework.

A supporting sub-hypothesis is also examined to enrich the analytical context:

SH_1: Professional role significantly moderates employee perceptions of AI's capacity to balance automation with human-centric values in the workplace.

6. Objectives of the Study

The study is guided by the following objectives:

(i) To empirically examine the association between employee perceptions of AI's automation-human balance and perceptions of organisational sustainability.

(ii) To assess whether professional role moderates perceptions of AI's human-centric orientation in the workplace.

(iii) To explore the influence of demographic variables (age, gender, and years of experience) on perceptions of AI in HRM, providing contextual depth to the primary hypothesis.

(iv) To map the interrelationships among key AI-HRM constructs Employee Experience and Wellbeing (EEWF), Talent Acquisition and Management (TAMF), Strategic Workforce Planning (SWPF), Implementation and Ethics (IEF), Organisational Impact (OIF), and Industry 5.0 Alignment (I5AF) to illuminate the structural coherence of AI-enabled SHRM in the Industry 5.0 context.

7. Research Methodology

7.1 Research Design

A cross-sectional quantitative research design was adopted, enabling the systematic examination of relationships between theoretically specified constructs at a single point in time. Quantitative methodology was selected for its capacity to generate generalisable, statistically testable findings regarding employee perceptions, a priority given the study's aim of producing empirical evidence suitable for theory-building in the AI-SHRM-Industry 5.0 intersection.

7.2 Population and Sampling

The target population comprised employees across diverse age cohorts, genders, professional roles, industry sectors, and organisational sizes operating within Mysuru, India. A stratified random sampling procedure was employed to ensure proportional representation across demographic and professional strata. The final analysable sample comprised 76 respondents, drawn from organisations spanning the IT, services, healthcare, and manufacturing sectors. Stratification was applied across gender, professional role, and organisational size to mitigate systematic sampling bias.

7.3 Instrumentation

Data were collected via a structured, self-administered questionnaire comprising 20 items distributed across six thematic dimensions: (i) Employee Experience and Wellbeing, (ii) Talent Acquisition and Management, (iii) Strategic Workforce Planning, (iv) Implementation and Ethics, (v) Organisational Impact, and (vi) Industry 5.0 Alignment. All items were measured on a five-point Likert scale anchored at "Strongly Disagree" (1) and "Strongly Agree" (5). Secondary data were drawn from extant literature on AI in HRM, including peer-reviewed journal articles, policy documents, and organisational case studies.

7.4 Reliability Assessment

Internal consistency of the instrument was evaluated using Cronbach's Alpha. The obtained coefficient ($\alpha = 0.942$) across all 20 items denotes

exceptional scale reliability, well exceeding the conventional threshold of 0.70 (Nunnally, 1978), and affirms that the questionnaire items consistently measure the underlying constructs of interest.

Table 1. Reliability statistics

Cronbach's Alpha	No. of Items
0.942	20

7.5 Data Analysis

Data were analysed using SPSS. Reliability Analysis was checked at 0.942 as per Table 1. The analytical strategy proceeded in two stages. First, descriptive statistics characterised the sample profile. Second, inferential statistics, including Pearson correlation analysis, one-way ANOVA, independent samples t-tests, and chi-square tests, were employed to test the hypotheses. The central hypothesis (H_1) was evaluated via Pearson correlation between the composite scores for "Balance automation with human-centric values" and "AI in HR improves Organisational Sustainability." The supporting sub-hypothesis (SH_1) was assessed via a chi-square test of independence between professional role and human-centric values perception.

8. Sample Profile

Table 2 presents the demographic characteristics of the 76 respondents. The sample is dominated by young professionals: 61.8% are aged 21-30 years, reflecting the age composition typical of the Indian IT sector. A modest male majority is observed (57.9% male,

Table 2. Demographic Profile of Respondents (N = 76)

Variable	Category	Frequency	Percentage
Age	21-30 years	47	61.8%
	31-40 years	13	17.1%
	41-50 years	15	19.7%
	>50 years	1	1.3%
Gender	Male	44	57.9%
	Female	32	42.1%
Professional Role	HR Professional/Manager	12	15.8%
	Senior Management	6	7.9%
	Employee	47	61.8%
	Other	11	14.5%
Experience	>5 years	44	57.9%
	2-5 years (various bands)	32	42.1%
Sector	Technology	23	30.3%

Table 2 Continued

	Services	22	28.9%
	Healthcare	7	9.2%
	Manufacturing	4	5.3%
	Others	20	26.3%
Organisation size	<100 employees	16	21.1%
	101-500 employees	13	17.1%
	501-1,000 employees	6	7.9%
	>1,000 employees	41	53.9%

42.1% female). The majority of respondents are general employees (61.8%), with HR professionals/managers (15.8%) and senior management (7.9%) comprising smaller but analytically meaningful sub-groups. Over half of respondents (57.9%) report more than five years of professional experience. In terms of sector, technology (30.3%) and services (28.9%) are the most represented. Organisationally, 53.9% of respondents are employed in large organisations (>1,000 employees), providing a perspective weighted toward enterprise-scale AI deployment.

9. Data Analysis and Results

9.1 Inter-construct Correlation Matrix

To establish the structural coherence of the AI-HRM measurement framework, Pearson

Table 3. Inter-construct Pearson Correlation Matrix (N = 76)

Variable	EEWF	TAMF	SWPF	IEF	OIF	I5AF
EEWF	1	0.683**	0.740**	0.543**	0.838**	0.728**
TAMF	0.683**	1	0.771**	0.436**	0.669**	0.600**
SWPF	0.740**	0.771**	1	0.560**	0.762**	0.708**
IEF	0.543**	0.436**	0.560**	1	0.601**	0.634**
OIF	0.838**	0.669**	0.762**	0.601**	1	0.810**
I5AF	0.728**	0.600**	0.708**	0.634**	0.810**	1

** Correlation significant at the 0.01 level (2-tailed). EEWF = Employee Experience and Wellbeing; TAMF = Talent Acquisition and Management; SWPF = Strategic Workforce Planning; IEF = Implementation and Ethics; OIF = Organisational Impact; I5AF = Industry 5.0 Alignment

correlation analysis was conducted across all six thematic constructs. As shown in Table 3, all inter-construct correlations are positive and statistically significant at the 0.01 level, with coefficients ranging from 0.436 (IEF-TAMF) to 0.838 (OIF-EEWF). The strong correlation between Organisational Impact (OIF) and Employee Experience (EEWF) (r = 0.838), and between OIF and Industry 5.0 Alignment (I5AF) (r = 0.810), affirms that AI's organisational impact is deeply intertwined with both employee-level experience and strategic sustainability alignment, a finding that is theoretically consonant with the Industry 5.0 framework. The null hypothesis of no significant relationship among the constructs is thus rejected across all pairs.

9.2 Test of the Primary Hypothesis: AI Human-Centric Balance and Organisational Sustainability

The primary hypothesis (H_1) posits a significant positive association between employees' perceptions of AI's capacity to balance automation with human-centric values and their perceptions of AI-driven improvements in organisational sustainability. Pearson correlation analysis was applied to these two composite variables.

The Pearson correlation coefficient (r = 0.464, p<0.01), as indicated in Table 4, shows a statistically significant moderate positive association between the two constructs. The null hypothesis (H_0) is therefore rejected. This finding supports H_1: employees who perceive AI systems as effectively balancing automation with human-centric values are significantly more likely to attribute improvements in organisational sustainability to AI-enabled HR practices. In the Industry 5.0 context, this result is substantively meaningful, as it empirically validates the proposition that the design and governance of AI systems to respect human values constitutes a prerequisite for achieving sustainable organisational outcomes, rather than a supplementary consideration.

9.3 Test of the Supporting Sub-hypothesis: Professional Role and Human-centric Perceptions

The chi-square test of independence was applied to assess whether professional role significantly moderates perceptions of AI's automation-human balance (SH_1).

The chi-square test as indicated in Table 5 yields a highly significant result for professional

Table 4. Pearson Correlation - Automation-human balance vs. organisational sustainability

Variable Pair	Pearson r	N	pvalue	Decision
Balance automation vs. organisational sustainability	0.464	76	0.000 (<0.01)	Reject H_0

** Significant at the 0.01 level (2-tailed)

Table 5. Chi-Square Test - professional role × automation-human balance

Variable	χ^2 statistic	df	pvalue	Expected cell freq. ≥5	Decision
Professional role	56.105	3	0.000	Yes (min. = 19.0)	Reject H_0
Automation-human balance	42.553	4	0.000	Yes (min. = 15.2)	—

role (χ^2 = 56.105, df = 3, p<0.001), confirming that perceptions of AI's automation-human balance differ meaningfully across professional categories. All expected cell frequencies exceed the minimum threshold of five, ensuring the statistical validity of the test. SH_1 is therefore supported: professional role is a significant moderator of human-centric AI perceptions, with implications for the design of role-differentiated AI governance and communication strategies within organisations.

9.4 Contextual Analyses: Demographic and Organisational Variables

To contextualise the primary findings, supplementary analyses assessed the influence of demographic and organisational variables

Table 6. Summary of supplementary statistical tests

Variable	Outcome measure	Test	F/t/χ^2	p-value	Decision
Age	AI Perception Scores	ANOVA	F = 1.078	0.392	Fail to Reject H_0
Gender	Work-Life Balance Perception	t-test	t = −0.814	0.418	Fail to Reject H_0
Experience	AI Transparency Trust	ANOVA	F = 0.796	0.500	Fail to Reject H_0
Organisation Size	Decision-Making Quality	ANOVA	F = 0.961	0.416	Fail to Reject H_0
Sector	Resource Utilisation	Chi-Square	χ^2 = 87.421	0.000	Reject H_0
Sector	Employee Retention	Chi-Square	χ^2 = 45.711	0.000	Reject H_0
HR Innovation	Employee Retention	Correlation	r = 0.563	0.000	Reject H_0

on AI perceptions in HRM. Table 6 summarises these results.

The supplementary analyses reveal an analytically coherent pattern: demographic variables (age, gender, experience, and organisation size) exert no statistically significant influence on AI perceptions in HRM, indicating that perceptions of AI in this context are not shaped by individual-level characteristics alone. By contrast, industry sector and professional role emerge as significant contextual moderators. Sector significantly influences perceptions of resource utilisation ($\chi^2 = 87.421$, $p<0.001$) and employee retention ($\chi^2 = 45.711$, $p<0.001$), while a moderate positive correlation between HR innovation capability and employee retention ($r = 0.563$, $p<0.01$) reinforces the strategic importance of AI-driven HR innovation for talent retention outcomes.

10. Discussion

The findings of this study carry several theoretically and practically significant implications for the integration of AI within the Industry 5.0-informed SHRM framework.

The confirmation of H_1 that perceptions of AI's automation-human balance are significantly positively associated with sustainability perceptions constitutes the study's most substantive contribution. This result empirically validates a core normative proposition of Industry 5.0: that the instrumental value of AI in organisational settings is conditional upon its alignment with human-centric principles. Organisations that deploy AI-enabled HR tools in ways perceived as respectful of human agency, transparent in decision-making, and supportive of employee wellbeing are more likely to cultivate perceptions of sustainable HR practice. This finding is consistent with Brown *et al.* (2024) and aligns with the European Commission's (2024) regulatory emphasis on human-centric AI as a prerequisite for sustainable industrial development.

The significant moderation of human-centric AI perceptions by professional role (SH_1 supported; $\chi^2 = 56.105$, $p<0.001$) suggests that HR professionals, senior managers, and general employees do not occupy a uniform epistemic position with respect to AI's human-centric orientation. This differential may reflect asymmetries in information access, decision-making authority, and proximity to AI deployment processes across organisational levels. It implies that a differentiated communication and training strategy is required: while senior managers and HR professionals may engage with AI governance at a policy level, general employees require tangible, experiential evidence of AI's human-centric intent through direct interactions with AI-enabled HR systems.

The absence of significant demographic effects (age, gender, experience, organisation size) on AI perceptions is also noteworthy. Contrary to technology acceptance research that has frequently identified age and experience as significant adoption moderators (Chen *et al.*, 2024), the present findings suggest that in the Indian IT context, exposure to AI-enabled HR tools may be sufficiently uniform across demographic groups to attenuate these effects. Alternatively, the dominance of younger respondents (61.8% aged 21-30) in the sample may have compressed variance in technology

familiarity, limiting the detectability of age-related differences. Future research with more age-diverse samples is warranted to revisit this finding.

The significant sector-level differences in perceptions of AI's impact on resource utilisation and employee retention affirm that AI's value proposition in HRM is not sector-agnostic. Technology and services sector respondents, who are more directly embedded in digital work environments, may have richer and more differentiated mental models of AI's HR applications compared to respondents from manufacturing or healthcare. This sectoral heterogeneity has important implications for HR technology vendors and organisational change managers, who must calibrate AI implementation strategies to sector-specific workforce characteristics and digital maturity levels.

11. Conclusion

This study has empirically investigated the relationship between employee perceptions of AI's human-centric orientation and perceptions of organisational sustainability within the Industry 5.0 framework, drawing on primary data from 76 respondents in the Mysuru IT sector. The central finding, a statistically significant moderate positive association between perceived automation human balance and sustainability perceptions ($r = 0.464$, $p<0.01$), provides empirical grounding for the normative claim that human-centric AI design is not merely an ethical aspiration but a strategic enabler of sustainable organisational outcomes.

The study further demonstrates that professional role is a significant moderator of human-centric AI perceptions, while individual demographic variables (age, gender, experience) do not exert significant influence, underscoring the primacy of organisational positioning over personal characteristics in shaping attitudes toward AI in HR. Sector-level variation in perceptions of resource utilisation and employee retention further highlights the contextual embeddedness of AI's value creation in HRM.

From a practical standpoint, these findings counsel organisations to foreground human-centric values in both the design and communication of AI-enabled HR systems, to develop role-differentiated AI literacy and governance programmes, and to treat the balancing of automation with human agency not as a regulatory compliance exercise but as a genuine sustainability strategy. From a scholarly standpoint, the study advances an empirically grounded, Industry 5.0-informed SHRM framework that situates human-centric AI deployment at the intersection of technological capability and organisational sustainability.

The study is subject to certain limitations. The cross-sectional design precludes causal inference; the sample, while representative of the Mysuru IT ecosystem, limits generalisability; and the dominance of younger respondents may constrain the detectability of age-related effects. Future research should employ longitudinal designs, extend sampling to a broader geographic and sectoral scope, and integrate qualitative methods to capture the experiential dimensions of human-centric AI deployment.

References

Ahmed, R., & Singh, P. (2024). AI-driven talent development: A two-year action research study across five organisations. *Journal of Human Resource Technology*, *12*(3), 45-67.

Brown, A., Clarke, M., & Patel, R. (2024). Sustainability metrics in AI-enhanced HRM: A mixed-methods study of 300 organisations. *Sustainable Business Review*, *8*(1), 112-134.

Chen, L., Wang, Y., & Kim, S. (2024). Cross-cultural determinants of employee acceptance of AI in HRM: Evidence from eight countries. *International Journal of Human Resource Management*, *35*(7), 1204-1231.

European Commission. (2024). Industry 5.0 and human-centric artificial intelligence: Regulatory framework and sustainability guidelines. Publications Office of the European Union.

Johnson, T., Williams, K., & Okonkwo, C. (2024). Machine learning in strategic workforce planning: A mixed-methods study. *Strategic Management Journal*, *45*(4), 678-702.

Nunnally, J. C. (1978). Psychometric theory (2nd ed.). McGraw-Hill.

Rodriguez, E., Martinez, C., & Chen, H. (2024). Predictive analytics in strategic HRM: Turnover prediction and skill gap forecasting. *Human Resource Management Review*, *34*(2), 89-112.

World Bank. (2024). The global impact of AI on workforce management: Economic projections and policy recommendations. World Bank Group.

DHARANA
International Journal of Business

INFORMATICS JOURNALS

DOI: 10.18311/DBIJB/v17_i1_2026_09

ISSN: 0974-0082 | Vol 17(1), 2026 | pp. 160-173

Bridging Innovation and Patent Law: Need for a Sui Generis Regime for Software Patents in India

M. G. Kodandaram

Assistant Director of Customs and Central Excise (Retd.), Advocate and Consultant;
mgkodandarm@gmail.com

Abstract

The rapid advancement of Artificial Intelligence (AI) is transforming organisational practices, particularly within Strategic Human Resource Management (SHRM), in the evolving landscape of Industry 5.0. This study investigates the integration of AI into SHRM and examines its influence on human-centric sustainability perceptions within organizations. Unlike Industry 4.0, which emphasises automation and efficiency, Industry 5.0 prioritises human well-being, ethical considerations, and sustainable value creation alongside technological advancement. In this context, AI-driven HR practices such as talent acquisition, performance analytics, employee engagement, and decision support systems are increasingly reshaping workforce management. The study adopts an empirical approach to assess how AI-enabled HR systems affect employee perceptions of fairness, transparency, inclusivity, and long-term sustainability. It further explores the interplay between technological adoption and human-centric values, highlighting the need for balancing efficiency with ethical responsibility. The findings suggest that while AI integration enhances operational effectiveness and strategic decision-making, its impact on sustainability perceptions is significantly mediated by organisational culture, ethical frameworks, and employee trust. The research also identifies potential risks, including algorithmic bias, reduced human interaction, and resistance to technological change. By contributing to the emerging discourse on AI-driven SHRM in the Industry 5.0 era, this study underscores the importance of designing human-centric AI systems that align with sustainability goals. The paper offers theoretical and managerial implications for organisations aiming to achieve sustainable competitive advantage through responsible AI adoption.

Keywords: Artificial Intelligence (AI), Digital Transformation, Employee Perceptions, Industry 5.0, Human-Centric Sustainability, Strategic Human Resource Management (SHRM)

JEL Classification Code: M41, O30

Cite this article as: Kodandaram, M. G. (2026). Bridging Innovation and Patent Law: Need for a Sui Generis Regime for Software Patents in India. *DHARANA - International Journal of Business*, *17*(1), 160-173. https://doi.org/10.18311/DBIJB/v17_i1_2026_09

Article Received on: 28-01-2026 Revised on: 19-02-2026 Accepted on: 17-03-2026

1. Introduction

The exponential growth of software-driven technologies has fundamentally altered the nature of innovation in the twenty-first century. In India, however, patent law continues to regulate software through a statutory framework conceived for a pre-digital industrial era. Section 3(k) of the Patents Act, 1970, excludes "computer programme per se" from patentability, resulting in persistent uncertainty regarding the legal protection of software-based inventions. Although Indian courts have progressively interpreted this exclusion to permit patents for computer-related inventions demonstrating a technical effect or technical contribution, such judicial intervention remains fragmented and highly fact-specific. This article contends that the widening conflict between software innovation and the existing patent framework cannot be adequately resolved through interpretative techniques alone. It advances a principled argument in favour of a sui generis regime for software patents in India - one that reconciles innovation incentives with legal certainty while safeguarding public interest and competitive markets.

2. Innovation and Patent Law Divide in the Digital Age

Innovation and Patent law are designed to operate in a complementary manner. The innovation generates new technological solutions, while the patent law incentivises and protects them. However, in the digital economy, this alignment has fractured. In the present cyber age, the application and use of software have transitioned from a supplementary computational tool to the foundational infrastructure of modern innovation. AI, fintech, blockchain, telecommunications, smart manufacturing, and e-governance and many more are all software-centric domains, but the patent law in India continues to treat software with doctrinal caution.

The Indian Patents Act, 1970[1], particularly Section 3(k)[2], reflects a historical uncertainty towards abstract and algorithmic subject matter. While such caution was once justified to prevent monopolisation of ideas, its continued application has become increasingly problematic. As of this date, the software-driven innovation does not reside merely in abstract logic but manifests itself in tangible technical effects, industrial processes, and economic efficiencies. The statutory framework has remained passive, not evolving at the same pace.

Indian courts, however, have attempted to connect this growing divide by interpreting "computer programme per se" in a manner that preserves patentability for inventions exhibiting technical contribution. The judicial efforts remain a provisional measure, as they cannot substitute for a coherent legislative framework. Bridging the gap between innovation and patent law requires the adoption of a sui generis regime for software patents. This article contends that India must progress beyond fragmented

[1] https://www.indiacode.nic.in/bitstream/123456789/1392/1/A1970-39.pdf (accessed on 11 Jan 2026)
[2] Sec. 3 '(k) a mathematical or business method or a computer programme per se or algorithms;'

doctrinal developments and embrace a clear, coherent legislative framework.

3. Understanding Software Patents

The term "software" or "software patent" is not defined in Indian statutes, including Indian patent law. The Oxford Advanced Learner's Dictionary defines "software" as "the programs, etc. used to operate a computer," while the Cambridge Dictionary describes it as "the instructions that control what a computer does; computer programs." Hence, a software patent can be understood as protection for any novel technical solution implemented through a computer programme, emphasising the inventive function rather than the literal code. By focusing on the functional contribution of software, such as improved efficiency, enhanced security, or the automation of complex processes, patent protection can support the development of innovations that have tangible industrial and societal impact, rather than merely safeguarding mere lines of code. Viewed in this manner, software patents emerge as a strategic instrument to nurture innovation, secure competitive advantage, and strengthen India's position as a global hub for digital and technological development.

At present, Indian copyright law provides a foundational layer of protection for software by recognising computer programmes as literary works under Section 2(o)[3] read with Section 2(ffc)[4] of the Copyright Act, 1957[5]. This classification ensures legal protection for the literal expression of a computer programme, which prevents only in direct copying and unauthorised reproduction of software code.

But the copyright protection is inherently confined to expression only, leaving the underlying ideas, algorithms, technical logic, and functional methods largely outside its ambit. The copyright law cannot prevent the development of functionally equivalent software that achieves the same technical result through independently written code. Consequently, reverse engineering, clean-room implementation, and alternative coding approaches remain legally permissible, enabling competitors to replicate the functional essence of an invention without infringing copyright.

Software development frequently relies on modular design, incremental improvement, and the recombination of functional ideas, meaning that innovation is often embodied in technical logic and methods rather than solely in literal code. Copyright protection alone is therefore insufficient to safeguard the broader inventive contribution that software represents. This gap has significant implications for incentivising investment in research-intensive software sectors, where developers may lack adequate legal mechanisms to protect novel functionalities, algorithms, or technical solutions embedded in their programmes. It also poses strategic challenges for enterprises

[3]Sec.2 (o) "literary work" includes computer programmes, tables and compilations including computer databases;

[4]Sec.2 (ffc) "computer programme" means a set of instructions expressed in words, codes, schemes or in any other form, including a machine readable medium, capable of causing a computer to perform a particular task or achieve a particular result;

[5]https://www.indiacode.nic.in/bitstream/123456789/1367/5/a1957-14.pdf (accessed on 11 Jan 2026)

seeking to commercialise software innovations in India, as copyright cannot secure exclusivity over the technical advantages that reinforce competitive differentiation.

The case for a sui generis regime for software patents in India is thus grounded in the recognition that copyright, while essential, provides only partial protection for software innovation. For innovators operating in high-investment and technology-intensive sectors such as telecommunications, AI, data analytics, industrial automation, and renewable energy, the functional contribution of software constitutes the core of its value. Without legal protection for these inventive elements, competitors can lawfully replicate functionality through independently written code, thereby diluting incentives for research, experimentation, and commercialisation. The reluctance of the existing patent framework, shaped largely by Section 3(k) of the Patents Act, 1970, to consistently recognise such innovation has resulted in a structural gap between technological advancement and legal recognition.

4. Section 3(k) of the Patents Act

Section 3(k) of the Patents Act, 1970 excludes from patentability "a computer programme per se," thereby placing software at the margins of the patent system. The insertion of the words per se through the Patents (Amendment) Act, 2002, was a deliberate legislative intervention intended to soften the exclusion rather than to impose a blanket prohibition. The Joint Parliamentary Committee[6] made it explicit that the objective was not to deny patent protection to all computer-related inventions, but only to exclude computer programmes as such, while permitting patentability where software formed part of a larger technical invention or contributed a genuine technical effect[7]. Although the amended Section 3(k) sought to balance the prevention of monopolisation of abstract ideas with the encouragement of technological innovation, this objective has largely remained elusive in practice, as patent examination by the authorities continued largely unchanged. Therefore, Section 3(k) has evolved into a doctrinal fault line within Indian patent law.

The absence of a software-specific framework has resulted in inconsistent examination standards, uncertainty for innovators, and prolonged litigation. Judicial decisions have attempted to reconcile innovation with statutory restraint by reading Section 3(k) purposively, focusing on concepts such as "technical effect" and "technical contribution."

[6]Report of the Joint Committee presented to the Rajya Sabha on 19th December, 2001 and laid on the table of Lok Sabha on 19th December 2001

[7]CRI Guidelines 2025- para 3.3 While examining the Patents (Amendments) Bill, 2002the Joint Parliamentary Committee expressed the following views regarding suffix "per se" to computer programme in section 3(k): "In the new proposed clause (k) the words "per se" have been inserted. This change has been proposed because sometimes the computer programme may include certain other things, ancillary thereto or developed thereon. The intention here is not to reject them for grant of patent if they are inventions. However, the computer programmes as such are not intended to be granted patent. This amendment has been proposed to clarify the purpose."

While this approach has enabled the patenting of certain computer-related inventions, it has also transformed Section 3(k) from a clear exclusionary provision into a domain of ongoing judicial negotiation. Each case becomes an exercise in line-drawing, dependent on factual nuance rather than predictable legal rules. Such uncertainty is particularly detrimental in the software sector, where rapid innovation cycles, cumulative development, and high upfront investment demand clarity and predictability in Intellectual Property (IP) protection.

5. Judicial Interpretation as a Bridge between Innovation and Patent Law

In the absence of clear legislative guidance on the patentability of software, Indian courts have increasingly assumed an interpretive role, seeking to reconcile rapid software innovation with the traditional contours of patent doctrine through purposive interpretation. Through a series of decisions, courts have progressively clarified that the exclusion of a "computer programme per se" does not extend to computer-implemented inventions that demonstrate a technical effect or technical contribution.

This judicial approach is prominently reflected in Telefonktiebolaget Lm Ericsson (Publ) vs Lava International Ltd.[8], where in a decision dated 28th March, 2024, the Hon'ble Delhi High Court examined the scope of Section 3(k) in the context of standard-essential patents in telecommunications. Rejecting a literal and mechanical application of the exclusion, the Court held that the mere presence of algorithms or software components does not automatically render an invention non-patentable. Instead, the decisive inquiry is whether the invention results in a practical, real-world technical application. By recognising that software-enabled systems may enhance network efficiency, improve data transmission, or resolve technical problems, the Court shifted the analytical focus from the presence of software to the nature of the technical contribution. This reasoning positioned judicial interpretation as a necessary bridge between outdated statutory language and modern innovation.

A similar corrective role was played by the Intellectual Property Appellate Board (IPAB) in Accenture Global Services GmbH v. Assistant Controller of Patents.[9]. In this case, the IPAB rejected the prevalent administrative assumption that software-related inventions must involve novel or specialised hardware to escape the bar under Section 3(k). The Board observed that neither the Patents Act nor the Patent Office Manual imposed such a requirement, cautioning against importing extra-statutory limitations into patent examination. By emphasising that patentability must turn on the technical contribution of the invention rather than the presence of special hardware, the IPAB acknowledged the reality that innovation in contemporary systems often lies in software architecture, data processing, and system-level efficiencies.

[8]elefonktiebolaget Lm Ericsson (Publ) vs Lava International Ltd [CS(COMM) 65/2016]
[9]Accenture global service GMBH v. the Assistant Controller of Patents & Designs, IPAB, OA/22/2009/PT/DEL, 28th December, 2012
[10]FeridAllani vs. Union Of India &Ors [W.P.(C) 7/2014 & CM APPL. 40736/2019]

The doctrinal shift in the interpretation of Section 3(k) was decisively consolidated in Ferid Allani v. Union of India[10], where the Delhi High Court adopted a purposive and future-oriented approach to the exclusion of computer programmes per se. Acknowledging that modern inventions across sectors such as automobiles, telecommunications, and consumer appliances are intrinsically software-driven, the Court cautioned that a rigid application of Section 3(k) would render contemporary innovation unpatentable, an outcome it characterised as retrograde. Crucially, the Court recognised that emerging technologies such as AI and blockchain are not inherently excluded from patent protection merely because they rely on software or algorithms; rather, their eligibility must be assessed on whether they demonstrate a technical contribution or solve a technical problem, thereby aligning patent doctrine with technological reality. In this context, while adjudicating the issue of non-patentability under the computer programme per se exclusion, the Court, in paragraph 11 of its order dated 12 December 2019, emphasised the global reliance on the "technical effect" and "technical contribution" tests, observing: "Across the world, patent offices have tested patent applications in this field of innovation, on the fulcrum of 'technical effect' and 'technical contribution'. If the invention demonstrates a 'technical effect' or a 'technical contribution', it is patentable even though it may be based on a computer program."

The decision in Enercon India Ltd. v. Aloys Wobben[11] provides a concrete illustration of this approach in an industrial context. In this case, the IPAB examined the patentability of a computer programme controlling wind turbines to optimise power generation. The IPAB held that such a programme could not be categorised as a computer programme per se under Section 3(k) of the Patents Act, 1970, as it executed a technical process and produced a measurable technical effect. By recognising that software-driven control systems functionally integrated with industrial machinery are capable of patent protection, the Board reinforced the principle that patentability analysis must be guided by the substance of the invention, its functional integration, and the technical outcome achieved, rather than by the mere presence of software.

Collectively, these decisions reveal a consistent judicial effort to bridge the widening gap between innovation and patent law by recognising technical contribution and industrial applicability as markers of eligibility. However, judicial interpretation, by its very nature, is irregular, reactive, and case-specific. While these interventions have mitigated the harshness of Section 3(k), reliance on courts to continually recalibrate patent doctrine generates uncertainty, procedural delays, and inconsistent outcomes. Against this backdrop, the case for a sui generis regime for software patents gains force.

---

[11]Enercon India Ltd. v. Aloys Wobben, ORA/6/2009/PT/CH & M.P. Nos. 15/2010, 29/2010, 77/2010, 45/2011 & 6 & 7/2013 (Intellectual Property Appellate Board, Delhi Bench, decided on 23 January 2013

[12]https://www.pib.gov.in/PressReleasePage.aspx?PRID=2149719&reg=3&lang=2 (accessed on 11 Jan 2026)

6. Decoding the CRI Guidelines, 2025

The latest development in this matter is that on 29 July 2025[12], the Office of the Controller General of Patents, Designs and Trade Marks (CGPDTM) released the Revised Guidelines for Examination of Computer Related Inventions (CRIs), 2025[13], marking a decisive step in modernising India's patent examination framework in response to rapid advances in Information and Communication Technology (ICT) and AI. These revised guidelines seek to address long-standing ambiguities surrounding the patentability of software-implemented inventions and to align examination practice with the evolving judicial doctrine under Section 3(k) of the Patents Act, 1970. Their significance must be understood against the backdrop of a profound technological transformation across sectors such as healthcare, education, finance, cybersecurity, telecommunications, and industrial automation, where software-driven systems increasingly perform core technical functions.

Traditional patent doctrines, originally crafted for mechanical and hardware-centric inventions, have struggled to accommodate such developments. The CRI Guidelines, 2025, have attempted to respond to this challenge in a small way by improving interpretational clarity, harmonising examination standards with binding judicial precedent, and reducing uncertainty in the treatment of computer-related inventions.

The central focus of the revised guidelines remains Section 3(k), particularly the exclusion of a "computer programme per se." The expression per se is clarified to mean "of, in, or by itself; standing alone, without reference to additional facts," in line with judicial precedent, thereby reinforcing the principle that patentability must be assessed by examining the claimed subject matter as a whole rather than by mechanically isolating software elements. This purposive approach draws heavily from the landmark decision of the Delhi High Court in Ferid Allani v. Union of India.[14], which held that inventions demonstrating a "technical effect" or "technical contribution" are not rendered non-patentable merely because they are based on computer programmes, a principle now firmly embedded in examination practice.

In Microsoft Technology Licensing LLC v. Assistant Controller of Patents and Designs[15], the Delhi High Court refined the test for assessing patentability under the computer programme per se exclusion in Section 3(k). While examining whether the claimed invention fell within the scope of the exclusion, the Court focused on the technical effect produced by the claimed technical solution, particularly whether the invention went beyond mere user-interface design and addressed issues at the level of computer and network technology. In

[13]https://ipindia.gov.in/writereaddata/images/pdf/CRI/1.%20GUIDELINES%20FOR%20EXAMINATION%20OF%20COMPUTER%20RELATED%20INVENTIONS%20(CRIs)-%202025.pdf (accessed on 11 Jan 2026)

[14]FeridAllani vs. Union Of India &Ors [W.P.(C) 7/2014 & CM APPL. 40736/2019]

[15]Microsoft Technology Licensing, Llc vs The Assistant Controller Of Patents And Designs [C.A. (COMM. IPD PAT) 29/2022]

paragraph 41 of its decision dated 15 May 2023, the Court held that where a technical solution "goes beyond the user-interface level and provides a technical effect and contribution, that is patentable," and where features such as the use of cookies and two-factor authentication are "fundamental to the functioning of computer networks" and involve "complex network-level communication protocols," the invention is closer to the heart of computer and network technology rather than the user interface, and therefore not excluded under Section 3(k).

In Raytheon Company v. Controller General of Patents and Designs[16], the Delhi Court in its order dated 15th September, 2023, categorically rejected the requirement of novel hardware as a condition for software patentability, finding no statutory basis for such a test.

In Blackberry Limited vs Assistant Controller of Patents and Designs[17], the Delhi High Court in its decision dated 30th August, 2024, clarified that while algorithms per se are excluded, inventive contribution may lie in their technical implementation, and in Ab Initio Technology LLC v. Assistant Controller of Patents and Designs[18], improved computational efficiency was expressly recognised as a valid technical effect. At para 38, Hon'ble Court stated: "38. …'Technical effect' is the bridge or the connection between an input and the processor. If an ingenious input system/method is able to allow the processor to give a more efficient and faster output and computation, the effect, in this Court's opinion, would be 'technical'. A 'technical effect' cannot be just about nuts and bolts, or hardware tweaks and transformations. If an innovative input [in the form of a program] allows the hardware to process the output faster, then it would amount to a 'technical effect'. In other words, a well-designed innovative input in the form of a process, system, or method which enhances the computational ability of the processor would undoubtedly result in a 'technical effect' and which goes beyond the usual 'user interface'…"

The Madras High Court in Microsoft Technology Licensing LLC v. Assistant Controller of Patents and Designs[19], by order dated 3rd July 2024, at Para 36[20], observed that a computer-related invention can overcome the exclusion under Section 3(k) if it delivers a system-level technical solution or produces a tangible technical effect by improving the system's functioning and efficacy or by providing a technical solution to a technical problem beyond a specific application or data set.

Beyond eligibility, the revised guidelines clarify that conventional patentability

[16]Raytheon Company vs Controller General Of Patents And Designs [C.A. (COMM.IPD-PAT) 121/2022]
[17]Blackberry Limited vs Assistant Controller Of Patents And Designs [C.A. (COMM.IPD-PAT) 229/2022]
[18]Ab Initio Technology Llc vs Assistant Controller Of Patents and Designs [C.A. (COMM.IPD-PAT) 26/2021]
[19]Microsoft Technology Licensing LLC vs Assistant Controller of Patents and Designs [[(T) CMA (PT) No.49 of 2023, [OA/36/2020/PT/CHN]]
[20]"Para 36.…Thus, even when the claimed invention relates to a CRI, if it results in a technical effect that improves the system's functioning and efficacy (effect on hardware), or provides a technical solution to a technical problem and is, therefore, not limited in its impact to a particular application or data set, it would surmount the exclusion under section 3(k) of the Patents Act…"

requirements such as novelty and inventive step apply to CRIs in the same manner as to other inventions, with explicit reliance on the "Seven Stambhas Approach" articulated in Telefonaktiebolaget LM Ericsson (Publ) v. Lava International Ltd.,[21] thereby enhancing analytical rigour, transparency, and accountability. They also emphasise sufficiency of disclosure, particularly for AI-related inventions, adopting the reasoning in Caleb Suresh Motupalli v. Controller of Patents[22], and require enablement sufficient to reproduce the invention, including clarity on algorithmic and functional aspects.

By consolidating judicial interpretations, identifying indicators of technical effect, and moving decisively away from the discredited "novel hardware" test of earlier guidelines, the Revised CRI Guidelines, 2025, represent a procedural correction.[23] rather than a source of substantive law. Therefore, only a sui generis regime for software patents could clearly distinguish between unpatentable abstract ideas, algorithms, and business methods, and the patent-eligible software inventions that deliver demonstrable technical solutions. By explicitly recognising technical contribution as the core criterion for protection, the law would reduce reliance on judicial improvisation and provide consistent guidance to patent examiners and applicants. Safeguards such as limited patent terms, mandatory disclosure obligations, and protections for interoperability and research would further ensure that software patents promote innovation without creating excessive monopolies.

7. Administrative Responses

India's administrative response to software innovation, centred largely on the issuance and periodic revision of the CRI Guidelines, continues to suffer from deep-seated structural limitations that undermine legal certainty and innovation policy coherence. The ambiguity has resulted in inconsistent interpretation across patent examinations and adjudicatory outcomes, discouraging long-term research and development investments, particularly for start-ups and micro, small, and medium enterprises (MSMEs) that lack the resources to navigate prolonged and uncertain patent prosecution. While copyright law offers an alternative form of protection by classifying computer programmes as literary works remains basically inadequate for software innovation. While the judicial interventions have been largely progressive, their case-specific and interpretive nature has generated unpredictability, leaving patentability determinations dependent on litigation outcomes rather than ex ante legal certainty. This over-reliance on judicial interpretation

[21]Telefonktiebolaget Lm Ericsson (Publ) vs Lava International Ltd [CS(COMM) 65/2016]
[22]Caleb Suresh Motupalli vs Controller Of Patents [C.M.A. (PT) No. 2 of 2024]
[23]The CRI Guidelines, 2025 - Para 1.4. 'It is important to mention that these guidelines do not constitute rule making. In case of any conflict between these guidelines and the statutory provisions of the Patents Act, 1970 (as amended), herein after referred as "the Act", or the Patents Rules, 2003 (as amended), herein after referred as "the Rules", made there under, the said provisions of the Act and Rules will prevail over these guidelines.'

is compounded by administrative discretion vested in patent examiners, whose decisions often vary based on individual understanding of software technology and evolving case law.

The absence of a coherent and predictable framework for protecting software-based inventions undermines flagship national initiatives such as 'Digital India', 'Startup India', 'Make in India', and the 'National AI Mission', all of which rely fundamentally on software and data-driven technologies. Without a stable legal architecture that recognises and incentivises software innovation, administrative guidelines alone remain an incomplete and fragile response, incapable of aligning India's patent system with its ambitions as a global technology and innovation hub.

8. Accelerated Developments in ICT and Artificial Intelligence

Recent developments in ICT and Computer Science, particularly AI, blockchain technology, quantum computing, cloud computing, and the Internet of Things (IoT), are rapidly transforming industries and redefining innovation. Vital to this evolution are Machine Learning, Natural Language Processing (NLP), and Large Language Models (LLMs), now recognised as core technologies enabling sophisticated automation, customised user experiences, and predictive analytics. Their integration across healthcare, finance, and education is enhancing overall system intelligence. Quantum computing represents a paradigm shift, with quantum algorithms capable of solving problems in seconds that would take classical systems centuries. This has transformative implications for cryptography, climate modelling, and pharmaceutical development, prompting significant investment by technology companies and research institutions to accelerate commercialisation.

The adoption of 5G and emerging 6G technology is further reshaping the ICT landscape by enabling high-speed, low-latency connectivity for IoT, Augmented Reality (AR), and Virtual Reality (VR). Collectively, the convergence of AI, cloud computing, cybersecurity, quantum computing, blockchain, and 5G/6G is nurturing a robust digital ecosystem and driving a surge in patentable innovations.

9. Global Approaches to Software Patentability

A comparative survey of major patent jurisdictions reveals that India occupies a distinct and increasingly strained position in the global landscape of software patentability. The United States has historically adopted a broad and pragmatic approach to patentable subject matter, premised on incentivising technological innovation while guarding against the monopolisation of abstract ideas. This approach was firmly articulated in Diamond v. Diehr[24], where the U.S. Supreme Court held that a computer-implemented invention does not become unpatentable merely because it employs

[24]Diamond v. Diehr (1981) 450 US 175: 209 USPQ 97

algorithms or mathematical formulas, so long as it is applied to produce a concrete and useful industrial result. By focusing on the invention as a whole and its practical application, rather than isolating the software component, the Court established an early doctrinal foundation for accommodating software-driven inventions within patent law.

Although subsequent decisions, most notably Alice Corp. v. CLS Bank International,[25] imposed important limits by excluding claims directed solely to abstract ideas implemented on a generic computer, the U.S. framework continues to provide relatively clear analytical tools. Under the Alice two-step test, namely 'claims that improve the functioning of a computer itself' or 'address a specific technological problem' remain patent-eligible, thereby preserving space for genuine software innovation while curbing overbroad or purely conceptual monopolies. Compared to India's Section 3(k), the U.S. approach offers greater doctrinal clarity and ex ante predictability for innovators and investors alike.

The European Patent Convention (EPC) adopts a more calibrated exclusion by disallowing computer programmes "as such," while simultaneously permitting patents for software-based inventions that produce a "further technical effect" beyond the normal physical interactions between software and hardware. Through the jurisprudence of the European Patent Office, this concept of technical effect has been systematically developed to include improvements in computer performance, data transmission efficiency, or control of industrial processes.

Japan adopts an even more explicit and innovation-friendly stance by recognising software as patentable subject matter when it embodies a "technical idea utilising the laws of nature," thereby embedding software protection firmly within the statutory framework itself rather than leaving it to interpretive discretion. Together, these jurisdictions demonstrate that software can be coherently accommodated within patent law through tailored statutory language and well-defined doctrinal tests that balance innovation incentives with public interest concerns.

India, by contrast, continues to rely predominantly on judicial interpretation and administrative guidelines to soften the rigidity of Section 3(k), resulting in uncertainty and fragmentation.

10. The Case for a SUI Generis Regime for Software Patents

The growing conflict between rapid software innovation and the rigid contours of conventional Indian patent law underlines the need for a sui generis regime for software patents. Software is not merely another category of invention; it is inherently distinct in its short development cycles, incremental and cumulative nature of innovation, dependence on interoperability, and its role as an enabling infrastructure across industries. When traditional patent standards, primarily designed for mechanical or chemical inventions, are applied without adaptation,

[25]Alice Corp. v. CLS Bank Int'l, 573 U.S. 208 (2014)

they tend to oscillate between two extremes: unjustifiably excluding genuine technical innovations from protection on the one hand, and granting overbroad monopolies that constrain follow-on innovation on the other.

A software-specific legislative framework would allow the law to recognise these unique characteristics while preserving the core objectives of the patent system. Such a regime could, for instance, provide a shorter term of protection calibrated to the fast obsolescence of software, statutorily anchor the concept of "technical contribution" as the touchstone for protection, and expressly exclude pure business methods and abstract algorithms from its ambit. Enhanced disclosure obligations could curb opaque, black-box monopolies, while built-in safeguards for interoperability, research, and fair use would ensure that protection does not come at the cost of competition or access.

By moving from judicially constructed exceptions to a clear legislative architecture, the sui generis regime would replace uncertainty with coherence. More importantly, it would align software patent protection with India's developmental priorities, nurturing innovation while maintaining a balanced and predictable legal environment.

11. Challenges in Establishing a SUI Generis Regime for Software Patents

The proposal for a sui generis regime for software patents seeks to remedy the structural mismatch in Indian patent law by creating a tailored legal framework that accounts for the distinctive characteristics of software innovation. However, establishing such a regime in India presents a complex set of doctrinal, institutional, economic, and policy-oriented challenges, reflecting enduring concerns relating to monopolisation, access to technology, administrative capacity, and international alignment.

At the doctrinal level, the central challenge lies in articulating clear, predictable, and principled boundaries between patentable and non-patentable software as it would inevitably confront the difficulty of distinguishing genuine technical innovation from abstract logic, algorithms, or business methods merely implemented through code. This problem is further compounded by the inherently cumulative nature of software development, which frequently builds incrementally upon shared standards, interoperable systems, and prior art. To mitigate these risks, a sui generis regime must codify a narrowly construed and statutorily defined standard of "technical contribution," anchoring patentability in demonstrable technical problem-solving, such as improvements in system performance, security, or resource optimisation, etc., rather than in functional outcomes or computational abstraction alone.

Institutional readiness constitutes an equally formidable challenge. The examination of software-related inventions demands high levels of technical expertise, interdisciplinary understanding, and consistency in decision-making. The introduction of a sui generis framework, without corresponding institutional reform, risks exacerbating these deficiencies rather than resolving them.

Finally, any sui generis regime must reconcile innovation incentives with broader public interest and developmental objectives. India's digital policy architecture places

significant emphasis on access, affordability, and open innovation, particularly through initiatives such as digital public infrastructure and open-source platforms. Excessively strong proprietary rights in software could undermine these goals by restricting interoperability and limiting downstream innovation. Accordingly, embedding public interest safeguards, like explicit exclusions for abstract algorithms and pure business methods, robust disclosure requirements, and exemptions for research, experimentation, and interoperability, would be essential. Moreover, the regime must be carefully crafted to remain compliant with India's international obligations under the TRIPS Agreement, while preserving sufficient policy space to respond to domestic economic and technological priorities.

12. Conclusion

It is a universal fact that software innovation no longer operates at the periphery of technological development; it lies at its very core. Contemporary advances in Cyber technologies, fintech, and industrial automation are fundamentally driven by software-based solutions that address complex technical problems and generate tangible industrial outcomes. Despite this reality, Indian patent law continues to engage with software through a statutory framework conceived for a markedly different technological era.

Indian courts have sought to bridge this divide through purposive and future-oriented interpretation. The rulings have undoubtedly advanced doctrinal clarity and prevented the wholesale exclusion of software-driven innovation from patent protection. But this judicial creativity operates within inherent limits. Courts, acting on a case-by-case basis, cannot substitute for a coherent legislative architecture capable of offering predictable, uniform, and prospective guidance. The resulting reliance on interpretive elasticity leaves patentability outcomes contingent on adjudicatory discretion rather than clear statutory standards.

In this context, the case for a sui generis regime for software patents in India becomes more compelling. A tailored framework could explicitly recognise technical contribution as the central criterion for patentability, while clearly excluding abstract ideas, business methods, and algorithmic logic devoid of technical problem-solving. It could also accommodate the distinctive characteristics of software innovation by providing shorter terms of protection, robust disclosure requirements, and safeguards for interoperability, research, and experimentation. These features would ensure that innovation incentives are preserved without permitting excessive monopolisation or hindering cumulative technological progress.

More importantly, the adoption of a sui generis regime is not merely a matter of legal reform but one of strategic and economic necessity. India's ambition to remain a global hub for software development, digital public infrastructure, and technology-driven entrepreneurship depends on a patent system that offers legal certainty, rewards genuine innovation, and aligns with public interest imperatives. By structurally integrating software innovation into patent law through a dedicated legislative framework, India can transform the fragile judicial bridge currently sustaining software patentability into a robust statutory foundation. Such a transition would reconcile innovation with regulation, certainty with flexibility, and private rights with

societal interests, ensuring that India's patent system remains responsive to contemporary technological challenges and capable of supporting sustained digital and economic growth in the decades to come.

13. References

Bag, Surajit, et al. (2021). Industry 4.0 and sustainable supply chain management: A systematic literature review. *International Journal of Production Research, 59*(5), 131-151.

Bondarouk, Tanya, & Brewster, Chris. (2016). Conceptualizing the future of HRM and technology research. The International Journal of Human Resource Management, 27(21), 2652-2671. https://doi.org/10.1080/09585192.2016.1232296

Boudreau, John W., & Cascio, Wayne F. (2017). Human capital analytics: Why are we not there? Journal of Organizational Effectiveness, 4(2), 119-126. https://doi.org/10.1108/JOEPP-03-2017-0021

Dwivedi, Yogesh K., et al. (2021). Artificial intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda. International Journal of Information Management, 57, 101994. https://doi.org/10.1016/j.ijinfomgt.2019.08.002 PMCid:PMC11414662

Floridi, Luciano, et al. (2018). AI4People An ethical framework for a good AI society. Minds and Machines, 28(4), 689-707. https://doi.org/10.1007/s11023-018-9482-5 PMid:30930541 PMCid:PMC6404626

Jabbour, Charbel José Chiappetta, et al. (2018). Industry 4.0 and the circular economy: A proposed research agenda and original roadmap. Annals of Operations Research, 270, 273-286. https://doi.org/10.1007/s10479-018-2772-8

Minbaeva, Dana B (2021). Disrupted HR? Human resource management in the digital age. Human Resource Management Review, 31(1), 100820. https://doi.org/10.1016/j.hrmr.2020.100820

Nahavandi, Afsaneh. (2019). The artificial intelligence imperative: Implications for leadership. The Leadership Quarterly, 30(5), 101315.

Ranjan, Jayanthi, & Foropon, Cyril. (2021). Big data analytics in building the competitive intelligence of organizations. International Journal of Information Management, 56, 102231. https://doi.org/10.1016/j.ijinfomgt.2020.102231

Sharma, Anil, et al. (2022). Industry 5.0: A survey on enabling technologies and potential applications. Journal of Industrial Information Integration, 26, 100257. https://doi.org/10.1016/j.jii.2021.100257

Stahl, Bernd Carsten, et al. (2016). Ethics of emerging information and communication technologies. Science and Public Policy, 43(3), 369-381. https://doi.org/10.1093/scipol/scw069

Tambe, Prasanna, Cappelli, Peter, & Yakubovich, Valery. (2019). Artificial intelligence in human resources management: Challenges and a path forward. California Management Review, 61(4), 15-42. https://doi.org/10.1177/0008125619867910

Vial, Gregory. (2019). Understanding digital transformation: A review and a research agenda. The Journal of Strategic Information Systems, 28(2), 118-144. https://doi.org/10.1016/j.jsis.2019.01.003

About Dhārana

DHĀRANA - International Journal of Business is a peer reviewed journal published bi-annually by M P Birla Institute of Management since 2007. The journal invites articles on Business, Economics, Commerce, Management and Data Analytics.

Dhārana uses double-blind peer review process for evaluation and selection of all submitted manuscripts. It publishes contemporary research articles, case studies, empirical papers, review articles, synopses, book reviews, and currently welcome original research contributions in the following areas of management (not restricted to):

Accounting and Tax Compliance
Banking and Financial Services
Insurance and Actuaries
Financial Management
Derivatives & Risk Management
Global Business Practices
International Business Scenario
Green & Sustainability Practices
Human Resource Management
Corporate Social Responsibility
Enterprise Resource Planning
Total Quality Management
Entrepreneurship & Start-ups
Tourism & Hospitality Management
Knowledge Management
Artificial Intelligence
Robotics & Machine Learning
Information Systems
Business Analytics
Business Ethics
Business Intelligence
Intellectual Property Rights
Logistics & Supply Chain Management
Production & Operations Management
Economics for Business Decisions
Marketing Management
Mobile Marketing
Rural Marketing
Farm Management
Digital Marketing
Eco-Marketing
Organizational Behaviour
Risk Management
Rural Management
Strategic Management
Technology Management
Health Care Sector
Meta-Analysis
E-business & E-commerce
Business Law
Change Management
Corporate Governance
Innovation & Creativity in Management
System Corporate Sustainability

Submission Guidelines

Dhārana welcomes original articles on research in the theory and practice of Business and Management. Publication of the article will depend on research rigour, relevance, and clarity on the subject. Articles of a speculative nature and of wide ramifications will also be considered.

I. Refereeing

Research contributions received will be subjected to double-blind peer review, with two or more subject matter experts. Acceptance of an article is dependent on meeting the standards set by the journal. Revision whenever necessary should be done by the author(s) before publication.

II. Paper processing fees

Only manuscripts that meets the aim and scope of the journal will be reviewed. No processing fee is charged.

III. Preparation of manuscript

1. The first page should contain the author(s) name(s), affiliations, institution(s), contact number, and email address. This page should also include an abstract of 250-300 words, which provides an overview of the article, including the title, objectives, methodology, major findings, and research contributions. Additionally, the abstract section should include a minimum of five relevant keywords and JEL classification codes.
2. Following the abstract, the article should be structured according to the format outlined in the "Structure of the Article" section. This ensures that the content is well-organized and clearly presented, making it easier for readers to follow and understand the research.
3. The final manuscript should not exceed 5000 words.(barring tables, figures, mathematical formulae, and references).
4. The manuscript must be written in English only, with 1.5 spacing and a one-inch margin on all sides.
5. The entire manuscript must be written in Times New Roman font, with font sizes of 14 for headings (in uppercase), and 12 for sub-headings.
6. Pages should be numbered sequentially.
7. All abbreviations within the manuscript must be defined for the first time when they appear, after which, only the abbreviations may be used for any subsequent appearances.
8. All tables and figures in the manuscript must be numbered appropriately, and the same must be cited with appropriate sources.
9. Formula(s) or equations should be consecutively numbered. Derivation details of Formula(s) may be provided with complete details.
10. Authors are required to check the article for grammatical accuracy and spelling correctness of their manuscripts completely before submission.
11. Copyrights infringement, plagiarism, and unauthorised use of information, images, etc. shall be considered for serious action.

IV. Structure of the article

The manuscript should be prepared as per the following layout:

Part 1 – Introduction that explains the background, and other details which are very essential for the proposed title.

Part 2 – Literature review

Part 3 – Research design specifying: Research methodology, population & sample size, and sampling design (in case of primary data source), area covered, objectives, hypotheses (if any), statistical tools used.

Part 4 – Data analysis.

Part 5 – Discussion & Conclusion, limitations of the research study, future scope of the study.

Part 6 – Annexures, References (follow APA reference style)

V. Arrangement of articles

The article should be arranged in the following order:

i. Title, Author(s), Affiliations, Postal address, e-mail id and contact number.

ii. Abstract, Keywords, JEL Classification.

iii. Title, Part 1 to Part 6 (refer to Structure of the Article)

References (including webliography). (URL link along with the date of retrieval).

VI. Copyright and publication

Once the article is accepted for publication, it is mandatory to submit the copyright form duly signed by all authors.

VII. Submission of manuscripts

All manuscripts must be submitted to the journal through online mode only on the journal portal. Submission link: dharana@mpbim.com

COPYRIGHT FORM

Dhārana International Journal of Business

Corresponding Author Name: _____

Title of Article/Paper/Manuscript: _____

_____

Article Type: (Research Paper/ Review Paper/ Others): _____

Author(s) Name(s): _____

_____

Corresponding Author's Details:

Name and Affiliation: _____

Address with Pin/Zip Code (institution): _____

_____

E-mail Id: _____

Contact Number: _____

I, the corresponding author, on behalf of myself and co-authors (if any), declare that the submitted article is an original manuscript/work that has neither been published nor is under consideration for publication elsewhere. It does not infringe any existing copyright or third-party rights. We grant Dhārana International Journal of Business all rights to the work, while reserving certain rights, such as patent rights and the right to use the article in future works with proper acknowledgment.

We certify that the article contains no unlawful material, does not infringe any proprietary or personal rights, and is factually accurate. We have substantially participated in the creation of the work and claim authorship. We also disclose any financial interests in the subject matter and are responsible for any plagiarism found in the article after publication.

In the event of any dispute, the final decision shall be taken by Dhārana International Journal of Business. By signing this declaration, I, the corresponding author, assign and transfer copyright and all rights under it to the journal, ensuring widest dissemination and protection against infringement. I certify that I am authorized to sign this copyright form and agree with all the terms outlined above.

Original Signature (in ink): _____

Authorized Name (Corresponding Author): _____

Date: _____ Place: _____

CALL FOR REVIEWERS

Dhārana - International Journal of Business is currently looking for peer reviewers. The peer review process is an integral part of safeguarding the journal's quality and we welcome your participation as a peer reviewer.

Eligibility

The editor is particularly interested to hear from researchers in the general field of Business and Management. Applicants should:

1. hold a doctoral degree, a university lecturer or research position, and/or possess relevant professional work experience in a subject-aligned organisation;
2. have published at least three academic papers in peer-reviewed journals or presented and published conference papers and practitioner-oriented articles in leading professional magazines; and
3. have excellent command of English language with verbal and written fluency.

Requirements

1. Reviewers should submit the review report within 7 days from receipt of the manuscript
2. Reviewers should provide complete and detailed comments on submitted papers.
3. Reviewers must not distribute any manuscripts reviewed or disclose information from the reviewed manuscripts.

Benefits

Benefits of Reviewing for Dhārana includes

1. Certificate of Recognition for your review work.
2. Global Academic Networking opportunities.
3. Formal Acknowledgement of your contributions to academic excellence.

Application

If you are interested in becoming a reviewer for Dhārana, please send your CV to dharana@mpbim.com providing information about your research interests and specialisms.

We value your commitment to advancing research in the field of business and management. Your insights will play a crucial role in upholding the quality of our journal.

Thank you. We look forward to your positive response.

SUBSCRIPTION

(For One Year Only)

Name of Subscribing Individual/Institution: .....

Address with PIN/ZIP: .....

.....

Please accept the enclosed Cheque (Local only) / Demand Draft (No.) Dated ..... drawn on .....

..... Bank, in favour of **M.P. Birla Institute of Management, Bengaluru.**

Tick the appropriate Box below:

☐ INDIVIDUAL (Print Version: ₹ 900/- for 2 years - 4 issues)

☐ INSTITUTION (Print Version: ₹ 900/- for 1 year - 2 issues)

Date: Signature

Mail the completed form along with Cheque/Draft to:
Subscription Desk, Dharana, M.P. Birla Institute of Management, Bharatiya Vidya Bhavan,
#43, Race Course Road, Bengaluru 560 001, India; Ph: +91 99022 52981, 4277 2000

Old issues can be referred in http://www.mpbim.com/dharana.
Hard copies of the issues can be availed @ Rs.200/- per issue, subject to availability.

ADVERTISEMENT

(Per Issue)

Name of Institution: .....

Address with PIN/ZIP: .....

.....

Please accept the enclosed Cheque (Local only) / Demand Draft (No.) Dated .....drawn on .....

……..... Bank, in favour of **M.P. Birla Institute of Management, Bengaluru.**

Tick the appropriate Box below

☐ Inner Full Page (Black & White)	₹ 4,000/-	☐ Back Cover Inside (Colour)	₹ 4,000/-
☐ Front Cover Inside (Colour)	₹ 7,000/-	☐ Back Cover (Colour)	₹ 5,000/-

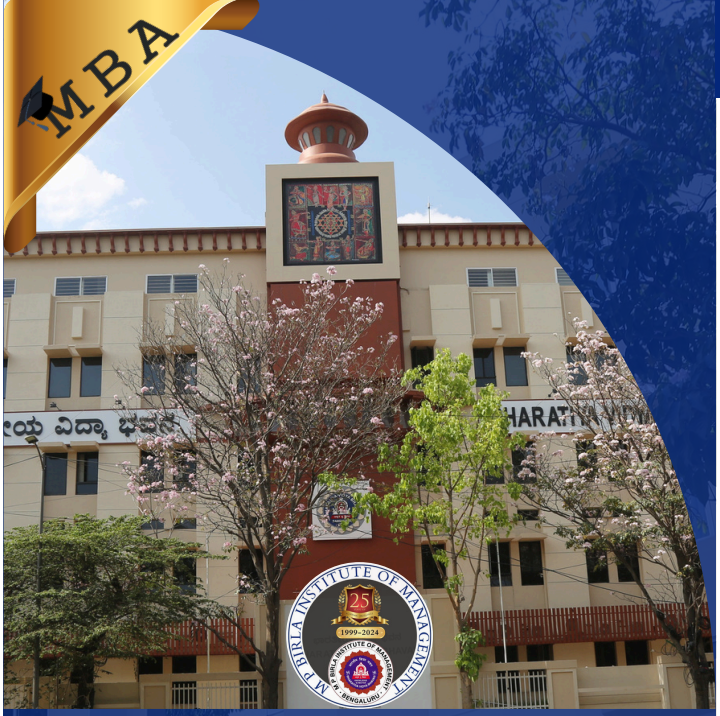
Advertisement Size:
Book Size: 19.0 cm (W) × 25.0 cm (H) Print Area: 16.0 cm (W) × 22.0 cm (H)

Date: Signature

Mail the completed form along with Cheque/Draft to:
Advertisement Desk, Dharana, M.P. Birla Institute of Management, Bharatiya Vidya Bhavan,
#43, Race Course Road, Bengaluru 560 001, India Ph: +91 99022 52981, 4277 2000

For More Details on Advertising in Dharana, Please Contact:
Manjula M, Assistance Subscription, Email: manjulam@mpbim.com

MBA



MPBIM

25 years of Excellence

ADMISSION OPEN

FOR BATCH 2025-27

JOIN MBA @ MPBIM

TWO YEAR FULL-TIME MBA DEGREE APPROVED BY AICTE & AFFILIATED TO BENGALURU CITY UNIVERSITY

DUAL SPECIALISATION OF YOUR CHOICE

MARKETING/FINANCE/HRM/
BUSINESS ANALYTICS

MPBIM offers

- Faculty with Excellent Industry Credentials & Academic Qualifications.
- Value-added course designed for Industial Requirements.
- Excellent Placement Opportunities.
- Business Leadership Forum for Industry Insights
- Industrial visits for practical exposure
- Academic Collaboration with North Dakota State University, USA for Faculty Exchange, Research, and Student Progression Programs.
- Paid internships for hands-on experience
- Multiple job opportunities to choose from

100% Placement Assistance

For Admissions :

99022 52981 / 99022 52842
admission@mpbim.com

M P Birla Institute of Management
Associate Bharatiya Vidya Bhavan,
43 Race Course Road, Bengaluru - 560001
080-42772000 / 9902252981
www.mpbim.com

M P Birla Institute of Management

Associate Bharatiya Vidya Bhavan, Bengaluru



M P Birla Institute of Management-An initiative of Bharaitya Vidya Bhavan which enjoys an enviable track record as a proponent of education with Indian Culture and Values in the area of higher management education. M.P. Birla Institute of Management in Bangalore stands as a distinguished Management Institute, commemorating 25 years of delivering exceptional education. Offering a comprehensive two-year full-time MBA Program affiliated with Bengaluru City University, MPBIM has shown remarkable growth since its establishment in 1999 under the guidance of Sri. Madhav Prasad Birla and Smt. Priyamvada Devi Birla. Starting with a modest enrollment of 30 students, the institute now boasts an impressive cohort of 360 students. Many alumni of MPBIM hold key positions in leading corporate entities and industries, reflecting the institution's success in nurturing talent. Er. N Ramanuja, Chairman and Former Chairman and Managing Director of HMT Ltd., a prominent public sector company, MPBIM has rightfully earned a reputation as one of the most sought-after postgraduate management institutions in Karnataka. In addition to shaping innovative, efficient managers for the industry, the institute prioritizes instilling core human values, emphasizing Nobility, Righteousness, and Excellence in its students. Recognized as a NAAC accredited institution, MPBIM benefits from an esteemed faculty comprising accomplished academicians and industry veterans who bring a wealth of experience to the classroom. Ranked 21st in the Silicon India All India Ranking of Non-IIM B Schools, MPBIM continues to uphold its commitment to providing a top-tier management education experience.