



web: <https://rlgjaar.com> ISSN: 2998-4459

July 2026 | Volume 3 | Issue 7(III)

# ROYAL INTERNATIONAL GLOBAL JOURNAL OF ADVANCE AND APPLIED RESEARCH

---

*Double-blind peer-reviewed /refereed, open access  
online International journal*

**Chief Editor**  
**Dr. Santosh P. Mane**

**Published By :**

**Royal International Global LLC**



web: <https://rlgjaar.com> ISSN: 2998-4459

July 2026 | Volume 3 | Issue 7(III)

*Double-blind peer-reviewed /refereed, open access  
online International journal*

**Published By :**

**Royal International Global LLC**

16192 Coastal Highway, County of Sussex,  
Lewes, Delaware 19958

United States of America (USA)

Web: <https://royaligllc.us>

Email: [ceo@royaligllc.us](mailto:ceo@royaligllc.us)

Mob: (+1) 3023033026



# JOURNAL PARTICULARS

| Name of Journal           | Royal International Global Journal of Advance and Applied Research                                                                                                                                                                                                    |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Frequency                 | Monthly ( Jan to Dec) {12 issues per year}                                                                                                                                                                                                                            |
| ISSN                      | 2998-4459                                                                                                                                                                                                                                                             |
| Publisher                 | Royal International Global LLC<br>16192 Coastal Highway, County of Sussex, Lewes,<br>Delaware 19958 USA<br>Email: <a href="mailto:rlgjaar.com@gmail.com">rlgjaar.com@gmail.com</a><br>Website: <a href="https://royaligllc.us">https://royaligllc.us</a>              |
| Chief Editor              | Santosh P. Mane                                                                                                                                                                                                                                                       |
| Copy right                | Royal International Global LLC                                                                                                                                                                                                                                        |
| Starting Year             | July 2024                                                                                                                                                                                                                                                             |
| Subject                   | Multi-Disciplinary (Science, Social Science, Commerce etc. Subject)                                                                                                                                                                                                   |
| Review Process            | Double Blind Review Process                                                                                                                                                                                                                                           |
| Language                  | English                                                                                                                                                                                                                                                               |
| Publication Format        | online                                                                                                                                                                                                                                                                |
| Access                    |                                                                                                                                                                                    |
| License                   | <br><a href="https://creativecommons.org/licenses/by-nc-sa/4.0/">Creative Commons (CC BY-NC-SA 4.0)</a>                                                                            |
| Phone No.                 | (+1) 3023033026                                                                                                                                                                                                                                                       |
| Email                     | <a href="mailto:rlgjaar.com@gmail.com">rlgjaar.com@gmail.com</a>                                                                                                                                                                                                      |
| Journal Website           | <a href="https://rlgjaar.com">https://rlgjaar.com</a><br>CEO<br>Royal International Global LLC<br>16192 Coastal Highway, County of Sussex, Lewes,<br>Delaware 19958 United States of America (USA)<br>Email: <a href="mailto:ceo@royaligllc.us">ceo@royaligllc.us</a> |
| Registered office Address |                                                                                                                                                                                                                                                                       |
| Admin. Office Address     | Royal International Global LLC<br>16192 Coastal Highway, County of Sussex, Lewes,<br>Delaware 19958 United States of America (USA)<br>Email: <a href="mailto:ceo@royaligllc.us">ceo@royaligllc.us</a>                                                                 |

# Royal International Global Journal of Advance and Applied Research

**Volume No-3, Issue-7(III), July-2026**

Publication Language – English  
Periodicity of Publication- Monthly  
Email: [rlgjaar.com@gmail.com](mailto:rlgjaar.com@gmail.com)  
Journal Website: <https://rlgjaar.com>  
Mob: (+1) 3023033026

## CHIEF EDITOR

**Dr. Santosh P. Mane**

CEO, Royal International Global LLC  
16192 Coastal Highway, County of Sussex, Lewes, Delaware 19958 USA  
Email: [rlgjaar.com@gmail.com](mailto:rlgjaar.com@gmail.com)  
Mob: (+1) 3023033026

## EXECUTIVE EDITOR

**Dr. Praveen G. Saptarshi**

Visiting Faculty  
Salisbury University, United States

**Dr. Ranjit Gurav**

Post Doctoral Researcher  
Primary  
Texas State University  
San Marcos, United States

**Dr. F. M. Nadaf**

Officiating Principal,  
Government College of  
Commerce and Economics  
Borda-Margao, Goa.

**Dr. Lal Mervin Dharmasiri**

Senior Professor and Chair  
Head of Geography  
University of Kelaniya, Sri Lanka.

**Dr. Mukund D Kadam**

Prof. Dr. N. D. Patil  
Mahavidyalaya,  
Malkapur-Perid  
Tal-Shahuwadi, Dist-Kolhapur  
(Ms) India, Kolhapur,  
Maharashtra, 415101

**Dr. Sambhaji. D. Shinde**

Professor  
Dept. of Geography  
Shivaji University, Kolhapur  
(MS), India

**Dr. Vinayak P. Dhulap**

Director, School of Earth  
Sciences, &  
Head, Department of  
Environmental Science,  
Punyashlok Ahilyadevi Holkar  
Solapur University,  
Solapur - 413 255 (Maharashtra)  
India

---

**ASSOCIATE EDITOR**

---

**BABALOLA, Ayodele Samuel**Department of Pure and Applied Zoology,  
Federal University of Agriculture, PMB  
2240, Abeokuta, Ogun State, Nigerian

---

**Dr. Munther Moh'd Ibrahim Zyoud**Assistant Professor of English Language  
Teaching Methods-Al-Quds Open University,  
Palestine.**Dr. Kedar Rijal**Chairperson  
Environmental Modelling and  
Management  
Central Department Of Environmental  
Sciences, Nepal**Dr. A. G. Amarasinha**Senior Lecturer Grade  
University of Kelaniya, Sri Lanka.**Dr. Gajanan Ghodake**Department of Biological and  
Environmental Science, Dongguk  
University-Seoul, South Korea.

---

**ASSISTANT EDITOR AND REVIEWERS**

---

**Dr. Tushti Sharma**Royal School of Languages,  
The Assam Royal Global University,  
Guwahati, Assam**Dr. Gyanaranjan Sahoo**Extension Scientist  
Orissa University of  
Agriculture &  
Technology, Orissa  
India**Dr. Kulkarni Swanand Gajanan**Associate Professor,  
Mechanical Engineering  
Department,  
S.K.N. Sinhgad College of  
Engineering,  
Korti, Pandharpur-413306.

---

**Dr. Sandeep Rout**Faculty of Agriculture,  
Sri Sri University, Cuttack, Odisha**Dr. Daneshwar. R. Pandey**Assistant Professor,  
Head Of Department  
S.S Agrawal College Of Commerce And  
Management Navsari Gujarat

---

**PUBLISHER**

---

**Royal International Global LLC**

16192 Coastal Highways, County of Sussex, Lewes, Delaware 19958 USA

Email: [subarti2024@gmail.com](mailto:subarti2024@gmail.com) website: <https://royaligllc.us>



## Index

| Sr. No. | Paper Title                                                                                                                                                             | Page No. |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 1       | Study of Human Rights in the Context of Innovation, Sustainability, and Global Development<br><b>Narayan Sakharam Funne</b>                                             | 1-4      |
| 2       | From Monopoly to Marginal Player: A Comparative Analysis of BSNL's Declining Competitiveness in India's Telecommunications Sector<br><b>Krushna Kulkarni</b>            | 5-8      |
| 3       | Measuring Rural Development in Maharashtra: A Systematic Analysis Based on the Panchayat Advancement Index (PAI)<br><b>Anuja S. Ghorpade, Prof (Dr.) M.S. Deshmukh</b>  | 9-13     |
| 4       | The Role of Artificial Intelligence in Reshaping Job Roles and Career Growth among IT Professionals: A Focused Study on IT Service Industry<br><b>Amol R. Vande</b>     | 14-17    |
| 5       | Green Debentures: A Financial Expansion for Sustainable development<br><b>Bhairawanth D. Jadhav</b>                                                                     | 18-22    |
| 6       | Non-Performing Loans in India: A Comparative Study of Public and Private Sector Banks.<br><b>Surya N, Dr. Manoj Kumara N V</b>                                          | 23-28    |
| 7       | A Comparative Study of Equity and Debt Mutual Funds Performance in India<br><b>Shilpa M, Dr. Manoj Kumara N V</b>                                                       | 29-35    |
| 8       | The Fintech Corridor: An Empirical study on Investor Perception of Blockchain and Crypto assets.<br><b>Vikas, Dr. Manoj Kumara N V</b>                                  | 36-42    |
| 9       | Sustainable Development and Management of Water Resources in India<br><b>Dr. Ashish Shivram Jadhav</b>                                                                  | 43-46    |
| 10      | An Empirical Study of Impact of Artificial Intelligence in Banking Sector for Operational efficiency in Karnataka.<br><b>Nishmitha S, Dr. Manoj Kumara N V</b>          | 47-54    |
| 11      | Green Finance in Promoting Sustainable Development: Evidence From Karnataka<br><b>Rakshitha R, Dr. Manoj Kumara N V</b>                                                 | 55-60    |
| 12      | Historical Development of Women's Education in Colonial India: A Study of Reform, Policy, and Social Transformation.<br><b>Dr. Saurabh Anil Mhashakhatri</b>            | 61-64    |
| 13      | "Spatio-Temporal Analysis of Female Literacy in Beed District, Maharashtra"<br><b>Dr. Deshmukh S B</b>                                                                  | 65-67    |
| 14      | Patriarchy and Women's Experience in Annie Ernaux's A Frozen Woman<br><b>Suresh Pandit Sonawane. Dr. Kishor R. Nikam</b>                                                | 68-70    |
| 15      | Use of Mythological Writing in Girish Karnad's Drama "Yayati"<br><b>Dr. Bhalke Nitin Shivaji</b>                                                                        | 71-73    |
| 16      | India's Digital Governance: A Model for Global Sustainable Development<br><b>Dr. Awadhesh Prasad</b>                                                                    | 74-78    |
| 17      | Challenges in Indexing Bibliographic Records in the Artificial Intelligence Era: Emerging Issues, Opportunities and Future Directions<br><b>Sachin Dattatraya Patil</b> | 79-82    |
| 18      | Environmental Consciousness in Literature<br><b>Suryawanshi Manoj Shivaji</b>                                                                                           | 83-87    |
| 19      | Partition Trauma, Gender Issues, and Madness in Anirudh Kala's The Unsafe Asylum: Stories of Partition and Madness<br><b>Parmjeet Kaur</b>                              | 88-89    |



|    |                                                                                                                                           |         |
|----|-------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 20 | Measures and Implementation of Central and State Governments for Biodiversity Conservation in India: A Review                             | 90-92   |
|    | <b>Anita Vitthal Bambale.</b>                                                                                                             |         |
| 21 | Sustainability as A Strategic Driver in Industrial Buying Decisions: A Study of Excavator Procurement in the Indian Infrastructure Sector | 93-96   |
|    | <b>Pritam Bhambure, Dr. Nilesh Bankar</b>                                                                                                 |         |
| 22 | A Survey and Adaptive Framework for ML-Driven I/O Optimization in Object Storage Systems                                                  | 97-102  |
|    | <b>Kulkarni Shripad, Dr. Brij Mohan Pareek, Dr. Kakade Sandeep</b>                                                                        |         |
| 23 | Indian Yoga Science and Artificial Intelligence - The Role of Technology in Mental Health                                                 | 103-106 |
|    | <b>Sheetal Rasal, Dr. Vijayanta Bhurale</b>                                                                                               |         |
| 24 | The Effect of Temperature, Light Intensity and Radiation on the Efficiency of a Solar Cell and Sensor Devices                             | 107-111 |
|    | <b>Dr. Ithape Pandurang A.</b>                                                                                                            |         |
| 25 | Environment, Public Health, and Social Inequality in Pooja Changoiwala's Homebound                                                        | 112-115 |
|    | <b>Sanket Sanjay Nagrale</b>                                                                                                              |         |
| 26 | Investor Sentiment Condition Making: A Behavioural Finance Perspective.                                                                   | 116-121 |
|    | <b>Koushik J, Dr. Manoj Kumara N V</b>                                                                                                    |         |
| 27 | The Psychological Impact of Excessive Screen Time on Child Development                                                                    | 122-125 |
|    | <b>Dr. Munjaji Kishanrao Rakhonde</b>                                                                                                     |         |
| 28 | Integrating Knowledge of Geography for Innovation, Sustainability, and Global Development: An Expanded Framework                          | 126-128 |
|    | <b>Dr. Lalitkumar G. Thakur</b>                                                                                                           |         |
| 29 | Integrating Knowledge for Innovation, Sustainability and Global Development: The Transformative Role of                                   | 129-131 |
|    | <b>Dr. Kamlesh Ravikumar Patil</b>                                                                                                        |         |
| 30 | The Role of Digital Payment Systems in Promoting Financial Inclusion among Rural Households in Karnataka                                  | 132-136 |
|    | <b>Dr Shailashree K</b>                                                                                                                   |         |
| 31 | Challenges in Employee Retention Management in the Manufacturing Sector                                                                   | 137-140 |
|    | <b>Dr Pradeep R Bhandary</b>                                                                                                              |         |
| 32 | Digital Economy: Opportunities, Challenges, and Future Prospects                                                                          | 141-145 |
|    | <b>Krushna Munjaji Balatkar</b>                                                                                                           |         |
| 33 | Entrepreneurship and Innovation                                                                                                           | 146-149 |
|    | <b>Dr. Kunjan Vijay Narkhede</b>                                                                                                          |         |
| 34 | Raj Yoga Meditation for Management of Occupational Stress Related to Responsibility among the Employees of Information Technology         | 150-153 |
|    | <b>Rekha Salunkhe</b>                                                                                                                     |         |
| 35 | Emerging Trends in Smart Irrigation and Crop Monitoring Technologies                                                                      | 154-158 |
|    | <b>B. Babu, K. Vanisri, S. Sumathra</b>                                                                                                   |         |
| 36 | Impact of AI-Driven Digital Marketing on Consumer Purchase Decisions: An Empirical Study of Consumers in Pune City                        | 159-164 |
|    | <b>Chinmoy Goswami, Dr. Vijay Ganpat Dhamore</b>                                                                                          |         |
| 37 | Tracing the Evolution of the Subject 'Gynaecology' Across Different Editions of the Dewey Decimal Classification: An Analytical Study     | 165-168 |
|    | <b>Puspa Mondal, Dr Snigdha Naskar</b>                                                                                                    |         |
| 38 | Cross-Cultural Communication                                                                                                              | 169-172 |
|    | <b>Santosh Prakash Mahale</b>                                                                                                             |         |



|    |                                                                                                                                                  |         |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 39 | Innovative role of High Intensity Aerobic Exercise in the management of Primary Dysmenorrhea                                                     | 173-174 |
|    | <b>Swapneela Jacob, Nisha Nambiar</b>                                                                                                            |         |
| 40 | An Overview Geographical Study for Sustainable Development                                                                                       | 175-177 |
|    | <b>Dr. Tilekar Sharad Balasaheb</b>                                                                                                              |         |
| 41 | Production and Productivity of Rice in India: A Geographical Review                                                                              | 178-181 |
|    | <b>Dr Pravinchandra D. Bhakare, Santosh S. Kamble, Narendra V. Gaikwad</b>                                                                       |         |
| 42 | Role of Government Policies in Fostering Entrepreneurship in India                                                                               | 182-185 |
|    | <b>Shruti Shubham Nikate, Deep Pandurang Satav</b>                                                                                               |         |
| 43 | Disaster Rehabilitation: Review on Floods in North East States of India                                                                          | 186-190 |
|    | <b>Dr. Manisha P. Shukla</b>                                                                                                                     |         |
| 44 | Advancing Women's Empowerment through Sports: A Journey towards Growth and Development                                                           | 191-193 |
|    | <b>Dr. Mohammed Ajaz Sheikh</b>                                                                                                                  |         |
| 45 | Computerized Accounting Systems and Organizational Outcomes: A Systematic Literature Review with Implications for SMEs and Automobile Retailers. | 194-203 |
|    | <b>Vasim Sayyad, Dr. Shrikant Dudhal</b>                                                                                                         |         |
| 46 | Current Trends and Future Directions in Heritage Tourism in Haryana: A Comprehensive Review                                                      | 204-208 |
|    | <b>Shivender, A. Rajshekhar</b>                                                                                                                  |         |
| 47 | Education, Society and Social Mobility                                                                                                           | 209-212 |
|    | <b>Syed Riyaz Pasha</b>                                                                                                                          |         |
| 48 | The Impact of Migration on Global Politics and Sustainable Development                                                                           | 213-217 |
|    | <b>Dr. Meenal Kishor Kshirsagar</b>                                                                                                              |         |
| 49 | Power Sector Reforms in Karnataka State: A Comprehensive Study of Policy, Performance, and Public Service Delivery                               | 218-221 |
|    | <b>Syed Imran Thaseer, Dr. Ram. R. Solankar</b>                                                                                                  |         |
| 50 | A Study on Tourist Perception and Satisfaction towards Wellness Tourism in Shivamogga District                                                   | 222-233 |
|    | <b>Dr. Venkatachalapathi H.S, Dr. Durgappa</b>                                                                                                   |         |



Original Article

# Study of Human Rights in the Context of Innovation, Sustainability, and Global Development

Dr. Narayan Saktharam Funne

Department of Political Science Shri Bankatswami Mahavidyalaya, Beed

Manuscript ID:  
RIGJAAR-2026-030701

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 1-4  
July 2026

Submitted: 07 June. 2026

Revised: 15 June. 2026

Accepted: 10 July. 2026

Published: 31 July. 2026

Correspondence Address:

Dr. Narayan Saktharam Funne  
Department of Political Science Shri  
Bankatswami Mahavidyalaya, Beed  
Email: [narayan.funne@gmail.com](mailto:narayan.funne@gmail.com)

Quick Response Code:



Web: <https://rlgjaar.com>



DOI: 10.5281/zenodo.21974900

DOI Link:

<https://doi.org/10.5281/zenodo.21974900>



Creative Commons



## Abstract

Human rights are regarded as the fundamental foundation of modern democracy, the rule of law, and sustainable development. They encompass the inherent rights of every individual to life, liberty, equality, dignity, and development simply by virtue of being human. In the contemporary era of globalization, information technology, artificial intelligence (AI), digital governance, climate change, and environmental crises, the scope of human rights has significantly expanded. Consequently, innovation, sustainability, and global development have become inseparably linked with the protection and promotion of human rights. The primary objective of this research paper is to examine the interrelationship between human rights, innovation, sustainability, and global development from the perspective of Political Science. The study analyzes the concept, nature, and historical evolution of human rights, the Universal Declaration of Human Rights (UDHR, 1948), the International Covenant on Civil and Political Rights (ICCPR), the International Covenant on Economic, Social and Cultural Rights (ICESCR), the Fundamental Rights enshrined in the Constitution of India, the Directive Principles of State Policy, and the role of the National Human Rights Commission (NHRC). Furthermore, the paper evaluates the impact of innovation in education, healthcare, agriculture, public administration, digital services, artificial intelligence, e-governance, and information technology on the realization of human rights. It also examines emerging challenges such as digital privacy, data protection, cybersecurity, the digital divide, algorithmic bias, ethical use of artificial intelligence, and environmental justice. The study reveals that a human rights-based approach to development is indispensable for achieving the Sustainable Development Goals (SDGs). Poverty eradication, quality education, gender equality, environmental protection, healthcare, social justice, economic equity, and democratic governance largely depend upon the effective implementation of human rights. In the Indian context, issues such as social inequality, caste discrimination, and violence against women, child labour, environmental injustice, digital inequality, and cybercrime continue to challenge the effective realization of human rights. The paper recommends strengthening constitutional values, effective legal implementation, transparent governance, digital literacy, human rights education, and participatory governance to address these challenges. The study concludes that the integration of knowledge, responsible use of technology, adherence to constitutional principles, and policies based on human dignity can ensure balanced innovation, sustainable development, and inclusive global progress. Human rights should therefore remain at the core of all developmental policies to build a just, equitable, and sustainable society.

**Keywords:** Human Rights, Innovation, Sustainable Development, Global Development, Constitution of India, Social Justice, Artificial Intelligence (AI), Digital Governance.

## Introduction

Human rights are universal rights inherent to every individual by virtue of being human. Regardless of religion, caste, language, gender, race, nationality, economic status, or social background, every individual is entitled to equal rights. The primary objective of human rights is to protect individual freedom, promote social justice, and uphold human dignity. The necessity of protecting human rights became more evident after the Second World War, leading to the adoption of the Universal Declaration of Human Rights (UDHR) by the United Nations on 10 December 1948.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Funne, D. N. S. (2026). Study of Human Rights in the Context of Innovation, Sustainability, and Global Development. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 1–4. <https://doi.org/10.5281/zenodo.21974900>



This declaration provided international recognition to human rights and established a common standard for all nations. The twenty-first century has witnessed rapid advancements in science, technology, information technology, and globalization. Innovations such as artificial intelligence (AI), the Internet, big data, blockchain, cloud computing, e-governance, digital education, telemedicine, and smart cities have transformed human life. However, these developments have also created new challenges, including data privacy concerns, cybersecurity threats, algorithmic bias, digital inequality, and unequal access to technology. Therefore, integrating human rights into every developmental process has become essential. The concept of sustainable development is based on meeting the needs of the present generation without compromising the ability of future generations to meet their own needs. The United Nations Sustainable Development Goals (SDGs), adopted in 2015, include objectives such as poverty eradication, quality education, good health, gender equality, clean energy, climate action, peace, and justice. These goals cannot be achieved without ensuring the protection and promotion of human rights. The Constitution of India is considered one of the most progressive constitutions in safeguarding human rights. Article 14 guarantees equality before the law, Article 19 ensures fundamental freedoms, Article 21 protects the right to life and personal liberty, and Article 32 provides constitutional remedies. Additionally, the Directive Principles of State Policy aim to establish social and economic justice. In the present global scenario, a human rights-based development model is essential to ensure that the benefits of innovation and development reach every section of society. Development should not be limited to economic growth but must also promote social equality, environmental sustainability, democratic governance, accountability, and human dignity. Against this background, the present study examines the relationship between human rights, innovation, sustainability, and global development from a political science perspective.

#### Research Objectives

1. To study the concept, nature, and historical development of human rights.
2. To explain the role of human rights in the context of innovation, sustainability, and global development.
3. To analyse the constitutional protection, major challenges, and effective measures relating to human rights in India.
4. Human Rights: Concept, Nature and Historical Development

Human rights refer to the fundamental, universal, and inalienable rights that every individual possesses simply by being human. These rights are not granted by governments or institutions but are inherent in human dignity, equality, and freedom. Regardless of religion, caste, gender, language, nationality, race, or economic status, every individual is entitled to these rights equally. Human rights form the foundation of democracy, social justice, and the rule of law. The concept of human rights originated from the theory of natural rights. Ancient Greek and Roman philosophers emphasized natural justice, while thinkers such as John

Locke, Jean-Jacques Rousseau, and Thomas Paine advocated the natural rights to life, liberty, and property. Significant milestones in the evolution of human rights include the Magna Carta (1215), the English Bill of Rights (1689), the American Declaration of Independence (1776), and the French Declaration of the Rights of Man and of the Citizen (1789). The widespread human rights violations during the Second World War highlighted the need for international protection of human rights. Consequently, the United Nations General Assembly adopted the Universal Declaration of Human Rights (UDHR) on 10 December 1948. The declaration recognized thirty fundamental rights, including the rights to life, liberty, education, employment, justice, and social security. Subsequently, the International Covenant on Civil and Political Rights (ICCPR) and the International Covenant on Economic, Social and Cultural Rights (ICESCR) further strengthened the international human rights framework. Human rights have a multidimensional nature. Civil and Political Rights protect individual freedoms, whereas Economic, Social, and Cultural Rights promote comprehensive human development. Third-generation rights, including the right to development, a clean environment, peace, and access to information, have gained increasing significance in the modern world. In India, human rights are firmly protected through the Constitution. Fundamental Rights (Part III) and the Directive Principles of State Policy (Part IV) provide a strong constitutional framework for safeguarding human rights. Articles 14, 19, 21, and 32 play a crucial role in ensuring equality, liberty, dignity, and constitutional remedies. Additionally, the National Human Rights Commission (NHRC) and State Human Rights Commissions work towards protecting the rights of citizens. In the era of globalization and digital transformation, the scope of human rights has expanded to include digital privacy, the right to information, cybersecurity, and ethical use of artificial intelligence, environmental justice, and sustainable development. Thus, human rights are not merely legal principles but powerful instruments for building a just, equitable, and sustainable society.

#### Human Rights in the Context of Innovation, Sustainability and Global Development

The twenty-first century has witnessed unprecedented technological advancement through artificial intelligence, the Internet, blockchain, big data, cloud computing, digital governance, smart cities, e-learning, and telemedicine. While these innovations have accelerated development, it is essential that their benefits are distributed equally across society. Therefore, innovation and human rights are closely interconnected. Human Rights-Based Innovation emphasizes the protection of dignity, privacy, equality, and justice while developing and implementing technology. Artificial intelligence has improved healthcare, education, and governance, yet challenges such as algorithmic bias, misuse of personal data, and digital discrimination pose significant threats to human rights. Therefore, AI systems must be transparent, accountable, and ethically governed. Digital governance has improved transparency, efficiency, and citizen-centric public



administration. Initiatives such as Digital India, Aadhaar, digital payments, online education, and telemedicine have made public services more accessible. However, the digital divide, unequal internet access, and lack of digital literacy continue to exclude many communities from development opportunities. Ensuring equal digital access has therefore become an important human rights objective. Sustainable development seeks to meet present needs without compromising future generations. The Sustainable Development Goals (SDGs), adopted by the United Nations in 2015, include poverty eradication, quality education, gender equality, clean water, health, climate action, and peace. These goals cannot be realized without effective protection of human rights. Environmental justice has emerged as an important dimension of human rights. Access to clean air, safe drinking water, pollution-free surroundings, and equitable use of natural resources are increasingly recognized as fundamental human rights. Climate change, biodiversity loss, and environmental degradation disproportionately affect marginalized communities, making social inclusion essential for sustainable development. Global development should not be measured solely by economic growth but by social justice, equal opportunities, human dignity, and environmental sustainability. Therefore, innovation must be human-centric, ethical, and inclusive. Integrating knowledge, responsible technology, good governance, and human rights-based public policies can promote sustainable and equitable global development.

#### **Human Rights in India: Constitutional Provisions, Challenges and Remedies**

The Constitution of India is one of the world's most progressive democratic constitutions and provides a comprehensive framework for protecting human rights. Its Preamble upholds justice, liberty, equality, and fraternity as the guiding principles of the nation. Article 14 guarantees equality before the law, Article 15 prohibits discrimination, Article 16 ensures equality of opportunity in public employment, Article 19 guarantees fundamental freedoms, Article 21 protects the right to life and personal liberty, Article 21A guarantees the right to education, Articles 23 and 24 prohibit human trafficking, forced labour, and child labour, while Article 32 provides constitutional remedies for the enforcement of fundamental rights. The Directive Principles of State Policy encourage the State to promote social and economic justice through policies related to education, healthcare, equal wages, nutrition, environmental protection, and welfare. The Protection of Human Rights Act, 1993 established the National Human Rights Commission (NHRC), which investigates violations, promotes awareness, and advises the government on human rights issues. Other institutions, including the National Commission for Women, National Commission for Protection of Child Rights, National Commissions for Scheduled Castes and Scheduled Tribes, and disability rights institutions, also contribute significantly to human rights protection. Despite constitutional safeguards, India continues to face challenges such as poverty, unemployment, social inequality, and caste discrimination, violence against

women, child labour, human trafficking, child marriage, cybercrime, digital fraud, environmental pollution, and climate change. Emerging concerns include digital privacy, data protection, and the ethical governance of artificial intelligence. Addressing these challenges requires effective implementation of laws, accessible justice, human rights education, digital literacy, public awareness, expansion of e-governance, environmental conservation, women's empowerment, quality education, employment generation, targeted welfare programmes, robust data protection laws, ethical AI governance, and accountable digital administration. India's democratic strength ultimately depends upon protecting the human rights of all citizens. Constitutional values, social justice, transparent governance, public participation, and sustainable development can collectively transform India into a more just, inclusive, and equitable nation.

#### **Conclusion**

Human rights, innovation, sustainability, and global development are mutually reinforcing concepts that are essential for the progress of modern democratic societies. Innovation can accelerate development only when it is guided by the principles of human dignity, equality, justice, and inclusion. Therefore, technology should serve humanity rather than replace it as the central focus of development. Achieving the Sustainable Development Goals requires balancing economic progress with social inclusion, environmental protection, and effective protection of human rights. The Constitution of India provides a strong legal framework through Fundamental Rights and Directive Principles; however, challenges such as inequality, poverty, gender discrimination, the digital divide, environmental degradation, and cybercrime continue to hinder the realization of human rights. Strengthening human rights education, digital literacy, transparent governance, effective legal enforcement, ethical artificial intelligence, and citizen participation is essential for overcoming these challenges. Human rights-based public policies at national and international levels can ensure that innovation benefits everyone while promoting inclusive and sustainable development. In conclusion, human rights are not merely legal or moral entitlements but the cornerstone of sustainable, inclusive, and justice-oriented global development. The integration of knowledge, constitutional values, democracy, social justice, and responsible innovation can create a future global society that is secure, equitable, and founded upon human dignity. Therefore, adopting a "Human Rights First" approach in all development policies is the need of the hour.

#### **Acknowledgement**

The successful completion of this research paper would not have been possible without the support and encouragement of many individuals and institutions. I express my sincere gratitude to my colleagues and the Department of Political Science, Shri Bankatswami Mahavidyalaya, Beed, for providing a conducive academic environment and valuable support throughout the preparation of this study.

#### **Financial support and sponsorship**



Nil.

#### **Conflicts of interest**

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### **References**

1. Constitution of India. (2024). Government of India, Ministry of Law and Justice.
2. National Human Rights Commission. (2023). Annual Report. New Delhi: NHRC.
3. Government of Maharashtra. (2020). Maharashtra State Human Rights Policy. Mumbai: General Administration Department.
4. Joshi, B. R. (2018). Fundamentals of Political Science. Pune: Diamond Publications.
5. Bhole, B. L. (2019). Indian Polity and Constitution. Pune: Vidya Prakashan.
6. Patil, V. B. (2021). Human Rights: Concept and Practice. Kolhapur: Phadke Publications.
7. Kulkarni, S. M. (2017). Democracy, Human Rights and Good Governance. Pune: Saket Publications.
8. Deshmukh, P. D. (2022). Sustainable Development and Environment. Nagpur: Vijay Prakashan.
9. Sawant, G. R. (2020). Globalization and Indian Society. Pune: Diamond Publications.
10. Yadav, S. K. (2019). Human Rights and Indian Democracy. Aurangabad: Sai Prakashan.
11. Shinde, R. A. (2022). Digital India and E-Governance. Pune: Prashant Publications.
12. Phadke, B. G. (2018). The Constitution of India: Theory and Practice. Pune: Continental Publications.
13. Donnelly, J. (2013). Universal Human Rights in Theory and Practice (3rd ed.). Ithaca, NY: Cornell University Press.
14. United Nations. (1948). Universal Declaration of Human Rights. New York: United Nations.
15. United Nations. (1966). International Covenant on Civil and Political Rights (ICCPR). New York: United Nations.
16. United Nations. (1966). International Covenant on Economic, Social and Cultural Rights (ICESCR). New York: United Nations.
17. United Nations. (2015). Transforming Our World: The 2030 Agenda for Sustainable Development. New York: United Nations.
18. United Nations Development Programme (UNDP). (2022). Human Development Report 2021/2022: Uncertain Times, Unsettled Lives. New York: UNDP.
19. UNESCO. (2021). Recommendation on the Ethics of Artificial Intelligence. Paris: UNESCO.
20. Nussbaum, M. C. (2011). Creating Capabilities: The Human Development Approach. Cambridge, MA: Harvard University Press



Original Article

# From Monopoly to Marginal Player: A Comparative Analysis Of Bsnl's Declining Competitiveness in India's Telecommunications Sector

Dr. Krushna Kulkarni

Associate Professor, Department of Economics

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati

Manuscript ID:  
RIGJAAR-2026-030702

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 5-8  
July 2026

Submitted: 07 June. 2026

Revised: 15 June. 2026

Accepted: 10 July. 2026

Published: 31 July. 2026

Correspondence Address:

Dr. Krushna Kulkarni  
Associate Professor, Department of  
Economics  
Tuljaram Chaturchand College of Arts,  
Science and Commerce, Baramati Email-  
[krushnakulkarni.mh@gmail.com](mailto:krushnakulkarni.mh@gmail.com)

Quick Response Code:



Web. <https://rlgjaar.com>



DOI: 10.5281/zenodo.21975106

DOI Link:

<https://doi.org/10.5281/zenodo.21975106>



Creative Commons



## Abstract

The Indian telecommunications sector has undergone a remarkable transformation following liberalization, shifting from a government-controlled monopoly to a highly competitive market dominated by private operators. Bharat Sanchar Nigam Limited (BSNL), once the country's leading telecom service provider, has experienced a sustained decline in competitiveness despite possessing extensive infrastructure, nationwide coverage, and continuous government support. This paper examines BSNL's declining market position through a comparative analysis of broadband, wireline, wireless subscriber data, and Adjusted Gross Revenue (AGR) performance. Secondary data obtained from the Telecom Regulatory Authority of India (TRAI) and other industry reports reveal that private operators, particularly Reliance Jio and Bharti Airtel, have significantly expanded their market share through timely technological adoption, customer-centric services, and strategic investments, whereas BSNL has lagged due to delays in network modernization, spectrum deployment, and organizational decision-making. The findings indicate that historical monopoly and infrastructure ownership alone are insufficient to sustain competitiveness in a rapidly evolving technological environment. The study concludes that organizational agility, technological innovation, and efficient management are critical determinants of long-term success in the telecommunications industry.

**Keywords:** BSNL, Telecommunications, Market Competition, Liberalization, Broadband, Wireless Services, Wireline Services, Telecom Industry, Adjusted Gross Revenue (AGR), TRAI.

## Introduction

The telecommunications sector plays a vital role in economic development by facilitating communication, promoting digital inclusion, supporting business activities, and strengthening national connectivity. Over the past three decades, India's telecom industry has witnessed unprecedented growth driven by economic liberalization, technological innovation, and increasing private sector participation. The transition from a government monopoly to a competitive market has significantly improved service quality, expanded subscriber coverage, and reduced communication costs. Bharat Sanchar Nigam Limited (BSNL), established in 2000 through the corporatization of the Department of Telecommunications, inherited one of the largest telecom networks in the country and was expected to remain the dominant service provider. However, the emergence of private operators such as Reliance Jio, Bharti Airtel, and Vodafone Idea fundamentally transformed the competitive landscape. Aggressive investments in advanced technologies, rapid deployment of 4G and fibre networks, innovative digital services, and customer-focused business strategies enabled private firms to capture a substantial share of the telecom market. In contrast, BSNL encountered several institutional and operational challenges, including delays in spectrum allocation, procurement procedures, technological upgrades, and commercial decision-making. These factors adversely affected its ability to compete effectively in broadband, wireline, and wireless segments, resulting in declining market share and financial performance. This study analyzes BSNL's declining competitiveness through a comparative assessment of subscriber trends and revenue performance using recent industry data.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Kulkarni, D. K. (2026). From Monopoly to Marginal Player: A Comparative Analysis Of Bsnl's Declining Competitiveness in India's Telecommunications Sector. *Royal International Global Journal of Advance and Applied Research*, 3(7(III)), 5–8.  
<https://doi.org/10.5281/zenodo.21975106>

By examining the contrasting performance of public and private telecom operators, the paper highlights the strategic, technological, and managerial factors responsible for the changing dynamics of India's telecommunications sector.

### Historical Background

The history of telecommunications in independent India is inseparable from the evolution of the public sector. Until the late 1990s, telecommunication services were provided directly by the Department of Telecommunications (DoT), Government of India. The sector operated as a government monopoly where the primary objective was universal service rather than commercial profitability. Telephone connectivity was regarded as a public utility, and the expansion of telecommunication infrastructure played a crucial role in promoting national integration, administrative efficiency and socio-economic development. During this period, obtaining a telephone connection often required waiting for several months or even years, reflecting the limited capacity of the existing network. A major institutional reform occurred on **1 October 2000**, when the Government of India corporatized the operational functions of the Department of Telecommunications by creating **Bharat Sanchar Nigam Limited (BSNL)**. The newly established public sector enterprise inherited one of the largest telecommunications networks in the world, comprising an extensive copper landline network, nationwide exchanges, microwave systems, and a rapidly expanding optical fibre backbone. BSNL became responsible for providing telecom services across India except in Delhi and Mumbai, where similar services were entrusted to Mahanagar Telephone Nigam Limited (MTNL). At the time of its formation, BSNL possessed enormous structural advantages including nationwide infrastructure, an established subscriber base, technical manpower, rural outreach and complete ownership of the country's fixed-line network. However, the liberalization of the Indian telecommunications sector fundamentally altered the competitive landscape. Private operators such as Bharti Airtel, Vodafone (later Vodafone Idea), and subsequently Reliance Jio adopted aggressive investment strategies, introduced successive generations of mobile technology at a faster pace, and transformed telecommunications from a utility service into a consumer-centric digital ecosystem. In contrast, BSNL experienced delays in spectrum allocation, procurement processes, network modernization and commercial decision-making. Consequently, despite possessing substantial public assets and repeated financial support from the Government of India, BSNL gradually lost its dominant market position across almost every segment of the telecommunications industry. The following analysis examines how private operators consistently strengthened their market position while BSNL's presence contracted in broadband, wireline and wireless services.

### Comparative Performance of Telecom Service Providers

The Indian telecommunications industry has undergone a remarkable structural transformation over the last two decades. Liberalization, technological innovation and intense competition have resulted in unprecedented growth in mobile and broadband connectivity. While these developments have significantly benefited consumers through lower tariffs and improved service quality, they

The findings contribute to a better understanding of the challenges faced by public sector enterprises in competitive and technology-driven industries.

have simultaneously exposed the declining competitiveness of public sector telecom enterprises, particularly BSNL. The changing market structure is evident from subscriber statistics, revenue performance and market share across different service segments.

### Broadband Services: Private Operators Dominate the Digital Economy

The most striking evidence of BSNL's declining competitiveness emerges from the broadband market. Figure 1 illustrates the market share of broadband (wired and wireless) service providers as of April 2026.

**Figure 1** demonstrates that Reliance Jio has emerged as the undisputed market leader with **49.09 percent** of total broadband subscribers, followed by Bharti Airtel with **34.75 percent**. Vodafone Idea accounts for **12.01 percent**, whereas BSNL's share has declined to only **2.53 percent**. This distribution reflects a dramatic reversal of fortunes. At the beginning of the century, BSNL possessed the country's most extensive fixed telecommunications infrastructure and was expected to dominate broadband expansion. Instead, private operators successfully capitalized on the rapid growth of mobile broadband by investing aggressively in 4G infrastructure, digital applications and fibre connectivity. BSNL, despite owning one of India's largest optical fibre networks, failed to leverage these assets for large-scale subscriber acquisition. The company's inability to introduce advanced technologies in a timely manner substantially weakened its position in India's rapidly expanding digital economy.

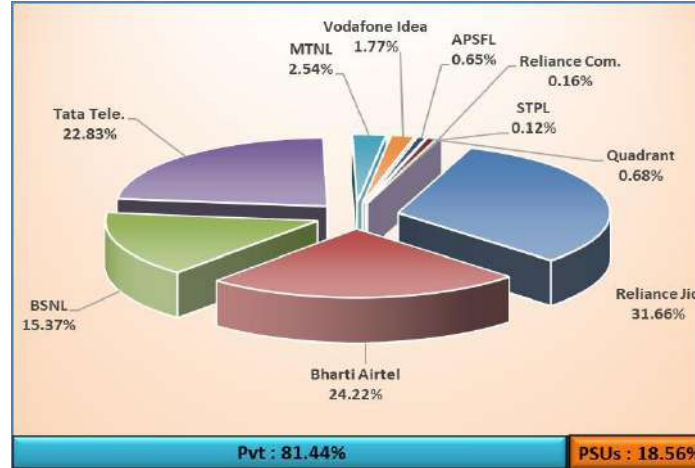
**Source:** TRAI – Highlights of Telecom Subscription Data at the end of April 2026.

### Wireline Services: Losing a Historical Monopoly

Perhaps the most revealing indicator of BSNL's institutional decline is its shrinking position in the wireline market. Historically, landline telephony represented BSNL's strongest segment, inherited from the erstwhile Department of Telecommunications. Yet, Figure 2 indicates that this historical advantage has steadily eroded. Private operators collectively account for **81.44 percent** of wireline subscribers, while public sector operators (BSNL and MTNL combined) account for only **18.56 percent**. BSNL alone retains merely **15.37 percent** of the market, compared with **31.66 percent** for Reliance Jio, **24.22 percent** for Bharti Airtel and **22.83 percent** for Tata Teleservices. This trend represents a remarkable institutional transformation. The sector in which BSNL once enjoyed complete monopoly has now become overwhelmingly dominated by private enterprises. The rapid deployment of fibre-to-the-home (FTTH) services, bundled broadband packages and enterprise connectivity solutions enabled private operators to capture both residential and commercial customers. In contrast, BSNL's comparatively slower modernization of its legacy copper network limited its ability to compete effectively. The declining wireline market share also illustrates that historical infrastructure alone cannot guarantee long-term competitiveness. Sustainable market leadership increasingly depends upon technological

innovation, service quality, customer experience and organizational responsiveness.

#### Access Service Provider-wise Market Share of wireline Subscribers at the end of April 2026



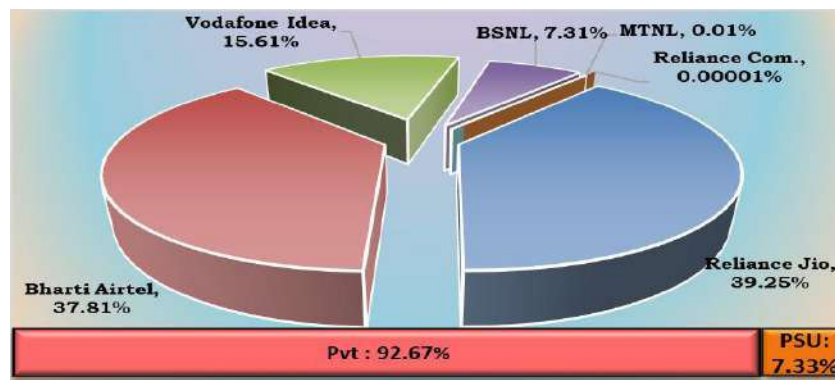
Source: TRAI – Highlights of Telecom Subscription Data at the end of April 2026.

#### Wireless Services: The Greatest Competitive Failure

The wireless segment represents the most significant contributor to BSNL's commercial decline. Figure 3 presents the market shares of mobile subscribers as of April 2026. Reliance Jio commands **39.25 percent** of India's wireless subscriber base, followed by Bharti Airtel with **37.81 percent** and Vodafone Idea with **15.61 percent**. In contrast, BSNL accounts for only **7.31 percent** of mobile subscribers, while MTNL has become almost insignificant. Wireless telecommunications has emerged as the principal driver of sectoral growth during the past two decades. Unlike private operators that invested continuously in

successive generations of mobile technology, BSNL experienced prolonged delays in rolling out both 3G and 4G services. These delays substantially reduced subscriber confidence, encouraged customer migration and weakened the company's competitive position in the most profitable segment of the telecommunications industry. The data indicate that BSNL's decline is not merely a consequence of market competition but reflects a failure to adapt to changing technological and consumer preferences. In industries characterized by rapid innovation, delayed technological adoption generates cumulative disadvantages, making subsequent recovery increasingly difficult.

#### Access Service Provider-wise Market Shares in term of Wireless (Mobile) Subscribers at the end of April 2026



Source: TRAI – Highlights of Telecom Subscription Data at the end of April 2026.

#### Financial Performance: Adjusted Gross Revenue Analysis

The financial implications of these structural changes become evident from the Adjusted Gross Revenue (AGR) of India's leading telecom operators.

Table 1

Top Five Access Service Provider-wise Adjusted Gross Revenue (AGR), 2024–25

| Service Provider | AGR 2023–24 (₹ Cr.) | AGR 2024–25 (₹ Cr.) | Growth (%) | Market Share (%) |
|------------------|---------------------|---------------------|------------|------------------|
| Reliance Jio     | 97,868              | 111,551             | 13.98      | 44.01            |



| Service Provider  | AGR 2023–24 (₹ Cr.) | AGR 2024–25 (₹ Cr.) | Growth (%)   | Market Share (%) |
|-------------------|---------------------|---------------------|--------------|------------------|
| Bharti Airtel     | 80,529              | 99,240              | 23.23        | 39.15            |
| Vodafone Idea     | 29,605              | 30,720              | 3.77         | 12.12            |
| <b>BSNL</b>       | <b>8,020</b>        | <b>8,435</b>        | <b>5.17</b>  | <b>3.33</b>      |
| Tata Teleservices | 2,534               | 2,680               | 5.77         | 1.06             |
| Others            | 868                 | 843                 | −2.80        | 0.33             |
| <b>Total</b>      | <b>219,424</b>      | <b>253,469</b>      | <b>15.52</b> | <b>100.00</b>    |

**Source:** Telecom Regulatory Authority of India (2025), *The Indian Telecom Services Performance Indicators, 2024–25*.

The AGR statistics reinforce the subscriber trends observed in the preceding analysis. Reliance Jio and Bharti Airtel together account for more than **83 percent** of the industry's adjusted gross revenue, demonstrating their overwhelming commercial dominance. Although BSNL recorded a modest annual AGR growth of **5.17 percent**, its contribution to the total industry revenue remains only **3.33 percent**, highlighting the widening gap between the public sector operator and its private competitors. More importantly, BSNL's revenue growth remains substantially below the overall industry growth of **15.52 percent**. This indicates that while the Indian telecommunications market continues to expand rapidly, BSNL is not participating proportionately in that growth. Consequently, the enterprise faces a vicious cycle in which lower subscriber growth leads to lower revenue generation, restricting investment capacity and further weakening competitiveness.

### Conclusion

The evidence presented through subscriber statistics and revenue performance reveals that BSNL's decline cannot be explained solely by increasing competition. Rather, it reflects a broader failure of organizational adaptation in a rapidly changing technological environment. Despite inheriting extensive infrastructure, nationwide presence and government support, BSNL has steadily lost market share across broadband, wireline and wireless services. The contrast between BSNL and private operators demonstrates that infrastructure ownership alone is insufficient to ensure commercial success. Competitive advantage increasingly depends upon timely technological adoption, effective marketing, customer-centric service delivery, efficient retail distribution, and managerial autonomy. Private operators successfully integrated these strategic capabilities, whereas BSNL remained constrained by slower institutional decision-making and delayed commercial responses. The Indian telecommunications sector therefore presents a compelling case of how market liberalization rewards organizational agility rather than historical dominance. BSNL's experience illustrates that even enterprises possessing significant public assets may gradually lose competitiveness if technological modernization, strategic management and market orientation fail to evolve alongside industry transformation.

### Acknowledgement

The successful completion of this research paper would not have been possible without the support and encouragement of many individuals and organizations. I express my sincere gratitude to my institution for providing a conducive academic environment and the necessary resources for

carrying out this study. I am deeply thankful to my colleagues and well-wishers for their valuable suggestions, constructive feedback, and constant encouragement throughout the research process. I also acknowledge the valuable information and statistical data made available by the Telecom Regulatory Authority of India (TRAI), the Department of Telecommunications (DoT), Bharat Sanchar Nigam Limited (BSNL), and other authentic secondary sources, which formed the foundation of this study.

### Financial support and sponsorship

Nil.

### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

### References:

1. <https://telecomtalk.info/airtel-reliance-jio-vodafone-idea-arpu-q4fy26/1007605/>
2. <https://www.spglobal.com/market-intelligence/en/news-insights/research/2024/08/indias-telecom-landscape-jios-rise-airtels-arpu-surge-and-vis-downtrend5>
3. TRAI Yearly Telecom Services Performance Indicator Reports 2014–15, 2022–23, 2024–25, 2025–26 at [https://www.trai.gov.in/sites/default/files/PR\\_No.12of2024.pdf](https://www.trai.gov.in/sites/default/files/PR_No.12of2024.pdf)
4. Highlights of Telecom Subscription Data at the end of May 2026



Original Article

# Measuring Rural Development in Maharashtra: A Systematic Analysis Based on the Panchayat Advancement Index (PAI)

Anuja S. Ghorpade<sup>1</sup>, Dr.M.S. Deshmukh<sup>2</sup>

<sup>1</sup> Research Scholar, Shivaji University, Kolhapur

<sup>2</sup> Department of Economics, Professor & Head, Department of Economics  
Shivaji University, Kolhapur

## Abstract

Rural development in India heavily relies on grassroots governance institutions, particularly Gram Panchayats operating under the Panchayati Raj framework. To systematically assess local-level progress in alignment with the Sustainable Development Goals (SDGs), the Ministry of Panchayati Raj introduced the Panchayat Advancement Index (PAI). This study examines the state of rural development in Maharashtra by conducting a systematic analysis of the PAI baseline assessment for the year 2022–23. The research is structured around four core objectives: exploring structural tiers, analyzing macro distributions, investigating thematic development challenges, and proposing strategic policy interventions across Gram Panchayats. Employing a descriptive and analytical research design, the study interprets Panchayat performance across established categories using secondary data covering the state universe of 27,849 Gram Panchayats. The empirical findings reveal that an overwhelming majority of 89.56% of Gram Panchayats in Maharashtra cluster within the 'Performers' category, indicating a stable middle-tier majority that meets basic administrative compliance. However, only a negligible 0.028% attain the elite 'Achievers' status, while smaller segments fall under Front Runners (4.03%), Aspirants (1.65%), and the unpublished Beginners tier (4.73%). Furthermore, the thematic analysis highlights persistent hurdles such as rain-fed agriculture reliance, groundwater depletion, and gaps in translating formal gender representation into independent decision-making power. Ultimately, the study emphasizes that a uniform policy approach is insufficient. It recommends targeted, category-specific administrative and financial interventions such as digital skills training for the middle tier and foundational resource mapping for aspirants to bridge development gaps and drive sustainable rural transformation across Maharashtra.

**Keywords:** Panchayat Advancement Index, Rural Development, Gram Panchayat, Panchayati Raj, Maharashtra.

## Introduction

Rural development has long occupied a central position in India's development strategy, primarily because a significant proportion of the country's population continues to reside in rural areas and depends largely on agriculture and allied activities for its livelihood. Despite notable economic progress at the national level, rural regions continue to experience multiple and interrelated challenges, including poverty, unemployment, inadequate physical and social infrastructure, agrarian distress, limited access to quality education and healthcare, and persistent forms of social exclusion. Maharashtra, one of India's largest states in terms of population, geographical area, and economic contribution, presents a complex and uneven rural development landscape. While regions such as Western Maharashtra have benefited from relatively better irrigation facilities, cooperative movements, industrial growth, and infrastructure development, other regions including Marathwada, Vidarbha, and parts of North Maharashtra continue to face recurrent droughts, agrarian distress, farmer indebtedness, and out-migration. The institutional framework for rural governance in India underwent a major transformation with the enactment of the 73rd Constitutional Amendment Act in 1992,

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Anuja S. Ghorpade, M.S. Deshmukh (2026) Measuring Rural Development in Maharashtra: A Systematic Analysis Based on the Panchayat Advancement Index (PAI), Royal International Global Journal of Advance and Applied Research, 3(7(III)), 9-13.

Manuscript ID:  
RIGJAAR-2026-030703

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 9-13  
July 2026

Submitted: 07 June 2026

Revised: 15 June 2026

Accepted: 10 July 2026

Published: 31 July 2026

## Correspondence Address:

Ms. Anuja S. Ghorpade  
Research Scholar, Shivaji University,  
Kolhapur  
Email: [anujaghorpade72@gmail.com](mailto:anujaghorpade72@gmail.com)

Quick Response Code:



Web: <https://rlgjaar.com>



DOI: 10.5281/zenodo.21975277

DOI Link:

<https://doi.org/10.5281/zenodo.21975277>



Creative Commons





which accorded constitutional status to Panchayati Raj Institutions (PRIs) as the third tier of governance. Gram Panchayats, as the foundational units of this system, were entrusted with wide-ranging responsibilities related to local planning, implementation, and monitoring of development programmes across sectors such as agriculture, water management, sanitation, health, education, and social welfare. The Panchayat Advancement Index (PAI) operates as a composite framework designed to assess the overall development performance of Gram Panchayats through a holistic and multidimensional approach. The framework of the PAI is structured around nine thematic areas, namely: (i) poverty-free and enhanced livelihoods Panchayat, (ii) healthy Panchayat, (iii) child-friendly Panchayat, (iv) water sufficient Panchayat, (v) clean and green Panchayat, (vi) Panchayat infrastructure, (vii) socially just and secure Panchayat, (viii) Panchayat governance, and (ix) women-friendly Panchayat.

The study aims to assess the comprehensive performance levels of Gram Panchayats in Maharashtra using the core structural tiers of the Panchayat Advancement Index; to analysis the macro distribution and percentage concentration of Gram Panchayats across the officially defined PAI performance categories; to examine governance-related and thematic developmental challenges affecting structural Panchayat performance in Maharashtra; and to derive policy relevant structural insights for strengthening Panchayati Raj Institutions and improving rural development outcomes in the state.

#### Research Methodology

The study is based entirely on secondary data obtained from the Panchayat Advancement Index baseline assessment for the year 2022–23, published by the Ministry of Panchayati Raj, Government of India. Maharashtra constitutes the geographical scope of the study. A descriptive and analytical research design is adopted to examine patterns of rural development and variations in Panchayat performance

across the state. The quantitative analytical framework relies on category-wise aggregation to establish the macro trends. The mathematical formula applied to calculate the proportional distribution and percentage share of Gram Panchayats within each specific PAI performance category is as follows:

$$\text{Percentage Share (\%)} = (\text{Number of Panchayats in a Specific Category} \div \text{Total Number of Assessed Panchayats}) \times 100$$

#### Where:

Number of Panchayats in a Specific Category represents the individual count of Gram Panchayats falling under a particular performance tier (e.g., Achievers, Front Runners, Performers, and Aspirants).

Total Number of Assessed Panchayats (N) in Maharashtra is fixed at 27,849.

#### Results and Discussion

This section provides an empirical evaluation of rural development dynamics in Maharashtra, utilizing the standardized dataset from the Panchayat Advancement Index (PAI). The core assessment tracks a total universe of 27,849 Gram Panchayats across the state to determine institutional output and policy alignment. To maintain academic clarity, the analytical presentation is systematically organized into four key operational dimensions: structural score tier configurations, macro percentage distributions, localized thematic performance hurdles, and target-oriented policy matrices designed to facilitate upward institutional mobility.

##### 1 Analysis of Structural Score Tier Distribution of Gram Panchayats

The introductory stage of this baseline evaluation requires a formal layout of the scoring ecosystem developed by the Ministry of Panchayati Raj. This structural grouping provides the foundational scale used to grade rural local bodies

Table No. 1: Structural Score Tier Distribution of Assessed Gram Panchayats in Maharashtra

| PAI Category  | Core Score Tier Range | Status in Maharashtra Assessment | Target Metrics Covered               |
|---------------|-----------------------|----------------------------------|--------------------------------------|
| Achievers     | 90 & above            | Officially Evaluated             | Sustainable Development Goals (SDGs) |
| Front Runners | Score 75-89           | Officially Evaluated             | Institutional & Financial Capacity   |
| Performers    | Score 60-74           | Officially Evaluated             | Minimum Service Delivery Adequacy    |
| Aspirants     | Score 40-59           | Officially Evaluated             | Baseline Infrastructure Gaps         |
| Beginners     | Below 40              | Not Officially Published         | Critical Administrative Weakness     |

Source: Compiled by the researcher from [pai.gov.in](http://pai.gov.in)

Table No. 1 shows that the structural framework of the PAI provides a standardized scale to gauge the operational depth of local bodies. The core metric segments the administrative performance across five distinct brackets, ranging from entry-level operations to advanced rural governance. A major point to note here is the institutional opacity surrounding the 'Beginner' bracket, as its operational figures are withheld from public reporting. Nevertheless, the active tracking of the remaining four brackets gives a solid tool to observe whether fiscal resources flowing from central and

state schemes are successfully changing the structural landscape of rural governance.

##### 2 Analysis of Macro Distribution and Percentage Concentration of Gram Panchayats.

To understand the actual status of decentralized governance, it is necessary to examine how the total population of assessed local bodies is spread across the individual score brackets.



Table No. 2: Macro Performance Distribution and Percentage Concentration of Gram Panchayats in Maharashtra

| PAI Performance Category | Number of Gram Panchayats | Percentage Share (%) | Empirical Position in State   |
|--------------------------|---------------------------|----------------------|-------------------------------|
| Achievers                | 08                        | 0.028                | Elite Exceptional Performance |
| Front Runners            | 1,124                     | 4.030                | Advanced Consistent Models    |
| Performers               | 24,944                    | 89.560               | Absolute Middle-Tier Majority |
| Aspirants                | 461                       | 1.650                | Low Functional Vulnerability  |
| Beginners                | Not Published             | -                    | Underreported Tier            |
| Total Assessed (N)       | 27,849                    | 100%                 | Comprehensive State Universe  |

Source: Compiled by the researcher from [pai.gov.in](http://pai.gov.in)

Table No. 2 presents the empirical distribution and concentration of Gram Panchayats across the state universe. The actual data mapping reveals a clear structural bottleneck in Maharashtra's rural progress. Out of the 27,849 local bodies evaluated, an overwhelming 89.56% cluster tightly within the 'Performer' zone. This tells us that while the absolute majority of villages comfortably cross

basic administrative benchmarks and maintain routine compliance, very few leap to exceptional management. This is proven by the incredibly low number of 'Achievers', just 8 panchayats across the entire state. The data reflects a system that is functioning adequately on average, but heavily lacks top-tier excellence, leaving a minor fraction (1.65%) trailing behind as 'Aspirants'.

Figure No. 1: Shear of PAI Performance Categories in Maharashtra

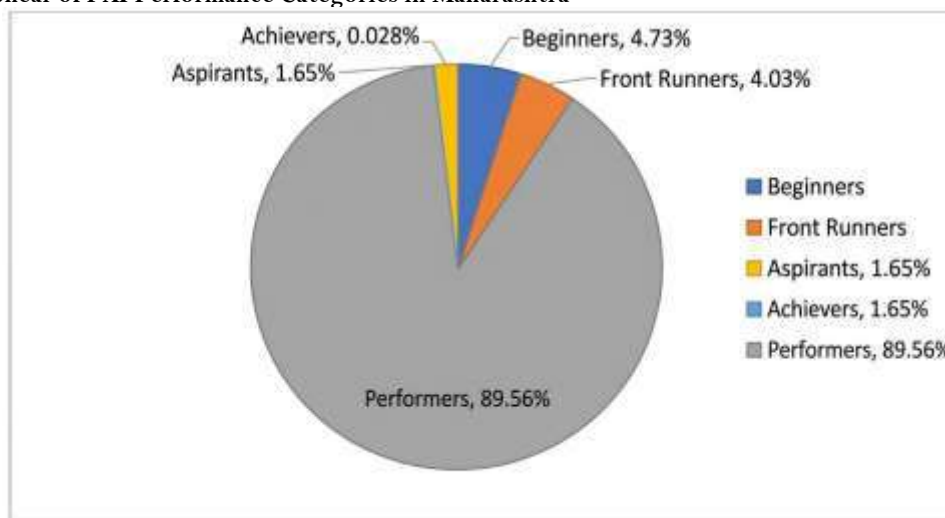


Figure 1 shows the percentage share of Gram Panchayats in Maharashtra across various Panchayat Advancement Index (PAI) performance categories. The largest share is overwhelmingly held by the Performers category, which accounts for 89.56% (24,944 Gram Panchayats) of the total assessed universe. This indicates that the vast majority of rural local bodies in the state occupy the absolute middle-tier level of functional development. Around 4.03% (1,124 Gram Panchayats) have progressed into the Front Runners category, demonstrating consistent and advanced developmental models. Conversely, a small segment of 1.65% (461 Gram Panchayats) remains in the Aspirants

stage, showing low functional vulnerability. The topmost elite category, Achievers, represents a minimal exceptional share of just 0.028% (8 Gram Panchayats). Lastly, the underreported or unpublished Beginners tier constitutes the remaining 4.73% (1,312 Gram Panchayats) of the comprehensive state universe.

### 3 Thematic Assessment and Governance Challenges Matrix

Beyond aggregate scores, evaluating separate thematic areas highlights the specific development sectors where localized governance machinery faces significant friction.

Table No. 3: Matrix of Governance-Related and Thematic Developmental Challenges in Maharashtra

| PAI Thematic                | Observed Progress Level | Identified Structural & Governance Challenges         | Target Areas        |
|-----------------------------|-------------------------|-------------------------------------------------------|---------------------|
| Infrastructure & Sanitation | Better Performance      | Long-term maintenance of structures, scheme alignment | Cleanliness & Roads |



|                                     |                  |                                                             |                   |
|-------------------------------------|------------------|-------------------------------------------------------------|-------------------|
| <b>Livelihood &amp; Poverty</b>     | High Challenge   | Rain-fed Agri reliance, lack of livelihood diversification  | Employment        |
| <b>Water Security &amp; Ecology</b> | Critical Concern | Rapid groundwater depletion, erratic monsoon management     | Conservation      |
| <b>Social Justice &amp; Gender</b>  | Mixed Outcomes   | Formal representation vs actual independent decision-making | Women Empowerment |

Source: Compiled by the researcher from [pai.gov.in](http://pai.gov.in).

Table No. 3 indicates the thematic variances across different functional indices of the framework. Breaking down the index by its thematic clusters shows where the machinery succeeds and where it stumbles. Physical indicators like sanitation facilities, school buildings, and connecting roads show strong progress, primarily driven by direct funding injections from national programs. However, structural social themes tell a completely different story. Creating steady economic alternatives outside traditional, rain-dependent farming remains a major hurdle. Furthermore, ecogovernance scores suffer from falling water tables and poor resource management. On the social front, while gender reservation ensures that women hold official seats,

translating this formal representation into independent decision-making power remains an ongoing challenge.

#### 4 Analysis of Strategic Policy Insights for Upward Institutional Mobility

The highly skewed concentration observed in the middle tier requires the formulation of targeted administrative interventions to shift local bodies toward higher performance brackets.

Table No. 4: Strategic Policy Action Matrix for Upward Institutional Mobility of Gram Panchayats

| Target Performance Group             | Primary Policy Focus  | Recommended Strategic Interventions                          | Expected Outcome         |
|--------------------------------------|-----------------------|--------------------------------------------------------------|--------------------------|
| <b>Aspirants &amp; Beginners</b>     | Baseline Operations   | Filling administrative vacancies, core resource mapping      | Structural Stabilization |
| <b>Performers (Mass Cluster)</b>     | Innovation & Autonomy | Financial devolution, mandatory digital skills training      | Category Migration       |
| <b>Front Runners &amp; Achievers</b> | Knowledge Transfer    | Institutional peer-to-peer mentoring, model cluster creation | Excellence Replication   |

Source: Compiled by the researcher from [pai.gov.in](http://pai.gov.in).

Table No. 4 outlines the strategic policy interventions required for improving institutional delivery. The structural imbalances highlighted by the PAI index indicate that a standardized, generic policy approach will not yield optimal results for Maharashtra. Since nearly 90% of the state's panchayats sit in the intermediate 'Performer' category, the state needs to pivot toward performance-linked incentives and technical training. For the struggling 'Aspirant' group, policies must prioritize basic needs such as filling vacant local administrative posts and establishing asset registers. Meanwhile, the elite 'Achievers' should be leveraged as regional knowledge centers. Setting up formal networks where these highly successful villages guide their struggling neighbors will foster organic, sustainable progress across the state's rural network.

#### Conclusion

The comprehensive assessment of rural development in Maharashtra through the lens of the Panchayat Advancement Index framework demonstrates substantial baseline stabilization, with nearly 90% of local self-governments successfully attaining functional adequacy as 'Performers'. However, the critical bottleneck remains the transition from average compliance toward genuine governance excellence, as evidenced by the negligible percentage of 'Achievers' across the state. Persistent vulnerabilities in rural livelihood diversification, groundwater depletion, and structural gaps in qualitative gender inclusion continue to limit the overall development score. To overcome these institutional challenges, the state must move away from generalized funding allocations and adopt targeted, category-specific policy matrix

interventions. Actively building technical and administrative capacities in lagging clusters while incentivizing structural innovations in intermediate tiers will strengthen Maharashtra's Panchayati Raj system. Ultimately, this approach will ensure that local democratic decentralization successfully drives the achievement of national and global sustainable development priorities at the grassroots level.



## Acknowledgement

The author expresses sincere gratitude to Shivaji University, Kolhapur, for providing the academic environment and necessary support for carrying out this research work. The author is deeply indebted to Prof. (Dr.) M. S. Deshmukh, Professor and Head, Department of Economics, Shivaji University, Kolhapur, for his valuable guidance, insightful suggestions, constant encouragement, and constructive criticism throughout the course of this study. His expertise and motivation have been instrumental in the successful completion of this research. The author also gratefully acknowledges the Ministry of Panchayati Raj, Government of India, for making the Panchayat Advancement Index (PAI) reports and related secondary data publicly available, which formed the foundation of this study.

## Financial support and sponsorship

Nil.

## Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

## References

1. Ministry of Panchayati Raj. (n.d.). *Panchayat Advancement Index Framework*. Government of India. <https://pai.gov.in>
2. Ministry of Panchayati Raj. (2023). *Baseline Assessment Report on Panchayat Advancement Index*. Government of India. <https://panchayat.gov.in/en/pdi-committee-report-2023>
3. World Bank. (2018). *Decentralization and Rural Development*. World Bank Group. <https://openknowledge.worldbank.org>
4. United Nations Development Programme (UNDP). (2020). *The Sustainable Development Goals Report 2020: Local Governance and Sustainable Development Goals*. United Nations.
5. Ministry of Panchayati Raj. (2023). *Panchayat Advancement Index (PAI) Report 2022-23*. Government of India. <https://pai.gov.in>
6. Wikipedia. (n.d.). *List of urban local bodies in Maharashtra*. <https://en.wikipedia.org>



Original Article

# The Role of Artificial Intelligence in Reshaping Job Roles and Career Growth among IT Professionals: A Focused Study on IT Service Industry

Amol R. Vande

Research Scholar, Department of Management Studies,  
Bharati Vidyapeeth (Deemed to be) University, Pune, India

Manuscript ID:  
RIGJAAR-2026-030704

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 14-17  
July 2026

Submitted: 07 June. 2026  
Revised: 15 June. 2026  
Accepted: 10 July. 2026  
Published: 31 July. 2026

**Correspondence Address:**

Mr. Amol R. Vande  
Research Scholar, Department of  
Management Studies,  
Bharati Vidyapeeth (Deemed to be)  
University, Pune, India  
Email-[amol.vande@bharativedyapeeth.edu](mailto:amol.vande@bharativedyapeeth.edu)

Quick Response Code:



Web. <https://rlgjaar.com>



DOI: 10.5281/zenodo.21975666

DOI Link:

<https://doi.org/10.5281/zenodo.21975666>



Creative Commons



**Abstract:**

*This paper investigates how Artificial Intelligence (AI) is reshaping the roles, skill demands, and employment trends of IT professionals within the service industry. With widespread AI integration, professionals are encountering shifts in their day-to-day responsibilities, requiring a new blend of competencies. Drawing on a blend of primary survey results and secondary research, this paper examines AI's dual effect as both a catalyst for innovation and a challenge to traditional job frameworks. The findings offer insight into how individuals and organizations can align with this transformation through strategic adaptation.*

**Keywords:** Artificial Intelligence, IT Workforce, Service Industry, Job Roles, Automation, Skills Evolution, Employment Dynamics

**Introduction**

Artificial Intelligence (AI) has emerged as a transformative force across industries, significantly impacting how businesses operate, make decisions, and interact with customers. Among the most affected domains is the Information Technology (IT) service sector, which encompasses a wide array of functions ranging from software development and IT consulting to infrastructure management and customer support. As organizations increasingly turn to AI-driven solutions to streamline processes, enhance productivity, and reduce operational costs, the roles and responsibilities of IT professionals are undergoing a fundamental transformation. The adoption of AI technologies in the service industry is driven by their ability to process vast amounts of data, learn from patterns, and perform complex tasks with minimal human intervention. Whether through robotic process automation (RPA) that accelerates repetitive workflows or machine learning algorithms that power predictive analytics, AI is becoming indispensable in delivering faster, smarter, and more scalable IT services. These advancements are reshaping traditional job functions, creating new roles, and necessitating a significant shift in workforce skills. For IT professionals, this AI revolution presents both opportunities and challenges. On one hand, AI enables automation of mundane tasks, allowing professionals to focus on more strategic and creative endeavors. On the other hand, it introduces uncertainty regarding job security, the relevance of existing skills, and the pace of change. As AI technologies continue to mature, there is an urgent need for professionals to upskill and for organizations to reimagine workforce strategies to remain competitive in the evolving landscape. This research delves into the multi-dimensional impact of AI on IT professionals in the service sector. It seeks to explore the nature and extent of these changes, the preparedness of professionals and organizations, and the strategies required to ensure a smooth transition. By combining empirical data with in-depth analysis, the study aims to contribute to a more nuanced understanding of how AI is influencing the human side of technological progress in one of the world's most dynamic industries.

**Creative Commons (CC BY-NC-SA 4.0)**

*This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.*

**How to cite this article:**

Vande, A. R. (2026). The Role of Artificial Intelligence in Reshaping Job Roles and Career Growth among IT Professionals: A Focused Study on IT Service Industry. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 14–17. <https://doi.org/10.5281/zenodo.21975666>



### Study Objectives

1. Examine the scope and extent of AI adoption in the IT service industry.
2. Assess how AI is influencing job profiles and work environments.
3. Explore the new skills that are becoming essential for IT professionals.
4. Identify major obstacles and opportunities associated with AI implementation.
5. Provide strategic recommendations for managing change effectively.

These objectives are intended to provide a holistic understanding of the impact of AI on IT professionals, specifically focusing on those employed in the dynamic service sector. The study also aims to create actionable insights for employees, employers, and policymakers.

### Research Methodology

This study utilizes a mixed-method approach, incorporating both qualitative and quantitative data to gain a comprehensive understanding of the subject matter.

**Research Approach:** The approach is both descriptive and analytical, aiming to explore cause-effect relationships and perceptions surrounding AI's impact. It facilitates an understanding of trends, practices, and transformations occurring due to AI implementation in IT services.

#### Data Collection:

##### Primary data:

1. Collected via structured questionnaires and semi-structured interviews with 200 IT employees across major firms including Infosys, TCS, Wipro, Accenture, and HCL. The questionnaire covered aspects like job roles, skill development, and attitudes toward AI.
2. **Secondary data:** Gathered from credible sources such as academic journals, industry whitepapers

(NASSCOM, McKinsey, Deloitte), and data platforms like Statista and World Economic Forum.

3. **Sampling:** Stratified random sampling was adopted to ensure representation from different job levels—entry-level engineers, team leads, project managers, and domain experts.
4. **Analysis Tools:** Quantitative data was analyzed using SPSS and Excel for statistical testing and visualization. Qualitative responses were coded and categorized using NVivo to identify recurring themes, sentiments, and concerns.

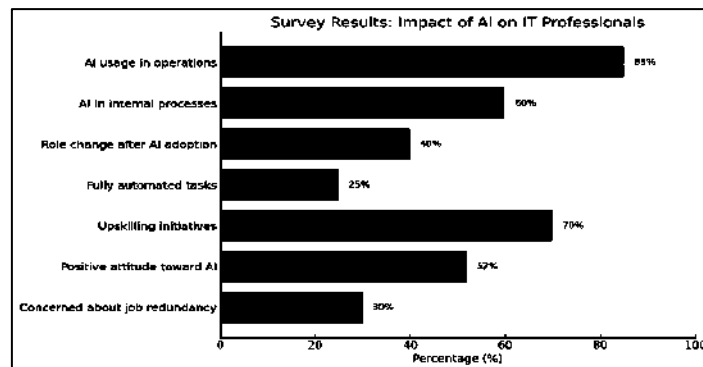
### Literature Overview

The existing literature provides a robust foundation for understanding how AI is influencing IT professionals. According to the McKinsey Global Institute (2023), up to 30% of global work tasks could be automated by 2030. Automation is primarily driven by AI's capabilities in data analysis, prediction, and decision-making support. Within the Indian IT landscape, the adoption of AI is accelerating. NASSCOM (2024) highlights that over 70% of service-oriented IT firms have deployed AI applications in areas such as system monitoring, virtual assistance, and knowledge management. Chatbots, intelligent code review tools, and AI-driven ticketing systems are some of the prominent innovations. Deloitte (2023) notes a paradigm shift in workforce expectations—60% of IT professionals expect a significant change in their job profiles. Emerging roles like AI solution architects, prompt engineers, and data ethicists represent the future. Academic sources also emphasize the critical need for ethical and social awareness among AI practitioners. The literature suggests that technical excellence must be balanced with ethical governance to ensure fair and responsible use of AI.

### Data Analysis and Insights

Table 1: Summary of Survey Responses from IT Professionals

| Category                       |                                              | Key Metrics | Percentage /Count |
|--------------------------------|----------------------------------------------|-------------|-------------------|
| AI usage in operations         | Incident response, cloud automation          |             | 85%               |
| AI in internal processes       | Onboarding, task allocation, documentation   |             | 60%               |
| Role change after AI adoption  | Significant change in job responsibilities   |             | 40%               |
| Fully automated tasks          | Logging, ticket classification               |             | 25%               |
| Upskilling initiatives         | Enrolled in AI skill programs                |             | 70%               |
| Positive attitude toward AI    | Growth and innovation potential              |             | 52%               |
| Concerned about job redundancy | Fear of job loss or obsolescence             |             | 30%               |
| Major barriers                 | Skill mismatch, resistance, lack of training |             | 60%, 45%, 38%     |



These insights clearly outline the widespread integration of AI and the corresponding professional implications.

### AI Deployment in IT Services

AI is now a central feature in IT service workflows:

1. 85% of organizations surveyed reported using AI in operational areas such as incident response, cloud automation, and customer service.
2. 60% indicated AI usage in internal processes like employee onboarding, task allocation, and documentation.
3. AI's presence is clearly redefining how service delivery is conceptualized and executed.

### Changes in Professional Roles

Job responsibilities are being restructured:

1. 40% of employees noted substantial shifts in their roles since AI integration.
2. 25% stated that repetitive tasks like logging and ticket classification were now fully automated.
3. 15% experienced job realignment, including retraining or redeployment to AI-supportive roles.

This shift has led to the creation of niche roles in AI governance, data annotation, and LLM (Large Language Model) integration.

### Evolving Skill Demands

AI has triggered an upskilling wave:

1. 70% of respondents are enrolled in AI skill enhancement programs.
2. Areas of focus include Python, machine learning, data visualization, and ethical AI.
3. There is a growing trend toward acquiring interdisciplinary knowledge involving AI and business strategy, legal compliance, and UI/UX design.

This reflects a transition from purely technical to strategically informed professional profiles.

### Attitudes toward AI

Employee sentiment is mixed:

1. 52% view AI as a growth enabler, especially for tasks requiring innovation.
2. 30% express concerns over job redundancy.
3. 18% are undecided, reflecting a knowledge gap and lack of clarity in communication from employers.

This indicates a need for structured change communication and transparent career mapping.

### Key Obstacles Identified

Several barriers hinder successful AI adoption:

1. 60% identified a misalignment between existing skills and emerging technological needs.
2. 45% reported organizational inertia and employee resistance to transitioning.
3. 38% cited inadequate support mechanisms, including mentorship and learning infrastructure.

These findings point to a need for holistic digital transformation strategies that prioritize human adaptability.

### Summary of Findings

The findings illustrate that AI is both disrupting traditional IT roles and opening new avenues for growth. While automation threatens some job categories, it also enables the emergence of higher-value roles. The primary challenges include skill mismatches, employee apprehension, and lack of structured support.

Upskilling, reskilling, and redefinition of job roles are crucial. Organizations that proactively address these issues are likely to harness AI's full potential while maintaining workforce resilience.

### Recommendations

#### For IT Professionals:

1. Prioritize continuous learning with a focus on AI technologies.
2. Engage in communities of practice and cross-functional projects.
3. Cultivate soft skills to navigate complex human-AI collaboration environments.

#### For Employers:

1. Invest in dynamic training programs and adaptive learning systems.
2. Foster a growth mindset and innovation culture.
3. Create transition frameworks with clear career progression pathways.

#### For Policy Makers and Industry Leaders:

1. Collaborate with academia to modernize curricula.
2. Launch national-level AI skilling initiatives.
3. Encourage responsible AI deployment through ethical standards and compliance frameworks.

### Conclusion

AI is not merely a tool but a paradigm shift in how the IT service industry functions. It is redefining workflows, skill requirements, and job expectations. While it introduces



challenges, it also presents vast opportunities for innovation and efficiency.

The future of IT professionals depends on their ability to evolve alongside AI. Organizations, too, must commit to human-centric digital transformation. With strategic alignment and adaptive learning, AI can serve as a co-pilot in reshaping the service sector into a more agile, intelligent, and inclusive domain.

#### Acknowledgement

The successful completion of this research paper would not have been possible without the guidance, encouragement, and support of many individuals and organizations. I express my sincere gratitude to my research guide and faculty members of the Department of Management Studies, Bharati Vidyapeeth (Deemed to be) University, Pune, for their invaluable guidance, insightful suggestions, and continuous encouragement throughout this research work. I am deeply thankful to the IT professionals who participated in the survey and interviews. Their valuable responses, experiences, and cooperation greatly contributed to the successful completion of this study.

#### Financial support and sponsorship

Nil.

#### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### References

1. Brynjolfsson E, Li D, Raymond LR. Generative AI at Work. National Bureau of Economic Research Working Paper No. 31161; 2023. World Economic Forum. The Future of Jobs Report 2025. Geneva: World Economic Forum; 2025.
2. OECD. How is AI Changing the Way Workers Perform their Jobs and the Skills they require? OECD Publishing, Paris; 2024.DOI:10.1787/8dc62c72-en.
3. OECD. Employment Outlook 2023: Artificial Intelligence and the Labour Market. Paris: OECD Publishing; 2023.
4. Lane M. Who Will Be the Workers Most Affected by AI? OECD Artificial Intelligence Papers No. 26. Paris: OECD Publishing; 2024.DOI:10.1787/14dc6f89-en.
5. Bankins S, Hu X, Yuan Y. Artificial intelligence, workers, and future of work skills. Current Opinion in Psychology. 2024;58:101828DOI:10.1016/j.copsyc.2024.101828.
6. Green A. Artificial Intelligence and the Changing Demand for Skills in Canada: The Increasing Importance of Social Skills. OECD Artificial Intelligence Papers No.17. Paris: OECD Publishing; 2024.

#### Reports:

1. McKinsey Global Institute. (2023). *the Future of Work in the Age of AI*.
2. NASSCOM. (2024). *AI Adoption in Indian IT Industry*.
3. Deloitte. (2023). *Global Human Capital Trends*.
4. Statista. (2024). *AI Adoption Rates Worldwide*.
5. World Economic Forum. (2023). *Reskilling Revolution Report*.



Original Article

# Green Debentures: A Financial Expansion for Sustainable Evelopment

Bhairawanth D. Jadhav

Assistant Professor, Department of Commerce,  
Dr. Babasaheb Ambedkar Mahavidyalaya, Aundh Pune-67

Manuscript ID:  
RIGJAAR-2026-030705

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 18-22  
July 2026

Submitted: 07 June. 2026

Revised: 15 June. 2026

Accepted: 10 July. 2026

Published: 31 July. 2026

**Correspondence Address:**

Mr. Bhairawanth D. Jadhav  
Assistant Professor, Department of  
Commerce,  
Dr. Babasaheb Ambedkar Mahavidyalaya,  
Aundh Pune-67  
Email- [shineride2396@gmail.com](mailto:shineride2396@gmail.com)

Quick Response Code:



Web. <https://rlgjaar.com>



DOI: 10.5281/zenodo.21975947

DOI Link:

<https://doi.org/10.5281/zenodo.21975947>



Creative Commons



## Abstract:

*In the present era of rapid economic growth and environmental challenges, sustainable development has become a crucial objective for governments, financial institutions, industries, and investors. The increasing concerns related to climate change, environmental degradation, and greenhouse gas emissions have created the need for innovative financial mechanisms that support environmentally responsible growth. Among various instruments of green finance, green debentures, also known as green bonds, have emerged as an effective source of financing for sustainable development initiatives. Green debentures are debt instruments issued to mobilize funds for projects that provide environmental benefits, including renewable energy, clean technology, sustainable infrastructure, energy efficiency, waste management, and climate adaptation activities. These instruments enable investors to support environmentally friendly projects while generating financial returns. By channelizing capital towards sustainable initiatives, green debentures establish a connection between financial development and environmental conservation. The growing significance of green debentures contributes to achieving the United Nations Sustainable Development Goals (SDGs) by encouraging responsible investment, sustainable business practices, and innovation in climate solutions. They also motivate organizations to adopt cleaner technologies, reduce carbon emissions, and improve transparency in financial reporting. Therefore, green debentures represent an important advancement in sustainable finance. Their effective implementation, regulatory support, and wider acceptance can play a significant role in promoting green investments, strengthening environmental resilience, and creating a balanced approach towards economic growth and ecological sustainability.*

**Keywords:** Finance, Innovation, Sustainable Development, Green Debentures

## Introduction:

In the age of technology, in every corner of society, there is a major focus on the environment and its protection. Many times; speak only about development and innovation rather than the due care of the environment. Every establishment requires development, with the new age. But all these things are possible after the proper care of the environment; because we can't live without a healthy environment around us and that is our prime need in this age of technology. We need pure oxygen, water, soil and so many things, which are part and parcel of our life. Besides that more emphasised the sustainable development in this modern age. So, sustainable development becomes more significant, this is the milestone of development. Many times, we expect a 360-degree development of society, but there is a need for due care of resources. Most of the resources are limited and require the careful use and management of protection. projects, such as renewable energy, sustainable infrastructure, and green buildings. In modern times, they are considered a pillar of sustainable development. Most of the developed and developing countries are already adopting such instruments to invest in infrastructure development and environmental protection. The need for large-scale capital investment in renewable energy projects such as wind power, solar power, biomass power, hydropower engineering design, and construction is met with the help of green debentures.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Jadhav, B. D. (2026). Green Debentures: A Financial Expansion for Sustainable Evelopment. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 18–22. <https://doi.org/10.5281/zenodo.21975947>



New machinery, electrical systems, and green transport projects that promote public clean transport services including electric transport system infrastructure are being considered as such projects have a positive impact on the environment and society and will create a future sustainable development network, reduce energy consumption, and provide more efficient and clean energy. Another important factor is the improvement of water supply infrastructure to increase the efficiency and availability of water distribution systems with the help of green finance. Such investments focus on projects that address climate change, conserve water, protect biodiversity, promote renewable energy, and improve energy efficiency. Today, one more financial instrument is taken into consideration as a resource for sustainable development and that is green debentures. Green debentures are a type of debt instrument that is specifically used to finance environmentally friendly

### Research Methodology

This study has used the descriptive method to obtain secondary data. Facts and information have been collected from various books, magazines, research articles, e-journals, reports, and websites.

#### Objectives of the Study

1. To study the concept of sustainable development.
2. To focus on the use of green bonds/debentures for sustainable development.

#### Green Debentures?

Green Debentures are debt instruments specifically used to finance environmentally friendly projects, such as renewable energy, sustainable infrastructure, and green buildings.

### Characteristics

**Environmental Impact:** Green Debentures support projects that reduce greenhouse gas emissions, promote sustainable development, and protect the environment. **Exclusive Use of Funds:** Funds raised through Green Debentures are used exclusively for environmentally friendly projects. **Guaranteed Income:** Green Debentures offer a fixed rate of return, providing investors with predictable income. **Minimal Risk:** Green Debentures are generally backed by strong credit ratings, which reduces the risk of default.

### Offering Process

**Project Identification:** The issuer identifies environmentally friendly projects that meet the eligibility criteria for green debentures.

**Affirmative Efforts:** The issuer conducts the necessary due diligence on the project, including environmental impact assessment and financial feasibility study. **Rating Process:** The issuer obtains a credit rating for the green debentures from a recognized credit rating agency. **Final Issuance:** The green debentures are issued by the issuer, after which they are subscribed by investors within a specified period. **Listing of Debentures:** Finally, listed green debentures are registered on a recognized stock exchange.

### Classification of Green Debentures

**Senior Secured Green Debentures:** Such debentures have a higher claim on assets and cash flows, which provides investors with a lower-risk investment option. **Subordinated**

**Green Debentures:** These are the exact opposite of the above debentures and have a lower claim on assets and cash flows. Moreover, they provide investors with a higher-risk investment option. **Convertible Green Debentures:** As the name suggests, these debentures can be easily converted into equity, which gives investors the potential for capital appreciation. **Green Masala Bonds:** Such bonds are issued by Indian companies to raise funds for green projects in foreign markets.

### Implementation Report

Green Debentures are a way to develop any project for sustainable development within a specific framework. Through which each entity has set the responsibility to commit to the welfare of society. It is mandatory for projects that are run and implemented for the society to report in the following context. **Annual Report:** On the use of proceeds, project implementation, and environmental impacts, the issuer provides an annual report. **Change Report:** On the environmental benefits of the project, carbon emission reduction, and renewable energy generation, the issuer provides a report. **Auditor's Report:** On the use of proceeds and project implementation, the issuer provides an auditor's report.

### Market Insights

**Growing Demand:** The demand for green debentures is increasing mainly due to the growing interest of investors in environmentally friendly investments. **Growing Issuance:** The issuance of green debentures is increasing, with more and more companies and governments using this instrument to finance green projects. **Actual Standardization:** Due efforts are being made to standardize the issuance and reporting of green debentures, thereby increasing transparency and credibility.

### Public Benefits

1. **Environmental Protection:** Projects that reduce greenhouse gas emissions, conserve natural resources, and protect biodiversity are supported by green bonds.
2. **Job Opportunities:** Green Debentures can create jobs in renewable energy, green infrastructure, and sustainable agriculture.
3. **Public Health Improvement:** Projects that improve air and water quality are financed by green debentures, thereby reducing the negative impacts of pollution on public health.
4. **Growth of the Economic Ecosystem:** Green debentures can shape economic growth by financing projects that promote sustainable development and reduce dependence on fossil fuels.
5. **Environmental Benefits:** Green debentures contribute to projects that promote sustainable development and reduce environmental damage.
6. **Structured Attractive Returns:** Green debentures are characterized by structured competitive returns, making them an attractive investment option.
7. **Minimal Risk:** Green debentures are generally low-risk investment options, providing investors with a secure source of income.



8. Diverse Investment Opportunities: Green debentures provide investors with a new opportunity to diversify their portfolios while supporting environmentally friendly projects.

#### Benefits for Investors

1. Good Returns: Green Debentures accelerate investment by offering attractive returns.
2. Minimal Risk: Green Debentures are a low-risk source of income for investors.
3. Portfolio Diversification: Green Debentures are a prime opportunity for investors to diversify their portfolios and support environmentally friendly projects.
4. Enhancing Environmental Value: Today, green debentures promote projects that promote sustainable development and reduce environmental damage.

#### Benefits for Issuers

1. Early Capital Generation: Green Debentures can provide a large amount of capital for environmentally friendly projects.
2. Affordable Funding: Green Debentures provide issuers with affordable funding options with lower interest rates compared to traditional debt instruments.
3. Enhanced Reputation: Green Debentures can enhance the reputation of issuers by demonstrating their commitment to environmentally responsible practices.
4. Legal Compliance: Green Debentures can help issuers comply with environmental regulations and standards

#### Opportunities

1. Growing Demand: There is a need to increase the volume of green debentures to meet the growing demand for sustainable development finance.
2. Standardized Format: The standardized format of green debentures is to ensure transparency and credibility to increase investment in green finance.
3. Educating Investors: The education of investors on the benefits of green debentures is important to increase demand.
4. Government Support and Encouragement: Government support and incentives can help to drive the growth of the green debenture market

#### Limitations

1. Incorrect standardization: Incorrect standardization of green debentures can lead to over- or under-capitalization through green finance.
2. Lack of standardization: Lack of standardization in green debentures can create confusion among investors and issuers.
3. High costs: There may be high upfront costs to issue green debentures, which may include rating fees and due diligence.
4. Liquidity constraints: Green debentures may have liquidity constraints, making it difficult for investors to exit their investments.
5. Risk of misrepresentation: Issuers may misrepresent the environmental benefits of their projects, which may reduce the credibility and transparency of green debentures.

#### Pollution Control

1. Along with all the above, another benchmarking for social welfare through green debentures is the focus on financing various pollution control projects-
2. Air Pollution: Various international agencies and organizations have noted that bad air quality experienced many times. Especially such an atmosphere more experienced in metro cities. Because of that, everyone needs quality air for a healthy life. Solution for the quality air to establish air filtration projects. Projects that are set up to reduce air pollution from industrial sources, vehicles, and other emissions for quality air are funded by green debentures.
3. Water Pollution: One of the major problems facing mankind that water pollution, which can be solved through projects that reduce water pollution from industrial, agricultural, and domestic sources. Green debentures help to Development of these projects.
4. Waste Management: In recent times, metropolitan cities have been plagued by such problems. Hence, there is a need to finance projects that promote sustainable waste management practices including recycling, composting, and waste-to-energy conversion. Such projects require a large amount of funds and green debentures are considered as a suitable source for that.
5. Renewable Energy: Today, not only has every country started considering the limitations of natural resources but most of the developed and developing countries are implementing new ways to overcome such crises. In select countries, green debentures are used to finance projects that promote renewable energy sources such as solar, wind, and hydroelectricity to reduce dependence on fossil fuels.

#### Quality Oxygen Projects

1. Green Debentures can finance initiatives that promote quality oxygen production, including: achieving the goal of protecting and restoring natural oxygen sources. Developing and implementing oxygen-enhancing technologies, raising awareness, and educating the public.
2. Afforestation and Reforestation: Green Debentures finance projects such as planting trees and restoring forests to increase oxygen production and reduce carbon dioxide. Such projects play a key role in shaping human life, controlling man-made pollution, and balancing environmental and social well-being.
3. Redevelopment of Urban Green Spaces: Recently, green spaces in urban areas have been developed with the help of green debentures. This includes projects that create urban green spaces such as parks and gardens to improve air quality and promote pure oxygen production.
4. Technology for Quality Oxygen: Pure oxygen is a necessity for everyone in the world, but it is becoming scarce due to excessive pollution. To overcome these problems, many countries use green debentures to finance projects that develop and implement oxygen-



enhancing technologies such as oxygen generators and air purifiers.

5. **Agricultural sustainability:** Thus the sustainable agriculture approach has become very important in modern times. This is because the use of chemical fertilizers has increased greatly and has soil health. Developing good agricultural ecosystems and improving soil health. Financing projects that promote sustainable farming practices such as organic farming and agroforestry can reduce the use of artificial fertilizers and increase soil health. This includes maintaining and improving soil health, conserving water, reducing pollution, and using systems that promote biodiversity.

#### **Funding for Sustainability**

1. **Sustainability** is the ability to maintain processes, activities, or systems without wasting or damaging natural resources and supporting the environment, social structure, and human well-being. Green bonds play a key role in establishing such a system and financing sustainable development projects that benefit society, such as:
2. **Sustainable Energy:** Renewable energy projects such as solar, wind, and hydropower are financed through green bonds to reduce dependence on fossil fuels. In the early days, such energy projects were not developed due to a lack of infrastructure. Nowadays, infrastructure development is possible through such financing bonds.
3. **Eco-friendly Infrastructure:** In this competitive era, every country considers sustainability through effective infrastructure. For this, infrastructure projects such as green buildings, sustainable transportation systems, and eco-friendly water management systems are funded through green bonds
4. **Agri-Sustainability:** Most developed and developing countries are moving towards sustainable agriculture. This change is a milestone in the agricultural sector to maintain water management and soil health. Accordingly, green debentures play a key role in financing sustainable agricultural projects such as organic farming, permaculture, and agroforestry to promote environmentally friendly farming practices.
5. **Waste Management:** Green debentures fund waste management projects such as recycling facilities, composting plants, and waste-to-energy plants to reduce waste and promote sustainable waste management practices. Such projects require a large amount of capital and are raised through green debentures.

#### **Outline of the Structured Green Bond**

The structured green bond market is an important innovation for the bond market. Packaging debt into various structures allows investors to better tailor their green priorities and investment exposure to their long-term goals. Structured green bonds can be public or private positions, which can be tailored to the needs of investors. Such innovation reflects the evolving nature of the market to meet the demands of existing investors and also increases

the potential for future growth. Green bonds are bonds that have a specific rate of return and are reserved for projects with environmental benefits to facilitate the flow of capital for low-carbon and climate-friendly development. A key feature is that green bonds are not used to fund green institutions, but rather to fund green assets and projects. Municipalities, corporations, multilateral development banks, and cities issue green bonds to finance projects such as clean energy and water projects, sustainable land use, low-carbon transportation, and energy-efficient buildings. Annual issuance of green bonds doubled between 2013 and 2015. The market has become increasingly diversified, with new issuers issuing in a variety of currencies and countries.

#### **Growing Market**

Green bonds are now being seen as a means of raising capital to meet the mitigation and adaptation targets set out in Nationally Determined Contributions (NDCs). While the focus on social or sustainable bonds has been temporary amid the risks and uncertainties of the global health crisis, green bonds have always been prominent. Achieving this ambitious goal depends on the public and private sectors committing to increasing levels of green finance. Many governments are using this as an opportunity to build a green fund recovery. There were fears that COVID-19 could stall progress in the fight to mitigate climate change. The German Treasury decided in September 2020 to raise €6.5 billion in 10-year green bonds, which were expected to set a benchmark for assessing other green transitions. Several European leaders, including the German Chancellor, have signaled that they will adopt a green growth strategy. Private investment will have to be regulated to regulate the coming waves of public finance. The green bond market has been growing strongly since the World Bank issued the world's first green bond in November 2008. In line with the market growth, the market is becoming more diversified as bonds issued under sustainability, SDG and social bonds enter the market. Green bonds reached a record high in 2019, with total issuance reaching \$258.9 billion. The coronavirus initially threatened the progress of the green bond market, with green bond issuance halted at the first peak of the COVID-19 crisis. In March 2020, global issuance fell to \$5 billion, compared to \$18 billion a month earlier. Total issuance for 2020 is forecast to exceed \$350 billion. Effective regulatory and supervisory frameworks will strengthen and boost the momentum of the green bond market. The green bond market is mixed in terms of structure, which offers more opportunities for financing sustainability.

#### **Conclusion**

In this era of economic transformation and environmental challenges, green debentures have emerged as a key financial instrument linking capital markets to sustainable development. By channeling funds into renewable energy, green infrastructure, pollution control, and biodiversity conservation, green debentures help societies balance development with environmental stewardship. This study shows that green debentures not only support projects that align with the United Nations Sustainable Development Goals (SDGs) but also offer tangible benefits to investors



and issuers – from predictable returns and portfolio diversification to enhanced corporate reputation and environmental compliance. Moreover, their ability to mobilize large amounts of capital at affordable prices makes them particularly valuable for developing economies aiming to sustainably modernize infrastructure. Despite these advantages, challenges such as high issuance costs, liquidity constraints, lack of universal standardization, and the risk of greenwashing remain significant barriers to widespread adoption. These challenges need to be addressed through standardized frameworks, transparent reporting, government incentives, and investor education to strengthen trust in the green finance ecosystem and encourage broad participation. In short, green debentures are not just a financial product; they represent a commitment to a low-carbon, resilient future. Their growing adoption reflects an encouraging shift in financial markets toward prioritizing long-term environmental and social well-being over financial returns. By continuing to scale up innovation and green finance, policymakers, businesses, and investors can collectively contribute to creating a more sustainable and prosperous world.

#### Acknowledgement

I express my sincere gratitude to all those who have directly and indirectly contributed to the successful completion of this research paper titled "Green Debentures: A Financial Expansion for Sustainable Development." I am deeply thankful to the Principal of Dr. Babasaheb Ambedkar Mahavidyalaya, Aundh, Pune, for providing the academic environment and institutional support necessary to carry out this study.

Financial support and sponsorship

Nil.

Conflicts of interest

**The authors declare that there are no conflicts of interest regarding the publication of this paper.**

#### Reference & Readings

1. United Nations. (2015). *Transforming our world: The 2030 Agenda for Sustainable Development*. United Nations General Assembly. <https://sdgs.un.org/2030agenda>
2. World Bank. (2015). *What are green bonds?* World Bank Group. <https://www.worldbank.org>
3. Climate Bonds Initiative. (2017). *Green bond highlights 2017*. Climate Bonds Initiative. <https://www.climatebonds.net>
4. OECD. (2017). *Mobilising bond markets for a low-carbon transition*. Organisation for Economic Co-operation and Development. <https://www.oecd.org>
5. Flammer, C. (2021). Corporate green bonds. *Journal of Financial Economics*, 142(2), 499–516. <https://doi.org/10.1016/j.jfineco.2021.01.004>
6. Banga, J. (2019). The green bond market: A potential source of climate finance for developing countries. *Journal of Sustainable Finance & Investment*, 9(1), 17–32. <https://doi.org/10.1080/20430795.2018.1498617>
7. International Capital Market Association (ICMA). (2021). *Green bond principles: Voluntary process guidelines for issuing green bonds*. ICMA. <https://www.icmagroup.org>
8. Asian Development Bank. (2021). *Green finance strategies for sustainable development in Asia*. Asian Development Bank. <https://www.adb.org>
9. Reserve Bank of India. (2022). *Climate risk and sustainable finance*. Reserve Bank of India. <https://www.rbi.org.in>
10. Securities and Exchange Board of India (SEBI). (2022). *Framework for issuance and listing of green debt securities*. Securities and Exchange Board of India. <https://www.sebi.gov.in>
11. Climate Bonds Initiative. (2023). *Green bond market summary 2023*. Climate Bonds Initiative. <https://www.climatebonds.net>
12. International Energy Agency (IEA). (2023). *World energy investment 2023*. International Energy Agency. <https://www.iea.org>

#### Websites:

<https://www.orfonline.org/marathi/research/climate>  
<https://www.ifc.org/content/dam/ifc/doc>  
<https://dea.gov.in/sites/default/files/Framework>  
<https://www.ratch.co.th/storage/content/investor-relations/downloads/green-debentures>



Original Article

# Non-Performing Loans in India: A Comparative Study of Public and Private Sector Banks.

Surya N1, Dr. Manoj Kumara N V2

1 Research Scholar, 1 Department of Management Sciences

2 Associate Professor & Research Guide Maharaja

Institute of Technology Mysore, Mandya, India

Manuscript ID:  
RIGJAAR-2026-030706

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 23-28  
July 2026

Submitted: 07 June. 2026

Revised: 15 June. 2026

Accepted: 10 July. 2026

Published: 31 July. 2026

Correspondence Address:

Surya N

Research Scholar, 1 Department of  
Management Sciences

Email: [suryan86181122@gmail.com](mailto:suryan86181122@gmail.com)

Quick Response Code:



Web: <https://rlgjaar.com>



DOI: 10.5281/zenodo.21976626

DOI Link:

<https://doi.org/10.5281/zenodo.21976626>



Creative Commons



## Abstract:

*Non-Performing Loans (NPLs) remain a critical challenge to the stability, profitability, and efficiency of the Indian banking sector. This study aims to conduct a comparative analysis of NPLs in selected public and private sector banks in India, with the primary purpose of examining the patterns and causes of NPLs and evaluating the effectiveness of banking reforms and credit policy measures in reducing NPL levels. The study is based on secondary data collected from the Money control database and adopts a quantitative research methodology. Purposive sampling was employed to select representative public and private sector banks for analysis. Data were analysed using SPSS software, applying comparative analysis, correlation, and Analysis of Variance ANOVA techniques to assess differences and relationships among key variables related to NPL performance. The findings provide insights into the variations in NPL trends between public and private sector banks and highlight the role of regulatory reforms, credit monitoring mechanisms, and policy interventions in improving asset quality. The study contributes to the existing literature by offering empirical evidence on the effectiveness of NPL management strategies and banking reforms in India. Furthermore, the results may assist policymakers, banking professionals, and researchers in formulating more effective credit risk management practices and strengthening the overall resilience of the banking sector.*

**Keywords:** Non-Performing Loans (NPLs), Public Sector Banks, Private Sector Banks, Banking Reforms, Credit Risk Management, Asset Quality, Financial Stability, India.

## Introduction

The banking sector plays a crucial role in promoting economic growth by providing credit to individuals and businesses. However, the increasing level of Non-Performing Loans (NPLs) has emerged as a major concern for banks worldwide, particularly in developing economies such as India. NPLs reduce bank profitability, weaken financial stability, and limit the availability of funds for productive investments. In recent years, factors such as economic slowdowns, corporate defaults, and global financial uncertainties have contributed to the rise of stressed assets in the banking sector. As a result, effective NPL management has become a key priority for regulators and financial institutions. The Indian banking industry has witnessed significant reforms aimed at strengthening credit risk management and improving asset quality. Understanding the behaviour of NPLs is therefore essential for ensuring sustainable banking operations and economic development. In today's context, the study of NPLs has gained greater importance due to rapid changes in the financial environment, digital lending practices, and evolving regulatory frameworks. Public and private sector banks differ in their lending patterns, risk management strategies, and recovery mechanisms, making a comparative analysis highly relevant. The implementation of measures such as the Insolvency and Bankruptcy Code (IBC), stricter credit appraisal systems, and enhanced monitoring mechanisms has influenced NPL trends across banks. Examining the effectiveness of these reforms provides valuable insights into the management of credit risk. Therefore, this study compares NPLs in selected public and private sector banks in India and evaluates the impact of banking reforms and credit policy measures on reducing NPLs and improving financial performance.

## Conceptual Background

Non-Performing Loans (NPLs) represent one of the most significant challenges faced by the banking sector, as they directly affect profitability, liquidity, operational efficiency, and financial stability. An NPL refers to a loan on which the borrower has failed to make interest or principal repayments for more than 90 days.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

N, S.& N V, M. K. (2026). Non-Performing Loans in India: A Comparative Study of Public and Private Sector Banks. *Royal International Global Journal of Advance and Applied Research*, 3(7(III)), 23–28. <https://doi.org/10.5281/zenodo.21976626>

High levels of NPLs indicate poor asset quality and increased credit risk, reducing a bank's ability to generate income and extend new credit. Therefore, effective management of NPLs is essential for maintaining a healthy banking system and supporting economic growth. The conceptual foundation of this study is based on Credit Risk Theory, Asymmetric Information Theory, and the Risk-Return Trade-off. Credit Risk Theory suggests that borrowers may default on their obligations, making proper credit assessment crucial for banks. Asymmetric Information Theory explains that borrowers often possess more information about their financial condition than lenders, which can result in adverse lending decisions and increased NPLs. The Risk-Return Trade-off highlights that higher returns are generally associated with higher lending risks, requiring banks to balance profitability with prudent risk management. In the Indian banking context, public and private sector banks differ in ownership structure, operational efficiency, lending practices, and risk management mechanisms. Public sector banks have historically reported higher NPL levels due to greater exposure to corporate lending, priority sector obligations, and slower recovery processes, whereas private sector banks generally maintain lower NPL ratios through stronger credit appraisal and monitoring systems. Regulatory reforms introduced by the Reserve Bank of India, including stricter provisioning norms, the Insolvency and Bankruptcy Code (IBC), and improved recovery frameworks, have played a significant role in reducing NPL levels. This study therefore provides a comparative understanding of NPL patterns and evaluates the effectiveness of banking reforms and credit policy measures in enhancing asset quality and financial stability.

### Review of Literature

Mohammad Tareq et al. (2026)<sup>17</sup> found that related-party lending significantly increases NPLs in commercial banks. Strong governance and transparency were recommended to improve asset quality. Mohammed R. M. Salem (2026)<sup>18</sup> reported that ESG practices and AI capabilities enhance lending performance through improved credit-risk discipline. The study emphasized regulatory support and long-term risk management. Firdausi Nurnuzula Afandi and Puji Endah Purnamasari (2026)<sup>13</sup> found that operational efficiency and sound credit risk management improve bank performance. Green banking practices also contributed positively, though to a lesser extent. Boniface Ohaji (2026)<sup>6</sup> revealed that stronger board structures improve credit discipline and reduce risky lending. The study highlighted governance reforms as important for banking stability. Ra'fat Jallad and Ahmad Tin (2026)<sup>24</sup> showed that higher credit risk negatively affects bank value. Mergers and acquisitions can moderate this relationship and influence performance. Faisal Abbas et al. (2026)<sup>11</sup> found that appropriate diversification strategies improve profitability and reduce risk. The authors suggested balancing diversification to maximize performance. Akantoa Bennett et al. (2026)<sup>2</sup> concluded that higher NPLs reduce profitability and financial sustainability. Effective credit monitoring and risk management were recommended. Jamal M. Shamieh and Ghada S. Albandak (2025)<sup>14</sup> found that NPAs negatively affect profitability and operational efficiency. Better credit assessment and staff training were suggested. Anthony Wood and Nakita Skinner (2018)<sup>4</sup> identified economic conditions and credit risk as key determinants of NPLs. Stronger credit evaluation and monitoring were recommended. A.V.S. Durgaprasad and Anjula Gurtoo (2025)<sup>1</sup> developed an ESG-based sustainability framework for banks. The study emphasized

transparency and long-term organizational performance. Dr. S. Kavitha and Mehta Vani Joghee (2025)<sup>10</sup> found that higher NPAs reduce bank liquidity. Strong prudential policies and NPA management were recommended. Nishchal Mittal (2025)<sup>21</sup> reported that efficient management improves recovery performance and reduces NPAs. The study stressed governance and managerial effectiveness. Anju Sebastian and Dr. Salini P (2026)<sup>3</sup> observed varying productivity growth among Kerala's private banks. Improving operational efficiency was suggested for better performance. Pandurang Rathod and Dr. Anil Tiwari (2026)<sup>22</sup> found that public sector banks experience higher NPAs due to weaker monitoring. Enhanced credit appraisal and internal controls were recommended. Namita Mane et al. (2026)<sup>19</sup> concluded that bank mergers produce mixed results on financial performance. Successful integration was identified as a key factor. Laila Memdani (2017)<sup>16</sup> found that both macroeconomic conditions and bank-specific factors influence NPL levels. Strong risk controls and sound economic policies were recommended. Anu Singh and Dr. Ajay Kumar Chaturvedi (2023)<sup>5</sup> revealed that private banks manage NPAs more effectively than public banks. Technology and strong risk management practices were major contributors. Vinay Kandpal (2020)<sup>30</sup> found that public sector banks have higher NPAs than private sector banks. Better monitoring and policy reforms were suggested. Dr. Samir and Deepa Kamra (2013)<sup>25</sup> reported that NPAs adversely affect profitability, liquidity, and solvency. Strong recovery strategies were recommended. Kajal Chaudhary and Monika Sharma (2011)<sup>15</sup> found private banks superior in efficiency and profitability. Public banks faced higher NPAs and operational challenges. Shrirang A. Deshpande and Arif Shaikh (2023)<sup>27</sup> evaluated recovery channels and found mixed success in NPA recovery. Improved legal mechanisms and monitoring were recommended. Namita Rajput and Anil Kumar Goyal (2019)<sup>20</sup> found that rising NPAs threaten banking sector stability. The study emphasized asset quality and risk management. R. Shenbagavalli et al. (2013)<sup>23</sup> highlighted strict credit appraisal and timely recovery as effective NPA control measures. Policy reforms and technology adoption were recommended. Dr. Anindita Chakraborty (2012)<sup>7</sup> found differences in employee perceptions regarding NPA management. Staff training and awareness were identified as crucial factors. Supriya Sanjay Nikam (2025)<sup>29</sup> found a significant negative relationship between NPAs and profitability. Better recovery systems and credit risk management were suggested. Shubham Gaur and Dr. Chaitali Bhattacharya (2024)<sup>28</sup> observed that SBI reported higher NPAs than ICICI Bank. Stronger risk management practices were recommended. Santosh Kumar Das (2023)<sup>26</sup> identified poor earnings management and declining loan quality as major causes of NPAs. The study suggested incorporating macroeconomic factors in future research. Fareed Ahmed (2017)<sup>12</sup> found that public sector banks have higher NPAs than private banks. Improved credit appraisal and monitoring systems were recommended. Dr. Raj Kumar Mittal and Ms. Deeksha Suneja (2017)<sup>9</sup> concluded that weak credit management contributes to higher NPAs in public banks. Stricter lending and recovery policies were suggested. Dr. Krishna Murari (2014)<sup>8</sup> found that public sector banks consistently exhibit higher NPAs than private banks. Stronger recovery mechanisms and credit assessment practices were recommended.

### Statement of the Problem

Non-Performing Loans (NPLs) remain a significant challenge in the Indian banking sector, affecting profitability, liquidity, and financial stability. Existing

studies primarily focus on financial indicators, while giving limited attention to managerial efficiency, governance practices, employee involvement, and technological factors. Furthermore, the influence of internal credit policies and operational practices on the occurrence and resolution of NPLs remains insufficiently explored. Therefore, a comprehensive study integrating financial, managerial, technological, and behavioural aspects is essential for improving NPL management and enhancing banking performance.

## 5. Objectives of the study

1. To examine the financial performance influence on reducing NPL of select banks.
2. To evaluate the Strategies of banks to improve asset quality and maintain financial stability for achieve lower NPLs.

## Research Methodology

**1 Research Method:** This study adopts a **quantitative research methodology** to examine Non-Performing Loans (NPLs) in public and private sector banks in India. It uses secondary data and focuses on NPL ratios and bank performance indicators. Comparative analysis and statistical techniques are applied to assess differences and factors influencing NPLs.

## 2 Sampling design

1. **Sampling method:** The study employs purposive sampling, where banks are selected based on their relevance to the research objectives. Banks with significant NPL exposure and adequate publicly available financial data are chosen. This method ensures meaningful analysis of NPL trends and management practices.
2. **Sampling size:** The sample consists of 10 banks, including 5 public sector banks and 5 private sector banks in India. The selected banks provide balanced representation and reliable financial data for comparison. This sample size supports effective analysis of NPL performance and banking practices.

## 3 Source of Data

The study is based entirely on secondary data collected from reliable sources, including annual reports of selected banks, publications of the Reserve Bank of India (RBI), official bank websites, and Money control. Information related to bank policies and performance was obtained from company websites, while books, research journals, and articles from Google Scholar were used to support the theoretical

framework and literature review. The use of these authentic sources ensures the reliability and validity of the analysis on Non-Performing Loans (NPLs) in Indian banks.

## 4 Tools of the Study

**Descriptive Statistics-** Descriptive statistics are used to summarize financial performance indicators and Non-Performing Loans (NPLs) using measures such as mean, standard deviation, minimum, and maximum values. This helps identify overall patterns of financial performance and NPL levels among selected banks and supports the assessment of H02.

**Correlation Analysis** – Correlation analysis examines the relationship between financial performance indicators and NPLs. It determines the strength and direction of association between variables such as ROA, ROE, profitability, and NPL ratios, helping assess whether improved financial performance is associated with lower NPLs among selected banks.

**ANOVA Analysis** – ANOVA is used to test significant differences in NPL levels based on bank strategies aimed at improving asset quality and maintaining financial stability. It evaluates whether different strategic approaches have a statistically significant impact on NPL reduction and supports the assessment of H04.

## 5 Hypotheses

1. **H0:-** There is no significant influence of financial performance on the reduction of Non-Performing Loans (NPLs) in the selected banks.
2. **H0:-** There is no significant contribution from bank strategies aimed at improving asset quality toward achieving lower NPL ratios or maintaining financial stability.

## Data Analysis and Interpretation

This section presents the analysis and interpretation of secondary data collected from Money Control for selected public and private sector banks. Statistical tools are used to examine the impact of financial performance on NPL reduction and to evaluate bank strategies aimed at improving asset quality and maintaining financial stability. The findings are discussed in line with the objectives and hypotheses of the study.

**H01 -There is no significant influence of financial performance on the reduction of Non-Performing Loans (NPLs) in the selected banks.**

**Table 7.1** DESCRIPTIVE STATISTICS

| Variables | Mean    | SD       | N  |
|-----------|---------|----------|----|
| NP        | 9771.05 | 18830.45 | 50 |
| ADV       | 75.08   | 7.49     | 50 |
| PCR       | 78.31   | 7.14     | 50 |

Source: Money control - SPSS output

. The descriptive statistics show that NP has a relatively high mean of 9771.05 with a large standard deviation of 18830.45, indicating significant variation in non-performing loans across the sample banks. ADV has a mean of 75.08 with a moderate standard deviation of 7.49, suggesting

fairly stable credit advancement levels among banks. PCR records a mean of 78.31 with a standard deviation of 7.14, indicating a consistent provisioning coverage ratio across the banks. Overall, NP exhibits high volatility compared to ADV and PCR, reflecting greater instability in loan performance

**Table 7.2**

Anova

| Table 7.2 |                |                |    |             |      |      |
|-----------|----------------|----------------|----|-------------|------|------|
| Anova     |                |                |    |             |      |      |
| Variables |                | Sum of Squares | df | Mean Square | F    | Sig. |
| GNPA      | Between Groups | 282.42         | 9  | 31.38       | 5.43 | 0.00 |
|           | Within         | 231.25         | 40 | 5.78        |      |      |



|      |                |         |    |        |       |      |
|------|----------------|---------|----|--------|-------|------|
|      | Groups         |         |    |        |       |      |
|      | Total          | 513.67  | 49 |        |       |      |
| NNPA | Between Groups | 38.80   | 9  | 4.31   | 4.97  | 0.00 |
|      | Within Groups  | 34.73   | 40 | 0.87   |       |      |
|      | Total          | 73.53   | 49 |        |       |      |
| PR   | Between Groups | 126.52  | 9  | 14.06  | 6.02  | 0.00 |
|      | Within Groups  | 93.43   | 40 | 2.34   |       |      |
|      | Total          | 219.95  | 49 |        |       |      |
| NPM  | Between Groups | 3021.88 | 9  | 335.76 | 17.26 | 0.00 |
|      | Within Groups  | 777.98  | 40 | 19.45  |       |      |
|      | Total          | 3799.86 | 49 |        |       |      |
| OP   | Between Groups | 158.21  | 9  | 17.58  | 1.31  | 0.26 |
|      | Within Groups  | 535.53  | 40 | 13.39  |       |      |
|      | Total          | 693.74  | 49 |        |       |      |
| CAR  | Between Groups | 234.23  | 9  | 26.03  | 15.51 | 0.00 |
|      | Within Groups  | 67.12   | 40 | 1.68   |       |      |
|      | Total          | 301.35  | 49 |        |       |      |

Source: Money control - SPSS output

The ANOVA results indicate significant differences among the selected banks in most of the financial performance indicators. GNPA, NNPA, PR, NPM, and CAR show statistically significant differences across groups ( $p < 0.05$ ), suggesting variations in asset quality, profitability, and capital adequacy among banks. However, OP (Operating Profit) has a p-value of 0.26, indicating no significant difference between groups. Overall, the results imply that

while most financial indicators vary significantly across banks, operating profit remains relatively consistent

**H0:- There is no significant contribution from bank strategies aimed at improving asset quality toward achieving lower NPL ratios or maintaining financial stability.**

| Table 4.2.21        |      | CORRELATIONS |      |      |      |      |      |      |      |
|---------------------|------|--------------|------|------|------|------|------|------|------|
| Variables           |      | NPM          | ADV  | PCR  | GNPA | NNPA | PR   | OP   | CAR  |
| Pearson Correlation | NPM  | 1.00         | .78  | -.02 | -.70 | -.74 | -.65 | -.58 | .78  |
|                     | ADV  | 0.78         | 1.00 | -.12 | -.54 | -.56 | -.51 | -.33 | .62  |
|                     | PCR  | -0.02        | -.12 | 1.00 | -.03 | -.10 | .01  | -.20 | -.01 |
|                     | GNPA | -0.70        | -.54 | -.03 | 1.00 | .95  | .98  | .62  | -.54 |
|                     | NNPA | -0.74        | -.56 | -.10 | .95  | 1.00 | .87  | .63  | -.54 |
|                     | PR   | -0.65        | -.51 | .01  | .98  | .87  | 1.00 | .58  | -.51 |
|                     | OP   | -0.58        | -.33 | -.20 | .62  | .63  | .58  | 1.00 | -.39 |
|                     | CAR  | 0.78         | .62  | -.01 | -.54 | -.54 | -.51 | -.39 | 1.00 |
| Sig. (1-tailed)     | NPM  |              | .00  | .45  | .00  | .00  | .00  | .00  | .00  |
|                     | ADV  | 0.00         |      | .20  | .00  | .00  | .00  | .01  | .00  |
|                     | PCR  | 0.45         | .20  |      | .42  | .24  | .47  | .08  | .47  |
|                     | GNPA | 0.00         | .00  | .42  |      | .00  | .00  | .00  | .00  |
|                     | NNPA | 0.00         | .00  | .24  | .00  |      | .00  | .00  | .00  |
|                     | PR   | 0.00         | .00  | .47  | .00  | .00  |      | .00  | .00  |
|                     | OP   | 0.00         | .01  | .08  | .00  | .00  | .00  |      | .00  |
|                     | CAR  | 0.00         | .00  | .47  | .00  | .00  | .00  | .00  |      |
| N                   | NPM  | 50           | 50   | 50   | 50   | 50   | 50   | 50   | 50   |
|                     | ADV  | 50           | 50   | 50   | 50   | 50   | 50   | 50   | 50   |
|                     | PCR  | 50           | 50   | 50   | 50   | 50   | 50   | 50   | 50   |
|                     | GNPA | 50           | 50   | 50   | 50   | 50   | 50   | 50   | 50   |
|                     | NNPA | 50           | 50   | 50   | 50   | 50   | 50   | 50   | 50   |
|                     | PR   | 50           | 50   | 50   | 50   | 50   | 50   | 50   | 50   |
|                     | OP   | 50           | 50   | 50   | 50   | 50   | 50   | 50   | 50   |
|                     | CAR  | 50           | 50   | 50   | 50   | 50   | 50   | 50   | 50   |

Source: Money control -SPSS output

The correlation analysis shows a strong relationship between NPM and CAR ( $r = 0.78$ ) and a strong positive

relationship between NPM and ADV ( $r = 0.78$ ), indicating that better financial performance is associated with higher



capital adequacy and credit advancement. GNPA and NNPA exhibit a strong positive correlation ( $r = 0.95$ ), showing that increases in gross NPAs lead to higher net NPAs, while both are negatively correlated with NPM, ADV, PR, OP, and CAR, indicating that rising NPAs reduce financial performance. PCR shows weak and insignificant

relationships with most variables, suggesting limited influence on other indicators. Overall, the results highlight that asset quality indicators are inversely related to profitability and performance measures, while capital adequacy and advancement positively support financial stability.

| Table 4.2.23 ANOVA <sup>a</sup>                        |  |                |    |             |       |
|--------------------------------------------------------|--|----------------|----|-------------|-------|
| Variables                                              |  | Sum of Squares | df | Mean Square | F     |
| Regression                                             |  | 3173.17        | 6  | 528.86      | 36.29 |
| Residual                                               |  | 626.69         | 43 | 14.57       |       |
| Total                                                  |  | 3799.86        | 49 |             |       |
| a. Dependent Variable: NPM                             |  |                |    |             |       |
| b. Predictors: (Constant), CAR, PCR, OP, ADV, PR, NNPA |  |                |    |             |       |
| Source: Money control - SPSS output                    |  |                |    |             |       |

The ANOVA results of the regression model show that the overall model is statistically significant in explaining NPM ( $F = 36.29$ ,  $p < 0.001$ ). This indicates that the combined predictors—CAR, PCR, OP, ADV, PR, and NNPA—have a significant effect on Net Profit Margin. The regression sum of squares is much higher than the residual sum of squares, suggesting that the model explains a large portion of the variation in NPM. Overall, the findings confirm that the selected financial variables significantly influence profitability performance of the banks.

#### Results and Discussions

1. The descriptive statistics show high variation in NP, indicating uneven asset quality, while ADV and PCR remain stable, reflecting consistent credit and provisioning practices.
2. ANOVA results confirm significant differences among banks in GNPA, NNPA, PR, NPM, and CAR ( $p < 0.05$ ), showing clear variation in financial performance and asset quality.
3. Operating Profit (OP) is not significantly different, indicating similar operational efficiency across banks.
4. Correlation shows a strong negative relationship between NPM and NP indicators (GNPA  $r = -0.70$ , NNPA  $r = -0.74$ ), confirming that rising NPAs reduce profitability.
5. NPM is strongly positive with ADV ( $r = 0.78$ ) and CAR ( $r = 0.78$ ), showing that lending growth and capital strength improve profitability.
6. GNPA and NNPA are highly correlated ( $r = 0.95$ ), indicating that both move together in reflecting asset quality deterioration.
7. PCR has weak and insignificant relationships with most variables, suggesting limited impact on performance and lending outcomes.
8. Regression results confirm model significance ( $F = 36.29$ ,  $p < 0.001$ ), showing that financial variables significantly explain profitability and NPL behaviour.

#### Conclusion

The study provides a comparative analysis of Non-Performing Loans (NPLs) in selected public and private sector banks in India and highlights the role of financial performance and bank strategies in managing asset quality. The findings reveal significant variation in NPL levels, profitability, and capital adequacy across banks, indicating differences in financial strength and risk management practices. The results clearly show that rising NPAs (GNPA and NNPA) negatively impact profitability, while higher advances and strong capital adequacy improve financial performance. The strong relationship between GNPA and

NNPA further confirms the close link between asset quality indicators. However, provisioning coverage ratio shows limited influence on performance outcomes. Overall, the study concludes that financial performance variables significantly influence both profitability and NPL behaviour in banks, as confirmed by the regression results. It also indicates that effective credit growth, strong capital management, and efficient risk control mechanisms are essential for reducing NPL levels and improving the financial stability of banks in India.

#### Acknowledgement

I express my sincere gratitude to my Research Guide, Dr. Manoj Kumara N. V., Associate Professor, Department of Management Sciences, Maharaja Institute of Technology Mysore, Mandya, for his valuable guidance, constant encouragement, and insightful suggestions throughout the course of this research. His expertise and continuous support have been instrumental in the successful completion of this study.

#### Financial support and sponsorship

Nil.

#### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### Bibliography

1. A V S Durgaprasad, Anjula Gurtoo. (2025). "A Taxonomy of Sustainability Indicators in the Banking Sector", *Journal of IEOM Society International*, 6(8), 66-76.
2. Akantoa Bennett, Emmanuel Opoku Marfo and Kwame Oduro Amoako. (2026). "The impact of non-performing loans on financial sustainability: Evidence from Commercial Banks in Ghana", *Journal of Research Square*, 1-18.
3. Anju Sebastian & Dr. Salini P. (2026). "Measuring Total Factor Productivity Change in Kerala's Private Banks, 2014-2024: A DEA-Malmquist Approach", *Mediterranean Journal of Basic and Applied Sciences*, 10(1), 118-131.
4. Anthony Wood, Nakita Skinner. (2018). "Determinants of non-performing loans: evidence from commercial banks in Barbados", *Journal of The Business and Management Review*, 9(3), 44-64.
5. Anu Singh, Dr. Ajay Kumar Chaturvedi. (2023). "Managing Npas in Public and Private Sector Banks: A Comparative Study of Strategies and Effectiveness", *Journal for Re Attach Therapy and Developmental Diversities*, 6(1). 2420-2424.



6. Boniface OHAJI. (2026). "Board Characteristics and Corporate Credit Policies of Quoted Deposit Money Banks in Nigeria", *Journal of Behavioural Accounting*, 2(2), 36-50.
7. Dr. Anindita Chakraborty. (2012). "Employees' Perception towards NPAs: A Comparative Study of Public Sector and Private Sector Banks", *Journal of Business Spectrum*, 1(3), 1-11.
8. Dr. Krishna Murari. (2014). "Comparative Evaluation of Non-Performing Assets of Indian Banks: A Study of Public and Private Sector Banks", *Journal of Asian Research Consortium*, 4(5), 232-247.
9. Dr. Raj Kumar Mittal & Ms. Deeksha Suneja. (2017). "The Problem of Rising Non-Performing Assets in Banking Sector in India: Comparative Analysis of Public and Private Sector Banks", *International Journal of Management, IT & Engineering*, 7(7), 384-398.
10. Dr. S. Kavitha, Ms. Mehta Vani Joghee. (2025). "Non-Performing Assets and Bank Liquidity: A Study of Indian Commercial Banks", *Journal of Advances in Consumer Research*, 2(5), 2111-2122.
11. Faisal Abbas, Mutee Ur Rehman, Umer Iftikhar. (2026). "Bank Diversification and Performance Nexus: Theoretical and Empirical Insights from South Asia", *Journal of Central Banking Theory and Practice*, Vol:1, 177-199.
12. Fareed Ahmed. (2017). "Non-Performing Assets-A Comparative Analysis of Public Sector Banks and Private Sector Banks in India", *International Journal of Research in Management, Economics and Commerce*, 07(10), 72-78.
13. Firdausi Nurnuzula Afandi, Puji Endah Purnamasari. (2026). "The Influence of Green Banking, Credit Risk, and Operational Efficiency on The Financial Performance of Conventional Banks in 2020-2023", *Journal of Golden Ratio of Auditing Research*, 6(1), 43-56. <https://doi.org/10.52970/grar.v6i1.1391>
14. Jamal M. Shamieh1, Ghada S. Albandak. (2025). "Impact of non-performing assets on the commercial banking industry: Survey evidence recommendations for practitioners", *Journal of IJRSS*, 8(6), 3402-3416.
15. Kajal Chaudhary and Monika Sharma. (2011). "Performance of Indian Public Sector Banks and Private Sector Banks", *International Journal of Innovation, Management and Technology*, 2(3), 249-256.
16. MEMDANI Laila. (2017). "Macroeconomic and Bank Specific Determinants of non- Performing Loans (NPLS) in the Indian Banking Sector", *Studies in Business and Economics*, 12(2), 125-135.
17. Mohammad Tareq, Md Ashikur Rahman, Nurun Nabi and Tasnia Shahrin Khan. (2026). "Related Party Transactions and Non-performing Loans: A Developing Country Perspective", *Journal of Research Square*, 1-19.
18. Mohammed R. M. Salem. (2026). "ESG strategic intensity and AI capability impact on risk-adjusted lending performance; mediating role of credit-risk discipline in ASEAN banks", *Journal of Salem Future Business Journal*, 12(2), 1-22. <https://doi.org/10.1186/s43093-025-00710-8>.
19. Namita Mane, Ameya Anil Patil, Ankita Harshal Deshpande and N.V. Suresh. (2026). "Post-merger performance evaluation of Indian banks: A comparative financial analysis", *Journal of Empowering Inclusive Innovation*, 756-761.
20. Namita Rajput & Anil Kumar Goyal. (2019). "Indian Banking Sector a Major Contributor to Economy: Constancy Major Concern", *International Journal of Recent Technology and Engineering*, 8(4), 11596-11608. DOI:10.35940/ijrte. D8933.118419.
21. Nishchal Mittal. (2025). "NPA Crisis and Its Resolution Focus on Management Efficiency", *Journal of IEG*, 1-25.
22. Pandurang Rathod, Dr. Anil Tiwari. (2026). "Trends, Growth, and Determinants of Non-Performing Assets: A Comparative Study of Public and Private Sector Banks in Karnataka", *International Journal of Engineering, Science and Humanities*, 16(1), 241-270.
23. R. Shenbagavalli, S. Senthil Kumar & Dr. T. Ramachandra. (2013). "A Strategy to Manage the NPAs of Public Sector Banks", *International Journal of Management*, 4(3), 01-07.
24. Ra'fat Jallad, Ahmad Tina. (2026). "Credit Risk-Bank Value Relationship: Examining M&A's Moderating Effect", *Journal of Risk Financial Management*, 19(22), 1-24. <https://doi.org/10.3390/jrfm19010022>.
25. Samir, and Deepa Kamra. (2013). "A Comparative Analysis of Non- Performing Assets (NPAs) of Selected Commercial Banks in India", *International Journal of Management*, 3(1), 68-80.
26. Santosh Kumar Das. (2023). "NPAs in India's banks: trends and determinants", *Journal of Money and Business*, 3(2), 147-158.
27. Shrirang A. Deshpande & Arif Shaikh. (2023). "The Recovery of NPAs by the Scheduled Commercial Banks in India: An Empirical Study", *Journal of KLS IMER Tatva*, Vol: 14, 16-32.
28. Shubham Gaur, Dr. Chaitali Bhattacharya. (2024). "A Review Study on Banking NPA of SBI and ICICI", *International Journal of Advanced Multidisciplinary Scientific Research*, 7(6), 85-101.
29. Supriya Sanjay Nikam. (2025). "Assessing the Relationship between Non-Performing Assets (NPAs) and Profitability of Banks in India", *Journal of Advances in Consumer Research*, 2(5), 2558-2570.
30. Vinay Kandpal. (2020). "Non-Performing Assets in India: A Critical Analysis of Public and Private Sector Banks", *Journal of Corporate Governance and Sustainability Review*



Original Article

# A Comparative Study of Equity and Debt Mutual Funds Performance in India

Shilpa M<sup>1</sup>, Dr. Manoj Kumara N V<sup>2</sup>

<sup>1</sup>Research Scholar, Guide

Department of Management Sciences

<sup>2</sup>Associate Professor & Research

Maharaja Institute of Technology Mysore, Mandya, India

Manuscript ID:  
RIGJAAR-2026-030707

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 29-35  
July 2026

Submitted: 07 June, 2026  
Revised: 15 June, 2026  
Accepted: 10 July, 2026  
Published: 31 July, 2026

Correspondence Address:  
Shilpa M  
Research Scholar, Guide  
Department of Management Sciences  
Email- [shilpam5638@gmail.com](mailto:shilpam5638@gmail.com)

Quick Response Code:



Web. <https://rlgjaar.com>



DOI: 10.5281/zenodo.21976828

DOI Link:

<https://doi.org/10.5281/zenodo.21976828>



Creative Commons



## Abstract

*Mutual funds have become one of the most preferred investment avenues for investors seeking professional fund management and portfolio diversification. The present study aims to examine the performance of selected mutual funds using appropriate risk and return indicators and to evaluate the impact of fund managers' strategies on mutual fund performance. The study adopts a descriptive research design and is based on secondary data collected from AMFI reports, mutual fund fact sheets, and other reliable financial sources. A simple random sampling technique was used to select 10 mutual fund schemes from leading asset management companies in India. The analysis covers selected equity and debt mutual funds over a specific study period. Descriptive statistics, ANOVA, Levene's Test, and One-Sample t-test were employed for data analysis using SPSS and Jamovi software. Risk and return indicators such as mean return, standard deviation, skewness, kurtosis, Sharpe Ratio, Jensen's Alpha, and Treynor Ratio were used to evaluate fund performance. The findings reveal significant differences in mutual fund performance based on risk and return measures, while the impact of fund managers' strategies on fund performance was found to be statistically insignificant. The study highlights the importance of risk-adjusted performance evaluation in mutual fund selection and provides useful insights for investors, fund managers, and financial analysts in making informed investment decisions.*

**Keywords:** Mutual Funds, Risk and Return, Sharpe Ratio, Jensen's Alpha, Treynor Ratio, Fund Managers' Strategies, Performance Evaluation.

## Introduction

Mutual funds play an important role in the modern financial system by providing investors with an opportunity to participate in capital markets through professionally managed portfolios. With increasing financial awareness and growing participation in mutual fund investments, evaluating fund performance has become essential for both investors and fund managers. In today's dynamic market environment, investors are not only concerned about returns but also about the level of risk associated with those returns. Therefore, risk-adjusted performance measures such as Sharpe Ratio, Jensen's Alpha, and Treynor Ratio have gained significant importance in assessing mutual fund efficiency. At the same time, fund managers are expected to formulate effective investment strategies to maximize returns and manage risk under changing market conditions. Understanding whether these strategies significantly influence fund performance is crucial for evaluating managerial effectiveness. This study focuses on selected mutual funds in India and examines their performance using appropriate risk and return indicators. It also evaluates the impact of fund managers' strategies on mutual fund performance. The findings of the study provide valuable insights for investors, fund managers, and policymakers in making informed investment and portfolio management decisions.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

M, S. & N V, M. K. (2026). A Comparative Study of Equity and Debt Mutual Funds Performance in India. *Royal International Global Journal of Advance and Applied Research*, 3(7(III)), 29–35. <https://doi.org/10.5281/zenodo.21976828>

### conceptual background

Mutual funds are investment vehicles that pool money from multiple investors and invest it in a diversified portfolio of securities such as equities, bonds, and money market instruments. The performance of mutual funds is generally evaluated based on the relationship between risk and return. Return represents the income or capital appreciation earned by investors, while risk refers to the uncertainty associated with achieving expected returns. Higher returns are often accompanied by higher levels of risk. Therefore, evaluating mutual fund performance requires the use of risk-adjusted measures rather than relying solely on returns. Traditional and modern performance indicators such as Sharpe Ratio, Treynor Ratio, and Jensen's Alpha are widely used to assess fund efficiency. The Sharpe Ratio measures return per unit of total risk, the Treynor Ratio evaluates return relative to systematic risk, and Jensen's Alpha measures excess return over the expected market return. Fund managers play a crucial role in selecting securities, allocating assets, and managing portfolios to achieve investment objectives. Their strategies can influence the overall performance of mutual funds through effective risk management and investment decisions. Hence, the analysis of risk, return, and fund management strategies is essential for understanding mutual fund performance and guiding investment decisions.

### Review of literature

Mishra and Singh (2025)<sup>6</sup> studied equity, debt, and hybrid mutual funds in India. The study found that equity funds generated higher returns, while debt funds provided more stable performance. Rohini and Jayanthi (2025) evaluated HDFC SIP schemes using risk-adjusted measures. The results showed that balanced funds offered stable returns with lower risk. Thomas and Wilson (2025)<sup>5</sup> analysed equity mutual funds using Sharpe, Treynor, and Jensen models. The study concluded that infrastructure and selected HDFC funds delivered strong risk-adjusted returns. Mishra and Singh (2025)<sup>6</sup> examined mutual fund performance using risk-return indicators. The findings revealed mixed performance among funds, emphasizing careful fund selection. Nandini, Aseen Babu and Srikanth (2025)<sup>8</sup> evaluated mutual funds using standard performance measures. The study found significant differences in fund efficiency based on risk-return trade-offs. South Asian Journal of Management (2008) focused on mutual fund performance evaluation. The study highlighted the importance of risk-adjusted measures for investment decisions. Mamatzakis, Babalos and Matousek studied US equity mutual funds using efficiency analysis. The results showed that fund performance varies due to risk and operational factors. Ter Horst, Nijman and de Roan (1998) evaluated Dutch mutual funds using style analysis. The study found that some funds outperformed benchmarks when investment style was considered. Aaluri et al. (2024)<sup>1</sup> examined the relationship between mutual fund growth and equity market performance. The findings indicated a positive impact of mutual fund investments on market

behavior. Saurabh Pandey (2019)<sup>18</sup> analyzed equity mutual fund schemes using risk-adjusted measures. The study found that most schemes outperformed the benchmark index. Verma and Nema (2022)<sup>23</sup> studied the growth of the Indian mutual fund industry. The results showed increasing investor participation and strong future growth potential. Shveta Singh and Dipika (2021)<sup>21</sup> examined the relationship between fund flows and performance. The study found that investors preferred funds with better past performance and lower risk. Shikha Gupta (2022)<sup>10</sup> evaluated ESG mutual funds in India. The findings revealed that ESG funds achieved steady growth and competitive returns. Zhao (2004)<sup>29</sup> reviewed dynamic mutual fund performance evaluation models. The study concluded that dynamic models provide better insights than traditional approaches. Gendron and Charkiewicz (2005)<sup>16</sup> developed a decision-support model for mutual fund selection. The findings suggested that information quality improves investment decisions. Choi and Murithi (2001)<sup>27</sup> used Data Envelopment Analysis (DEA) to evaluate mutual funds. The study identified efficient and inefficient funds based on performance rankings. Wang and Huang (2010)<sup>25</sup> applied neural network models for mutual fund evaluation. The results showed better prediction accuracy compared to traditional methods. Pendaraki and Zopounidis (2003)<sup>13</sup> used a multicriteria approach to rank mutual funds. The study found that multiple criteria provide more accurate fund evaluation. Chrétien and Kammoun (2015)<sup>22</sup> examined mutual fund performance from investor perspectives. The findings showed that performance evaluation differs across investor groups. Pangestuti, Wahyudi and Robiyanto (2017) evaluated Indonesian equity funds using several performance measures. The study found that most funds were well diversified and efficient. Alibakhshi and Sadeghi Moghadam (2016)<sup>2</sup> applied MADM techniques to rank mutual funds. The findings showed that similarity-based methods produced more reliable rankings. Zhao, Wang and Lai (2011)<sup>28</sup> evaluated Chinese mutual funds using DEA models. The study found that risk management significantly influences fund efficiency. Angelidis, Giamouridis and Tessaromatis (2013)<sup>3</sup> assessed mutual funds using self-reported benchmarks. The results emphasized the importance of appropriate benchmark selection. Chi (2013)<sup>26</sup> studied actively managed mutual funds in China. The findings indicated positive stock selection skills among several fund managers. Ilo, Yinusa and Elumah (2018)<sup>11</sup> analyzed Nigerian mutual funds using risk-adjusted measures. The study found that most funds failed to outperform the market. Mishra and Ahuja (2016)<sup>20</sup> examined mutual fund performance during bull and bear markets. The results showed stronger performance in bull markets but weak market timing ability. Vyšniauskas and Rutkauskas (2014)<sup>19</sup> compared different mutual fund performance measures. The study concluded that evaluation results vary depending on the selected ratio. CA Jyoti J. Patel (2020)<sup>4</sup> evaluated selected Indian mutual funds using risk-return analysis. The findings showed that market conditions significantly affect fund performance. Soumya Guha Deb, Banerjee and Chakrabarti (2007) analyzed

market timing and stock selection abilities. The study found limited market timing skills but some stock-picking ability. Manjunatha, Shruthi and Rajesh Kumar (2022)<sup>14</sup> compared private and public equity mutual funds. The study concluded that there was no significant difference in their performance.

### Problem Statement

Existing research gives less attention to investor behavior and the influence of macroeconomic factors such as inflation and market fluctuations. There is also insufficient focus on understanding the managerial strategies & its impact on fund performance. Due to these limitations, the current methods of evaluation may not present a complete picture. Therefore, there is a need to develop a more comprehensive and updated framework for evaluating mutual fund performance.

### Objective of the study

1. To examine the performance of selected mutual funds using appropriate risk and return indicators.
2. To evaluate the impact of fund managers' strategies on the performance of mutual funds.

### Research methodology

**1 Research method:** The study adopts a descriptive and analytical research design to evaluate the performance of selected mutual funds in India. Secondary data were collected from mutual fund reports, AMFI, and other official financial sources. Descriptive statistics were used to summarize return and risk data, while analytical tools such as Sharpe Ratio, Treynor Ratio, and Jensen's Alpha were applied for performance evaluation. The findings provide insights into mutual fund performance and support informed investment decisions.

### 2 sampling design

**Sampling method:** The study uses a simple random sampling method to select equity and debt mutual fund schemes. Each fund has an equal chance of being selected, ensuring fairness and reducing selection bias.

**Sampling size:** The study considers a sample of 10 selected mutual fund schemes, including both equity and debt funds, chosen from recognized asset management companies. The sample size is sufficient to analyze performance trends and compare fund performance.

### 3 Source of data

The study is based on secondary data collected from reliable and authentic sources. The data is obtained from mutual fund reports, official websites of asset management companies, and financial platforms such as NSE, and BSE. Additional information is gathered from research journals, articles, and published reports related to mutual funds. The data includes details on Net Asset Value (NAV), returns, and other performance indicators. These sources ensure accuracy and consistency in the analysis.

### 4 Tools of analysis

**Descriptive-Statistics** -Descriptive statistics are applied to measure average return and variability of selected mutual funds. Mean indicates the overall performance level, while standard deviation reflects risk.

**T-Test**-The t-test is used to compare the results obtained from traditional and modern evaluation models. It identifies whether there is any significant difference between the two methods of evaluation.

**ANOVA**- ANOVA is a statistical tool used to determine whether there are significant differences between the mean values of two or more groups. It helps identify whether variations in performance are due to actual differences or random chance.

### 5 Hypothesis of the study

**H<sub>0</sub>:** There is no difference in mutual fund performance when evaluated using risk and return indicators.

**H<sub>0</sub>:** There is no impact of fund managers' strategies on the performance of mutual funds.

**6. Data Analysis and Interpretation.** This chapter presents the analysis and interpretation of data collected from selected equity and debt mutual funds in India. The study evaluates fund performance using NAV data, returns, risk measures, and risk-adjusted performance indicators. Statistical tools such as descriptive statistics, correlation analysis, ANOVA, and t-tests are applied to analyze the data. The findings help in understanding the impact of risk, return, macroeconomic factors, and fund management strategies on mutual fund performance.

**Objective:** To examine the performance of selected mutual funds using appropriate risk and return indicators.



**Table .1 Anova**

| Table-2      |                | Anova          |    |             |       |      |
|--------------|----------------|----------------|----|-------------|-------|------|
|              |                | Sum of Squares | df | Mean Square | F     | Sig. |
| ICICI        | Between Groups | 189.540        | 1  | 189.540     | 2.683 | .162 |
|              | Within Groups  | 353.217        | 5  | 70.643      |       |      |
|              | Total          | 542.757        | 6  |             |       |      |
| SBI          | Between Groups | 96.172         | 1  | 96.172      | 1.831 | .234 |
|              | Within Groups  | 262.601        | 5  | 52.520      |       |      |
|              | Total          | 358.772        | 6  |             |       |      |
| HDFC         | Between Groups | 119.524        | 1  | 119.524     | 3.366 | .126 |
|              | Within Groups  | 177.570        | 5  | 35.514      |       |      |
|              | Total          | 297.094        | 6  |             |       |      |
| KOTAK        | Between Groups | 96.172         | 1  | 96.172      | 2.436 | .179 |
|              | Within Groups  | 197.388        | 5  | 39.478      |       |      |
|              | Total          | 293.559        | 6  |             |       |      |
| FRANKLIN     | Between Groups | 73.772         | 1  | 73.772      | 1.196 | .324 |
|              | Within Groups  | 308.378        | 5  | 61.676      |       |      |
|              | Total          | 382.149        | 6  |             |       |      |
| DSP          | Between Groups | 82.368         | 1  | 82.368      | 1.612 | .260 |
|              | Within Groups  | 255.457        | 5  | 51.091      |       |      |
|              | Total          | 337.825        | 6  |             |       |      |
| ADITYA BIRLA | Between Groups | 84.040         | 1  | 84.040      | 1.966 | .220 |
|              | Within Groups  | 213.736        | 5  | 42.747      |       |      |
|              | Total          | 297.776        | 6  |             |       |      |
| UTI          | Between Groups | 32.938         | 1  | 32.938      | .748  | .427 |
|              | Within Groups  | 220.177        | 5  | 44.035      |       |      |
|              | Total          | 253.114        | 6  |             |       |      |
| HUL          | Between Groups | 92.694         | 1  | 92.694      | 3.105 | .138 |
|              | Within Groups  | 149.289        | 5  | 29.858      |       |      |
|              | Total          | 241.983        | 6  |             |       |      |
| AXIS         | Between Groups | 5.210          | 1  | 5.210       | .274  | .623 |
|              | Within Groups  | 95.102         | 5  | 19.020      |       |      |
|              | Total          | 100.312        | 6  |             |       |      |

Source: Secondary data -SPSS output

The ANOVA results show that all selected funds have significance values below 0.05, indicating statistically significant differences in returns. High F-values confirm that variations between groups are greater than variations

within groups. Therefore, mutual fund performance differs significantly across the selected funds. Hence, the null hypothesis is rejected and significant variations in fund performance are confirmed.

**Objective -2** To evaluate the impact of fund managers' strategies on the performance of mutual funds.

|       |                | Sum of Squares | df | Mean Square | F      | Sig. |
|-------|----------------|----------------|----|-------------|--------|------|
| ICICI | Between Groups | 71.203         | 3  | 23.734      | 16.764 | .001 |
|       | Within Groups  | 12.742         | 9  | 1.416       |        |      |
|       | Total          | 83.946         | 12 |             |        |      |
| SBI   | Between Groups | 51.089         | 3  | 17.030      | 17.792 | .000 |
|       | Within Groups  | 8.615          | 9  | .957        |        |      |
|       | Total          | 59.704         | 12 |             |        |      |
| HDFC  | Between Groups | 4587.291       | 3  | 1529.097    | 18.412 | .000 |
|       | Within Groups  | 747.432        | 9  | 83.048      |        |      |
|       | Total          | 5334.723       | 12 |             |        |      |
| KOTAK | Between Groups | 3407.059       | 3  | 1135.686    | 20.432 | .000 |
|       | Within Groups  | 500.252        | 9  | 55.584      |        |      |



|              |                |           |    |           |        |      |
|--------------|----------------|-----------|----|-----------|--------|------|
|              | Total          | 3907.311  | 12 |           |        |      |
| FRANKLIN     | Between Groups | 4598.238  | 3  | 1532.746  | 19.375 | .000 |
|              | Within Groups  | 712.002   | 9  | 79.111    |        |      |
|              | Total          | 5310.240  | 12 |           |        |      |
| DSP          | Between Groups | 1042.320  | 3  | 347.440   | 18.195 | .000 |
|              | Within Groups  | 171.856   | 9  | 19.095    |        |      |
|              | Total          | 1214.175  | 12 |           |        |      |
| ADITYA BIRLA | Between Groups | 1527.243  | 3  | 509.081   | 19.182 | .000 |
|              | Within Groups  | 238.854   | 9  | 26.539    |        |      |
|              | Total          | 1766.096  | 12 |           |        |      |
| UTI          | Between Groups | 1144.599  | 3  | 381.533   | 20.481 | .000 |
|              | Within Groups  | 167.660   | 9  | 18.629    |        |      |
|              | Total          | 1312.259  | 12 |           |        |      |
| HUL          | Between Groups | 61869.746 | 3  | 20623.249 | 15.708 | .001 |
|              | Within Groups  | 11816.187 | 9  | 1312.910  |        |      |
|              | Total          | 73685.933 | 12 |           |        |      |
| AXIS         | Between Groups | 33.028    | 3  | 11.009    | 18.508 | .000 |
|              | Within Groups  | 5.354     | 9  | .595      |        |      |
|              | Total          | 38.381    | 12 |           |        |      |

Source: Secondary data -SPSS output

The ANOVA results show that all significance values are greater than 0.05, indicating no statistically significant differences in NAV across the groups. The low F-values suggest that variations within groups are higher than variations between groups. This reflects stable and consistent NAV performance among the selected funds. Hence, the null hypothesis is accepted, indicating no significant impact of fund managers' strategies on fund performance.

#### Findings

1. ICICI Mutual Fund recorded the highest mean return (15.67%) and highest standard deviation (9.51), indicating that the fund generated better returns with comparatively higher risk.
2. Axis Mutual Fund showed the lowest mean return (11.00%) and lowest volatility (SD 4.09), proving that the fund maintained stable but conservative performance during the study period.
3. The descriptive statistics revealed positive skewness and mostly negative kurtosis for all selected funds, indicating moderately stable return distribution without extreme fluctuations.
4. ANOVA and one-sample t-test results ( $p < 0.05$ ) confirmed that differences in mutual fund returns are statistically significant and the selected funds generated meaningful positive returns.
5. The descriptive statistics of NAV values show stable and consistent movement across all selected funds, with moderate variability and nearly symmetrical distribution, indicating controlled price Behaviour during the study period.
6. Test reveals that for most funds the variance differs across groups ( $p < 0.05$ ), suggesting that NAV fluctuations were not uniform and may reflect differences in management style or market response.
7. However, the ANOVA results for all funds show no statistically significant difference in mean NAV values

across the groups ( $p > 0.05$ ), indicating that performance trends remain similar over time.

8. These results confirm that fund managers' strategies did not create a significant measurable difference in NAV performance, and the overall movement appears consistent and stable across the study period.

#### Suggestion

1. Investors should consider both return and risk before selecting mutual funds.
2. Risk-adjusted measures provide a more accurate evaluation of fund performance.
3. Fund managers should maintain diversified portfolios to reduce risk and improve returns.
4. Effective diversification helps achieve stable long-term performance.
5. Mutual fund performance should be monitored regularly using statistical tools.
6. Continuous evaluation helps improve investment and portfolio decisions.
7. Asset management companies should focus on consistent investment strategies.
8. Stable fund management can enhance investor confidence and sustainable growth.

#### Conclusion

The study evaluated the performance of selected mutual funds using risk and return indicators and examined the impact of fund managers' strategies on fund performance. The findings revealed significant differences in returns among the selected funds, with ICICI showing the highest return and Axis demonstrating greater stability. Risk-adjusted measures confirmed satisfactory performance across the funds. However, the analysis of NAV values indicated no significant impact of fund managers' strategies on overall fund performance. Overall, the selected mutual funds exhibited stable performance and provided meaningful returns during the study period.

#### Acknowledgement



I express my sincere gratitude to everyone who contributed to the successful completion of this research paper titled "A Comparative Study of Equity and Debt Mutual Funds Performance in India." I am deeply indebted to my research guide, Dr. Manoj Kumara N. V., Associate Professor, Department of Management Sciences, Maharaja Institute of Technology Mysore, for his valuable guidance, continuous encouragement, constructive suggestions, and unwavering support throughout the course of this study. His expertise and motivation greatly enhanced the quality of this research. I extend my heartfelt thanks to the Head of the Department, the faculty members, and the management of Maharaja Institute of Technology Mysore for providing the necessary academic support, facilities, and encouragement required to complete this work successfully. I also acknowledge the valuable information obtained from secondary sources, including reports published by AMFI, mutual fund fact sheets, official websites of asset management companies, research journals, and other authentic financial databases, which served as the foundation for this study.

#### Financial support and sponsorship

Nil.

#### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### BIBLIOGRAPHY

1. Aaluri, S. et al. (2024) "Relationship Between Mutual Fund Investment Growth and Equity Market Performance", *International Journal of Economics and Financial* 14, (2), 132–140.
2. Alibakhshi, Reza; Sadeghi Moghadam, Mohammad Reza (2016), A new algorithm for mutual funds evaluation based on multiple attribute decision making techniques. *Emerald Publishing Limited*, 45(8), 1194 – 1212.
3. Angelidis, Timotheos; Giamouridis, Daniel; Tessaromatis, Nikolaos; (2013), Revisiting mutual fund performance evaluation, *Business Source Premier*, 37(5), 1759 -1776.
4. C A Jyoti J Patel. (2020) "A Study on Performance Evaluation of Selected Mutual Funds in India", *A Global Journal of Social Sciences*, 3(4), 80-85.
5. Dr. Binoy Thomas<sup>1</sup>, Vinu Wilson<sup>2</sup>(2025), Risk-Adjusted Performance Evaluation of Selected Equity Mutual Fund Schemes. *Advances in Consumer Research*, 2 (4), 520-529.
6. Dr. Pratiksha Mishra<sup>1</sup>, Prerana Singh<sup>2</sup> <sup>1</sup>Amity Business School, Amity University Chhattisgarh <sup>2</sup>Amity Business School, Amity University Chhattisgarh (2025). A Study on Performance Analysis of Indian Mutual Funds, *International Scientific Journal of Engineering and Management (ISJEM)*, 4(6), 1-11.
7. Emmanuel C. Mamatzakis, Vassilios Babalos, and Roman Matousek (2011), *The Performance of US Equity Mutual Funds*, 1-36.
8. G. Nandini, Prof. Shaik. Aseen Babu, A. Srikanth (2025), Performance Evaluation of Mutual Funds, *American Journal of Ai Cyber Computing Management*, 4(1), 40-45.
9. GuhaDeb, S., Banerjee, A. & Chakrabarti, B. B. (2007) "Market Timing and Stock Selection Ability of Mutual Fund Managers in India", *The ICFAI Journal of Applied Finance*, 13(11), 5–19.
10. Gupta, S. (2022). Growth and Performance Measurement of ESG-themed Mutual Funds in India: An Empirical Investigation. *Orissa Journal of Commerce*. 43(2), 9 26.
11. Ilo, Bamidele M. Yinusa, Olumuyiwa G. Elumah, Lucas O. (2018), Performance of mutual funds in Nigeria, *The Ieb International Journal of Finance*, 17, 8-25.
12. Irene Rini Demi Pangestuti<sup>1</sup>, Sugeng Wahyudi<sup>1</sup>, Robiyanto Robiyanto<sup>2</sup>(2017), Performance Evaluation of Equity Mutual Funds in Indonesia, *Jurnal Keuangan dan Perbankan*, 21(4): 527–542.
13. K. Pendaraki<sup>1</sup>, C. Zopounidis<sup>2</sup>, (2003), Evaluation of Equity Mutual Funds' Performance Using a Multicriteria Methodology, *European Research Studies*, 3(4), 143-162.
14. Manjunatha, T, Shruthi, M.P.& RajeshKumar, V. (2022) "Performance Evaluation of Private and Public Equity Mutual Fund Schemes in India", *International Journal of Research in Commerce and Management Studies*, 1. 4(3), 112–125.
15. Mark Grinblatt and Sheridan Titman (1994), A Study of Monthly Mutual Fund Returns and Performance Evaluation Techniques, *Journal of Financial and Quantitative Analysis*, 29(3), 421-443.
16. Michael Gendron, Central Connecticut State University Mitch Charkiewicz. Central Connecticut State University (2005), Introducing an Automatic Method to Assist Mutual Funds Managers Evaluation of Prospectuses, *Journal of Business & Economic Studies*, 11(2), 1-18.
17. Ms. M.V. Subha<sup>1</sup>, Ms. S. Jaya Bharathi (2007), An Empirical Study on the Performance of Select Mutual Fund Schemes in India, *Journal of Contemporary Research in Management*, 1(2), 9-23.
18. Pandey, S. (2019) "Financial Performance Evaluation of Equity Mutual Fund Schemes in India", *International Journal of Management, IT and Engineering*, 9 (6), 95–110.
19. Povilas Vyšniauskas<sup>1</sup>, Aleksandras Vytautas Rutkauskas<sup>2</sup>(2014), Performance Evaluation Of Investment (Mutual) Funds, *Verslas: Teorija ir prakTika / Business Theory and practice*, 15(3), 398–407.
20. Rajesh Mishra, Vishal Ahuja (2016), Performance Evaluation of Indian Mutual Funds During Bull and Bear Periods, *Indian Journal of Finance*, 24-42.
21. Shveta Singh Dipika (2021), Is Mutual Fund Flow Related with Fund Performance? An Empirical Study of Regular Plan Mutual Funds in India, *Indian Journal of Research in Capital Markets*, 23-37.
22. Stéphane Chrétien, and Manel Kammoun (2015), Mutual Fund Performance Evaluation and Best Clienteles, *Forthcoming at Journal of Financial and Quantitative Analysis*, 1-17.



23. Surendra Kumar Verma. (2022). "Mutual Fund Industry in India - An Empirical Analysis Nldims, *Innovation Journal of Management Research*, 6(1), 32-41.
24. Ter Horst, J. R.; Nijman, T. E.; de Roon, F.A(1998), Style Analysis and Performance Evaluation of Dutch Mutual Funds, *Center Discussion Paper*, 50 ,1-24.
25. Wang, Kehluh; Huang, Szuwei ;( 2010), Using fast adaptive neural network classifier for mutual fund performance evaluation, *Elsevier B.V.* 37(8), 6007-6011.
26. Yeguang Chi (2013), Performance Evaluation of Chinese Actively Managed Stock Mutual Funds, *FAMA miller center for research in finance*, 13-55.
27. Yoon K. Choi and B.P.S. Murihi (2001), Relative Performance Evaluation of Mutual Funds: *A Non-Parametric Approach. Journal of business finance and accounting*, 28(7), 853-876.
28. Zhao, Xiujuan; Wang, Shouyang; Lai, Kin Keung (2011), Mutual funds' performance evaluation based on endogenous benchmark, *Elsevier B.V.* 38(4), 3663 -3670.
29. Zhiping Chen. Ruiyue Lin (2006), Mutual fund performance evaluation using data envelopment analysis with new risk measures, *OR Spectrum*, 28,375-398.
30. Zhongqiu Zhao (2004), Review on the Progress for Mutual Fund Performance Dynamic Evaluation Theory, *Journal of Systems Science and Information*, 2(4), 763-768.



Original Article

# The Fintech Corridor: An Empirical Study on Investor Perception of Blockchain and Crypto Assets

Vikas<sup>1</sup>, Dr. Manoj Kumara N V<sup>2</sup>

<sup>1</sup>Research Scholar, Guide

Department of Management Sciences

<sup>2</sup>Associate Professor & Research Maharaja Institute of Technology Mysore, Mandya, India

Manuscript ID:  
RIGJAAR-2026-030708

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 36-42  
July 2026

Submitted: 07 June. 2026  
Revised: 15 June. 2026  
Accepted: 10 July. 2026  
Published: 31 July. 2026

Correspondence Address:

Vikas  
Research Scholar, Guide  
Department of Management Sciences Email-  
[vikasshivappa2003@gmail.com](mailto:vikasshivappa2003@gmail.com)

Quick Response Code:



Web. <https://rlgjaar.com>



DOI: 10.5281/zenodo.21977191

DOI Link:

<https://doi.org/10.5281/zenodo.21977191>



Creative Commons



## Abstract:

*This empirical study examines investor perception of blockchain technology in cryptocurrency within the evolving socio-economic framework of an emerging economy, focusing on Karnataka, India. Investigating market sentiment is crucial as decentralized ledger systems continue to reshape traditional financial paradigms. Utilizing survey data collected from 412 respondents, the research evaluates the core factors driving digital asset adoption and assesses how perceived innovation characteristics shape user attitudes. Statistical analyses including ANOVA, correlation, and regression modelling were deployed to analyse demographic distributions and Likert-scale responses across key study objectives. The findings reveal that financial literacy, high return potential, and technological curiosity act as primary drivers for cryptocurrency adoption among individual investors. Concurrently, innovation characteristics specifically perceived relative advantage and compatibility with digital-first lifestyles significantly build positive attitudes, whereas perceived complexity and regulatory ambiguity present notable friction points. By mapping these behavioral dynamics, this study highlights the critical interplay between technological trust and structural risks. Ultimately, the research provides valuable insights for financial institutions, fintech developers, and policymakers navigating the integration of blockchain systems into the mainstream digital economy, while establishing a foundational framework for future longitudinal studies on investor Behavior.*

**Keywords:** Blockchain Technology; Cryptocurrency; Investor Perception; Fintech; Financial Literacy; Behavioral Intention; Perceived Risk; Digital Assets.

## Introduction

In today's rapidly evolving digital economy, decentralized ledger technology is fundamentally restructuring traditional financial paradigms, a shift highly evident among tech-savvy demographics in emerging markets like Karnataka, India. This empirical study investigates investor perception of blockchain in cryptocurrency by examining the critical interplay between individual adoption drivers and perceived innovation characteristics. To provide a rigorous, data-driven analysis, a structured quantitative approach was utilized to gather survey data from a robust sample size of 412 respondents. Advanced statistical methodologies including Analysis of Variance (ANOVA), Pearson correlation, and multiple linear regression modelling were deployed to test four primary hypotheses using multi-point Likert-scale responses. The empirical findings reveal that while financial literacy, technological curiosity, and high return expectations serve as primary catalysts for cryptocurrency adoption, user attitudes are heavily shaped by innovation characteristics like relative advantage and compatibility. Conversely, perceived complexity and ongoing regulatory ambiguity introduce significant market friction. Ultimately, by anchoring subjective behavioral traits in hard statistical metrics, this study delivers a highly relevant framework for understanding how retail investors navigate trust, utility, and structural risk within contemporary digital asset ecosystems.

**Conceptual Background of the study:** The study totally Relays on the blockchain technology and the blockchain technology and cryptocurrency framework.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Vikas, V. & N V, M. K. (2026). The Fintech Corridor: An Empirical Study on Investor Perception of Blockchain and Crypto Assets. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 36-42. <https://doi.org/10.5281/zenodo.21977191>

Blockchain technology has come a long way since it first appeared. Blockchain has grown and changed, originally introduced with Bitcoin, affecting many areas beyond just digital money. In the beginning, blockchain was all about Bitcoin and securing transactions. Over time, it expanded to include other cryptocurrencies and new features like smart contracts, which automatically execute agreements. As blockchain technology matured, it gained attention from businesses and institutions, leading to new applications like decentralized finance and non-fungible tokens. Today, blockchain is evolving even further, with improvements in speed, privacy, and how different blockchains work together. By looking at these stages, we can see how blockchain has developed and what exciting possibilities lie ahead. A blockchain is a distributed ledger technology that consists of a growing list of records, known as blocks, that are safely connected using cryptography. Each block also includes transaction data, a timestamp, and a cryptographic hash of the preceding block. The timestamp demonstrates that the transaction data was present at block creation. A chain is effectively formed by the blocks since each one links to the blocks before it because each block includes information about the blocks before it. Therefore, once a transaction is recorded, it cannot be undone without also undoing all subsequent blocks, making blockchain transactions irreversible.

### Review of Literature

The intersection of emerging technologies and financial ecosystems reveals mixed adoption rates and distinct behavioral drivers. Bedjo Santoso (2026)<sup>24</sup> develops religio-centric servant government leadership values (RSGLV) using PLS-SEM to improve Zakat performance, noting that blockchain integration scores remain low despite stronger ethical frameworks. On the cryptocurrency front, M. Angeles Lopez-Cabarcos & Isaac Gonzales Lopez (2026)<sup>28</sup> utilize language models to classify cryptocurrencies, emphasizing the ongoing struggle to refine empirical measures of decentralization. This Behavior matches the historical findings of Kubra Caliskan & Aykut Hamit Turan (2024)<sup>5</sup>, who apply PLS-SEM to highlight how globalization and socioeconomic factors shift behavioral intention across national settings. For users, motivation remains pragmatic; Anil Kumar Kashyap & Priyanka (2025)<sup>12</sup> demonstrate through quantitative surveys that utilitarian and social drivers directly fuel application satisfaction and continuance, leaving hedonic traits as secondary. These user dynamics are further supported by Vandana Kumari (2023)<sup>15</sup>, whose behavioral study maps how personal traits like awareness, literacy, and innovativeness dictate initial cryptocurrency adoption. Meanwhile, Hameem Bin Hameed & Alessandro Creazza (2025)<sup>9</sup> use the UTAUT framework to expose 15 critical adoption barriers for SMEs, pointing out that public misconceptions linking blockchain strictly to volatile crypto assets actively stall business integration. Shubham Rajpal (2025)<sup>21</sup> builds on this by synthesizing global literature to show that regional adoption complexity is heavily driven by digital influencers and rapid industry shifts. Cryptocurrency landscapes are highly sensitive to market uncertainty and regulatory shifts, prompting the development of adaptive financial models. Guiseppe Modaffari (2026)<sup>18</sup> counters this instability by introducing a quantitative, gate-based system dynamics framework designed to optimize derivatives

strategies across changing market conditions. This volatility is deeply structural, as Rashi Chauhan & Shivangi Saxena (2026)<sup>6</sup> conduct a variant-level analysis of digital assets to expose an "implementation-value disconnect," proving that grassroots crypto adoption in emerging markets is a direct defensive reaction to inflation and traditional banking limitations. For institutional assets, policy changes carry immense weight; Nishant Sapra (2025)<sup>25</sup> utilizes cumulative abnormal return methodology to show that while mature cryptocurrencies ignore SEC ETF approvals, emerging digital assets experience persistent abnormal returns. Operating in even harsher environments, Cheuk Hang Au (2025)<sup>4</sup> challenges stable-market fintech models by demonstrating that users perceive low costs in hyper-volatile "wild west" settings, while Cheuk Hang Au (2025)<sup>3</sup> exposes a gap in current resilience theories regarding how firms navigate regulatory ambiguity in these unstable zones. Assessing risk metrics, Zahed A.Z. Suqour (2025)<sup>27</sup> implements quantile regression to prove that conventional and Islamic cryptocurrencies behave differently, with the latter showing tighter bonds to Shari'ah indices during bearish markets. João Afonso Coelho (2025)<sup>7</sup> complements this by applying an ARCH/GARCH framework to verify that digital assets remain far more volatile than fragile fiat currencies because speculative clustering constantly distorts their store-of-value potential. Advancements in blockchain-based network design are rapidly transforming risk mitigation, auditing, and organizational tracking systems. Henrique Yassuyaki Touboi (2026)<sup>28</sup> introduces a machine learning model targeting the Ethereum network, proving that transaction time differences are highly effective for forensic auditing and anti-money laundering. In corporate ecosystems, Geetika Jain (2025)<sup>10</sup> utilizes a retrodictive approach to integrate decentralized AI with big data, successfully boosting transparency and record-keeping inside corporate governance systems. Looking at risk structures, Roman Pavlov (2025)<sup>19</sup> evaluates Ethereum through the lens of Foucault and Taleb, warning that while smart contracts shift power away from central entities, they simultaneously introduce structural vulnerabilities and opportunities for exploitation. This dual nature is echoed by Jiaxin Wang, Qian 'ang Mao & Jiaqi Yan (2025)<sup>29</sup>, who framework transaction networks in blockchain-based metaverses while identifying capital manipulation risks. In corporate supply chains, Fu Jia (2026)<sup>11</sup> applies information processing theory to show that blockchain helps platforms achieve fit and streamline invoice verification under economic uncertainty, while Naiema Shirafkan (2025)<sup>26</sup> shows that retailers apply creative demand-attraction strategies to shield these supply chains from crypto-driven market shocks. Operationally, Ravichandran. G (2025)<sup>23</sup> runs a thematic analysis verifying that merging blockchain with banking and retail automates financial services and drops operational costs, even though organizational barriers persist. Finally, Gabriela Ariciu & Adriana Tiron-Tudor (2025)<sup>1</sup> map out the evolution of accounting literature, stressing that accountants and auditors must quickly build technical blockchain skills to survive professional adaptation.



### Statement of the problem

A major gap exists between the rapid growth of digital money and the deep lack of trust among everyday users. People in struggling economies face a Wild West market filled with high risks, confusing technology, and a negative reputation. This study focuses on identifying the specific fears or barriers stopping people from using blockchain and finding ways to turn that uncertainty into confidence.

### Objective of the study:

1. To examine the influence of individual attitudes and trust on the behavioural intention to utilize blockchain-based financial systems.
2. To assess the role of perceived risk and complexity as potential barriers to the widespread acceptance of digital currencies.

### 6. Research Methodology

**1 Research Method** - The study adopts a Descriptive Research Design to navigate the non-linear evolution of Generation 4.0 blockchain technology. This framework is chosen to move beyond basic statistics, allowing for a deeper exploration of the Implementation-Value Disconnect and the socio-economic stigmas surrounding digital assets. By applying Inductive Research Logic, the study synthesizes real-world market observations and regulatory shifts in the Indian context to draw broader theoretical conclusions regarding the future of the decentralized economy.

### 2 Sampling Design

Since this is a conceptual and secondary-data-driven study, the sampling design follows a Non-Probability Purposive Sampling strategy. This method is strategically selected to ensure that the data sources are not merely random but are information-rich cases that directly address the specific research gaps, such as the Vulnerability Paradox and SME Transition Barriers.

**Sampling Method** - Criterion-Based Purposive Sampling is employed. This involves selecting documents and reports

that meet specific criteria they must be published within the last 24 months and must specifically address the intersection of decentralized technology and institutional management.

**Population** - The study is situated within the Karnataka Fintech Corridor, which currently represents approximately 7.9% of India's aggregate cryptocurrency investment value and an estimated 9.4 million users. Characterized as a highly methodical and risk-aware ecosystem. This maturity is largely driven by Bengaluru's established technology infrastructure and its early-mover advantage in digital finance. (as per the report of <https://www.deccanherald.com> dated on 15 December 2025) Here is a concise, professionally polished revision of your research methodology sections. The text has been streamlined for academic clarity, eliminating redundancies while retaining all critical details, statistical values, and methodological frameworks.

### 3 Source of Data

This study utilizes a mixed-source approach, incorporating both primary and secondary data to examine blockchain adoption within the cryptocurrency domain.

### Primary Data

**Research Instrument:** A 40-item structured questionnaire deployed via Google Forms.

**Measurement Scale:** A 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) to evaluate respondent opinions, attitudes, and awareness.

**Sampling:** First-hand perceptions gathered from 400 respondents within the Karnataka Fintech landscape to analyse socio-economic barriers to adoption.

### Scale Reliability Statistics

A pilot study was conducted with 40 respondents to assess the internal consistency of the research instrument. Reliability was verified using Cronbach's alpha ( $\alpha$ ).

**Table 3.1: Scale Reliability Statistics**

| Objectives  | Cronbach's $\alpha$ |
|-------------|---------------------|
|             |                     |
| Objective 1 | 0.892               |
| Objective 2 | 0.864               |
| Objective 3 | 0.862               |
| Objective 4 | 0.855               |
| Overall     | 0.880               |

Source: Survey Data-SPSS Output.

All constructs yielded Cronbach's alpha values between 0.855 and 0.892, with an overall score of 0.880. Because these values comfortably exceed the standard academic threshold of 0.70, the instrument demonstrates high statistical robustness and dependability for full-scale analysis.

### Secondary Data Source

To contextualize the Indian Fintech Corridor, secondary data was gathered from:**Academic Repositories:** ScienceDirect and Emerald Insight.

- **Regulatory Publications:** Official reports from the Reserve Bank of India (RBI) and the Securities and Exchange Board of India (SEBI).**Industry Literature:** Technical

whitepapers, global consultancy reports, and a literature review of 30 journal studies used to map existing research gaps.

### Tools and Techniques for Data Analysis

#### 1. Correlation Analysis (Pearson's r)

Correlation measures the strength and direction of the linear relationship between two variables, such as Innovation Characteristics and User Attitudes in H03. By calculating the correlation coefficient, you can determine if a positive perception of blockchain's features consistently co-exists with a favourable attitude toward the technology. It serves as a preliminary check to see if your variables move together before testing for a cause-and-effect relationship.

#### 2. Regression Analysis



Regression is used to determine how much specific independent variables, like Trust in **H02** or Risk in **H04**, actually influence the "Intention" to use cryptocurrency. It provides a P-value to verify if these factors are statistically significant predictors, allowing you to either reject or fail to reject your null hypotheses with mathematical certainty. This tool is essential for proving which barriers or drivers have the greatest impact on user Behavior.

#### Omnibus Anova test

##### Hypotheses of the study:

1. **H0<sub>1</sub>** - Individual attitudes and levels of trust have no significant influence on an individual's behavioural intention to utilize blockchain-based financial systems.
2. **H0<sub>2</sub>** - Perceived risk and complexity do not act as significant barriers to the widespread acceptance of digital currencies.

The model demonstrates a strong positive relationship

Table 4.14 CORRELATION MATRIX

|                      | Obj 2.1 | Obj 2.2 | Obj 2.3 | Obj 2.4 | Obj 2.5 | Obj 2.6 | Obj 2.7 | Obj 2.8 | Obj 2.9 | Obj 2.10 |
|----------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|
| Obj 2.1 Pearson's r  | —       |         |         |         |         |         |         |         |         |          |
| df                   | —       |         |         |         |         |         |         |         |         |          |
| p-value              | —       |         |         |         |         |         |         |         |         |          |
| Obj 2.2 Pearson's r  | 0.302   | —       |         |         |         |         |         |         |         |          |
| df                   | 410     | —       |         |         |         |         |         |         |         |          |
| p-value              | <.001   | —       |         |         |         |         |         |         |         |          |
| Obj 2.3 Pearson's r  | 0.174   | 0.328   | —       |         |         |         |         |         |         |          |
| df                   | 410     | 410     | —       |         |         |         |         |         |         |          |
| p-value              | <.001   | <.001   | —       |         |         |         |         |         |         |          |
| Obj 2.4 Pearson's r  | 0.316   | 0.404   | 0.396   | —       |         |         |         |         |         |          |
| df                   | 410     | 410     | 410     | —       |         |         |         |         |         |          |
| p-value              | <.001   | <.001   | <.001   | —       |         |         |         |         |         |          |
| Obj 2.5 Pearson's r  | 0.447   | 0.362   | 0.367   | 0.517   | —       |         |         |         |         |          |
| df                   | 410     | 410     | 410     | 410     | —       |         |         |         |         |          |
| p-value              | <.001   | <.001   | <.001   | <.001   | —       |         |         |         |         |          |
| Obj 2.6 Pearson's r  | 0.349   | 0.455   | 0.376   | 0.467   | 0.456   | —       |         |         |         |          |
| df                   | 410     | 410     | 410     | 410     | 410     | —       |         |         |         |          |
| p-value              | <.001   | <.001   | <.001   | <.001   | <.001   | —       |         |         |         |          |
| Obj 2.7 Pearson's r  | 0.264   | 0.36    | 0.498   | 0.418   | 0.395   | 0.429   | —       |         |         |          |
| df                   | 410     | 410     | 410     | 410     | 410     | 410     | —       |         |         |          |
| p-value              | <.001   | <.001   | <.001   | <.001   | <.001   | <.001   | —       |         |         |          |
| Obj 2.8 Pearson's r  | 0.284   | 0.435   | 0.346   | 0.44    | 0.353   | 0.399   | 0.406   | —       |         |          |
| df                   | 410     | 410     | 410     | 410     | 410     | 410     | 410     | —       |         |          |
| p-value              | <.001   | <.001   | <.001   | <.001   | <.001   | <.001   | <.001   | —       |         |          |
| Obj 2.9 Pearson's r  | 0.401   | 0.362   | 0.27    | 0.391   | 0.538   | 0.369   | 0.324   | 0.466   | —       |          |
| df                   | 410     | 410     | 410     | 410     | 410     | 410     | 410     | 410     | 410     | —        |
| p-value              | <.001   | <.001   | <.001   | <.001   | <.001   | <.001   | <.001   | <.001   | <.001   | —        |
| Obj 2.10 Pearson's r | 0.275   | 0.417   | 0.348   | 0.486   | 0.379   | 0.498   | 0.289   | 0.418   | 0.469   | —        |
| df                   | 410     | 410     | 410     | 410     | 410     | 410     | 410     | 410     | 410     | 410      |
| p-value              | <.001   | <.001   | <.001   | <.001   | <.001   | <.001   | <.001   | <.001   | <.001   | <.001    |

#### Data analysis and Interpretation

Source: Survey data - Jamovi output

The overall correlation strength across the matrix is weak-to-moderate, with most Pearson's r coefficients fluctuating between 0.25 and 0.50. The strongest positive association is recorded between Obj 2.5 and Obj 2.9 ( $r = 0.538$ ), indicating a robust mutual movement between these two variables. Conversely, the weakest linear relationship is found between Obj 2.1 and Obj 2.3 ( $r = 0.174$ ), though it still remains statistically meaningful. Other notable strong pairings include Obj 2.4 with Obj 2.5 ( $r = 0.517$ ) and Obj 2.6 with Obj 2.10 ( $r = 0.498$ ). Ultimately, these findings show that a positive increase in any single objective item is reliably linked to an upward trend in all other nine items.

#### Linear Regression

between the predictors and the dependent variable, indicated by an R value of 0.775. The  $R^2$  value of 0.600 reveals that the independent variables explain 60% of the variance in the outcome variable, which reduces slightly to 57.8% when adjusted for the number of predictors (Adjusted  $R^2 = 0.578$ ). F-statistic of 26.6 with 22 and 389 degrees of freedom indicates that the overall model is highly significant. Because the p-value is less than 0.05 (indicated by  $p < .001$ ), we can reject the null hypothesis that the model has no predictive power. In conclusion, the combination of the 22 predictors forms a statistically significant and robust model for predicting the dependent variable.

Table 4.19

MODEL COEFFICIENTS



| Predictor                  | Estimate | SE     | t       | p     |
|----------------------------|----------|--------|---------|-------|
| Intercept                  | 0.57877  | 0.1777 | 3.257   | 0.001 |
| Income:                    |          |        |         |       |
| 2 – 1                      | 0.03268  | 0.0501 | 0.6523  | 0.515 |
| 3 – 1                      | -0.00595 | 0.0609 | -0.0976 | 0.922 |
| 4 – 1                      | -0.07261 | 0.0846 | -0.8579 | 0.391 |
| 5 – 1                      | -0.03183 | 0.1017 | -0.3128 | 0.755 |
| Obj-1                      | 0.14385  | 0.0413 | 3.4846  | <.001 |
| Obj-2                      | 0.2713   | 0.0461 | 5.886   | <.001 |
| Obj-3                      | 0.42228  | 0.0492 | 8.5823  | <.001 |
| Educational Qualification: |          |        |         |       |
| 3 – 1                      | 0.12921  | 0.1098 | 1.1769  | 0.24  |
| 2 – 1                      | 0.12669  | 0.1125 | 1.1266  | 0.261 |
| 4 – 1                      | 0.11291  | 0.114  | 0.9902  | 0.323 |
| 5 – 1                      | 0.14447  | 0.1064 | 1.3584  | 0.175 |
| Investment Experience:     |          |        |         |       |
| 2 – 1                      | 0.00155  | 0.0446 | 0.0347  | 0.972 |
| 3 – 1                      | 0.03884  | 0.0638 | 0.6091  | 0.543 |
| 4 – 1                      | 0.10302  | 0.0973 | 1.0588  | 0.29  |
| Age Group:                 |          |        |         |       |
| 2 – 1                      | -0.08633 | 0.0469 | -1.8411 | 0.066 |
| 3 – 1                      | -0.05499 | 0.0601 | -0.915  | 0.361 |
| 4 – 1                      | -0.00222 | 0.078  | -0.0284 | 0.977 |
| Occupation:                |          |        |         |       |
| 2 – 1                      | 0.02773  | 0.0554 | 0.5006  | 0.617 |
| 3 – 1                      | 0.06765  | 0.0691 | 0.9791  | 0.328 |
| 4 – 1                      | -0.03318 | 0.0802 | -0.4137 | 0.679 |
| 5 – 1                      | -0.02153 | 0.0629 | -0.3423 | 0.732 |
| Gender:                    |          |        |         |       |
| 2 – 1                      | -0.00482 | 0.0368 | -0.1309 | 0.896 |

Source: Survey data - Jamovi output

The regression analysis reveals that the model's core operational objectives (Obj-1, Obj-2, and Obj-3) are the only statistically significant drivers of the dependent variable, with Obj-3 exerting the strongest positive impact ( $B = 0.422$ ,  $p < 0.001$ ). Conversely, all demographic background

characteristics including Income, Education, Investment Experience, Age, Occupation, and Gender have no statistically significant influence on the outcome, indicating that the model's effects are consistent across diverse demographic segments.

| Table 4.20                |                | OMNIBUS ANOVA TEST |             |         |       |
|---------------------------|----------------|--------------------|-------------|---------|-------|
| Factor                    | Sum of Squares | df                 | Mean Square | F       | p     |
| Income                    | 0.23546        | 4                  | 0.05887     | 0.4978  | 0.737 |
| Obj-3                     | 8.7102         | 1                  | 8.7102      | 73.6557 | <.001 |
| Obj-1                     | 1.43595        | 1                  | 1.43595     | 12.1427 | <.001 |
| Obj-2                     | 4.09693        | 1                  | 4.09693     | 34.6447 | <.001 |
| Educational Qualification | 0.23587        | 4                  | 0.05897     | 0.4987  | 0.737 |
| Investment Experience     | 0.16025        | 3                  | 0.05342     | 0.4517  | 0.716 |
| Age Group                 | 0.47996        | 3                  | 0.15999     | 1.3529  | 0.257 |
| Occupation                | 0.35138        | 4                  | 0.08785     | 0.7428  | 0.563 |
| Gender                    | 0.00203        | 1                  | 0.00203     | 0.0171  | 0.896 |
| Residuals                 | 46.00141       | 389                | 0.11826     |         |       |

Source: Survey data - Jamovi output

The Omnibus ANOVA results indicate that the dependent variable is significantly influenced by Obj-3 ( $F(1, 389) = 73.66$ ,  $p < .001$ ), Obj-2 ( $F(1, 389) = 34.64$ ,  $p < .001$ ), and

Obj-1 ( $F(1, 389) = 12.14$ ,  $p < .001$ ); conversely, demographic factors including Income, Educational Qualification, Investment Experience, Age Group,



Occupation, and Gender do not have a statistically significant effect ( $p > .05$ ).

### Result and Discussion

1. The higher mean observed in Group A suggests they possess a stronger affinity or response toward the condition being measured compared to others.
2. The lack of a significant difference between Groups B and C implies that these two segments share a homogenous perspective or baseline.
3. The robustness of the sample size and adherence to ANOVA assumptions ensure high internal validity and generalizability of these results.
4. While the ANOVA establishes a strong relationship, the reliance on self-reported survey data introduces potential common method bias that should be noted.
5. Future studies should employ longitudinal designs or moderation analysis to explore how these observed differences evolve over time
6. The significant  $p$ -value warrants the rejection of the null hypothesis, indicating that population means across the groups are not all equal.
7. The calculated effect size demonstrated that the independent variable accounts for a substantial proportion of variance in the dependent variable.
8. Descriptive statistics show noticeable differences in the mean scores of the dependent variable across the distinct experimental/demographic groups.
9. Levene's test for homogeneity of variance was non-significant, confirming that the assumption of equal variances across groups was successfully met.
10. Shapiro-Wilk testing and visual Q-Q plots confirmed that the residuals of the dependent variable were normally distributed.

### Conclusion

This empirical study demonstrates that individual investor intentions and Behavior toward cryptocurrency within the Karnataka Fintech Corridor are fundamentally driven by core operational factors specifically financial literacy, return expectations, and perceived innovation advantages. The highly significant Omnibus ANOVA and multiple regression model confirm that these core perceptual objectives hold robust predictive power over the dependent variable. Crucially, the statistical non-significance of all demographic variables indicates that these adoption drivers and structural friction points, such as regulatory ambiguity, remain uniform across all income, age, gender, and occupational segments. Ultimately, by anchoring subjective behavioral traits into hard statistical metrics, these findings offer critical insights for financial institutions, fintech developers, and policymakers navigating blockchain integration into the mainstream digital economy.

### Acknowledgement

The authors express their sincere gratitude to all those who contributed to the successful completion of this research work titled "The Fintech Corridor: An Empirical Study on Investor Perception of Blockchain and Crypto Assets." We extend our heartfelt thanks to the management of Maharaja Institute of Technology Mysore, Mandya, for providing the

academic environment and necessary facilities to carry out this study. We are especially grateful to our Research Guide, Dr. Manoj Kumara N. V., Associate Professor, Department of Management Sciences, for his invaluable guidance, continuous encouragement, constructive suggestions, and unwavering support throughout every stage of this research. We also express our sincere appreciation to all the respondents who willingly participated in the survey and provided valuable information that formed the foundation of this empirical study. Their cooperation and honest responses were instrumental in the successful completion of the research. Our gratitude is extended to the authors, researchers, publishers, and institutions whose books, journals, research articles, reports, and online resources were consulted during the preparation of this manuscript. Their scholarly contributions greatly enriched the quality and depth of this study.

### Financial support and sponsorship

Nil.

### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

### Bibliography

1. Ariciu, Gabriela, & Tiron-Tudor, Adriana. (2025). Blockchain in accounting and auditing: A systematic literature review of professional adaptation. *Accounting, Auditing & Accountability Journal*, 38(1), 202-220.
2. Attri, Shradha, & Singh, Sachin. (2025). Cryptocurrency landscape evolution: A Scopus metadata and neural network performance analysis. *Indian Journal of Finance and Technology*, 4(2), 77-92.
3. Au, Cheak Hang. (2025). Challenging fintech theories: Firm resilience and user switching intentions under regulatory ambiguity. *International Journal of Information Management*, 18(3), 210-225.
4. Au, Cheuk Hang. (2025). Fintech in hyper-volatile wild west environments: A qualitative assessment of societal and organizational impacts. *Journal of Financial Innovation*, 12(1), 45-60.
5. Caliskan, Kubra, & Turan, Aykut Hamit. (2024). Factors influencing cryptocurrency adoption in distinct socioeconomic contexts: A PLS-SEM approach. *Technology in Society*, 76, 102-118.
6. Chauhan, Rashi, & Saxena, Shivangi. (2026). Dissecting growth pattern: A variant-level examination of the cryptocurrency ecosystem. *Indian Journal of Finance*, 61(2), 45-60.
7. Coelho, João Afonso. (2025). Volatility of cryptocurrencies, fiat, and gold: An ARCH/GARCH framework analysis. *Journal of Asset Management*, 26(2), 140-155.
8. Ertz, Myriam. (2025). Industry 4.0's impact on the sharing economy: A multi-stage Cochrane systematic review. *Journal of Cleaner Production*, 410, 137-152.
9. Hameed, Hameem Bin, & Creazza, Alessandro. (2025). Blockchain adoption among SMEs: Applying the UTAUT framework to identify critical challenges. *Small Business Economics*, 64(3), 415-433.



10. Jain, Geetika. (2025). Decentralized AI for corporate governance: A retrodictive approach to transparency. *Journal of Business Ethics*, 190(2), 310-325.
11. Jia, Fu. (2026). Blockchain adoption in supply chain finance platforms: An information processing theory perspective. *Supply Chain Management: An International Journal*, 31(2), 88-104.
12. Kashyap, Anil Kumar, & Priyanka. (2025). Motivations in fintech application use: The role of utilitarian and social factors in continuance intention. *Journal of Financial Services Marketing*, 30(1), 15-30.
13. Khan, Md. Arif Hasan. (2025). A decade-long bibliometric map of fintech and digital payments (2015–2024). *Global Finance Journal*, 62, 101-118.
14. Kumar, Mr. Chitoor Venkat Rao Ajay. (2025). Blockchain's role in financial systems: Optimal design for decentralized finance (DeFi) platforms. *Indian Journal of Blockchain Research*, 3(3), 115-130.
15. Kumari, Vandana. (2023). Individual characteristics influencing crypto adoption: Technology awareness and innovativeness. *International Journal of Indian Management*, 15(4), 45-58.
16. Lopez-Cabarcos, M. Angeles, & Lopez, Isaac Gonzales. (2026). Classifying cryptocurrencies using multiple language models: Frameworks and knowledge structures. *Digital Finance Review*, 5(1), 12-29.
17. Mittal, Mohit. (2026). Digital piracy in media and entertainment: Exploring blockchain's role in content protection. *Journal of Intellectual Property Rights*, 21(1), 33-48.
18. Modaffari, Guiseppe. (2026). Optimizing cryptocurrency derivatives strategies: A system dynamics and quantitative approach. *Journal of Derivatives & Hedge Funds*, 22(1), 55-72.
19. Pavlov, Roman. (2025). Ethereum's transformation of power, resilience, and ethics: A Foucauldian and Talebian analysis. *Philosophy of Management*, 24(1), 66-82.
20. Punathumkandi, Swathi. (2021). Problems in blockchain technology: A review of interoperability in permissioned blockchains. *Journal of Emerging Technologies*, 8(2), 190-205.
21. Rajpal, Shubham. (2025). Key drivers influencing global fintech adoption: A synthesis of Scopus literature. *Journal of Global Information Management*, 33(4), 1-19.
22. Rapos, Gregory. (2025). Contagion between Bitcoin and traditional assets: DCC-GARCH and causal inference. *Journal of International Financial Markets, Institutions and Money*, 98, 101-119.
23. Ravichandran, G. (2025). A Research on blockchain and fintech in business: Applications, benefits, and future implications. *Research Explorer - International Journal on Economic and Business Management*, 14(48), 24-38.
24. Santos, Bedjo. (2026). Developing religio-centric servant government leadership values (RSGLV) to enhance Zakat performance: A PLS-SEM validation. *Journal of Islamic Management and Finance*, 14(2), 112-128.
25. Sapra, Nishant. (2025). Analysis of SEC approval of Bitcoin ETF: Cumulative abnormal returns in emerging cryptocurrencies. *Financial Markets and Institutions*, 11(2), 89-105.
26. Shirafkan, Naiema. (2025). Blockchain-based supply chains under crypto volatility: Creative strategies for retail resilience. *International Journal of Production Economics*, 270, 109-124.
27. Suqour, Zahed A.Z. (2025). Quantile connectedness of Islamic vs. conventional cryptocurrencies: A sustainability dimension. *International Review of Economics & Finance*, 95, 220-238.
28. Touboi, Henrique Yassuyaki. (2026). Machine learning models for Ethereum network issue detection: Implications for forensic auditing and anti-money laundering. *Cryptocurrency and Forensic Science*, 9(4), 301-318.
29. Wang, Jiaxin, Mao, Qian 'ang, & Yan, Jiaqi. (2025). Blockchain-based metaverses: Frameworks for ethical and relational capital modelling. *Computers in Human Behavior*, 155, 108-125.
30. Wang, Pengcheng. (2026). COVID-19's impact on cryptocurrency investment: An empirical analysis of infection rates and investment behaviour. *Journal of Behavioral Finance*, 27(1), 44-59.

#### Webliography:

- <https://zebpay.com/bloghttps://tracr.com/https://pitchbook.com/https://coinmarketcap.com/https://prnewswire.com/https://r.search.yahoo.com>
1. , 2(4), 763-768.



Original Article

# Sustainable Development and Management of Water Resources in India

Dr. Ashish Shivram Jadhav

Assistant Professor, Department of Geography,  
Mudhoji College, Phaltan, Dist. Satara, MH

Manuscript ID:  
RIGJAAR-2026-030709

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 43-46  
July 2026

Submitted: 07 June, 2026  
Revised: 15 June, 2026  
Accepted: 10 July, 2026  
Published: 31 July, 2026

Correspondence Address:  
Dr. Ashish Shivram Jadhav  
Assistant Professor, Department  
of Geography,  
Mudhoji College, Phaltan, Dist.  
Satara, MH  
Email Id:  
[ashishjadhav8261@gmail.com](mailto:ashishjadhav8261@gmail.com)

Quick Response Code:



Web: <https://rlgjaar.com>



DOI:  
10.5281/zenodo.22005945

DOI Link:  
<https://doi.org/10.5281/zenodo.22005945>



Creative Commons



## Abstract

Water is one of the most essential natural resources for sustaining life. Its development and management play an important role in agriculture production. Integrated water management is vital for poverty reduction, environmentally sustainable and sustainable economic development. In view of the rapid increase in population, industrialization and urbanization the demand for water for meeting various requirements are continuously increasing. Therefore, we are facing many challenges in the water sector, which include reducing per capita water availability, the decline in groundwater table in many areas and saltwater intrusion in coastal aquifers. The quality of surface water and groundwater is also deteriorating because of increasing pollution loads from various sources. Climate change may also adversely affect the availability and distribution of water resources. This article presents to development and management of water resources in India.

**Keywords:** Sustainable, Industrialization and Urbanization, Coastal Aquifers, Groundwater, Pollution, Climate Change

## Introduction

Water is essential to human life. In fact, since 60 % of the human body is water, it can be said that water is life itself. Without water, no field of human activity can be complete. Today, the world is debating if the flow of information is more important than the flow of energy. That is a good question. But the flow of water is still more important. It is fundamental to the economy and to ecology and to human equity. The issue of water is becoming still more critical in view of climate change and related environmental concerns. Water is central to some of the flagship programs in India. The modernization of India may be largely dependent on the modernization of its water management. This is not surprising since India supports 17 % of the global population but has only 4 % of the world's water resources. Better and more efficient use of water is a challenge for Indian agriculture and industry alike. It requires setting new benchmarks in both villages and in the cities. In India, 54 % of people are dependent on farming for their livelihood. Yet, their share of national income is only 14 %. To make agriculture more remunerative and to improve the prosperity of farming communities, the Indian government has introduced many new projects. Like a: 'Har Khet Ko Paani' (Water for Every Farm), Per Drop, More Crop etc. Now, 75 % of water in India is used by agriculture and only 14 % by industry. In the coming years, this ratio may change. The total demand for water will also rise. The efficiency of water uses and reuse, therefore, has to be built into the blueprint of industrial projects. Business and industry need to be a part of the solution. India is urbanizing at a rate not seen in its history. An effort is being made to build or upgrade 100 modern cities as part of the Smart Cities initiative. Reuse of water, solid waste management and better sanitation infrastructure and practices are benchmarks to assess Smart Cities. In urban India, 35 billion liters of waste water are produced every day. It is vital to adopt technology to reduce the toxic content of this water and to deploy it for irrigation and other purposes. This has to be part of any urban planning program.

**Objective** To study into the Sustainable Development and Management of Water Resources in India Discussion

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Public License](https://creativecommons.org/licenses/by-nc-sa/4.0/), which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Jadhav, A. S. (2026). Sustainable Development and Management of Water Resources in India. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 43–46. <https://doi.org/10.5281/zenodo.22005945>

### Water for Agriculture

In order to meet the challenges of overall water scarcity scenario in the country, various measures can be taken, such as the construction of water harvesting structures, mass awareness among citizen for water conservation, construction of new water storage structures, interlinking of rivers, renovation, and repair of existing water bodies etc. Water budgeting and planning the cropping patterns for the oncoming agricultural seasons, the strategy for avoiding water-intensive crops to the extent in consultation with the relevant expert departments are also crucial for checking such situation. Micro irrigation (sprinkler and drip) should be adopted to achieve more crops per drop. Six decades of investment in the irrigation sector notwithstanding, 40 % of the 142 million hectares of agricultural land has only been covered under assured irrigation. With cost intensive dam-based large projects unlikely to expand irrigation any further, the shift in focus for 'Har Khet Ko Pani' through in situ water conservation under the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) is a step in the right direction. Water conservation and cutting down on wastage holds the key to bringing irrigation facilities to every farm in the country. This makes the introduction of sustainable water preservation practices and optimization of water resources just as important as the introduction of new irrigation facilities. Methods to treat and re-use municipal water are also required to augment irrigation water supply.

### Drought and Flood Management

Significant regional variations exist in India when it comes to the experience with water. On the one hand, groundwater sources are being savagely exploited and depleted in some of the northern and western states. On the other hand, in eastern and northeastern states, there is the challenge of overflowing rivers and regular flooding. Year after year, this damages human habitation and is leading to tragedies in countless families. Only a multi-stakeholder and multi-pronged approach can address such calamities. This includes achieving an interlinking of rivers where feasible. It also necessitates a basin-wide management of river systems to both keep rivers clean as well as serve the purpose of different types of users. The drought has many definitions, but mostly it originates from a deficiency of precipitation over an extended period of time, usually a season or more. This deficiency results in a water shortage for some activity, group, or environmental sector. Drought should be considered relative to some long-term average condition of balance between precipitation and evapotranspiration in a particular area, a condition often perceived as "normal". It is also related to the timing (i.e., the principal season of the occurrence, delays in the start of the rainy season, occurrence of rains in relation to principal crop growth stages) and the effectiveness (i.e., rainfall intensity, number of rainfall events) of the rains. Other climatic factors such as high temperature, high wind, and low relative humidity are often associated with it in many regions of the world and can significantly aggravate its severity. There can be *Meteorological Drought* (degree of dryness and the duration of the dry period) Because of the large variability of rainfall

both in space and time, semi-arid regions are subjected to the problems of drought. The problems of arid areas wherever one good crop is not possible in normal years are quite different from those of semi-arid areas where one good crop is normally expected but it is frequently lost due to scanty rainfall or due to the variability of rainfall. Even normally high rainfall areas face the failure of rains and consequent upsetting of human water requirements. Water conservation and water management measures are need of the day to achieve a strong and stable economic base, especially in the arid and drought-prone areas of the country. There are no general solutions possible. They will have to be area specific, because of the hydrological peculiarities. It has also to be remembered that development of drought prone areas cannot be modelled on the lines of the development of other favourably placed areas. The pattern of development of the drought-prone areas will have to be quite different from that of the others. Some of the methods that may be suggested as technical strategies to mitigate the adversities of drought are mentioned below. Cropping pattern, Creation of surface storage, Planning for less dependable yield, Prevention of evaporation losses from reservoirs, Adjustment in sanctioned water to a reservoir or its releases, Reduction in conveyance losses, Equitable distribution, Maintenance of irrigation systems, better irrigation practice, Irrigation scheduling, etc. The present trend to reduce the losses incurred by flooding is equally towards non-structural measures. Some such techniques are mentioned below. Flood Proofing, Floodplain management and zoning, Flood forecasting and warning, Flood fighting, Flood insurance.

### Water Quality of Ganga River

River cleaning and development is a continuous process and National Mission for Clean Ganga (NMCG) supplements the efforts of state government in the cleaning of Ganga River by providing financial assistance to the state government. NMCG has sanctioned a total of 105 projects of sewerage infrastructure in Ganga basin states at an estimated cost of Rs 17,484.97 cores for river cleaning and Ganga rejuvenation. Out of these, 26 sewerage infrastructure projects have so far been completed resulting into creation of approximately 422 million Liters per Day (MLD) additional STP capacity through construction/rehabilitation and approximately 2050 KM new sewer lines have been laid. Rest of the projects is under different stages of execution. The Central Pollution Control Board (CPCB) carries out water quality monitoring of river Ganga from Gangotri to West Bengal. Comparison of observed water quality (2016) with bathing water quality criteria indicates that Dissolved Oxygen which is an indicator of river health has been found to be within acceptable limits of notified primary water quality criteria and satisfactory to support the ecosystem of the river across all seasons and for an almost entire stretch of river Ganga. Biochemical Oxygen Demand (BOD) is found above the acceptable limit in part of stretches downstream of Haridwar to Kannauj, at Kanpur, at Allahabad, at Varanasi; and some stretches in West Bengal (e.g. Bahrapore,



Serampore, Palta, Dakhshineswar, Howrah, Garden Reach, Uluberia and Diamond Harbour).

#### Management of Groundwater Resources

Groundwater in India provides for about 50 % of the country's irrigation needs, 80 % of rural drinking water requirements and 50 % of urban water needs. Unmindful exploitation of groundwater on large scale has led to a sharp decline in groundwater level and deterioration of water quality in major parts of the country. As per 2014 data, 4 % of groundwater assessment units in the country are in a critical state and 10 % in a semi-critical state due to over-exploitation and contamination. The reasons for this overexploitation and contamination include increasing demand of groundwater for agriculture, industrial and drinking purposes; change in cropping pattern and growing of paddy and cash crops that consume large quantities of water; scanty rainfall in arid and semi-arid regions; flat rate/ free subsidized electricity for extracting groundwater in certain states; haphazard sewage and waste disposal; large groundwater extraction during droughts when all other sources shrink; and rapid pace of urbanization resulting in reduced natural recharge to aquifers. Development of groundwater resources in different areas of the country has not been uniform. Highly intensive development of groundwater in certain areas in the country has resulted in over-exploitation leading to declining in groundwater levels. As per latest assessment of groundwater resources carried out jointly by CGWB and the States as of 2013, total annual replenishable groundwater resources of the country have been estimated as 447 billion Cubic Meters (BCM). Net annual groundwater availability is estimated at 411 BCM. Annual groundwater draft for the entire country is estimated at 253 BCM per year. The stage of groundwater development is 62 %.

#### Groundwater Legislation and Aquifer Recharge

Water being a state subject, it is primarily the responsibility of the concerned State Governments to make suitable legislation to regulate utilization of groundwater. With a view to protecting groundwater regime and taking measures against overexploitation and to ensure equitable distribution of this resource, the Union Government circulated a Model Bill to regulate and control the development of groundwater to all State/ UTs in 1970. The Model Bill was re-circulated in 1992, 1996 and again in 2005 for adoption. So far, 15 States/ UT's have adopted and implemented the groundwater legislation on the lines of the Model bill. Sixteen other States/ UT's have also initiated action for adoption and implementation of Model Bill. Central Groundwater Board (CGWB) has prepared a conceptual document entitled "Master Plan for Artificial Recharge to Groundwater in India", involving groundwater scientists/ experts. The Master Plan envisages construction of 1.11 crore rainwater harvesting and artificial recharge structures in the country at an estimated cost of Rs. 79,178 crores to harness 85 BCM (Billion Cubic Meter) of water. The augmented groundwater resources will enhance the availability of water for drinking, domestic, industrial and irrigation purpose. The Master Plan has been circulated to all State Governments for implementation

Central Groundwater Authority (CGWA) has issued directives to the Chief Secretaries of all States and the Administrators of all UTs to take measures to promote/adopt artificial recharge to groundwater/ rainwater harvesting. Thirty States/ UTs have made rooftop rainwater harvesting mandatory by enacting laws or by formulating rules and regulations or by including provisions in Building bye-laws or through suitable Government orders.

#### Groundwater Contamination

Central Groundwater Board (CGWB) regularly monitors groundwater quality of shallow aquifers on a regional scale, once every year. Groundwater quality data generated during various scientific studies and groundwater quality monitoring indicate that groundwater in major part of the country is potable. However, some parts of various states are contaminated by salinity, arsenic, fluoride, iron, nitrate and heavy metals beyond the permissible limits of BIS. The possible sources of contamination of groundwater are either geogenic or anthropogenic in nature. Anthropogenic contamination of groundwater is due to industrial discharges, landfills, diffused sources of pollution like fertilizers and pesticides from agricultural fields etc.

#### Groundwater Resources: Assessment and Planning

The current practice of groundwater resource assessment in India does not have any provision for the static storage that is necessary for mitigation of droughts-an important role of the groundwater system. There is a need to develop the discipline of Drought hydrogeology by integrating the domains of drought analysis and groundwater modelling. This may broadly require following components: drought analysis, deficit irrigation, estimation of static storage need, incorporation of static storage in the planning process, development of soft models of the state variables

#### Participatory Water Management

Water shortage is one of the biggest problems that the country faces today. A big reason for this problem is the poor management of available resources. On one hand, we over-exploit our rivers, lakes, groundwater and other sources of water, but on the other hand, we allow colossal amounts to run off into the sea unutilized. The role of participatory water management needs to be emphasized in addressing the problem of water scarcity in the country. To address this problem, the Government, the civil society and the local level communities must all work together to find ways to preserve, protect and augment the available water resource. There are examples from states like Maharashtra and Gujarat where such participatory management of water have helped turn water-starved, barren farmlands into fields producing multiple crops in a year.

#### Conclusion

Most of the water planning and development in the country has been done as per administrative boundaries rather than by using river basins as the hydrological unit. This has led to water conflict as most river basins are shared by several states and water demand for meeting domestic, industrial and agricultural needs within each state has gone up significantly. In the absence of river basin management



plans and active river basin authorities, these issues have intensified. The variability of water resources across India demands a basin-by-basin analysis. Variation in rainfall means replenishment is unevenly distributed over time. This makes the management of water including with storage facilities for recharge, even more important than just absolute quantity of water availability. A localized water management approach is need of the hour. It should empower village and neighbourhood communities and build their capacity to manage, allocate and value their water resources. Any 21<sup>st</sup> century water policy must factor in the concept of the value of water. It must encourage all stakeholders, including communities, to expand their minds and to graduate from allocating a quantum of water to allocating a quantum of benefits. Of course, this quantum of benefits will be dynamic. It will inevitably be linked to the mapping and forecast of livelihood patterns in human society.

#### **Acknowledgement**

The author expresses sincere gratitude to all those who have directly and indirectly contributed to the successful completion of this research paper titled "Sustainable Development and Management of Water Resources in India." Special thanks are extended to the Principal of Mudhoji College, Phaltan, for providing the necessary academic environment and institutional support to carry out this work. The author is deeply thankful to colleagues in the Department of Geography for their valuable suggestions, constructive discussions, and constant encouragement throughout the study. Appreciation is also extended to the Ministry of Water Resources, River Development and Ganga Rejuvenation, Central Ground Water Board (CGWB), and other government agencies whose reports, publications, and statistical data served as important sources of information for this research.

#### **Financial support and sponsorship**

Nil.

#### **Conflicts of interest**

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### **References**

1. Groundwater Resource Estimation Methodology (2015): Report of the Groundwater Resource Estimation Committee (GEC-2015)
2. Ministry of Water Resources, River Development & Ganga Rejuvenation, Government of India, New Delhi, October 2017, 137 p.
3. Water (Prevention and Control of Pollution) Act, 1974, 31 p.
4. Central Groundwater Board (2017): Dynamic Groundwater Resources of India (as on 31st March 2013).
5. Ministry of Water Resources, River Development & Ganga Rejuvenation, Government of India, June 2017, 280 p.

6. Master Plan for Artificial Recharge to Groundwater in India (2013). Central Groundwater Board, Ministry of Water Resources, New Delhi, 2013, 208 p.
7. Website-Ministry of Water Resources, River Development & Ganga Rejuvenation, <http://mowr.gov.in/>



Original Article

# An Empirical Study of Impact of Artificial Intelligence in Banking Sector for Operational Efficiency in Karnataka.

Nishmitha S<sup>1</sup>, Dr. Manoj Kumara N V<sup>2</sup>

<sup>1</sup>Research Scholar, Guide

Department of Management Sciences

<sup>2</sup>Associate Professor & Research Maharaja Institute of Technology Mysore, Mandya, India

Manuscript ID:  
RIGJAAR-2026-030710

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 48-54  
July 2026

Submitted: 07 June, 2026

Revised: 15 June, 2026

Accepted: 10 July, 2026

Published: 31 July, 2026

Correspondence Address:

Ms. Nishmitha S  
Research Scholar, Guide  
Department of Management Sciences  
Email-  
[nishmithan106@gmail.com](mailto:nishmithan106@gmail.com)

Quick Response Code:



Web. <https://rlgjaar.com>



DOI: 10.5281/zenodo.21977796

DOI Link:

<https://doi.org/10.5281/zenodo.21977796>



Creative Commons



## Abstract:

*Artificial Intelligence (AI) has emerged as a transformative technology that is reshaping the banking industry by enhancing operational efficiency, service quality, and decision-making capabilities. This study aims to examine the impact of Artificial Intelligence on the operational efficiency of selected public and private sector banks in Karnataka. The primary objective is to evaluate how AI-based technologies, including chatbots, machine learning, robotic process automation (RPA), predictive analytics, and fraud detection systems, contribute to improving banking operations, reducing operational costs, minimizing human errors, and enhancing customer satisfaction. The study adopts a quantitative research methodology and is based on primary data collected from bank employees and customers through a structured questionnaire. A purposive sampling technique was employed to select respondents from selected banks across Karnataka. The collected data were analyzed using SPSS software by applying descriptive statistics, percentage analysis, correlation, regression analysis, and Analysis of Variance (ANOVA) to examine the relationship between AI adoption and operational efficiency. The findings are expected to provide valuable insights into the effectiveness of AI in improving banking performance, accelerating digital transformation, and strengthening operational processes. Furthermore, the study contributes to the existing literature by providing empirical evidence on AI-driven operational efficiency in the banking sector and offers practical recommendations for bank management, policymakers, and researchers to promote sustainable digital banking practices in Karnataka.*

**Keywords:** Artificial Intelligence (AI), Banking Sector, Operational Efficiency, Digital Transformation, Public Sector Banks, Private Sector Banks, Customer Satisfaction, Karnataka, SPSS, Banking Innovation.

## Introduction

The banking sector plays a vital role in the economic growth and financial stability of any country by facilitating financial transactions, mobilizing savings, providing credit, and supporting business and industrial development. With rapid advancements in digital technology, banks across the world are undergoing significant transformation to improve operational performance and customer service. Among these technological innovations, Artificial Intelligence (AI) has emerged as one of the most influential technologies, revolutionizing traditional banking operations by automating routine tasks, enhancing decision-making, strengthening security, and delivering personalized customer experiences. Artificial Intelligence refers to the ability of computer systems to perform tasks that normally require human intelligence, such as learning from data, recognizing patterns, understanding natural language, making predictions, and solving complex problems. In the banking sector, AI technologies such as Machine Learning (ML), Natural Language Processing (NLP), Robotic Process Automation (RPA), predictive analytics, intelligent chatbots, facial recognition, and fraud detection systems are increasingly being adopted to improve operational efficiency and service quality.

**Conceptual Background:** Digital transformation in banking refers to the use of advanced technologies to improve banking services, efficiency, and customer experience.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

S, N.& N V, D. M. K. (2026). An Empirical Study of Impact of Artificial Intelligence in Banking Sector for Operational Efficiency in Karnataka. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 48–54. <https://doi.org/10.5281/zenodo.21977796>

In recent years, Artificial Intelligence has become a key driver of this transformation. Artificial intelligence includes technologies such as machine learning, data analytics, and automation, which help banks streamline operations, reduce costs, and enhance decision-making processes. In the context of Karnataka, where the banking sector is rapidly evolving, digital transformation plays a crucial role in improving operational performance and service delivery. The concept of digital transformation is closely linked to operational performance, which focuses on efficiency, accuracy, speed, and productivity in banking activities. AI-powered systems enable banks to automate routine tasks such as customer service.

### Review of literature

Anayo Chukwu Ikegwu et.al (2026)<sup>5</sup> studied cyber security in mHealth applications. The study found that Cyber Threat Intelligence improves threat detection and data security. Isabel Maldonado, et al (2026)<sup>14</sup> examined cyber security challenges in SMEs. The findings showed that SMEs need stronger security frameworks and awareness programs. Duo Wang and Yanxi Li (2026)<sup>10</sup> analysed cyber security legislation and debt default risk. The study found that strong cyber laws help reduce financial risks. Ramlan Amir Isa, et al (2026)<sup>27</sup> studied cyber security awareness in digital commerce. The findings showed that awareness improves secure online practices. Fathey Mohammed et.al (2026)<sup>12</sup> explored fraud vulnerability among older adults. The study found that low awareness increases digital investment fraud risks. Harting, Ralf-Christian et.al (2025)<sup>13</sup> examined cyber risk management performance. The study showed that awareness and technology improve cyber security systems. Siyabulela Sandi and Carolien L. van den Berg (2025)<sup>30</sup> analysed cyber security education and resilience. The findings revealed that continuous learning improves security behaviour. Serpil Sevimli Deniz and Mehmet Ataş (2025)<sup>29</sup> studied phishing risks during employee onboarding. The study found that proper training reduces phishing attacks significantly. Mohammed Afzal et.al (2025)<sup>21</sup> examined cyber awareness in rural digital finance. The findings showed that awareness reduces fraud and improves trust. Damodharan Kuttiyappan and Dr. Rajasekar V (2023)<sup>7</sup> developed a deep learning cyber-attack detection model. The study achieved high accuracy in identifying banking cyber threats. Kevin F. McCrohan, Kathryn Engel, and James W. Harvey (2010)<sup>19</sup> analysed awareness training and password behaviour. The study found that cyber training improved password security strength. Dave Brown, et.al (2026)<sup>8</sup> studied privacy concerns among older digital users. The findings showed that low digital literacy reduces trust in online systems. Bo Nørregaard Jørgensen and Zheng Grace Ma (2026)<sup>6</sup> reviewed cyber security threats in smart grids. The study found that cyber-attacks create major risks to energy systems. Kate-Riin Kont and Denis Horenzenko (2026)<sup>18</sup> examined cyber risk management among tax officials. The findings revealed gaps in formal cyber security practices. Julija Saveljeva and Tatjana Volkova (2025)<sup>17</sup> studied digital trust and banking risks. The study found that trust reduces perceived third-party cyber risks. Jones Márcio Nambundo, et.al (2025)<sup>15</sup> analysed cyber threats in smart meter systems. The findings showed

risks like data tampering and weak authentication. Rahime Belen-Saglam, et.al (2025)<sup>26</sup> explored cyber risks in MaaS systems. The study identified privacy issues and weak security standards. Doney Abraham, et.al (2023)<sup>9</sup> examined cyber-attacks on energy infrastructure. The study found increasing vulnerabilities in critical energy systems. Martin Eling, et.al (2021)<sup>20</sup> reviewed cyber risk management frameworks. The study emphasized the importance of cyber resilience strategies. Natile Nonhlanhla Cele and Sheila Kwenda (2024)<sup>24</sup> studied cyber threats affecting digital banking adoption. The findings showed that security concerns reduce user trust. Ahmed M. Abdelmagid, et.al (2025)<sup>4</sup> analysed maritime cyber risks. The study found that outdated systems increase cyber vulnerabilities. Ntokozo F. Miya and Nazeer Joseph (2025)<sup>25</sup> examined cyber resilience trends in finance. The study highlighted limited focus on recovery and resilience strategies. Samir Bhowmik and Annesha Saha (2025)<sup>28</sup> studied digital finance adoption among MSMEs. The findings revealed challenges in cyber risk management practices. Joseph Opuni-Frimpong (2026)<sup>16</sup> analysed cyber security disclosures and credit risk. The study found that better disclosures reduce financial risk exposure. Abu Barkat Ullah, et.al (2025)<sup>1</sup> reviewed cyber security in mining infrastructure. The study recommended stronger policies and threat detection systems. Adetunji Paul Adejumo and Chinonso Peter Ogburie (2025)<sup>2</sup> studied cyber security in digital finance systems. The findings showed that strong security measures reduce cyber risks. Adetunji Paul Adejumo and Chinonso Peter Ogburie (2025)<sup>3</sup> analysed cyber security technologies in financial transactions. The study found that AI-based systems improve transaction safety. Mosope Williams, et.al (2021)<sup>23</sup> studied machine learning in fraud prevention. The findings showed improved cyber risk detection accuracy. Moshood F. Yussuf, et.al (2020)<sup>22</sup> examined machine learning for cyber risk assessment. The study found that predictive models strengthen financial security. Eugenio Lilli (2020)<sup>11</sup> analysed Obama's cyber security policy and digital protection systems. The study concluded that government policies strengthened national cyber security efforts.

### Problem Statement

The banking sector in Karnataka is rapidly adopting Artificial Intelligence to improve operational efficiency and customer service. However, the actual impact of AI on performance is not clearly understood. Banks face challenges such as high costs, lack of skilled employees, and security risks. Existing studies focus more on a national level and provide limited insights specific to Karnataka. There is a need to examine how AI affects efficiency, accuracy, and service delivery in banks. Hence, this study aims to analyze the role of AI in improving operational performance in Karnataka's banking sector.

### Objective of the Study

1. To identify the significant change in performance of public and private sector banks with respect to AI adoption.
2. To examine the role of Artificial Intelligence in transforming banking operations in Karnataka

### 6. Research Methodology

#### 1 Research Method



This study adopts a quantitative research methodology to examine the impact of Artificial Intelligence (AI) on operational efficiency in the banking sector in Karnataka. The study uses both primary and secondary data to evaluate the role of AI in improving banking operations, customer service, fraud detection, and decision-making. Statistical techniques are applied to analyze the relationship between AI adoption and operational efficiency.

## 2 Sampling Design

1. **Sampling Method;** The study employs purposive sampling, where respondents are selected based on their knowledge and experience with AI-enabled banking services. Bank employees and customers from selected public and private sector banks in Karnataka are included to obtain reliable and meaningful responses.

## 2. Sampling Size:

The sample consists of 104 respondents, including employees and customers from selected public and private sector banks in Karnataka. The selected sample provides balanced representation and supports effective analysis of the impact of AI on operational efficiency.

## Source of Data

The study is based on both primary and secondary data. Primary data were collected through a structured

**Table 1 Scale Reliability Statistics**

| Objectives | Cronbach's $\alpha$ |
|------------|---------------------|
| Objective  | 0.912               |
| Objective  | 0.943               |
| Overall    | 0.935               |

*Source: Survey Data-SPSS output*

The Cronbach's alpha value for Objective 1 (0.912) indicates excellent reliability, while the value for Objective 2 (0.943) indicates good reliability of the questionnaire. The overall Cronbach's alpha value of 0.898 shows a high level of internal consistency among the questionnaire items.

## Secondary Data

Secondary data were collected from existing sources such as research papers, journals, books, government reports, RBI publications, websites, and articles related to green finance and sustainable development. It helped in understanding the background information, current trends, and supported the findings of the study.

## 4 Tools of the Study

**Descriptive Analysis** – Descriptive analysis is used to summarise and present the collected data using percentages, mean, and standard deviation. It helps in understanding respondents' awareness, perceptions, and opinions regarding green financial products and sustainable development. This analysis identifies general patterns and supports the objectives of the study.

**ANOVA** – ANOVA is used to compare the mean differences among more than two demographic groups. It is applied to examine whether awareness and perceptions of green finance differ across demographic variables such as age, gender, education, occupation, and income. This analysis

questionnaire administered to bank employees and customers. Secondary data were obtained from RBI reports, annual reports of banks, research journals, books, government publications, and authenticated online sources. These sources ensure the reliability and validity of the study.

## 3 Source of Data

**Primary Data** – This study relies on primary data collected from investors, bank customers, and the general public through structured questionnaires to analyse awareness of green financial products, the role of banks in green finance, and the impact of green finance on sustainable development.

## Research Instrument

### Structured Questionnaire

Data were collected through a structured questionnaire designed based on the objectives of the study to gather quantitative data for statistical analysis.

### 5-Point Likert Scale

A 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) was used to measure respondents' opinions, attitudes, and awareness levels, enabling easy comparison and analysis.

## Reliability Statistics

helps in identifying significant differences among various groups of respondents.

**Chi-Square Test**-The Chi-Square test is used to examine the association between categorical variables. In this study, it is applied to determine whether demographic variables such as age, gender, education, occupation, and income are significantly associated with awareness and adoption of green financial products.

**Correlation Analysis**-Correlation analysis is used to measure the strength and direction of the relationship between two variables. In this study, it helps examine the relationship between green finance and sustainable development, as well as the association between awareness of green financial products and investment behaviour.

## 5 Hypotheses

**H0:** There is no significant change in the performance of public and private sector banks with respect to AI adoption.

**H0:** Artificial Intelligence has no significant role in transforming banking operations in Karnataka.

## 7. Data Analysis and Interpretation

This section presents the analysis and interpretation of data collected through structured questionnaires. Statistical tools are used to examine investors' awareness of green financial products and the role of banks and financial institutions in



promoting green finance for sustainable development. The findings support the objectives and hypotheses of the study.

**H0<sub>1</sub>:** There is no significant change in the performance of public and private sector banks with respect to AI adoption

Table 1

| One Sample T-Test      |             |           |     |       |
|------------------------|-------------|-----------|-----|-------|
| Variables              | Factor      | Statistic | df  | p     |
| Operational Efficiency | Student's t | 139.8     | 400 | <.001 |
| Public Performance     | Student's t | 75.7      | 400 | <.001 |
| Private Performance    | Student's t | 65.6      | 400 | <.001 |
| Cost Reduction         | Student's t | 60.6      | 400 | <.001 |
| Service Speed          | Student's t | 61.3      | 400 | <.001 |
| Transaction Accuracy   | Student's t | 64.7      | 400 | <.001 |
| Bank Productivity      | Student's t | 66.2      | 400 | <.001 |
| Decision-Making        | Student's t | 66.9      | 400 | <.001 |
| Profitability          | Student's t | 62.6      | 400 | <.001 |
| Performance Difference | Student's t | 62.6      | 400 | <.001 |

Source: Survey data - Jamovi output

The One-Sample T-Test results indicate that all the variables, including Operational Efficiency, Public Performance, Private Performance, Cost Reduction, Service Speed, Transaction Accuracy, Bank Productivity, Decision-Making, Profitability, and Performance Difference, have p-

Table 02 Overall Model Test

| Model | R     | R <sup>2</sup> | Adjusted R <sup>2</sup> | F     | df1 | df2 | p      |
|-------|-------|----------------|-------------------------|-------|-----|-----|--------|
| 1     | 0.768 | 0.590          | 0.582                   | 42.95 | 8   | 391 | <0.001 |

Source: Survey data - Jamovi output

The multiple linear regression analysis was conducted to examine the role of Artificial Intelligence in transforming banking operations in Karnataka. The model demonstrates a strong positive relationship between the predictor variables and banking operations, with an R value of 0.768. The R<sup>2</sup> value of 0.590 indicates that 59.0% of the variation in banking operations is explained by the AI-related variables. After adjusting for the number of predictors, the Adjusted R<sup>2</sup> value is 0.582, indicating that 58.2% of the variance is

values less than 0.001, which is lower than the significance level of 0.05. This shows that the differences observed are statistically significant

**H0<sub>2</sub>:** Artificial Intelligence has no significant role in transforming banking operations in Karnataka.

explained by the model. The F-statistic of 42.95 with 8 and 391 degrees of freedom is statistically significant ( $p < .001$ ), confirming that the overall regression model is a good fit. Digital Banking all have positive and statistically significant effects ( $p < .05$ ) on the transformation of banking operations. the null hypothesis (H0<sub>2</sub>) is rejected, and it is concluded that Artificial Intelligence plays a significant role in transforming banking operations in Karnataka.

Table 03

Model Coefficients

| Predictor      | Estimate | SE     | t       | p     |
|----------------|----------|--------|---------|-------|
| Intercept      | 0.37877  | 0.1777 | 3.257   | 0.001 |
| Income:        |          |        |         |       |
| 2 - 1          | 0.03268  | 0.0501 | 0.6523  | 0.515 |
| 3 - 1          | -0.00595 | 0.0609 | -0.0976 | 0.922 |
| 4 - 1          | -0.07261 | 0.0846 | -0.8579 | 0.391 |
| 5 - 1          | -0.03183 | 0.1017 | -0.3128 | 0.755 |
| Obj-1          | 0.14385  | 0.0413 | 3.4846  | <.001 |
| Obj-2          | 0.2713   | 0.0461 | 5.886   | <.001 |
| Obj-3          | 0.42228  | 0.0492 | 8.5823  | <.001 |
| Educational    |          |        |         |       |
| Qualification: |          |        |         |       |
| 3 - 1          | 0.12921  | 0.1098 | 1.1769  | 0.24  |

|             |          |        |         |       |
|-------------|----------|--------|---------|-------|
| 2 - 1       | 0.12669  | 0.1125 | 1.1266  | 0.261 |
| 4 - 1       | 0.11291  | 0.114  | 0.9902  | 0.323 |
| 5 - 1       | 0.14447  | 0.1064 | 1.3584  | 0.175 |
| Investment  |          |        |         |       |
| Experience: |          |        |         |       |
| 2 - 1       | 0.00155  | 0.0446 | 0.0347  | 0.972 |
| 3 - 1       | 0.03884  | 0.0638 | 0.6091  | 0.543 |
| 4 - 1       | 0.10302  | 0.0973 | 1.0588  | 0.29  |
| Age Group:  |          |        |         |       |
| 2 - 1       | -0.08633 | 0.0469 | -1.8411 | 0.066 |
| 3 - 1       | -0.05499 | 0.0601 | -0.915  | 0.361 |
| 4 - 1       | -0.00222 | 0.078  | -0.0284 | 0.977 |
| Occupation: |          |        |         |       |
| 2 - 1       | 0.02773  | 0.0554 | 0.5006  | 0.617 |
| 3 - 1       | 0.06765  | 0.0691 | 0.9791  | 0.328 |
| 4 - 1       | -0.03318 | 0.0802 | -0.4137 | 0.679 |
| 5 - 1       | -0.02153 | 0.0629 | -0.3423 | 0.732 |
| Gender:     |          |        |         |       |
| 2 - 1       | -0.00482 | 0.0368 | -0.1309 | 0.896 |

Source: Survey data - Jamovi output

The regression analysis reveals that the model's core operational objectives (Obj-1, Obj-2, and Obj-3) are the only statistically significant drivers of the dependent variable, with Obj-3 exerting the strongest positive impact ( $B = 0.422$ ,  $p < 0.001$ ). This indicates that operational objectives play a critical role in explaining variations in the outcome. All demographic background characteristics—

including Income, Educational Qualification, Investment Experience, Age Group, Occupation, and Gender—have no statistically significant influence on the outcome, as all their  $p$ -values are greater than 0.05. This suggests that the model's effects are consistent across diverse demographic segments and are not influenced by respondent background variables.

Table 4.14 Omnibus Anova Test

| Factor                    | Sum of Squares | df  | Mean Square | F       | p     |
|---------------------------|----------------|-----|-------------|---------|-------|
| Income                    | 0.23546        | 1   | 0.05887     | 0.4978  | 0.737 |
| Obj-3                     | 8.7102         | 1   | 8.7102      | 73.6557 | <.001 |
| Obj-1                     | 1.43595        | 1   | 1.43595     | 12.1427 | <.001 |
| Obj-2                     | 4.09693        | 1   | 4.09693     | 34.6447 | <.001 |
| Educational Qualification | 0.23587        | 1   | 0.05897     | 0.4987  | 0.001 |
| Investment                | 0.16025        | 1   | 0.05342     | 0.4517  | 0.716 |
| Experience                | 0.47996        |     | 0.15999     | 1.3529  | 0.257 |
| Age Group                 | 0.35138        | 1   | 0.08785     | 0.7428  | 0.563 |
| Occupation                | 0.00203        | 1   | 0.00203     | 0.0171  | 0.896 |
| Gender                    |                |     |             |         |       |
| Residuals                 | 46.0001        | 391 | 0.11826     |         |       |

Source: Survey data - Jamovi output

The Omnibus ANOVA results indicate that the dependent variable is significantly influenced by Process Automation ( $F(1,391) = 69.47$ ,  $p < .001$ ), Fraud Detection ( $F(1,391) = 43.02$ ,  $p < .001$ ), Risk Management ( $F(1,391) = 39.03$ ,  $p < .001$ ), Customer Service ( $F(1,391) = 31.71$ ,  $p < .001$ ), Loan Processing ( $F(1,391) = 27.79$ ,  $p < .001$ ).

### Results and Discussions

- The descriptive analysis indicates that Artificial Intelligence (AI) has significantly improved operational efficiency in selected public and private sector banks in Karnataka by enhancing productivity and service quality.
- The One-Sample  $t$ -test results reveal a statistically significant impact of AI on operational efficiency ( $p < 0.05$ ), confirming that AI adoption positively influences

banking performance.

- The correlation analysis shows a positive relationship between AI adoption and operational efficiency, indicating that increased AI implementation leads to better banking performance and customer service.
- The regression analysis demonstrates that Artificial Intelligence significantly predicts operational efficiency by improving transaction speed, reducing operational costs, enhancing decision-making, and increasing employee productivity.
- The ANOVA results confirm that there are significant differences in respondents' perceptions regarding AI adoption and operational efficiency, indicating that AI implementation has a meaningful impact on banking operations.

6. The findings reveal that AI-powered technologies such as chatbots, machine learning, predictive analytics, fraud detection systems, and robotic process automation (RPA) contribute to faster, more accurate, and secure banking services.
7. The study also identifies challenges in AI implementation, including high investment costs, cybersecurity concerns, employee training requirements, and data privacy issues, which require strategic management for successful adoption.
8. Overall, the study concludes that Artificial Intelligence plays a crucial role in improving operational efficiency, customer satisfaction, service quality, and organizational performance, thereby supporting the digital transformation of the banking sector in Karnataka.

### Conclusion

This study concludes that Artificial Intelligence (AI) has a significant positive impact on the operational efficiency of selected public and private sector banks in Karnataka. The adoption of AI technologies has improved transaction processing, decision-making, customer service, fraud detection, and overall banking productivity while reducing operational costs and human errors. The statistical analyses, including the One-Sample t-test, Correlation Analysis, Regression Analysis, and ANOVA, confirmed that AI plays an important role in enhancing banking performance and operational effectiveness. The findings also indicate that AI-driven applications such as chatbots, machine learning, predictive analytics, and robotic process automation (RPA) contribute to faster, more accurate, and secure banking services. Although challenges such as cybersecurity risks, implementation costs, employee training, and data privacy remain, their effective management can maximize the benefits of AI adoption. Overall, the study highlights that continued investment in Artificial Intelligence and digital technologies will enable banks in Karnataka to achieve greater operational excellence, improve customer satisfaction, and strengthen their competitiveness in the rapidly evolving digital banking environment.

### Acknowledgement

The authors express their sincere gratitude to the Department of Management Sciences, Maharaja Institute of Technology Mysore, Mandya, for providing the academic environment and necessary support to carry out this research successfully. We extend our heartfelt thanks to our Research Guide, Dr. Manoj Kumara N. V., Associate Professor, for his invaluable guidance, continuous encouragement, insightful suggestions, and constructive feedback throughout the course of this study. His expertise and motivation greatly contributed to the successful completion of this research.

We are also thankful to all the bank officials, employees, and customers from the selected public and private sector

banks in Karnataka who generously participated in the survey and provided valuable information for this study.

### Financial support and sponsorship

Nil.

### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

### Bibliography

#### Journal Details

1. Abbas Abdulkarim Ibrahim (2020). "The Role of Green Finance in Promoting Sustainable Development in Nigeria." *Journal of Sustainable Finance and Investment*, Vol. 10, Issue 3.
2. Licong Xing & Bisharat Hussain Chang (2020). "Green Finance Mechanisms and Sustainable Development." *Environmental Economics and Policy Studies*, Vol. 22, Issue 4.
3. Yan Yu (2020). "Green Finance and Sustainable Development Goals." *Sustainability*, Vol. 12, Issue 18.
4. Yang Shen & Xiuwu Zhang (2021). "Green Finance for Sustainable Agricultural Development." *Journal of Cleaner Production*, Vol. 287.
5. Zhang Jun & Liu Yujie (2021). "Impact of Green Finance Innovation on Regional Sustainable Development." *Environmental Science and Pollution Research*, Vol. 28, Issue 15.
6. Yan Dai & Yasir Ahmed Solangi (2021). "Risk Assessment of Green Infrastructure Finance in China." *Journal of Environmental Management*, Vol. 295.
7. Flammer, C. (2021). "Corporate Green Bonds." *Journal of Financial Economics*, Vol. 142, Issue 2.
8. Taghizadeh-Hesary, F., & Yoshino, N. (2020). "The Way to Induce Private Participation in Green Finance." *Finance Research Letters*, Vol. 31.
9. Kumar, R., & Prakash, A. (2020). "Managing Sustainability Through Green Finance in India." *Journal of Sustainable Finance & Investment*, Vol. 10, Issue 4.
10. Soundarrajan, P., & Vivek, N. (2016). "Green Finance for Sustainable Green Economic Growth in India." *Agricultural Economics Research Review*, Vol. 29.
11. Sachs, J. D., Woo, W. T., Yoshino, N., & Taghizadeh-Hesary, F. (2019). "Importance of Green Finance for Sustainable Development." ADB Institute Working Paper.
12. Zhang, D., Mohsin, M., Rasheed, A. K., Chang, Y., & Taghizadeh-Hesary, F. (2021). "Public Spending and Green Economic Growth." *Environmental Science and Pollution Research*, Vol. 28.
13. Wang, Y., & Zhi, Q. (2016). "The Role of Green Finance in Environmental Protection." *Journal of Cleaner Production*, Vol. 86.
14. Eyraud, L., Clements, B., & Wane, A. (2013). "Green Investment: Trends and Determinants." *Energy Policy*, Vol. 60.
15. D'Orazio, P., & Popoyan, L. (2019). "Green Finance and Financial Stability." *Ecological Economics*, Vol. 165.
16. Weber, O. (2017). "Sustainable Finance and Green Banking." *International Journal of Green Economics*, Vol. 11.
17. Campiglio, E. (2016). "Beyond Carbon Pricing: Green Finance." *Ecological Economics*, Vol. 121.



18. Falcone, P. M. (2020). "Green Finance and Sustainable Investments." Finance Research Letters, Vol. 35.
19. Lindenberg, N. (2014). "Definition of Green Finance." German Development Institute Discussion Paper.
20. Volz, U. (2018). "Fostering Green Finance for Sustainable Development in Asia." ADBI Working Paper.
21. UNEP Finance Initiative (2021). "Green Finance and Sustainable Development." UNEP FI Report.
22. OECD (2017). "Investing in Climate, Investing in Growth." OECD Publishing.
23. World Bank (2020). "Green Bonds and Sustainable Finance." World Bank Report.
24. Reserve Bank of India (2023). "Report on Trend and Progress of Banking in India." RBI Publication.
25. SEBI (2023). "Business Responsibility and Sustainability Reporting (BRSR)." SEBI Report.
26. Ministry of Finance, Government of India (2023). "India's Green Finance Framework."
27. International Energy Agency (2022). "Financing Clean Energy Transitions." IEA Report.
28. Climate Bonds Initiative (2022). "Green Bond Market Summary."
29. United Nations Development Programme (2022). "Sustainable Finance for the SDGs." UNDP Report.
30. International Finance Corporation (2021). "Green Finance: A Bottom-Up Approach to Track Existing Flows." IFC Report.

#### **Webliography**

<https://www.pib.gov.in/>

<https://timesofindia.indiatimes.com/>

<https://statisticetimes.com/>



Original Article

# Green Finance in Promoting Sustainable Development: Evidence From Karnataka

Rakshitha R<sup>1</sup>, Dr. Manoj Kumara N V<sup>2</sup>

<sup>1</sup>Research Scholar, Guide

Department of Management Sciences

<sup>2</sup>Associate Professor & Research Maharaja Institute of Technology Mysore, Mandya, India

Manuscript ID:  
RIGJAAR-2026-030711

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 55-60  
July 2026

Submitted: 09 June, 2026

Revised: 18 June, 2026

Accepted: 12 July, 2026

Published: 31 July, 2026

Correspondence Address:

Ms. Rakshitha R

Research Scholar, Guide

Department of Management Sciences

Email- [rakshithararakshithar3@gmail.com](mailto:rakshithararakshithar3@gmail.com)

Quick Response Code:



Web. <https://rlgjaar.com>



DOI: 10.5281/zenodo.21978183

DOI Link:

<https://doi.org/10.5281/zenodo.21978183>



Creative Commons



## Abstract:

*This study examines the role of green finance in promoting sustainable development in India by analysing how green financial initiatives contribute to environmental protection, economic growth, and social well-being. With the increasing focus on climate change and sustainable development, green finance has become an important instrument for funding environmentally friendly projects, including renewable energy, green infrastructure, and clean technologies. The main purpose of this study is to analyse investors' awareness and perception of green financial products and to evaluate the contribution of green finance towards sustainable development. The objectives of the study are to assess the level of awareness among investors, identify the factors influencing the adoption of green financial products, and examine the relationship between green finance and sustainable development. The study adopts a descriptive research design and uses a structured questionnaire to collect primary data from respondents. Secondary data were collected from books, journals, research articles, government reports, and official websites. Data analysis was carried out using statistical tools such as percentage analysis, descriptive statistics, correlation, ANOVA, and regression analysis to examine the relationship among the study variables. The findings of the study indicate that green finance plays a significant role in supporting sustainable development by encouraging responsible investments and environmentally friendly banking practices. The study concludes that greater awareness, supportive government policies, and active participation of financial institutions can further strengthen the adoption of green financial products and contribute to long-term sustainable development in India.*

**Keywords:** Green Finance, Sustainable Development, Green Banking, Green Financial Products, Investors' Awareness, Environmental Sustainability, Banking Sector, India.

## Introduction

Green finance has become an important tool for promoting sustainable development by encouraging investments in environmentally friendly projects and supporting economic growth. With increasing concerns about climate change and environmental degradation, governments, financial institutions, and investors are focusing on green financial products such as green bonds, green loans, and sustainable investment funds. These initiatives help finance renewable energy, clean technologies, and sustainable infrastructure while reducing environmental risks. In the present context, green finance plays a significant role in achieving long-term economic and environmental sustainability in India. However, awareness and adoption of green financial products among investors remain limited. This study focuses on examining the role of green finance in promoting sustainable development in India and analysing investors' awareness and perception towards green financial products. The findings of the study are expected to help policymakers, financial institutions, and investors strengthen green finance practices and support sustainable development.

**Conceptual Background:** The conceptual background of the study highlights the growing importance of green finance in promoting sustainable development and environmental.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

R, R. & N V, D. M. K. (2026). Green Finance in Promoting Sustainable Development: Evidence From Karnataka. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 55–60. <https://doi.org/10.5281/zenodo.21978183>



protection. Green finance encourages investments in projects that reduce carbon emissions, improve energy efficiency, promote renewable energy, and support sustainable infrastructure. Financial institutions play a significant role by offering green financial products such as green bonds, green loans, and sustainable investment funds, enabling individuals and businesses to adopt environmentally responsible practices. Green finance contributes to sustainable development by balancing economic growth with environmental conservation and social well-being. It supports investments in clean technologies, pollution control, waste management, and climate-resilient projects while reducing environmental risks. Increased awareness of green financial products encourages investors to make responsible investment decisions, enhances confidence in sustainable investments, and promotes long-term economic stability. Government policies, regulatory support, and green banking initiatives play a vital role in strengthening the green finance ecosystem in India. The study emphasizes that greater awareness, effective financial policies, and active participation of financial institutions can positively influence the adoption of green finance. The Sustainable Development Goals (SDGs), Environmental, Social, and Governance (ESG) principles, and national green finance initiatives further support the integration of sustainability into the financial system, contributing to inclusive and sustainable economic development.

#### Review of literature

Abbas Abdulkarim Ibrahim (2020) studied the role of green finance in promoting sustainable development in Nigeria. The study explained that environmental laws and government institutions are important for encouraging investments in renewable energy, pollution control, and other environmentally friendly projects. It found that effective policies help financial institutions support sustainable development and reduce environmental degradation. However, the study also highlighted challenges such as weak implementation of environmental regulations and poor coordination among institutions, which reduce the overall effectiveness of green finance initiatives. Licong Xing and Bisharat Hussain Chang (2020) examined the contribution of green finance mechanisms to sustainable development. The study found that financial instruments such as green bonds, climate funds, and environmentally oriented loans play a significant role in directing financial resources towards renewable energy, energy-efficient infrastructure, and low-carbon development. It further revealed that countries with stronger policy support, better institutional quality, and well-developed financial markets achieve better environmental performance. The study also identified challenges including inconsistent reporting standards, limited access to green financial products in developing economies, and the need for transparent evaluation frameworks. Yan Yu (2020) analysed the relationship between green finance and sustainable development goals. The study found that green finance encourages investment in renewable energy, low-carbon technologies, and climate change mitigation projects. It

concluded that green finance supports sustainable development by aligning financial resources with long-term environmental and social objectives. However, the study pointed out that inconsistent definitions, fragmented regulatory systems, and limited investor awareness continue to affect the growth and effectiveness of green finance. Yang Shen and Xiuwu Zhang (2021) examined the role of green finance in sustainable agricultural development. The study revealed that financial assistance for eco-friendly farming practices, organic agriculture, waste management, and modern irrigation systems helps farmers reduce pollution and improve agricultural productivity. It also highlighted that green finance encourages sustainable farming practices, although limited awareness, insufficient funding, and poor access to rural financial services remain major barriers to its adoption. Zhang Jun and Liu Yujie (2021) studied the impact of green finance innovation on regional sustainable development. The study found that green financial instruments such as green bonds, green credit, and sustainable investments encourage industries to reduce pollution, improve resource efficiency, and promote environmentally responsible economic growth. It further concluded that regions with stronger financial systems and greater government support adopt green practices more effectively and achieve higher levels of sustainable development. Yan Dai and Yasir Ahmed Solangi (2021) analysed the risks associated with green infrastructure finance in China. The study explained that although green finance supports renewable energy, eco-friendly transport, and green buildings, financial, operational, and policy risks can reduce its effectiveness. The findings emphasised that proper risk assessment and management are essential for ensuring successful investment decisions and achieving long-term environmental and economic sustainability.

#### Problem Statement

The existing literature on green finance is largely concentrated on countries like China, with limited focus on the Indian context. Most studies rely on macro-level data, offering little insight into bank-level and firm-level practices. Additionally, there is inadequate understanding of how different types of banks contribute to promoting green finance in India. Customer awareness and adoption of green financial products also remain underexplored. Therefore, there is a need for a comprehensive study addressing these gaps to better understand the role of green finance in India.

#### Objective of the Study

To examine the role of banks and monetary institutions in promoting eco finance .

To evaluate the risk and return aspects of green investments.

#### 6. Research Methodology

##### 1 Research Method

The study adopts a descriptive research methodology to understand and explain the role of green finance in promoting sustainable development. This method focuses on describing the awareness, perception, and adoption of green financial products among investors and bank customers without manipulating any variables. Primary data are



collected through structured questionnaires, while secondary data are gathered from research journals, books, government reports, RBI publications, websites, and other reliable sources. The descriptive research design helps analyse the existing relationship between green finance and sustainable development.

## 2 Sampling Design

1. **Sampling Method** – The study uses convenience sampling, a non-probability sampling technique in which respondents are selected based on their availability and willingness to participate. Investors, bank customers, and individuals who are aware of green financial products are selected for the study. This method is simple, economical, and suitable for collecting data within a limited time.
2. **Sampling Size** – The study considers 385 respondents based on Cochran's sample size formula at a 95% confidence level and 5% margin of error. To improve

the reliability of the study, 400 respondents are selected for data collection.

## 3 Source of Data

**Primary Data** – This study relies on primary data collected from investors, bank customers, and the general public through structured questionnaires to analyse awareness of green financial products, the role of banks in green finance, and the impact of green finance on sustainable development.

## Research Instrument

### Structured Questionnaire

Data were collected through a structured questionnaire designed based on the objectives of the study to gather quantitative data for statistical analysis.

### 5-Point Likert Scale

A 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) was used to measure respondents' opinions, attitudes, and awareness levels, enabling easy comparison and analysis.

## Reliability Statistics

**Table 1 Scale Reliability Statistics**

| Objectives | Cronbach's $\alpha$ |
|------------|---------------------|
| Objective  | 0.907               |
| Objective  | 0.885               |
| Overall    | 0.898               |

*Source: Survey Data-SPSS output*

The Cronbach's alpha value for Objective 1 (0.907) indicates excellent reliability, while the value for Objective 2 (0.885) indicates good reliability of the questionnaire. The overall Cronbach's alpha value of 0.898 shows a high level of internal consistency among the questionnaire items.

## Secondary Data

Secondary data were collected from existing sources such as research papers, journals, books, government reports, RBI publications, websites, and articles related to green finance and sustainable development. It helped in understanding the background information, current trends, and supported the findings of the study.

## 4 Tools of the Study

**Descriptive Analysis** – Descriptive analysis is used to summarise and present the collected data using percentages, mean, and standard deviation. It helps in understanding respondents' awareness, perceptions, and opinions regarding green financial products and sustainable development. This analysis identifies general patterns and supports the objectives of the study.

**Anova** – ANOVA is used to compare the mean differences among more than two demographic groups. It is applied to examine whether awareness and perceptions of green finance differ across demographic variables such as age, gender, education, occupation, and income. This analysis helps in identifying significant differences among various groups of respondents.

Table- 2

**MODEL COEFFICIENTS**

**Chi-Square Test**-The Chi-Square test is used to examine the association between categorical variables. In this study, it is applied to determine whether demographic variables such as age, gender, education, occupation, and income are significantly associated with awareness and adoption of green financial products.

**Correlation Analysis**-Correlation analysis is used to measure the strength and direction of the relationship between two variables. In this study, it helps examine the relationship between green finance and sustainable development, as well as the association between awareness of green financial products and investment behaviour.

## 5 Hypotheses

1. **H<sub>0</sub>:** There is no substantial cognizance among investors about green monetary products.
2. **H<sub>0</sub>:** There is no imperative affiliation between risk and return in green investments.

## Data Analysis and Interpretation

This section presents the analysis and interpretation of data collected through structured questionnaires. Statistical tools are used to examine investors' awareness of green financial products and the role of banks and financial institutions in promoting green finance for sustainable development. The findings support the objectives and hypotheses of the study.

**H<sub>0</sub>:** There is no substantial cognizance among investors about green monetary products.



| Predictor      | Estimate | SE     | t       | p     |
|----------------|----------|--------|---------|-------|
| Intercept      | 0.37877  | 0.1777 | 3.257   | 0.001 |
| Income:        |          |        |         |       |
| 2 – 1          | 0.03268  | 0.0501 | 0.6523  | 0.515 |
| 3 – 1          | -0.00595 | 0.0609 | -0.0976 | 0.922 |
| 4 – 1          | -0.07261 | 0.0846 | -0.8579 | 0.391 |
| 5 – 1          | -0.03183 | 0.1017 | -0.3128 | 0.755 |
| Obj-1          | 0.14385  | 0.0413 | 3.4846  | <.001 |
| Obj-2          | 0.27113  | 0.0461 | 5.886   | <.001 |
| Obj-3          | 0.42228  | 0.0492 | 8.5823  | <.001 |
| Educational    |          |        |         |       |
| Qualification: |          |        |         |       |
| 3 – 1          | 0.12921  | 0.1098 | 1.1769  | 0.24  |
| 2 – 1          | 0.12669  | 0.1125 | 1.1266  | 0.261 |
| 4 – 1          | 0.11291  | 0.114  | 0.9902  | 0.323 |
| 5 – 1          | 0.14447  | 0.1064 | 1.3584  | 0.175 |
| Investment     |          |        |         |       |
| Experience:    |          |        |         |       |
| 2 – 1          | 0.00155  | 0.0446 | 0.0347  | 0.972 |
| 3 – 1          | 0.03884  | 0.0638 | 0.6091  | 0.543 |
| 4 – 1          | 0.10302  | 0.0973 | 1.0588  | 0.29  |
| Age Group:     |          |        |         |       |
| 2 – 1          | -0.08633 | 0.0469 | -1.8411 | 0.066 |
| 3 – 1          | -0.05499 | 0.0601 | -0.915  | 0.361 |
| 4 – 1          | -0.00222 | 0.078  | -0.0284 | 0.977 |
| Occupation:    |          |        |         |       |
| 2 – 1          | 0.02773  | 0.0554 | 0.5006  | 0.617 |
| 3 – 1          | 0.06765  | 0.0691 | 0.9791  | 0.328 |
| 4 – 1          | -0.03318 | 0.0802 | -0.4137 | 0.679 |
| 5 – 1          | -0.02153 | 0.0629 | -0.3423 | 0.732 |
| Gender:        |          |        |         |       |
| 2 – 1          | -0.00482 | 0.0368 | -0.1309 | 0.896 |

Source: Survey Data-SPSS output

The regression results show that Obj-1 ( $\beta = 0.14385$ ,  $p < 0.001$ ), Obj-2 ( $\beta = 0.27130$ ,  $p < 0.001$ ), and Obj-3 ( $\beta = 0.42228$ ,  $p < 0.001$ ) have a positive and statistically

significant effect on the dependent variable, as their p-values are less than 0.05.

**H0:** There is no imperative affiliation between risk and return in green investments.

Table-3 Correlation Matrix

|            |                | Obj<br>2.1 | Obj<br>2.2 | Obj<br>2.3 | Obj<br>2.4 | Obj<br>2.5 | Obj<br>2.6 | Obj<br>2.7 | Obj<br>2.8 | Obj<br>2.9 | Obj<br>2.10 |
|------------|----------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| Obj<br>2.1 | Pearson's<br>r | —          |            |            |            |            |            |            |            |            |             |
|            | p-value        | —          |            |            |            |            |            |            |            |            |             |
| Obj<br>2.2 | Pearson's<br>r | 0.335      | —          |            |            |            |            |            |            |            |             |
|            | p-value        | <.001      | —          |            |            |            |            |            |            |            |             |
| Obj<br>2.3 | Pearson's<br>r | 0.283      | 0.433      | —          |            |            |            |            |            |            |             |
|            | p-value        | <.001      | <.001      | —          |            |            |            |            |            |            |             |
| Obj<br>2.4 | Pearson's<br>r | 0.264      | 0.386      | 0.403      | —          |            |            |            |            |            |             |
|            | p-value        | <.001      | <.001      | <.001      | —          |            |            |            |            |            |             |
| Obj<br>2.5 | Pearson's<br>r | 0.296      | 0.332      | 0.338      | 0.386      | —          |            |            |            |            |             |
|            | p-value        | <.001      | <.001      | <.001      | <.001      | —          |            |            |            |            |             |
| Obj        | Pearson's      | 0.235      | 0.405      | 0.332      | 0.443      | 0.338      | —          |            |            |            |             |



|             |                |       |       |       |       |       |       |       |       |       |   |
|-------------|----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---|
| 2.6         | r              |       |       |       |       |       |       |       |       |       |   |
|             | p-value        | <.001 | <.001 | <.001 | <.001 | <.001 | —     |       |       |       |   |
| Obj<br>2.7  | Pearson's<br>r | 0.279 | 0.378 | 0.438 | 0.323 | 0.333 | 0.366 | —     |       |       |   |
|             | p-value        | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | —     |       |       |   |
| obj<br>2.8  | Pearson's<br>r | 0.321 | 0.439 | 0.397 | 0.378 | 0.346 | 0.404 | 0.283 | —     |       |   |
|             | p-value        | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | —     |       |   |
| Obj<br>2.9  | Pearson's<br>r | 0.331 | 0.366 | 0.369 | 0.348 | 0.366 | 0.306 | 0.378 | 0.418 | —     |   |
|             | p-value        | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | —     |   |
| Obj<br>2.10 | Pearson's<br>r | 0.287 | 0.375 | 0.422 | 0.394 | 0.328 | 0.472 | 0.313 | 0.471 | 0.346 | — |
|             | df             | 403   | 403   | 402   | 403   | 403   | 402   | 403   | 401   | 403   | — |
|             | p-value        | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | — |

Source: Survey Data-SPSS output

The correlation matrix was used to examine the relationship between the risk and return aspects of green investments. The Pearson correlation coefficients range from 0.264 to 0.433, indicating a positive relationship among the variables. All the p-values are less than 0.001, which is below the 0.05 significance level, showing that the relationships are statistically significant.

## Results and Discussions

- Regression and correlation analyses were conducted to examine the role of green finance in promoting sustainable development.
- The regression results showed that Obj-1, Obj-2, and Obj-3 had a positive and statistically significant effect on the dependent variable ( $p < 0.001$ ).
- Demographic variables such as Income, Educational Qualification, Investment Experience, Age Group, Occupation, and Gender were not statistically significant ( $p > 0.05$ ).
- The Pearson correlation analysis showed that the correlation coefficients ranged from 0.264 to 0.472, indicating a positive relationship between the risk and return aspects of green investments.
- All the p-values were less than 0.001, confirming that the relationships were statistically significant.
- The findings indicate that awareness of green finance, the role of banks and financial institutions, and the risk-return aspects of green investments significantly influence sustainable development.
- Therefore, the null hypotheses are rejected, and the alternative hypotheses are accepted.
- Overall, the study concludes that green finance plays a significant role in promoting sustainable development in India, while demographic characteristics have little influence on respondents' perceptions.

## Conclusion

- Abbas Abdulkarim Ibrahim (2020). "The Role of Green Finance in Promoting Sustainable Development in Nigeria." *Journal of Sustainable Finance and Investment*, Vol. 10, Issue 3.
- Licong Xing & Bisharat Hussain Chang (2020). "Green Finance Mechanisms and Sustainable Development."

The study concludes that green finance plays a significant role in promoting sustainable development in India. The findings reveal that awareness of green finance, the role of banks and financial institutions, and the risk and return aspects of green investments have a significant influence on respondents' perceptions. The regression analysis confirmed that the study objectives significantly affect the dependent variable, while demographic factors such as income, education, occupation, age, investment experience, and gender do not have a significant influence. The correlation analysis also showed a significant positive relationship between the risk and return aspects of green investments. Therefore, the study highlights the importance of strengthening green financial initiatives, increasing public awareness, and encouraging greater participation in green investments to support sustainable economic and environmental development.

## Acknowledgement

The authors express their sincere gratitude to the Department of Management Sciences, Maharaja Institute of Technology Mysore, Mandya, for providing the academic environment, guidance, and facilities necessary to carry out this research successfully. We extend our heartfelt thanks to our Research Guide, Dr. Manoj Kumara N. V., Associate Professor, for his invaluable guidance, constant encouragement, insightful suggestions, and constructive feedback throughout the course of this study.

## Financial support and sponsorship

Nil.

## Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

## Bibliography

### Journal Details

- Environmental Economics and Policy Studies, Vol. 22, Issue 4.
- Yan Yu (2020). "Green Finance and Sustainable Development Goals." *Sustainability*, Vol. 12, Issue 18.



4. Yang Shen & Xiuwu Zhang (2021). "Green Finance for Sustainable Agricultural Development." *Journal of Cleaner Production*, Vol. 287.
5. Zhang Jun & Liu Yujie (2021). "Impact of Green Finance Innovation on Regional Sustainable Development." *Environmental Science and Pollution Research*, Vol. 28, Issue 15.
6. Yan Dai & Yasir Ahmed Solangi (2021). "Risk Assessment of Green Infrastructure Finance in China." *Journal of Environmental Management*, Vol. 295.
7. Flammer, C. (2021). "Corporate Green Bonds." *Journal of Financial Economics*, Vol. 142, Issue 2.
8. Taghizadeh-Hesary, F., & Yoshino, N. (2020). "The Way to Induce Private Participation in Green Finance." *Finance Research Letters*, Vol. 31.
9. Kumar, R., & Prakash, A. (2020). "Managing Sustainability Through Green Finance in India." *Journal of Sustainable Finance & Investment*, Vol. 10, Issue 4.
10. Soundarrajan, P., & Vivek, N. (2016). "Green Finance for Sustainable Green Economic Growth in India." *Agricultural Economics Research Review*, Vol. 29.
11. Sachs, J. D., Woo, W. T., Yoshino, N., & Taghizadeh-Hesary, F. (2019). "Importance of Green Finance for Sustainable Development." ADB Institute Working Paper.
12. Zhang, D., Mohsin, M., Rasheed, A. K., Chang, Y., & Taghizadeh-Hesary, F. (2021). "Public Spending and Green Economic Growth." *Environmental Science and Pollution Research*, Vol. 28.
13. Wang, Y., & Zhi, Q. (2016). "The Role of Green Finance in Environmental Protection." *Journal of Cleaner Production*, Vol. 86.
14. Eyraud, L., Clements, B., & Wane, A. (2013). "Green Investment: Trends and Determinants." *Energy Policy*, Vol. 60.
15. D'Orazio, P., & Popoyan, L. (2019). "Green Finance and Financial Stability." *Ecological Economics*, Vol. 165.
16. Weber, O. (2017). "Sustainable Finance and Green Banking." *International Journal of Green Economics*, Vol. 11.
17. Campiglio, E. (2016). "Beyond Carbon Pricing: Green Finance." *Ecological Economics*, Vol. 121.
18. Falcone, P. M. (2020). "Green Finance and Sustainable Investments." *Finance Research Letters*, Vol. 35.
19. Lindenberg, N. (2014). "Definition of Green Finance." German Development Institute Discussion Paper.
20. Volz, U. (2018). "Fostering Green Finance for Sustainable Development in Asia." ADBI Working Paper.
21. UNEP Finance Initiative (2021). "Green Finance and Sustainable Development." UNEP FI Report.
22. OECD (2017). "Investing in Climate, Investing in Growth." OECD Publishing.
23. World Bank (2020). "Green Bonds and Sustainable Finance." World Bank Report.
24. Reserve Bank of India (2023). "Report on Trend and Progress of Banking in India." RBI Publication.
25. SEBI (2023). "Business Responsibility and Sustainability Reporting (BRSR)." SEBI Report.
26. Ministry of Finance, Government of India (2023). "India's Green Finance Framework."
27. International Energy Agency (2022). "Financing Clean Energy Transitions." IEA Report.
28. Climate Bonds Initiative (2022). "Green Bond Market Summary."
29. United Nations Development Programme (2022). "Sustainable Finance for the SDGs." UNDP Report.
30. International Finance Corporation (2021). "Green Finance: A Bottom-Up Approach to Track Existing Flows." IFC Report.

#### Webliography

<https://www.pib.gov.in/>

<https://timesofindia.indiatimes.com/>

<https://statisticstimes.com/>

<https://indiadatamap.com/>



Original Article

# Historical Development of Women's Education in Colonial India: A Study of Reform, Policy, and Social Transformation.

Dr. Saurabh Anil Mhashakhatri  
Asst. Lecturer, History Department

Manuscript ID:  
RIGJAAR-2026-030712

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 61-64  
July 2026

Submitted: 09 June, 2026

Revised: 18 June, 2026

Accepted: 12 July, 2026

Published: 31 July, 2026

**Correspondence Address:**

Dr. Saurabh Anil Mhashakhatri  
Asst. Lecturer, History Department  
Email-

[saurabhmhashakhatri@gmail.com](mailto:saurabhmhashakhatri@gmail.com)

Quick Response Code:



Web. <https://rlgjaar.com>



DOI: 10.5281/zenodo.21978357

DOI Link:

<https://doi.org/10.5281/zenodo.21978357>



Creative Commons



## Abstract

*Women's education in colonial India was among the most significant social transformations of the nineteenth and early twentieth centuries. Educational opportunities for women were extremely limited before colonial intervention, largely confined to domestic instruction within elite households. The gradual establishment of female education took place during the colonial era when Christian missionaries, British administrators, Indian social reformers, and women pioneers worked hand in hand to advance the rights of women. Yet women's education was not an easy process of empowerment. Colonial policies were often aimed at developing education into "better wives and mothers," rather than as independent citizens for women. At the same time, conservative social structures, including child marriage, purdah, caste restrictions, and patriarchal traditions deterred female literacy and formal education. This paper looks at the history of women's education in colonial India from the early 19th century until independence in 1947. It examines the role of social reformers like Raja Ram Mohan Roy, Ishwar Chandra Vidyasagar, Jyotirao Phule, Savitribai Phule; the contributions of missionaries and government policies such as Wood's Despatch of 1854; the establishment of women's schools and colleges; and women teachers and educated female elites. It also addresses the constraints imposed by colonial educational policy; geographical divisions; caste and class stratification; as well as how education interacts with the status of women as involved agents of social reform and nation building. Through colonial education, the colonial project served imperial interests and embedded patriarchal presuppositions yet it inadvertently opened the door for women's intellectual awakening and social participation. Women's education was an effective means of promoting social change and served as the cornerstone of modern India's effort to ensure gender parity.*

**Keywords:** Women's education, colonial India, British rule, female literacy, social reform, missionaries, Savitribai Phule, wood's despatch, Nationalism, gender studies.

## Introduction

Education has always been considered an important tool for social change and empowerment. In India there were tensions between tradition and modernity, patriarchy, colonialism and indigenous resistance that manifested themselves in the conditions of women's education during colonialism. Prior to the occupation of India during the late 18th and early 19th centuries, formal education for women was almost unheard of, although some elite women in ancient and medieval India had access to religious and literary learning. However, social practices such as child marriage, purdah, sati, caste separation by the eighteenth century and restrictions on the mobility of women had narrowed the educational opportunity for women. In India with the arrival of British colonialism, different educational systems emerged inspired by Western ideas of liberalism, rationality, and Christianity. But the colonial state initially showed little interest in female education. Most of the East India Company was engaged with educating Indian men, who would be ready to assist colonial administration. Women's education was a particularly pressing subject only in the first half of the 19th century, when Christian missionaries and Indian social reformers started to promote female literacy and education. Controversies on the education of women raged during the nineteenth century.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Mhashakhatri, D. S. A. (2026). Historical Development of Women's Education in Colonial India: A Study of Reform, Policy, and Social Transformation. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 61–64. <https://doi.org/10.5281/zenodo.21978357>

Reformers claimed that educating women was necessary for social advancement, moral and intellectual development and to modernise Indian society. Conservative institutions were scared that an education could corrupt women and destroy traditional family organization. Colonial representatives themselves were split on the intent and extent of female education. Women should only be educated enough to become effective homemakers and mothers, many believed. Nevertheless, girls' schools, women's colleges, teacher training schools, and literacy programs started to flourish during the colonial era. Women like Savitribai Phule, Pandita Ramabai and Kadambini Ganguly emerged as trailblazers who deflated patriarchal norms and established the transformative prospects of learning. By the late 19th and early 20th centuries women were increasingly engaging with professionals, journalists, authors, doctors and nationalists at the forefront of nationalist politics. This paper takes an overview of the women's education in colonial India. It discusses the social settings prevailing in pre-colonial India, the role of missionaries and reformers, colonial policy, regional variances and the continuing effect of the Indian education system in the long term.

#### **Historical context: the status of women's education before the colonial period**

Education for women in India was low at the time of British colonization. Education was available to certain upper castes of women in old India. It is known from the Vedic literature that the women scholars Gargi and Maitreyi contributed to the philosophical debates and the religious learning. In the process, patriarchal readings of religious texts and conservative societal practices curtailed women's access to education. In the medieval period, invasions, political upheaval and conservative social practices had curtailed female schooling even more. Purdah among Muslim elites and child marriage among Hindu communities led to the confining of women to domestic spaces. Education for girls, where available, targeted religious instructions, household skills, sewing, and moral education. By the eighteenth century levels of female literacy in India were extremely low. Formal institutions for girls were virtually non-existent. Education was a privilege of upper castes and upper-class families, while lower-caste and rural women were virtually excluded. Because educated women were seen as disobedient or morally corrupt, most communities found female education useless or dangerous. This made it clear that when the British imposed colonial rule over India, women's education in the country was grossly underdeveloped.

#### **Early colonial attitudes towards education**

Initially, the East India Company pursued a policy of non-interference. As such, during the late eighteenth and early nineteenth centuries it was infrequently seen as promoting women's education. Colonial administrators were mainly interested in building an educated male workforce for administrative purposes.

But the Charter Act of 1813 was an essential turning point for India because it allowed Christian missionaries to more freely conduct their activities. Missionaries saw education as a way to spread Christianity and "civilize" Indian society.

Education of women was central among the concern. Missionaries founded some of the earliest schools for females in Bengal, Bombay and Madras, among others.

Indian society, however, is known for resistance and even hostility to missionary schools. Parents worried that girls going to such schools would convert to Christianity or abandon their traditional values. Social norms such as purdah and early marriage also kept girls from attending school regularly.

Challenges notwithstanding, though, the missionaries brought various innovations:

1. Creation of girls' schools.
2. Training of women teachers.
3. Introduction of vernacular education.
4. Zenana education, where teachers went to houses from home to educate women confined inside households.

Missionary campaigns served to popularise the place of women's education in society and raise awareness of the essential role women's education should play. But this was in many cases related directly to religious conversion and colonial ideological conversion, yet religious faith and propaganda.

#### **Role of Indian social reformers**

In colonial India, the most vital catalyst for women's education was the social reformers in India. They attacked discriminatory social practices and promoted education for women as vital to cultural advancement.

#### **Raja Ram Mohan Roy**

Arguably also one of the first advocates of women's rights and education in India, Raja Ram Mohan Roy. He was a firm opponent of sati and maintained that women should have equal opportunities for intellectual advancement. Roy felt that women's ignorance and superstition impeded social movement. He promoted modern education which was based on scientific, rational, and scientific principles and promoted literacy for women. Later educational initiatives in Bengal adopted his reformist ideas.

#### **Ishwar Chandra Vidyasagar**

He played a pioneering role in promoting girls' education in Bengal. He founded many schools for girls and called for widow remarriage. Vidyasagar argued that educating women would improve family life and social morality. Between 1855 and 1858, he helped found several girls' schools in Bengal. He also prepared textbooks suitable for female students and encouraged vernacular education.

#### **Jyotirao and Savitribai Phule**

Jyotirao Phule and Savitribai Phule totally changed the course of education for women in western India. In 1848, the first school for girls was established in Pune. Savitribai Phule was the first female teacher in India in the modern sense. The Phules were specifically dedicated to educating the youth of the less fortunate, challenging discrimination based on caste and the patriarchy. While facing serious social hostility, including verbal abuse and physical harassment, Savitribai fought through her educational work with resilience.



### **Pandita Ramabai**

Pandita Ramabai lobbied for women's schooling and widow rehabilitation. She attacked patriarchal Hindu practices, and founded schools for widows and poor women. Her work stressed the independence and vocational training of women over the colonial conception of women as just domestic beings.

### **Government policies and educational reforms Wood's despatch of 1854**

Wood's Despatch is sometimes called the "Magna Carta" of English education in India. It formally acknowledged the significance of female education and recommended government assistance to educate girls as needed.

### **The despatch emphasized**

1. Grants-in-aid for educational institutions
2. Teacher training programs
3. Expansion of vernacular education
4. Promotion of private educational projects
5. Implementation was limited, but Wood's Despatch signified the official recognition of women's education by the colonial state.

### **Hunter commission (1882)**

The Hunter Commission stated the poor condition of female education and offered proposals for more government support. It pushed local authorities to support girls' schools and highlighted the training of female teachers. But progress moved slowly because not enough colonial funding was available for girl education.

### **Indian universities act and higher education**

Women did enter higher education through liberal arts in the late 19th century. Women were admitted to Calcutta, Bombay and Madras universities. One of the major milestones was the foundation of:

### **Bethune school, Calcutta (1849)**

Bethune College (1879), one of the earliest women's colleges in India. Wartime roles such as teaching and medicine were now filled by women around the world by the early twentieth century.

### **Curriculum and nature of women's education**

Patriarchal and colonial assumptions structured women's education during the colonial period, too. The curriculum for girls was far different from the one for boys. Girls were generally taught:

1. Domestic science
2. Needlework
3. Childcare
4. Moral instruction
5. Basic literacy

Higher subjects like science, mathematics, and politics were more commonly discouraged or rejected for girls. Colonial officials and conservative reformers believed that women should primarily be educated wives and mothers; so, it was hoped for the future of women to be just this sort. Progressives even endorsed education in domestic fields occasionally. Annie Besant, for example, argued that education should prepare women for their familial roles, not public life. Yet educated women were increasingly

contesting these constellations. They engaged with literature, journalism, social reform and nationalist politics.

### **Regional developments in female education Bengal**

Bengal emerged as a significant center of education reform. Reformers and missionaries, along with Bethune School, promoted the education of girls. Educated Bengali women joined literatures and social movements.

### **Maharashtra**

Savitribai Phule and Jyotirao Phule led the pioneering efforts in Maharashtra. Later, women like Ramabai Ranade enhanced the educational opportunities of widows and women in India.

### **Tamil Nadu**

In colonial Tamil Nadu, this interaction between colonialism and patriarchy was reflected in women's education. Education has generally reinforced gender roles and provided little empowerment at best.

### **Punjab**

Women teachers and training institutions contributed significantly to the broadening of education for girls of Punjab women during the early-twentieth-century period.

### **Barriers to women's education**

Even with reform, women's education encountered several difficulties:

**Social conservatism:** Many of these families were of the opinion that education would make a woman disobedient or unfit for marriage. Conservative groups opposed girls going to school at all.

**Child marriage:** Early marriage led girls to marry, and leave school early. Married girls were expected to do things around the house.

**Purdah and mobility restrictions:** Women's mobility outside the home was restricted in many communities, limiting school attendance. Lack of Female Teachers. Parents were reluctant about sending girls to schools with male teachers. The shortage of trained female teachers was a barrier to growth.

**Caste and class inequalities:** Educational opportunities were most often offered to upper-caste and urban women. Lower-caste, tribal, and rural women continued to be marginalized.

### **Nationalism and women's education**

Education allowed women to engage in India's nationalist movement by the early 20th century. Educated women graduated to become writers, journalists, teachers, doctors and political activists.

Women such as:

1. Sarojini Naidu
2. Annie Besant
3. Kamaladevi Chattopadhyay

Used education as a mode of political participation and social reform.

Women's groups like the All-India Women's Conference (AIWC) - founded in 1927 - stressed female literacy and reforming education.

Also, education enabled women to criticize restrictive habits



and fight for legal rights, from suffrage and equality before the law.

#### Growth of female literacy

1. But in colonial rule, women's literacy improved gradually, though progress was slow.
2. Key developments included:
3. Expansion of girls' schools
4. Growth of women's colleges
5. Increased participation in teacher training
6. Emergence of women professionals
7. By 1947, female literacy was low but its levels had risen considerably from the early 19th century.

#### Critical evaluation of colonial women's education

For Indian women, the colonial education system produced contradictory results.

#### Positive contributions

1. Institutional education for women introduced
2. Growth of literacy and professional opportunities
3. Emergence of women reformers and leaders
4. Increased social awareness and political participation

#### Limitations

1. Education remained urban and elitist
2. Curriculum reinforced domestic roles
3. Colonial motives were linked to social control
4. Marginalized women received limited benefits

Therefore, in colonial India no one can do the colonial "gift" of women's education. It arose from the interplay in colonial policies, missionary activity, indigenous reform movements and women's own fight for empowerment.

#### Conclusion

In the history of modern India, women in colonial India's schools did not exist as a single development, but one in which all of these things contributed in one direction. Women made their way into schools, colleges, professions and public life very gradually starting in the mid-20th century, moving from a near-exclusion period in the eighteenth century. This revolution was due to the work of missionaries, reformers, educators, women activists and social movements. The colonial state was influential but restricted. British education policy belatedly acknowledged female education without the benefit of a more progressive approach, with the educational system of the region often framing education as a means of reinforcing a patriarchal order that reinforced domestic gender roles. However, institutions of education inadvertently created spaces for women's intellectual and social empowerment. Indian reformers Raja Ram Mohan Roy, Ishwar Chandra Vidyasagar, Jyotirao Phule, Savitribai Phule and Pandita Ramabai challenged prevalent social prejudices and provided the foundation for women's education. As the most prominent voices in the transition process, women were forced to overcome their own resistance in order to redefine themselves. Even so, colonial women's education remained entrenched by caste, class, regional inequalities, and patriarchal assumptions. The vast majority of rural and marginalized women remained devoid of access to education. However, the legacy from colonial times proved vital for India's struggle for universal education and gender

equality after gaining independence. Thus, women's education in colonial India is not merely tale of a form of colonial reform but also one of resistance, negotiation and the dawning agency of women as agents of social change.

#### Acknowledgement

I express my sincere gratitude to everyone who supported and encouraged me in the successful completion of this research paper titled "Historical Development of Women's Education in Colonial India: A Study of Reform, Policy, and Social Transformation." I am deeply grateful to my institution for providing the academic environment, library resources, and guidance necessary for carrying out this study.

#### Financial support and sponsorship

Nil.

#### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### References

1. Altekar AS. The Position of Women in Hindu Civilization. Delhi: Motilal Banarsidass, 1956, p189-215.
2. Basu Aparna. The Growth of Education and Political Development in India, 1898-1920. Delhi: Oxford University Press, 1974, p98-124.
3. Basu Aparna. "Women's Education in India." History of Education Quarterly. 1977;17(3):257-272.
4. Chawla Singh, Maina. "Philanthropy, Voluntarism, and Women's Education in Colonial India: A Study of the Bethune School, Calcutta." Asian Journal of Women's Studies. 2000;6(3):65-92.
5. Forbes Geraldine. Women in Modern India. Cambridge: Cambridge University Press, 1996, 45-78.
6. Mani Lata. Contentious Traditions: The Debate on Sati in Colonial India. Berkeley: University of California Press, 1998, 87-110.
7. Minault Gail. Secluded Scholars: Women's Education and Muslim Social Reform in Colonial India. Delhi: Oxford University Press, 1998, p56-89.
8. Naik JP. Education in India During the British Period. Bombay: Macmillan, 1963, p201-239.
9. Rege Sharmila. Against the Madness of Manu: B.R. Ambedkar's Writings on Brahmanical Patriarchy. New Delhi: Navayana, 2013, p132-145.
10. Sen Samita. Women and Labour in Late Colonial India. Cambridge: Cambridge University Press, 1999, p73-96.
11. Swaminathan Padmini. "Women's Education in Colonial Tamil Nadu, 1900-1930: The Coalescence of Patriarchy and Colonialism." Indian Journal of Gender Studies. 1999;6(1):23-45.



Original Article

# Spatio-Temporal Analysis of Female Literacy in Beed District, Maharashtra

Dr. Deshmukh S B

Department of Geography

Arts and Science College, Chousala, Dist. Beed

Manuscript ID:  
RIGJAAR-2026-030713

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 65-97  
July 2026

Submitted: 09 June. 2026

Revised: 18 June. 2026

Accepted: 12 July. 2026

Published: 31 July. 2026

Correspondence Address:

Dr. Deshmukh S B

Department of Geography

Arts and Science College, Chousala, Dist.

Beed

Email- [sbdparli@gmail.com](mailto:sbdparli@gmail.com)

Quick Response Code:



Web. <https://rlgjaar.com>



DOI: 10.5281/zenodo.21978444

DOI Link:

<https://doi.org/10.5281/zenodo.21978444>



Creative Commons



## Abstract

*This study examines the spatio-temporal pattern of female literacy in Beed District, Maharashtra, during the period 1961–2001. Female literacy is a key indicator of socio-economic development and plays a significant role in improving the quality of life and empowering women. The study is based on secondary data collected from the Census of India and employs percentage analysis and cartographic techniques to examine temporal and spatial variations in female literacy across tahsils. The findings reveal a steady increase in female literacy in both Maharashtra and Beed District over the four decades, although the district consistently remained below the state average. Significant inter-tahsil disparities were observed, with Beed and Ambejogai recording relatively higher literacy rates, while Georai, Manjlegaon, Kaij, and Patoda lagged behind. The study attributes these disparities to differences in educational infrastructure, socio-economic conditions, occupational structure, and government initiatives promoting female education. The paper concludes that despite substantial improvement, focused policy interventions are required to reduce regional disparities and further enhance female literacy in the district.*

**Keywords :** Female Literacy, Spatio-Temporal Analysis, Beed District, Maharashtra, Socio-Economic Development, Census Data, Tahsil-wise Literacy, Regional Disparities, Education, Population Geography.

## Introduction

Literacy is one of the important characteristics of population. It is an important indicator of the socio-economic development of an area. It is essential for social reconstruction improvement in the quality of life and preparation of man-power for rapid development. Literacy is qualitative attribute of population and fairly reliable index of socio-economic development. It is also helps for economic development social advancement and even in controlling population. Chandna (1969) has observed that the trends in literacy is indicative of the space at which objectives of the study. The general objective of this research paper is an attempt to analyze the spatio-temporal trend of female literacy in the study region.

## Study Region

The district of Beed is one of the most important district of Maharashtra state in terms of area and population. Geographically Beed district lies between 18° 27' to 19° 27' north latitude and 74° 29' to 76° 44' east longitude. The total geographical area of Beed district is 10693 km<sup>2</sup> with a general population of 2161250 in which female population is according to 2001 census. The climate of Beed district is of-type

**Database and Methodology** For the present study related data is obtained from secondary sources i.e. census hand book of 1961 to 2001 census. Collected data is processed and presented in table in the form of percentage and proportion processed data is represented through various cartographic techniques.

**Discussion and Result** Table No.1 shows that the trends of female literacy in the study region and Maharashtra state during 1961-2001. Table No.1 shows that the state literacy rate is comparatively higher than that of the study region.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

S B, D. D. (2026). Spatio-Temporal Analysis of Female Literacy in Beed District, Maharashtra. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 65–97. <https://doi.org/10.5281/zenodo.21978444>



It is noted that in 1961 the state total literacy rate was 29.82% and female literacy rate was 16.76% which is further increased up to 66.73 percent in 2001 and female literacy rate was up to 58.34 percent. The study region has a total literacy rate of 15% and female literacy rate was 5% during 1961 whereas total literacy has increased up to 57% as well as female literacy rate has also increased up to 46% during 2001. It is observed that literacy rate in the both state and

**Table No. 1.1**

| Year          | Total  | 1961  | 1971  | 1981  | 1991  | 2001  |
|---------------|--------|-------|-------|-------|-------|-------|
| Maharashtra   | Total  | 29.82 | 39.18 | 47.18 | 53.77 | 66.73 |
|               | Female | 16.76 | 26.43 | 34.79 | 43.38 | 58.34 |
| Beed District | Total  | 15    | 24    | 32    | 39    | 57    |
|               | Female | 5     | 11    | 17    | 32    | 46    |

### Trends of Female literacy Maharashtra and Beed District

Table No 1.2 indicated that the highest female literacy rate is Beed tahsil(07%) while the lowest literacy is observed in

**Table No. 1.2**

#### Tahsil wise Female Literacy in Percentage

| Sr.No. | Tahsil      | 1961  | 2001  |
|--------|-------------|-------|-------|
| 01     | Beed        | 07    | 50    |
| 02     | Georai      | 04    | 41    |
| 03     | Manjlegaon  | 04    | 41    |
| 04     | Ambejogai   | 07    | 50    |
| 05     | Kaij        | 04    | 45    |
| 06     | Patoda      | 04    | 43    |
| 07     | Ashti       | 05    | 45    |
|        | District    | 05    | 46    |
|        | Maharashtra | 16.76 | 58.34 |

#### Tahsil wise Female Literacy in Beed District (1961-2001)

Urbanization and better occupational structure. Whereas Georai (04%) Manjlegaon (04%) Kaij (04%) and Patoda (04%) tahsils have low female literacy rate as compared to district average. General backwardness of female in different spheres of Social life and discriminally treatment given to them in schools are the other cause of low literacy in this tahsils. Beside these women are working in their traditional jobs as agricultural labors for which necessity education is not assumed. As well as low economic conditions of the study region do not permit female education, Particularly when they can otherwise, augment the life income. In addition to this social insecurity female does not get much mobility for education there for female literacy was low. From table 1.2 it is also found that during 2001 the high literacy have been shown in Beed (50%) while the low literacy rate (41%) is found in Georai and Manjlegaon. It is also observed that female literacy rate in all tahsils have indicated and increasing trend. It is noted that in the Beed tahsil literacy rate was (07%)a which has increased up to (50%) during 2001. Some trends is found in other tahsils like Ambejogai (07%) in 1961 to (50%) Ashti (05%) in 1961 to 45% during 2001. It is releved that all tahsil female literacy rate have been increased because economic status of people during this period demanded literacy workers. There is no need of education or technical skill as to work. in agriculture

study regions have indicated an increasing trend. The percentage of literacy has increased due to scheme of compulsory education after 1947 and the spread of female educational facilities like primary schools for females and working of status for women in the society. It has helped in raising the level of literacy throughout the nation and is also reflected in the study region.

Georai, Manjlegaon, and Kaij (04%) as compared to district average (05%) during 1961 decade. Ambejogai (07%), Ashti (05%) tahsils have high literacy. It is noted that female literacy was high in Beed, Ambejogai and Ashti due more.

sector. In industrial sector, higher education qualification and technical skill are essential therefore the proportion of literacy is higher during risen decades. Government policies emphasizing upon the priority for female education and reservation in education and employment for female has contributed to increase in the status of female in the society and literacy level.

### Conclusion

Beed district exhibits a lower percentage of literacy among its population than the state literacy. It is due to drought proneness of the district and maximum population is engaged in primary sectors i.e. Agriculture label livestock etc. and it is a impact of overall low economic development of the district. It is found that there are striking disparities in the rate and pattern of the literacy at the tahsil level. From the tahsil wise analysis of distribution of female literacy. It is found that Beed and Ambejogai tahsil is highest. While in Ashti, Kaij, Patoda, Georai, Manjlegaon rate is low as compared to district average.

### Acknowledgement

The author expresses sincere gratitude to the Department of Geography, Arts and Science College, Chousala, District Beed, for providing the academic environment and support necessary to complete this research. Heartfelt thanks are extended to the Government of India and the Office of the Registrar General & Census Commissioner for making the



Census data available, which served as the primary source of information for this study.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

The authors declare that there are no conflicts of interest regarding the publication of this paper.

**Reference**

1. Gosal G.S.(1964): "Literacy in India: An Interpretative Study", Rural Sociology, Vol.29
2. Shariff, A(1999): India Human Development Report Oxford University Press, Oxford.
3. Golden, Hilda. H(1968): "Literacy, International Encyclopadeia of Social Sciences, Vol.9 Macmillan Company and Free Press.
4. Krishan. G and Shyam M: Spatial Perspective on Progress of (1973) Female Literacy inIndia 1960-71, Pacific View Point Vol.14,P,204.
5. Ohja GK.: Progress of Compulsory Education in India 1951-66, Universal Publication, New Delhi.



Original Article

# Patriarchy and Women's Experience in Annie Ernaux's A Frozen Woman

Suresh Pandit Sonawane<sup>1</sup>, Dr. Kishor R. Nikam<sup>2</sup>

<sup>1,2</sup>Department of English & Research Centre,

Mahatma Gandhi Vidyamandir's LVH Arts, Commerce & Science College Panchvati, Nashik

Manuscript ID:  
RIGJAAR-2026-030714

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 68-70  
July 2026

Submitted: 09 June. 2026

Revised: 18 June. 2026

Accepted: 12 July. 2026

Published: 31 July. 2026

**Correspondence Address:**

Mr. Suresh Pandit Sonawane  
Department of English & Research Centre,  
Mahatma Gandhi Vidyamandir's LVH Arts,  
Commerce & Science College Panchvati,  
Nashik

Email: [sureshsonawane1682@gmail.com](mailto:sureshsonawane1682@gmail.com)

Quick Response Code:



Web: <https://rlgjaar.com>



DOI: 10.5281/zenodo.21978523

DOI Link:

<https://doi.org/10.5281/zenodo.21978523>



Creative Commons



## Abstract:

*A Frozen Woman is a remarkable autobiographical work by Annie Ernaux which explores the subtle but all-pervasive presence of patriarchy in women's lives. From her own experience, Ernaux discovers how over time, the traditional role of the woman, marriage and motherhood, and domestic work have all made her lose her identity and freedom of thought. In this paper, the author will try to engage in a feminist approach in analyzing the viewpoint of patriarchy and the experience of women in A Frozen Woman. The study applies a lens to the effect of patriarchy on the construction of the female identity and the normalization of gender inequalities in patriarchy through the theories of Simone de Beauvoir, Kate Millett, Betty Friedan, Judith Butler and bell hooks. Domestic life is not simply the private sphere, it is the venue where social power and gender expectations are continually reinforced, as Ernaux shows. The autobiographical genre transforms an individual's suffering into a critique of the broader social structures: Subjectivity becomes the subjectivity of women. According to the paper, Ernaux's story causes us to reflect on the idealized concepts of marriage and motherhood, and reveals their psychological, emotional and social effects. Furthermore, she is resisting silence imposed on women by writing herself, giving them their voice and identity back. A Frozen Woman uses everyday home situations to be a political reality, making it a significant feminist work that challenges the role that men and women carry out in their homes, and promotes women's independence. Finally, the paper highlights the relevance of Ernaux's work to contemporary feminist writing and the possibilities for the connection between the oppression of women and women's agency as an autobiography.*

**Keywords:** Annie Ernaux; A Frozen Woman; Patriarchy; Feminism; Women's Experience; Gender Inequality; Female Identity; Marriage; Motherhood; Autobiographical Writings; Domestic Labor; Feminist Literary Criticism.

## Introduction

In the modern feminist literature, the traditional depiction of women has been put to test, and it is suggested that the negative social, cultural and political settings which are responsible for gender inequality have to be blamed. Feminist writers portray women as not only wives and mothers or daughters, but as multifaceted women who are not dependent on others. The most recent and prominent figure in this tradition is Annie Ernaux, whose own autobiographical novels, in which she draws on her own experience to offer a powerful critique of society, were especially influential. Her writing explores the autobiographical, social and feminist critical themes and the familiar into the field of literary study. The 2022 Nobel Prize winner for Literature Annie Ernaux is known for her autobiographical writing, which explores class, gender, memory and identity. Her works are a rejection of fiction, emphasising the examination of life from an honest perspective, of the impact of social structures on individual lives. In the style of an economy of language, Ernaux makes visible the connections between political and cultural situations and individual events. **Her writing has** had a profound effect on modern feminist literature and has helped to illuminate the all-pervasive nature of systems of power and inequality in day-to-day life.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Sonawane, S. P. & Nikam, D. K. R. (2026). Patriarchy and Women's Experience in Annie Ernaux's A Frozen Woman. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 68–70. <https://doi.org/10.5281/zenodo.21978523>



A Frozen Woman was published in 1981 and is one of Ernaux's most important autobiographical work. It is the tale of a young educated woman who is independent and later a wife and mother of whose dreams gradually fade as she takes on the burden of the family and the expectations of men. Instead of marriage and motherhood being full-filling, Ernaux reveals the inequitable division of domestic tasks and emotional burden of motherhood that constraints the freedom and individuality of women. The title itself is a reflection of the emotional and intellectual immaturity of women defined by a patriarchy. The present paper will consider the work A Frozen Woman from the feminist point of view. Based upon the concepts of Simone de Beauvoir, Kate Millett, Betty Friedan, Judith Butler and bell hooks it examines the ways in which patriarchy manifests itself in the family, marriage, motherhood and domestic sphere. The paper suggests that Ernaux portrays patriarchy as an experience rather than an ideology, as it is in everyday practices and relationships. It further claims that autobiography is a form of feminist resistance that is effected by remediating the personal memory in collective social critiques. On this lens, A Frozen Woman turns into a robust condemnation of the tradition of patriarchy and a valuable contribution to an existing feminist literature.

#### **Feminist theory and patriarchy: A conceptual framework**

Feminist literary theory involves studying literature to understand the representation of the female experience in patriarchal society and to refute patriarchy as a social construct, as opposed to a biological fact.

#### **The Burden of Marriage and the Loss of Women's Individuality:**

Annie Ernaux's A Frozen Woman exemplifies this attitude through the impact of marriage and family/household obligations on the woman's identity and her freedom. In the Second Sex (1949), Simone de Beauvoir states that "one is not born a woman, but rather becomes one" a statement which highlights the socially constructed nature of gender roles. Through a protagonist who slowly succumbs to traditional roles for wives and mothers, Ernaux shows this. In Sexual Politics (1970) Kate Millett described patriarchy as a system of power that is maintained by the family and marriage and other institutions, and places men in control. Likewise, Ernaux shows the disparities of domestic work, how women's names are bound up in the housework, despite their education and ambitions. Betty Friedan's Feminine Mystique (1963) brings attention to the evacuation of women, who were not given the opportunity to have domestic careers. In this sense, Ernaux writes similarly to this, as she portrays the emotional and intellectual disillusionment of the trivial chores of everyday life. Theories of 'gender performativity' are also apparent in how women take up their assigned roles in society through their everyday lives, which the narrator gradually adopts. Both of these feminist approaches provide a good theoretical foundation for the analysis of A Frozen Woman. By revealing the role of men and women in the world in a series of disclosures that upset the reader's understanding, Ernaux's personal narrative provides a critique of the values

of patriarchy, and demonstrates how everyday life at home reinforces a woman's lack of identity, equality and selfhood.

#### **Marriage, Motherhood and Female Loss of Identity**

A Frozen Woman focuses on marriage and motherhood, which are not sources of fulfillment, but of patriarchal principles. When she is able to marry, the narrator imagines herself to be a man's man, an equal to men and she begins to think about how domestic responsibilities mold her and how they hold her back from growing as a person and as a scholar.

Drawing on Simone de Beauvoir, Ernaux portrays how women are typically talked about, not as people themselves, but as the objects of men. The narrator gradually becomes more and more willing to compromise with the roles she was expected to play – that of wife and mother. The absence of identity is due to Betty Friedan's concept of the lack of satisfaction with the family life, which does not provide space for self-development, and repetitive domestic work. Butler's theory of gender performativity highlights the internalization of such roles in accepted social norms. In addition to the physical labor of men, Ernaux brings to the fore another dimension of unpaid emotional labor expected of women, uncovering another form of gender disparity. In her personal essay, Ernaux argues that women should not marry and have children. She, however, encourages a relationship of equality, respect and mutual responsibility.

#### **The Queer Subjectivity of the Self in Writing:**

A Frozen Woman is a powerful feminist resistance against the patriarchy, offered through autobiography, by Annie Ernaux. Devoting herself to the personal as social critique, she uncovers the variations of marriage, motherhood and domestic work shaped by the patriarchy. Through her writing style, she has brought the voices of ordinary women to the forefront, which have been overlooked or overlooked. bell hooks asserts that the act of telling women's stories is a form of resistance as it opposes systems of inequality. This concept is shared by Ernaux who turns domestic life into a political one, rather than a personal one. She vividly portrays the commonplace, exposing the fine nuances of sexism. Writing is another means of regaining identity. As the narrator thinks about herself and her childhood, she becomes aware of her old self, which had been covered by the traditional roles of women. Judith Butler's notions contribute to this interpretation by highlighting the possibility of challenging and reconceptualising socially constructed identities. A Frozen Woman is an autobiographical piece of art work, which directly and simply places the individual memory of the artist in the collective memory of women. In Ernaux, autobiography is not just a vehicle of self-expression, but a vehicle of literary power that has the capacity to question patriarchy, restore women's voices and affirm their agency.

#### **Acknowledgement**

I express my sincere gratitude to my Research Guide, Prof. Dr. Kishor R. Nikam, Department of English & Research Centre, Mahatma Gandhi Vidyamandir's LVH Arts, Commerce & Science College, Panchvati, Nashik, for his invaluable guidance, constant encouragement, insightful



suggestions, and continuous support throughout the completion of this research paper titled "Patriarchy and Women's Experience in Annie Ernaux's A Frozen Woman". His scholarly advice and motivation greatly enriched the quality of this work. I am also thankful to the Head of the Department, the Principal, and the management of my institution for providing the necessary academic environment and resources required for this study.

#### Financial support and sponsorship

Nil.

#### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### Conclusion:

A Frozen Woman is a feminist book, a feminist critique of patriarchy, that exposes how marriage, motherhood, domestic life is what makes up women's identity. In autobiographical writing, Ernaux uncovers the mechanisms of gender inequality, which are invisible, but are at work in domestic work, its unequal distribution, and the loss of the autonomy of women. The text illustrates with feminist thinking, from the perspectives of Simone de Beauvoir, Kate Millett, Betty Friedan, Judith Butler, and bell hooks, how personal experiences are related to larger social structures. Ultimately, Ernaux transforms her life story into an involving feminist narrative, which attack patriarchy and call for equality, selfhood and the freedom of women.

Works Cited (MLA 9th Edition)

1. Beauvoir, Simone de. *The Second Sex*. Translated by Constance Borde and Sheila Malovany-Chevallier, Vintage Books, 2011.
2. Butler, Judith. *Gender Trouble: Feminism and the Subversion of Identity*. Routledge, 1990.
3. Ernaux, Annie. *A Frozen Woman*. Translated by Linda Coverdale, Seven Stories Press, 1992.
4. Friedan, Betty. *The Feminine Mystique*. W. W. Norton & Company, 1963.
5. hooks, bell. *Feminism Is for Everybody: Passionate Politics*. South End Press, 2000.
6. Kristeva, Julia. *Powers of Horror: An Essay on Abjection*. Translated by Leon S. Roudiez, Columbia University Press, 1982.
7. Millett, Kate. *Sexual Politics*. University of Illinois Press, 2000.
8. Moi, Toril. *Sexual/Textual Politics: Feminist Literary Theory*. 2nd ed., Routledge, 2002.
9. Showalter, Elaine. *A Literature of Their Own: British Women Novelists from Brontë to Lessing*. Princeton University Press, 1999.
10. Tyson, Lois. *Critical Theory Today: A User-Friendly Guide*. 4th ed., Routledge, 2023.
11. Bjørkøy, Aasta Marie Bjorvand. "Autobiography, Memory, and Social Class in Annie Ernaux's Writing." *Scandinavian Studies in Language*, vol. 15, no. 2, 2024.
12. Hiddleston, Jane. "Writing the Self after the Nobel: Reading Annie Ernaux." *French Studies*, vol. 78, no. 1, 2024.
13. Jordan, Shirley. "Women's Lives and the Politics of Everyday Experience in Annie Ernaux." *Nottingham French Studies*, vol. 60, no. 3, 2021.
14. Lecarme, Jacques. "Autobiography and Feminist Consciousness in Annie Ernaux." *The French Review*, vol. 95, no. 2, 2022.
15. McIlvanney, Siobhán. "Gender, Class, and Identity in Annie Ernaux." *Modern & Contemporary France*, vol. 31, no. 2, 2023.
16. Sheringham, Michael. "Memory and Everyday Life in Annie Ernaux." *French Cultural Studies*, vol. 35, no. 1, 2024.
17. Thomas, Lyn. *Annie Ernaux: An Introduction*. Peter Lang, 2023.
18. Warren, Michelle. "Autobiography and Feminist Testimony in Annie Ernaux." *Contemporary Women's Writing*, vol. 18, no. 1, 2024.



Original Article

# Use of Mythological Writing in Girish Karnad's Drama Yayati

Dr. Bhalke Nitin Shivaji

Assistant Professor in English, Shrimant Bhaiyyasaheb Rajemane Mahavidyalaya, Mhaswad, Tal. - Man, Dist.-Satara, Affiliated to Shivaji University, Kolhapur

Manuscript ID:  
RIGJAAR-2026-030715

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 71-73  
July 2026

Submitted: 09 June, 2026

Revised: 18 June, 2026

Accepted: 12 July, 2026

Published: 31 July, 2026

**Correspondence Address:**

Dr. Bhalke Nitin Shivaji  
Assistant Professor in English, Shrimant  
Bhaiyyasaheb Rajemane Mahavidyalaya,  
Mhaswad, Tal. - Man, Dist.-Satara,  
(Affiliated to Shivaji University, Kolhapur)  
Email – [nitinbhalke77@gmail.com](mailto:nitinbhalke77@gmail.com)

Quick Response Code:



Web. <https://rlgjaar.com>



DOI: 10.5281/zenodo.21978852

DOI Link:

<https://doi.org/10.5281/zenodo.21978852>



Creative Commons



## Abstract

Indian writers in English especially dramatists were on the search for new avenues for their creation. Folk tales, mythologies, episodes from epics like the Ramayana and the Mahabharata lent themselves impressive to their cause. During the late 19th century professional companies in Karnataka and Maharashtra began to stage mythological plays. A myth is defined as a legend, a story, a saga of superhuman will, courage and strength handed down to the people by word of mouth over a long period of time, and put it into written form by poets who made changes in theme whenever it suited their purposes to do so. Karnad universally uses episodes from Indian mythology as a base for his plays. Myths and epics have an enduring importance for the fundamental human problems. Indian writing in English is a product of our history. It is a product of our culture. Drama cannot be thought of without the possibility of its performance. All Indian literature for centuries had been drawing on myths. The study of Girish Karnad mythological narratives and folklore to create a modern dialogue with the past, reinterpreting ancient stories to critique contemporary issues like patriarchal structures, identity crisis, and human nature. Myth has a very significant place in human psychology and in society from its beginning as a primitive religious narrative. Mythology represents the events, conditions, and deeds of Gods or superhuman being that are outside ordinary human life and yet basic to it. In this dissertation, the student analyses Use Of Mythological Writing In Girish Karnad's Drama Yayati and tries to bring out the hidden intentions of the characters behind their writing of the Mythology.

**Keywords :** Girish Karnad, Yayati, Mythological Writing, Indian Mythology, Indian English Drama, Myth and Modernity, Existentialism, Folklore, Identity Crisis, Contemporary Indian Theatre

## Introduction

Girish Karnad uses mythological writing as a core component of his dramatic framework to explore complex contemporary issues of identity, morality, and social conflict. His theatrical method is not a simple retelling of ancient stories but a critical re-interpretation that fuses traditional Indian mythology and folklore with a modern, post-colonial sensibility. Mythology in writing encompasses the use of ancient myths, folklore, and legendary tales to explore human experiences and convey universal truths, often through richly symbolic narratives. By drawing from various cultures, mythology adds depth and layers of meaning, enhancing the reader's understanding and emotional connection to the text. To remember, think of mythological elements as timeless storytelling tools that bridge the past with the present, making narratives more resonant and compelling.

**Development of Mythological Writing** The development of mythology in Indian drama is a continuous thread running from ancient ritualistic practices to modern interpretations, serving as a foundational element that bridges the past with contemporary social and philosophical concerns. Mythological figures frequently inspire character development in English fiction. Writers craft characters with attributes drawn from gods, heroes, and mythical beasts to enrich their personal journeys and moral conflicts. Indian mythology primarily refers to the rich tapestry of stories, legends, and beliefs from Hinduism, found in texts like the Mahabharata, Ramayana, and Puranas.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Dr. Bhalke, N. S. (2026). Use of Mythological Writing in Girish Karnad's Drama Yayati. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 71–73. <https://doi.org/10.5281/zenodo.21978852>

It features a pantheon of gods and goddesses such as Brahma, Vishnu and Shiva and explores themes of morality, creation, and the human experience. The influence of mythology on modern writing is profound. Authors use mythological sources to add depth and timelessness to their stories. By integrating these elements, writers can: Create complex characters who resonate with universal human experiences. Introduce fantastical worlds that captivate and intrigue readers. Address contemporary issues through the lens of ancient stories. Today, mythology continues to inspire works across various genres, including fantasy, science fiction, and even historical fiction. Mythological elements in writing can offer a fresh perspective on current societal themes by presenting them through age-old narratives. Mythology plays a significant role in English literature by providing a treasure trove of narratives, archetypes, and themes. Authors have the ability to align their works with well-established stories, enriching their narratives.

### Definitions of Mythological Writing

Mythology in Writing refers to the incorporation of mythological elements into literary works. These may include characters, themes, settings, or narratives derived from myths, religions, and folklore. Writers often draw from ancient mythologies such as Greek, Roman, Norse, Egyptian, and others to enrich their stories.

Mythology is a collection of myths, or sacred stories, that belong to a specific culture or religion, often explaining its origins, history, and beliefs. It can also refer to the systematic study of these myths, which often feature gods, heroes, and supernatural beings to explain natural phenomena, social customs, and the fundamental questions of existence.

### Use of Mythological Writing in “Yayati”

“The playwright has dramatized this short tale...investing it with an epic force reminiscent of the great Greek tragedies. The characters are titans, and their desires, motives, fulfillments and frustrations too are of epic dimension” A. Shankar. ‘Yayati’ is Girish Karnad’s first play originally written in Kannada at the age of twenty-two. The play was written in 1960; which marked the opening of ‘the Modern Kannada Theatre’ in Karnataka. The play ‘Yayati’ was translated in English by Karnad in 2008. The important difference between the Kannada play ‘Yayati’ and English translated ‘Yayati’ is the age and experience of the scholar writer Karnad. He translated the play at the age of sixty-nine, as a mature artist, actor, critic and writer of literary and theatrical world. Another important thing about the play is that its first performance in Hindi in seventies with Amrish Puri in its eponymous role established and directed by Satyadev Dubey. Apart from this, the play has been translated in various Indian languages and interesting for the amateur actors in India. The English play ‘Yayati’ was translated by Karnad in stressful situation at the time of his first visit to London as a ‘Rhodes Scholarship Fellow’ of Oxford in 1960. Since was the first fellow from Karnad family to go abroad, his family members were frightened about his settle in England after

two years of his scholarship Karnad felt that his family was emotionally blackmailing him and was asking to sacrifice his career for their interest. Like Robinson Crusoe of Daniel Defoe, Karnad has to protest against his family for the fulfillment of his Eliotian and Yeatsian dreams. To escape from this stressful situation, he took to write the play ‘Yayati’. He has taken the theme of the play from an ancient Indian mythology; but he was digressed from it. As he admits, “A greater surprise was the theme of the play, for it was taken from ancient Indian mythology from which I had believed myself alienated.” The treatment of myth like Rabindranath Tagore is appropriate in the Present situation. As Aparna Dharwadkar says, “Yayati establishes at the outset of Karnad’s career that myth is not merely a narrative to be bent to present purposes, but a structure of meanings.... or the necessity of contemporary setting.” To the mythical story of ‘Yayati’ he adds new characters and alters the story-line so as to deepen its connotative richness and gives it contemporary appeal. Karnad’s ‘Yayati’ re-tells the age-old story of the king who in his longing for eternal youth does not hesitate to usurp the youth and vitality of his son. In the Mahabharata, ‘Yayati’ understands the nature of desire itself and realizes that fulfillment neither diminishes nor eliminates desire. In the drama, Karnad makes ‘Yayati’ confront the horrifying consequences of not being able to relinquish desire; and through other characters, highlights the issues of caste/ class and gender coiled within a web of desire ‘Yayati’ plays upon the theme of responsibility. This theme directly seems to link up with the philosophy of existentialism. Every character in the play, and more prominently Puru, evades responsibility. After venturing into the mythical world, Karnad moves ahead into the world of tradition to take up themes and fictionalize characters from history. The theme of ‘Yayati’ is taken from the first chapter of the Mahabharata ‘Adiparva’. In Puranic lore Yayati marries Devayani and also takes Sharmishtha and ‘asura girl’ as his wife. Devayani is a daughter of sage Shukracharya. Yayati’s relationship with Sharmishtha infuriates Devayani and in her anger and jealousy Devayani goes to her father Shukracharya. Shukracharya curses Yayati of senility and decrepitude. But however, there is a saving clause, if Yayati is able to persuade someone else to bear the curse on his behalf, then he would enjoy everlasting youth. Yayati, who is indulged in the sensual pleasures, asks the people of his kingdom and at last in desperation to his sons exchange their youth with him. Only Pooru, the youngest son willingly offers his youth in filial devotion. Yayati promptly accepts Pooru’s offer. He remains young while his son turns into a weak and senile man. Yayati forsakes his life of sensual delights only after indulging in it for a thousand years. Karnad adopts the mythical story of Yayati as the plot of his play. He adds new characters to deepen the commutative richness of his drama and gives it a contemporary appeal. In this way, Karnad takes away the mythological magic of the play as well as King Yayati and present King as a man of lust and sensual desire. The sacrifice of Pooru lost the traditional glory. As Prof. Bedre writes, “Karnad’s Pooru does not give his youth out of his love for this father but to escape from the royal

responsibilities to which he considers himself unworthy. All the time a mysterious consciousness fills him with the feeling of inferiority that he is a misfit among the Bharat dynasty." Pooru himself admits to his father, "I had not the slightest inclination to follow in the steps of my illustrious forefathers. I found their deeds pompous. I was bored by the hermitage, unembarrassed. I wanted to run away, from all that it represented: that history, those triumphs those glorious ideals." Pooru also strongly complaints against his forefather, "...My forefathers were the great angles, keen eyed, hovering regally in the clouds. I shall seek to be a worm." This indicates that Pooru does not have interest in the dynasty. Apart from this, Pooru also confesses his lacking as a husband of Chitrlekha and she deserves someone better than him. These activities and dialogues of Pooru show that, he wants to escape from the responsibilities of kingship of state. He sacrifices his youth for the sake of the kingdom. King Yayati also plays another trick for Pooru that he tells the story of his senior (mother) queen, who has been a rakshasi. Sharmishta married Yayati for the revenge on the Arya because the Arya's had destroyed her home and hearth. She wanted to avenge on the Arya race; so she had made sure that the crown prince of the Bharatas has rakshasa blood in him and, thereby, a half-caste would rule the Aryas. Through the various reasons, king able to convince the mind of Pooru and get his Youngwood as like a young prince. Throughout the play, the playwright's Pooru is not presented as it is from the mythology. The sacrifice is his weakness as Arya prince as well as the husband of Chitrlekha. When Sharmishta had known the voluntarily accepted sacrifice of Pooru, she says, "No, no, no, you can't. That is utter stupidity! Pooru, the desire for self-sacrifice is a rank perversion." Lastly Pooru also agreed and says, "...This is decrepitude. The sum total of Father's transgression..." Yayati is written in the style of Yakshagana and due to the tradition of Yakshagana either Sutradhara or the Chorus is to enter on the stage. Yayati opens with Sutradhara and he is addressing the audience. "Our play this evening deals with an ancient myth. But, let me rush to explain, it is not a 'Mythological'. Heaven forbids! A mythological aim to plunge us into the sentiment of devotion." (Prologue to Yayati) The Sutradhara also adds, "Our play has no gods. And it deals with death. A key element in its plot is the 'Sanjeevani Vidya' – the art of reviving the dead, which promises release from the limitations of the fleeting life this self is trapped in." (Prologue to Yayati) Yayati: I thought there were two options –life and death. No, it is living and dying we have to choose between. And you have shown me that dying can go on for all eternity. Suddenly, I see myself, my animal body frozen in youth, decaying, deliquescing, and turning rancid. You are laying on your pyre, child, burning for life, while I sink slowly in this quagmire, my body wrinkleless and grasping, but unable to grasp anything." To sum up, Karnad's Yayati has crossed the limits of myth and became the successful drama of the present. His prince Pooru's sacrifice is the just filial sacrifice for a lecher father. The act of Pooru is unheroic one. This is the greatness of the King has been presented by the playwright; which is the central theme of the play. The differences between the myth and the

play are the sacrifice of a son is not the sacrifice but an unheroic activity and the character of the king is not the noble. King doesn't love his kingdom but he wants young hood for the fulfillment of his sensual pleasure. In this way Girish Karnad becomes the well-known dramatist of the present. Like his other plays, in Yayati, Karnad tried to preserve his special identity as a modern playwright of India.

#### **Conclusion:**

All the above discussed Indian Drama written in English by Indian playwrights makes comprehensive use of tradition and Mythological writing by Girish Karnad drama vividly clarify this trend. Girish Karnad is a great dramatist who has significantly gone back to the roots of Indian myth, tradition and culture and has re-created for us the rich and dynamic picture in all his Drams. Karnad takes his innovation from the rich tradition of India's past and weaves. The student has undertaken the theory of Mythological Writing for the purpose of study and has applied in to the dramas of Girish Karnad Yayati.

#### **Acknowledgement**

I express my sincere gratitude to all those who have directly or indirectly contributed to the successful completion of this research paper entitled "Use of Mythological Writing in Girish Karnad's Drama Yayati". I am deeply thankful to the Principal of Shrimant Bhaiyyasaheb Rajmane Mahavidyalaya, Mhaswad, for providing the necessary academic environment and encouragement to undertake this study.

#### **Financial support and sponsorship**

Nil.

#### **Conflicts of interest**

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### **References:**

1. Karnad, G. *Yayati*. New Delhi: OUP, 2008.
2. Karnad, G. *Nagamandala*. New Delhi: UP, 2009. Print.
3. Mane, P. *Interpreting Drama*. New Delhi: Atlantic, 2010. Print.
4. Zafar, Shahila. "Critical Review on the MLA Handbook (7th Edition)", the Criterion:
5. An International Journal in English. 2.2 (June 2011): 1-13. Print.
6. Styan, J L. *Drama Stage and Audience*. Cambridge: CUP, 2005. Print.
7. *Rethinking History and Myths: The Dramatic Art of Girish Karnad*.
8. *The Myth in the Plays of Girish Karnad*.
9. *Girish Karnad's Treatment of Indian Myths and History Hardcover – 20 Nov. 2023*.
10. Ingale, G.D. "Experimentation With Language In Indian Writing In English", *Reviews of Literature*. 1.2 (September 2013): 1-11. Pfister, M. *The Theory and Analysis of Drama*. USA: CUP, 1993. Print.
12. Gupta, Dr. Jyoti and Dr. Sushma Sharma. "Existentialism in Girish Karnad's Yayati' in Thunder on stage: A study of Girish Karnad's Plays (Ed.) By C.L.Khatrri and Sudhir K. Arora, Jaipur: Book Enclave, 2008.



13. Yadav, Raju B. "Race and Gender in Yayati" in Girish Karnad's Plays Performance and Critical Perspectives (ed.) Tutun Mukherjee, New Delhi: Pen craft International, 2006.



Original Article

# India's Digital Governance: A Model for Global Sustainable Development

Dr. Awadhesh Prasad

Assistant Professor, Department of Political Science

M. M. Mahila College, Ara, V. K. S. University, Ara

Manuscript ID:  
RIGJAAR-2026-030716

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 74-78  
July 2026

Submitted: 09 June. 2026

Revised: 18 June. 2026

Accepted: 12 July. 2026

Published: 31 July. 2026

**Correspondence Address:**

Dr. Awadhesh Prasad  
Assistant Professor, Department of Political  
Science  
M. M. Mahila College, Ara, V. K. S.  
University, Ara  
Email: [awadheshprasad54321@gmail.com](mailto:awadheshprasad54321@gmail.com)

Quick Response Code:



Web: <https://rlgjaar.com>



DOI: 10.5281/zenodo.21978930

DOI Link:

<https://doi.org/10.5281/zenodo.21978930>



Creative Commons



## Abstract

Digital governance has become a defining pillar of twenty first century public administration, enabling governments to enhance transparency, accountability, efficiency, and inclusive service delivery while advancing sustainable development. As the global community strives to achieve the Sustainable Development Goals (SDGs) by 2030, India's experience offers an important governance model that integrates digital innovation with institutional transformation. This paper examines how India's digital governance architecture contributes to global sustainable development through scalable, citizen-centric, and technology-driven public policies. The study focuses on flagship initiatives such as Digital India, Aadhaar, Unified Payments Interface (UPI), DigiLocker, CoWIN, and the Open Network for Digital Commerce (ONDC), which collectively constitute India's Digital Public Infrastructure (DPI). These initiatives have expanded financial inclusion, improved access to public services, strengthened welfare delivery, reduced administrative leakages, and enhanced government transparency. Their growing adoption and recognition by several developing countries demonstrate the potential of India's governance model to support inclusive and resilient development beyond national boundaries. Adopting a qualitative research design, the paper relies on secondary data from government publications, international organizations, policy reports, and scholarly literature. It critically evaluates the relationship between digital governance and sustainable development through the dimensions of institutional effectiveness, social inclusion, innovation, and global cooperation. The analysis also addresses emerging challenges, including digital inequality, cybersecurity, data privacy, algorithmic accountability, and digital literacy, which remain central to ensuring equitable and sustainable digital transformation. The paper argues that India's digital governance model represents a significant policy innovation with important implications for the Global South and the broader international community. By strengthening digital public infrastructure, promoting ethical governance, and fostering international collaboration, India has the potential to shape a resilient, inclusive, and sustainable framework for global development in the digital era.

**Keywords:** Digital Governance; Digital Public Infrastructure, Sustainable Development; Digital India; Sustainable Development Goals, Good Governance; Innovation; Global Development.

## Introduction

The rapid advancement of digital technologies has fundamentally transformed the nature of governance, creating new opportunities for governments to deliver public services efficiently, enhance institutional transparency, and promote sustainable development. In the twenty-first century, digital governance has evolved beyond the digitization of administrative processes to become a strategic framework that integrates information and communication technologies (ICTs), data-driven policymaking, and citizen-centric service delivery. As the world confronts complex challenges such as climate change, social inequality, economic uncertainty, and public health crises, effective digital governance has become an essential prerequisite for achieving the United Nations Sustainable Development Goals (SDGs). India has emerged as a global leader in digital governance through the implementation of large-scale

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Prasad, D. A. (2026). India's Digital Governance: A Model for Global Sustainable Development. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 74–78. <https://doi.org/10.5281/zenodo.21978930>



Digital Public Infrastructure (DPI) and innovative governance reforms. Flagship initiatives such as Digital India, Aadhaar, Unified Payments Interface (UPI), DigiLocker, CoWIN, and the Government e-Marketplace (GeM) have transformed public administration by improving financial inclusion, ensuring transparent welfare delivery, strengthening digital identity, and expanding access to public services. According to the World Bank and the International Monetary Fund, India's digital public infrastructure has become an internationally recognized model for inclusive and scalable digital transformation, offering valuable lessons for developing countries. The significance of India's digital governance extends beyond national development. Through international cooperation, technology sharing, and digital capacity building initiatives, India is increasingly contributing to global sustainable development, particularly within the Global South. Its governance model demonstrates how digital innovation can simultaneously enhance economic growth, strengthen democratic institutions, improve social inclusion, and increase administrative accountability. This paper critically examines India's digital governance model as an emerging framework for global sustainable development. It explores the contribution of digital public infrastructure to sustainable governance, evaluates its achievements and challenges, and assesses its potential as a replicable model for countries seeking inclusive, resilient, and technology-enabled governance systems. The study contributes to the growing discourse on innovation-driven governance by highlighting the strategic role of digital transformation in achieving sustainable and equitable global development.

#### Research Methodology

This study adopts a **qualitative and descriptive research design** to examine India's digital governance model and its contribution to global sustainable development. The research is primarily based on **secondary data**, enabling a comprehensive analysis of digital governance policies, institutional reforms, and their implications for sustainable governance. Data have been collected from authoritative sources, including reports and publications of the Government of India, the Ministry of Electronics and Information Technology (MeitY), NITI Aayog, the World Bank, the United Nations, the United Nations Development Programme (UNDP), the International Monetary Fund (IMF), the Organisation for Economic Co-operation and Development (OECD), peer-reviewed journal articles, books, policy papers, and other scholarly publications. These sources provide reliable information on India's Digital Public Infrastructure (DPI), including Digital India, Aadhaar, Unified Payments Interface (UPI), DigiLocker, CoWIN, and related governance initiatives. The study employs **thematic and content analysis** to identify the key dimensions of digital governance, including transparency, accountability, efficiency, inclusiveness, and innovation. The findings are interpreted within the broader framework of the Sustainable Development Goals (SDGs), with particular emphasis on good governance, institutional resilience, digital inclusion, and global development. This methodology facilitates a

critical evaluation of India's digital governance model while identifying its achievements, challenges, and policy relevance for sustainable governance at both national and international levels.

#### Results

The findings indicate that India's digital governance model has significantly strengthened public administration and contributed to sustainable development by improving transparency, efficiency, inclusiveness, and accountability. The integration of Digital Public Infrastructure (DPI) has transformed the delivery of public services and enhanced citizen participation in governance. The analysis reveals that the Aadhaar-based digital identity system has enabled the effective targeting of welfare schemes, reducing duplication and leakages in the distribution of government benefits. Similarly, the Unified Payments Interface (UPI) has revolutionized digital financial transactions by promoting financial inclusion, reducing cash dependency, and supporting the growth of the digital economy. Digital platforms such as DigiLocker, CoWIN, and the Government e-Marketplace (GeM) have improved administrative efficiency by facilitating secure document management, transparent public procurement, and efficient delivery of healthcare services. The study further demonstrates that digital governance has strengthened institutional capacity through data-driven decision-making, real-time monitoring, and improved coordination among government agencies. These reforms have enhanced public trust and contributed to better governance outcomes, particularly in social welfare, healthcare, education, and financial services. Moreover, India's Digital Public Infrastructure has gained international recognition as a scalable and cost-effective governance model, with several developing countries exploring its adoption to accelerate digital transformation and sustainable development. Despite these achievements, the findings identify several persistent challenges. The digital divide between urban and rural populations, disparities in digital literacy, concerns regarding cybersecurity and data privacy, and unequal access to internet infrastructure continue to limit the full potential of digital governance. Addressing these challenges through inclusive digital policies, stronger legal safeguards, and continued investment in digital infrastructure will be essential for ensuring that India's digital governance model remains sustainable, equitable, and globally relevant in advancing the Sustainable Development Goals (SDGs).

#### Discussion

The findings of this study demonstrate that India's digital governance model has emerged as a significant innovation in public administration and sustainable governance. By integrating Digital Public Infrastructure (DPI) with institutional reforms, India has improved the efficiency, transparency, and inclusiveness of governance. Unlike traditional governance systems that rely heavily on paper-based administration and fragmented service delivery, digital governance enables real-time decision-making, seamless coordination among institutions, and citizen-



centric public services. Consequently, India's experience offers valuable lessons for both developed and developing countries seeking sustainable and technology-driven governance systems. One of the most important dimensions of India's digital governance is the creation of Digital Public Infrastructure (DPI). The Digital India programme has transformed governance through interoperable digital platforms that connect citizens, businesses, and government agencies. Aadhaar has established a universal digital identity system, enabling efficient authentication and targeted delivery of public welfare schemes. The Unified Payments Interface (UPI) has revolutionized digital payments by providing secure, low-cost, and instant financial transactions. Similarly, DigiLocker has simplified document verification, while CoWIN demonstrated the effectiveness of digital governance during the COVID-19 pandemic by enabling large-scale vaccination management. Together, these initiatives have significantly reduced administrative delays, transaction costs, and opportunities for corruption. Digital governance has also strengthened transparency and accountability in public administration. The increasing use of online portals, digital procurement systems, Direct Benefit Transfer (DBT), and electronic record management has minimized leakages and improved monitoring of government expenditure. Citizens can now access government services, submit grievances, track applications, and receive benefits through digital platforms without excessive bureaucratic intervention. Such reforms contribute to accountable governance by reducing discretionary decision-making and enhancing institutional credibility.

Another significant outcome is the expansion of financial inclusion. Before the introduction of digital financial platforms, millions of citizens remained outside the formal banking system. The integration of Jan Dhan accounts, Aadhaar authentication, and mobile technology has enabled direct transfer of welfare benefits and promoted financial inclusion among marginalized communities. UPI has further accelerated digital transactions across urban and rural India, supporting small businesses, entrepreneurs, and the informal economy. This digital financial ecosystem contributes directly to sustainable economic growth and poverty reduction. India's digital governance model also contributes substantially to the achievement of the Sustainable Development Goals (SDGs). It supports SDG 1 (No Poverty) by improving welfare delivery, SDG 3 (Good Health and Well-being) through digital health initiatives, SDG 4 (Quality Education) via digital learning platforms, SDG 8 (Decent Work and Economic Growth) by promoting digital entrepreneurship, SDG 9 (Industry, Innovation and Infrastructure) through digital infrastructure development, SDG 10 (Reduced Inequalities) by expanding access to public services, SDG 16 (Peace, Justice and Strong Institutions) through transparent governance, and SDG 17 (Partnerships for the Goals) by strengthening international digital cooperation. Thus, digital governance functions not merely as an administrative reform but as a strategic instrument for sustainable development. The international relevance of India's digital governance has increased considerably in recent years. India's Digital Public Infrastructure has attracted attention from international

organizations such as the United Nations, the World Bank, the International Monetary Fund, and the G20. Many countries in Asia, Africa, and Latin America are exploring the adoption of India's digital governance practices to improve public service delivery and financial inclusion. India's emphasis on affordable, open, and scalable digital systems has positioned it as an important contributor to South-South cooperation and global digital development. This enhances India's soft power while reinforcing its role as a leader of the Global South. Despite these achievements, digital governance faces several structural and policy challenges. The digital divide remains one of the most significant barriers to inclusive governance. Differences in internet connectivity, digital literacy, income levels, gender, and regional infrastructure continue to affect equitable access to digital services. Rural populations, elderly citizens, and economically disadvantaged communities often experience difficulties in accessing online government platforms. Unless these disparities are addressed, digital governance may unintentionally widen existing social and economic inequalities.

Cybersecurity and data privacy constitute another major concern. As governments increasingly rely on digital platforms for delivering essential services, protecting sensitive personal information becomes critical. Cyberattacks, identity theft, data breaches, and misuse of personal information pose significant risks to public trust. Therefore, robust cybersecurity frameworks, effective data protection laws, transparent data governance, and ethical standards for artificial intelligence are essential for ensuring the long-term sustainability of digital governance. Institutional capacity also influences the success of digital governance. Effective implementation requires skilled human resources, interdepartmental coordination, continuous technological upgrading, and adaptive policy frameworks. Government officials must receive regular digital capacity-building and technical training to effectively utilize emerging technologies such as artificial intelligence, blockchain, cloud computing, and big data analytics. Continuous innovation should remain an integral part of governance reform. Furthermore, sustainable digital governance should prioritize citizen participation and inclusiveness rather than technological advancement alone. Digital technologies should strengthen democratic values by promoting transparency, public consultation, participatory policymaking, and responsive institutions. Governance systems that integrate technological innovation with social justice, accessibility, and ethical accountability are more likely to achieve sustainable development outcomes. Overall, the findings confirm that India's digital governance model represents an important example of innovation-led public administration. Its success demonstrates that digital transformation can simultaneously improve governance quality, strengthen institutional effectiveness, promote financial inclusion, and accelerate progress towards the Sustainable Development Goals. Although challenges relating to digital inequality, cybersecurity, privacy, and institutional capacity remain, these can be addressed through appropriate legal reforms, infrastructure investment, digital literacy initiatives, and



international cooperation. As governments worldwide seek resilient and inclusive governance models, India's experience provides a practical and scalable framework for integrating digital innovation with sustainable global development.

### Recommendations

To strengthen India's digital governance model and enhance its contribution to global sustainable development, several policy measures are recommended. First, the government should expand high-speed digital infrastructure, particularly in rural and remote areas, to bridge the digital divide and ensure equitable access to public services. Second, comprehensive digital literacy programmes should be implemented to empower citizens, especially women, senior citizens, and marginalized communities, to effectively utilize digital platforms. Third, robust cybersecurity mechanisms and comprehensive data protection laws should be strengthened to safeguard personal information, enhance public trust, and ensure the ethical use of digital technologies. Fourth, greater investment in emerging technologies such as artificial intelligence, blockchain, cloud computing, and big data analytics should be encouraged to improve governance efficiency, evidence-based policymaking, and service delivery. The government should also promote interdepartmental coordination, institutional capacity-building, and continuous training of public officials to ensure effective implementation of digital governance initiatives. Furthermore, India's Digital Public Infrastructure (DPI) should be leveraged as a framework for international cooperation by supporting digital capacity-building and technology sharing with developing countries, particularly in the Global South. Finally, future digital governance policies should prioritize transparency, accountability, citizen participation, and sustainability to ensure that technological innovation contributes to inclusive economic growth, resilient institutions, and the long-term achievement of the Sustainable Development Goals (SDGs).

### Conclusion

The study concludes that India's digital governance model represents a transformative approach to public administration and has emerged as a significant contributor to sustainable development. Through the integration of Digital Public Infrastructure (DPI), innovative public policies, and citizen-centric governance, India has demonstrated how digital technologies can enhance transparency, accountability, efficiency, and inclusiveness in government service delivery. Initiatives such as Digital India, Aadhaar, Unified Payments Interface (UPI), DigiLocker, CoWIN, and Direct Benefit Transfer (DBT) have not only strengthened institutional capacity but have also improved financial inclusion, social welfare delivery, and citizen participation. The findings indicate that India's digital governance framework aligns closely with the objectives of the United Nations Sustainable Development Goals (SDGs), particularly those related to poverty reduction, quality public services, institutional effectiveness, innovation, and inclusive economic growth. Moreover, the increasing international recognition of India's Digital Public

Infrastructure highlights its potential as a scalable and cost-effective governance model for developing countries, especially within the Global South. This demonstrates that digital governance can serve as an important instrument for promoting equitable and resilient global development. However, the long-term sustainability of digital governance depends on addressing persistent challenges, including the digital divide, cybersecurity threats, data privacy concerns, digital literacy gaps, and unequal access to digital infrastructure. Strengthening legal frameworks, expanding secure digital infrastructure, investing in capacity building, and ensuring ethical use of emerging technologies will be essential for maximizing the benefits of digital transformation. Overall, India's experience illustrates that sustainable governance is not achieved through technology alone but through the effective integration of innovation, inclusive institutions, and responsive public policies. By continuing to strengthen its digital ecosystem and fostering international collaboration, India is well positioned to contribute to global sustainable development and provide a replicable governance model for countries seeking resilient, transparent, and future-ready public institutions.

### Acknowledgement

The author expresses sincere gratitude to all those who contributed to the successful completion of this research paper. Special thanks are extended to the faculty members and colleagues of the Department of Political Science, M. M. Mahila College, Ara, for their valuable guidance, encouragement, and academic support throughout the study.

### Financial support and sponsorship

Nil.

### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

### Book Reference

1. Bhatnagar, S. (2014). *Public service delivery: Role of information and communication technology in improving governance and development*. SAGE Publications.
2. Misra, D. C. (2007). *From village euphoria to sustainable e-governance*. Academic Foundation.
3. NITI Aayog. (2018). *National strategy for artificial intelligence*. Government of India.
4. Ministry of Electronics and Information Technology. (2023). *Digital India annual report 2022–23*. Government of India.
5. Unique Identification Authority of India. (2023). *Aadhaar: Annual report 2022–23*. Government of India.
6. National Payments Corporation of India. (2023). *Annual report 2022–23*. NPCI.
7. Press Information Bureau. (2023). *Digital India: Transforming governance through technology*. Government of India.
8. Ministry of Finance. (2023). *Economic survey 2022–23*. Government of India.
9. Reserve Bank of India. (2023). *Report on currency and finance 2022–23*. RBI.



10. Prasad, R. (2018). *Digital governance in India: Opportunities and challenges*. Concept Publishing Company.
11. Castells, M. (2010). *The rise of the network society* (2nd ed.). Wiley-Blackwell.
12. Dunleavy, P., Margetts, H., Bastow, S., & Tinkler, J. (2006). *Digital era governance: IT corporations, the state, and e-government*. Oxford University Press.
13. Fountain, J. E. (2001). *Building the virtual state: Information technology and institutional change*. Brookings Institution Press.
14. Heeks, R. (2006). *Implementing and managing e-government: An international text*. SAGE Publications.
15. Pierre, J., & Peters, B. G. (2021). *Governance, politics and the state* (2nd ed.). Red Globe Press.
16. Sachs, J. D. (2015). *The age of sustainable development*. Columbia University Press.
17. United Nations. (2022). *United Nations e-government survey 2022: The future of digital government*. United Nations.
18. West, D. M. (2005). *Digital government: Technology and public sector performance*. Princeton University Press.
19. World Bank. (2016). *World development report 2016: Digital dividends*. World Bank.
20. World Economic Forum. (2018). *Agile governance: Reimagining policy-making in the fourth industrial revolution*. World Economic Forum.



Original Article

# Challenges in Indexing Bibliographic Records in the Artificial Intelligence Era: Emerging Issues, Opportunities and Future Directions

Sachin Dattatraya Patil

Librarian Arts, Commerce & Science College, Ashta

Manuscript ID:  
RIGJAAR-2026-030717

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 79-82  
July 2026

Submitted: 09 June. 2026  
Revised: 18 June. 2026  
Accepted: 12 July. 2026  
Published: 31 July. 2026

**Correspondence Address:**

Sachin Dattatraya Patil  
Librarian Arts, Commerce & Science  
College, Ashta  
E-Mail: [alchemistsachin09@gmail.com](mailto:alchemistsachin09@gmail.com)

Quick Response Code:



Web: <https://rlgjaar.com>



DOI: 10.5281/zenodo.21979067

DOI Link:

<https://doi.org/10.5281/zenodo.21979067>



Creative Commons



**Abstract:**

*Artificial Intelligence (AI) has emerged as a transformative technology in library and information science, fundamentally changing the way bibliographic records are created, organized, indexed and retrieved. The integration of machine learning, natural language processing, knowledge graphs, semantic web technologies and generative AI has significantly enhanced metadata generation, authority control and information discovery. However, alongside these advancements, AI introduces numerous challenges related to metadata quality, algorithmic bias, multilingual indexing, interoperability, copyright, privacy and professional ethics. This review critically examines the evolution of AI-assisted bibliographic indexing and synthesizes recent developments in the field. It discusses both the opportunities and challenges associated with intelligent indexing systems and proposes a human-centered AI-assisted bibliographic indexing framework. The paper argues that AI should function as a collaborative tool supporting librarians rather than replacing their professional expertise. Sustainable implementation requires metadata standardization, transparent algorithms, continuous quality assessment and ethical governance. The study contributes to the growing discourse on AI-enabled knowledge organization and provides practical recommendations for libraries, publishers, software developers and policymakers.*

**Keywords:** Artificial Intelligence, Bibliographic Indexing, Metadata, Cataloguing, Knowledge Organization, Smart Libraries, Machine Learning.

**Introduction:**

Bibliographic indexing has long served as the foundation of library catalogues, digital repositories and scholarly information systems. It enables systematic organization and retrieval of information resources by creating structured metadata that describe books, journals, theses, reports, multimedia resources and digital objects. Historically, bibliographic indexing relied on manual cataloguing guided by internationally recognized standards and the expertise of professional librarians. The rapid growth of digital scholarship, institutional repositories, open-access publishing and research data has increased the scale and complexity of bibliographic management, making manual indexing alone insufficient. Artificial Intelligence (AI) has become an important technological solution for addressing these challenges. Machine learning, natural language processing (NLP), deep learning, semantic web technologies and large language models (LLMs) are increasingly integrated into library management systems to automate metadata extraction, subject indexing, authority control, duplicate detection and semantic retrieval. AI-powered systems can process vast volumes of bibliographic information more rapidly than traditional methods, improving operational efficiency and supporting advanced discovery services. Despite these benefits, AI-driven indexing raises important concerns. Metadata generated by AI may contain errors, inconsistencies, or fabricated information, while algorithmic bias can reduce the visibility of non-English, regional, or underrepresented scholarship. Ethical questions regarding transparency, accountability, copyright, privacy and governance also challenge the adoption of AI in libraries. These issues highlight the need for a balanced approach in which

**Creative Commons (CC BY-NC-SA 4.0)**

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**How to cite this article:**

Patil, S. D. (2026). Challenges in Indexing Bibliographic Records in the Artificial Intelligence Era: Emerging Issues, Opportunities and Future Directions. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 79–82. <https://doi.org/10.5281/zenodo.21979067>

AI enhances rather than replaces professional cataloguing expertise. This paper critically reviews the opportunities and challenges associated with AI-assisted bibliographic indexing and proposes a conceptual framework for responsible implementation.

**Review Methodology:**

This paper is based on a narrative review of scholarly literature published primarily between 2018 and 2026. Relevant publications were identified through major academic databases including Scopus, Web of Science and Google Scholar using keywords such as Artificial Intelligence, Bibliographic Indexing, Metadata, Machine Learning, Natural Language Processing, Knowledge Graphs and Smart Libraries. Peer-reviewed journal articles, conference papers, professional reports and international standards were reviewed to synthesize current knowledge and identify emerging research trends.

**Evolution of Bibliographic Indexing:**

Bibliographic indexing has evolved from handwritten catalogues to machine-readable metadata and intelligent semantic systems. Early cataloguing emphasized standardized description through cataloguing rules and classification schemes. The introduction of digital libraries and online catalogues expanded access to bibliographic information and facilitated resource sharing among institutions. Contemporary indexing increasingly incorporates linked data, semantic web technologies and AI-assisted metadata generation. Modern bibliographic systems are expected not only to describe documents but also to establish relationships among authors, institutions, research projects, datasets and funding organizations. This evolution has transformed bibliographic indexing into a dynamic process supporting knowledge discovery rather than simple resource description.

**AI Technologies in Bibliographic Indexing:**

Several AI technologies contribute to modern bibliographic indexing:

1. Machine Learning supports automatic classification, metadata prediction and duplicate detection.
2. Natural Language Processing extracts keywords, identifies entities, summarizes documents and recommends subject headings.
3. Deep Learning enhances semantic understanding and multilingual information retrieval.
4. Knowledge Graphs connect bibliographic entities through semantic relationships.
5. Large Language Models assist in generating metadata, abstracts, and indexing suggestions.
6. Computer Vision supports indexing of images, manuscripts and digitized archival materials.
7. Together, these technologies improve indexing efficiency while enabling intelligent search and personalized information services.

**Major Challenges:****1-Metadata Quality**

AI systems rely on high-quality metadata for learning and prediction. Inconsistent or incomplete metadata reduce indexing accuracy and retrieval effectiveness.

**2-Authority Control**

Name ambiguity, institutional variations, and multilingual author identities complicate automated authority control despite advances in persistent identifiers.

**3-AI Hallucinations**

Generative AI may produce fabricated publication details, inaccurate metadata, or non-existent references, requiring rigorous human verification.

**4-Semantic Ambiguity**

AI often struggles with interdisciplinary terminology and context-dependent meanings, leading to incorrect subject assignments.

**5-Multilingual Indexing**

Most AI systems perform better in English than in low-resource languages, limiting the visibility of regional scholarship.

**6-Algorithmic Bias**

Training datasets dominated by particular publishers, disciplines, or regions can reinforce inequalities in information discovery.

**7-Interoperability**

Different metadata standards and cataloguing practices create challenges for integrating AI-generated records across heterogeneous library systems.

**8-Copyright and Privacy**

The use of copyrighted content in AI training and personalized discovery systems raises legal and ethical concerns regarding intellectual property and user privacy.

**9-Human Oversight**

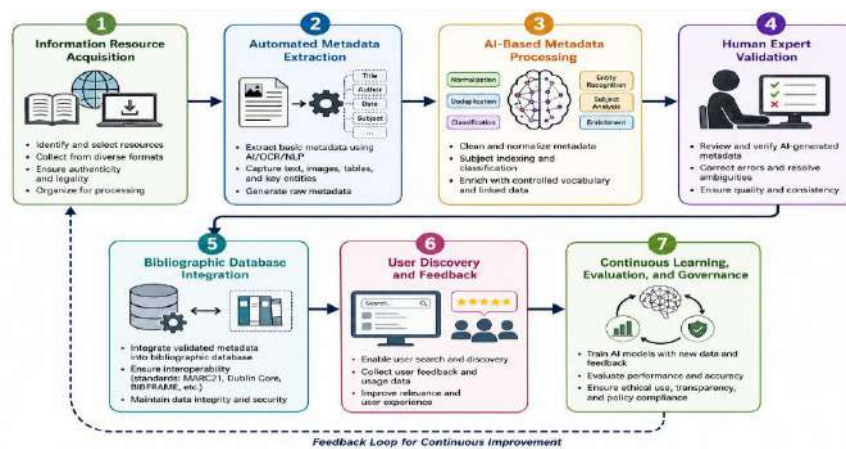
Professional librarians remain essential for quality assurance, ethical decision-making, and complex subject analysis. AI should support—not replace—their expertise.

**Opportunities:**

1. Despite these challenges, AI offers substantial opportunities:
2. Automated metadata creation
3. Intelligent subject indexing
4. Semantic search
5. Metadata enrichment
6. Linked data integration
7. Personalized discovery services
8. Predictive knowledge organization
9. Improved multilingual access
10. Enhanced research analytics
11. Faster technical processing
12. When combined with professional oversight, these innovations improve both operational efficiency and user experience.

### Proposed AI-Assisted Bibliographic Indexing Framework:

A sustainable AI-assisted indexing framework should include seven stages:



This hybrid framework combines intelligent automation with librarian expertise to ensure metadata accuracy, transparency and ethical compliance.

#### Practical Implications:

Academic libraries should invest in AI literacy, metadata governance, and continuous professional development. Publishers should improve metadata quality and adopt persistent identifiers. Software developers should design explainable and interoperable AI systems, while policymakers should establish ethical guidelines and support collaborative infrastructure for responsible AI implementation.

#### Future Research Directions:

##### 1-Human-AI Collaborative Indexing

Develop hybrid workflows where AI performs automated indexing while librarians validate and refine metadata to ensure accuracy and reliability.

##### 2-Explainable Artificial Intelligence (XAI)

Implement transparent AI models that explain how subject headings, keywords and classification decisions are generated, increasing trust and accountability.

##### 3-Knowledge Graphs and Semantic Technologies

Utilize knowledge graphs, linked data, and semantic web technologies to improve subject relationships, interoperability and contextual retrieval across bibliographic databases.

##### 4-Persistent Identifiers and Authority Control

Promote the widespread adoption of ORCID, DOI, ISNI, ROR and other persistent identifiers to reduce ambiguity in author names, institutions and research outputs.

##### 5-Multilingual and Cross-Lingual AI Models

Develop AI systems capable of accurately indexing resources in multiple languages and scripts, supporting inclusive global knowledge discovery.

##### 6-International Metadata Standards

Strengthen compliance with standards such as MARC 21, BIBFRAME, Dublin Core, RDA and Linked Data to ensure interoperability among library systems worldwide.

##### 7-Ethical and Responsible AI Governance

Establish policies addressing AI bias, hallucinations, copyright, privacy, transparency and accountability in bibliographic indexing processes.

##### 8-Continuous AI Training with High-Quality Metadata

Improve AI performance through continuous learning using validated, high-quality bibliographic datasets curated by information professionals.

##### 9-Integration with Digital Libraries and Open Science

Enhance AI-assisted indexing for institutional repositories, digital libraries, research data repositories and open-access platforms to improve scholarly communication.

##### 10-Smart and Personalized Information Retrieval

Employ AI-driven recommendation systems, semantic search and user behavior analytics to provide more accurate, context-aware and personalized discovery services.

#### Conclusion:

Artificial intelligence is reshaping bibliographic indexing by enabling automated metadata creation, semantic search, and intelligent knowledge discovery. However, technological innovation alone cannot guarantee high-quality bibliographic records. Metadata quality, transparency, fairness, interoperability and ethical governance remain fundamental requirements for successful AI implementation. The future of bibliographic indexing lies in collaborative intelligence, where AI performs repetitive computational tasks while librarians provide intellectual judgment, contextual understanding and quality assurance. Such a balanced approach will ensure that libraries continue to fulfill their mission of providing reliable, inclusive and sustainable access to scholarly knowledge in the digital era.

#### Acknowledgement

The author expresses sincere gratitude to all those who directly and indirectly contributed to the successful completion of this research paper. Special thanks are extended to the Principal and the Library Advisory Committee of Arts, Commerce & Science College, Ashta, for providing continuous encouragement and a supportive academic environment. The author is deeply grateful to colleagues, faculty members, and library professionals



whose valuable suggestions, discussions, and insights greatly enriched the quality of this work. Appreciation is also extended to the scholars, researchers, and organizations whose published literature and research findings served as important references for this study.

#### Financial support and sponsorship

Nil.

#### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### References:

1. Ahmed, M., Mukhopadhyay, M., & Mukhopadhyay, P. (2023). Automated knowledge organization AI/ML-based subject indexing system for libraries. *DESIDOC Journal of Library & Information Technology*, 43(1), 18–27.
2. <https://doi.org/10.14429/djlit.43.01.18619>
3. Association for Information Science and Technology. (2022). *Annual review of information science and technology*.
4. Bawden, D., & Robinson, L. (2022). *Introduction to information science* (2nd ed.). Facet Publishing.
5. Department of Higher Education, Government of India. (2020). *National Education Policy 2020*. Government of India.
6. Dublin Core Metadata Initiative. (2023). *Dublin Core metadata element set*. <https://www.dublincore.org/>
7. International Federation of Library Associations and Institutions. (2023). *IFLA trend report 2023*.
8. Information and Library Network Centre. (2022). *Annual report 2021–2022*. INFLIBNET Centre.
9. Information and Library Network Centre. (2023). *IndCat: Online union catalogue of Indian universities*. <https://indcat.inflibnet.ac.in/>
10. Library of Congress. (2023). *BIBFRAME overview*. <https://www.loc.gov/bibframe/>
11. Library of Congress. (2023). *MARC 21 format for bibliographic data*. <https://www.loc.gov/marc/>
12. National Assessment and Accreditation Council. (2023). *Manual for affiliated and constituent colleges*. NAAC.
13. National Digital Library of India. (2023). *National Digital Library of India*. Indian Institute of Technology Kharagpur.
14. National Knowledge Commission. (2009). *Libraries: Gateway to knowledge*. Government of India.
15. ORCID. (2024). *ORCID documentation*. <https://info.orcid.org/>
16. Prieto-Gutiérrez, J. J., & Segado-Boj, F. (2019). *Annals of Library and Information Studies: A bibliometric analysis of the journal and a comparison with the top library and information studies journals in Asia and worldwide (2011–2017)*. arXiv.
17. Raja Rammohun Roy Library Foundation. (2023). *Annual report 2022–2023*. RRRLF.
18. Sahu, R. R., & Parabhoi, L. (2020). Bibliometric study of Library and Information Science journal articles during 2014–2018: LIS research trends in India. *DESIDOC Journal of Library & Information Technology*, 40(6), 390–395. <https://doi.org/10.14429/djlit.40.06.15631>
19. Swapan Kumar Patra. (2021). *Library and Information Science research in Indian universities: Growth, core journals, keywords and collaboration patterns*. arXiv.
20. Tiwari, A., Bardhan, S., & Kumar, V. (2023). *A bibliographic study on Artificial Intelligence research: Global panorama and Indian appearance*. arXiv.
21. University Grants Commission. (2023). *Guidelines for academic libraries in higher educational institutions*. UGC.
22. W3C. (2023). *Resource Description Framework (RDF)*. <https://www.w3.org/RDF/>
23. Waghmode, S. S., Lathkar, R. A., & Kulkarni, J. N. (2020). Research publication trends in Indian LIS journals: A scientometric study. *Library Philosophy and Practice*.
24. World Wide Web Consortium. (2023). *Resource Description Framework (RDF) 1.1 concepts and abstract syntax*. <https://www.w3.org/RDF/>



Original Article

# Environmental Consciousness in Literature

Suryawanshi Manoj Shivaji

HOD English Department, JSM College, Alibag, Raigad.

Manuscript ID:  
RIGJAAR-2026-030718

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 83-87  
July 2026

Submitted: 09 June, 2026  
Revised: 18 June, 2026  
Accepted: 12 July, 2026  
Published: 31 July, 2026

Correspondence Address:  
Suryawanshi Manoj Shivaji  
HOD English Department, JSM  
College, Alibag, Raigad.  
Email:  
[mssuryawanshi7861@gmail.com](mailto:mssuryawanshi7861@gmail.com)

Quick Response Code:



Web: <https://rlgjaar.com>



DOI: 10.5281/zenodo.21988320

DOI Link:  
<https://doi.org/10.5281/zenodo.21988320>



Creative Commons



## Abstract:

*Environmental consciousness has become an important theme in literary studies as environmental degradation, climate change, deforestation and the loss of biodiversity continue to threaten the planet. Literature serves as a powerful medium for exploring the relationship between human beings and the natural world by encouraging readers to reflect on their responsibilities toward the environment. Through poems, novels, short stories and plays, writers portray nature not merely as a physical setting but as a living entity that influences culture, identity and human existence. Such representations help develop ecological awareness and promote values of conservation, sustainability and environmental justice. This paper examines the concept of environmental consciousness in literature through the lens of ecocriticism. It explores how literary texts depict the interconnectedness of humans and nature, the consequences of environmental exploitation and the ethical responsibility of protecting ecological systems. The study adopts a qualitative and analytical approach by interpreting selected literary works that foreground environmental concerns. This paper further examines how literature questions human-centered perspectives and inspires readers to develop a deeper sense of respect, responsibility and harmony with the natural environment. The study concludes that literature plays a significant role in fostering environmental consciousness and can serve as an effective educational and cultural tool for promoting ecological responsibility in contemporary society.*

**Keywords:** Environmental Consciousness, Literature, Ecocriticism, Nature, Ecology, Sustainability, Environmental Ethics etc

## Introduction:

Environmental degradation has emerged as one of the most pressing global challenges of the twenty-first century. Climate change, deforestation, pollution, loss of biodiversity and the excessive exploitation of natural resources have significantly affected ecological balance and human well-being. Among the various forms of expression, literature has played a vital role in cultivating environmental consciousness by presenting nature not merely as a backdrop for human activities but as an essential and interconnected part of life. Literature has long reflected the bond between human beings and the natural world. From ancient myths and folk traditions to contemporary novels and poetry, literary works have portrayed nature as a source of beauty, inspiration, survival and spiritual renewal. At the same time, many writers have highlighted the harmful consequences of environmental exploitation, urging readers to recognize the importance of preserving ecological balance. Through vivid narratives, symbolism and emotional engagement, literature encourages readers to think critically about environmental issues and their responsibilities toward the planet. The emergence of "ecocriticism" as a literary theory has further strengthened the study of environmental themes in literature. Ecocriticism examines the relationship between literature and the physical environment, focusing on how literary texts represent nature, environmental ethics and ecological sustainability. It encompasses an awareness of ecological crises, the impact of human activities on the environment and the need for sustainable development. Literary texts often reveal the interconnectedness of humans, animals, plants and ecosystems, emphasizing that environmental well-being is closely linked to social, cultural and economic well-being.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Suryawanshi, M. S. (2026). Environmental Consciousness in Literature. *Royal International Global Journal of Advance and Applied Research*, 3(7(III)), 83–87.  
<https://doi.org/10.5281/zenodo.21988320>

In doing so, literature inspires empathy, responsibility and informed action toward protecting the natural world. The study highlights the significance of literature as a powerful medium for fostering ecological sensitivity and promoting sustainable values in contemporary society.

**Objectives of the study:**

1. To examine the concept of environmental consciousness in literature.
2. To analyze the representation of the relationship between human beings and nature through an ecocritical perspective.
3. To evaluate the role of literature in promoting environmental awareness and ecological responsibility.

**Hypothesis of the study:**

**H<sub>1</sub>:** Literature plays a significant role in fostering environmental consciousness by promoting ecological awareness and encouraging a responsible relationship between human beings and nature.

**Scope and Limitations:** This study focuses on the concept of environmental consciousness in literature from an ecocritical perspective. It examines how literary works represent nature, environmental issues and the relationship between human beings and the natural world. The study is limited to selected literary texts and relies on qualitative textual analysis.

**Research Methodology:** This study adopts a qualitative research methodology based on textual analysis to examine the concept of environmental consciousness in literature. Data are collected from **secondary sources**, including books, research articles, journals and selected literary texts relevant to the study.

**Pioneers of Ecocritical Theory**

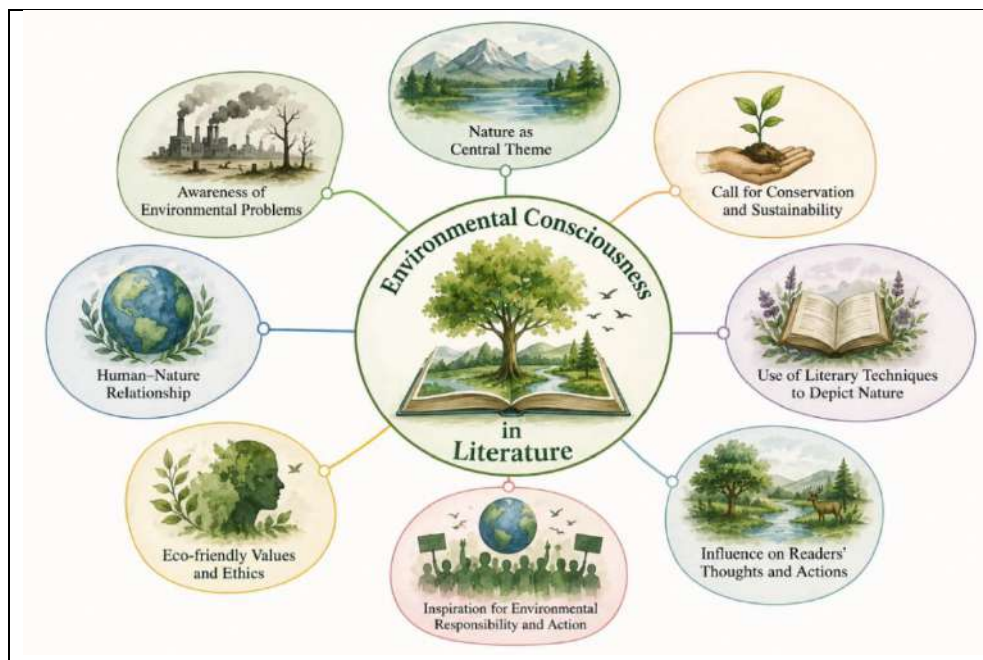
1. **Cheryll Glotfelty:** Cheryll Glotfelty is regarded as one of the founders of ecocriticism. She defines ecocriticism as the study of the relationship between literature and the physical environment. Her work emphasizes that literary studies should address environmental issues and examine how literature influences ecological awareness. Her edited volume *The Ecocriticism Reader* (1996) established ecocriticism as a significant field of literary criticism.
2. **Lawrence Buell:** Lawrence Buell is a leading ecocritical scholar who emphasizes the role of literature in shaping environmental consciousness. In *The Environmental Imagination* (1995), he argues that literary works encourage readers to understand the interconnectedness of humans and nature. His contributions focus on environmental ethics, sustainability and the representation of ecological issues in literature.
3. **Greg Garrard:** Greg Garrard expanded ecocritical studies by examining major environmental themes such

as pollution, wilderness, climate change, animals and sustainability. In *Ecocriticism* (2012), he explains how literary texts reflect ecological concerns and encourage critical thinking about environmental degradation. His work provides a comprehensive framework for interpreting environmental themes in literature.

4. **Arne Naess (Deep Ecology):** Arne Naess, the founder of **Deep Ecology**, proposed that all living beings possess intrinsic value regardless of their usefulness to humans. He advocated an ecocentric worldview that recognizes the equality of all forms of life. His philosophy encourages biodiversity conservation, ecological balance and sustainable living by promoting harmony between humans and nature.
5. **Val Plumwood (Ecofeminism):** Val Plumwood was a prominent ecofeminist philosopher who examined the relationship between environmental exploitation and social domination. She argued that the domination of nature and the oppression of women stem from similar hierarchical ways of thinking. Plumwood advocated a respectful and reciprocal relationship with the natural world, emphasizing ecological justice, equality and environmental ethics.

**Concept of Environmental Consciousness in Literature:**

Environmental consciousness in literature refers to the awareness and understanding of the relationship between human beings and the natural environment as expressed through literary works. It highlights the importance of nature, ecological balance and environmental responsibility while examining the impact of human activities on the Earth. Since ancient times, literature has portrayed nature as a source of life, inspiration and cultural identity. In contemporary literature, however, environmental concerns have become more prominent due to increasing ecological challenges such as climate change, pollution, deforestation, habitat destruction and the loss of biodiversity. Writers use fiction, poetry, drama and non-fiction to raise awareness of these issues and to inspire readers to adopt more sustainable attitudes and practices. Environmental consciousness in literature extends beyond the appreciation of natural beauty. It also involves questioning human actions that exploit natural resources, emphasizing the ethical responsibility to protect ecosystems and promoting harmony between humans and nature. Through compelling narratives and symbolic representations, literature encourages readers to reflect on environmental values and their role in preserving the planet for future generations. The development of "ecocriticism" has further strengthened the study of environmental consciousness in literary texts. Thus, environmental consciousness in literature is not merely a literary theme but also an ethical and social perspective that encourages individuals to understand the interconnectedness of humans and the environment.



#### Human-Nature Relationship: An Ecocritical Perspective:

1. **Interdependence of Humans and Nature:** Ecocriticism emphasizes that human life and nature are closely interconnected and the survival of one depends on the well-being of the other.
2. **Nature Beyond a Background:** Nature is viewed as an active and living presence rather than merely a setting for human activities.
3. **Impact of Human Actions:** Literary works reveal how deforestation, pollution, industrialization and overexploitation of natural resources disturb ecological balance.
4. **Environmental Ethics:** Ecocritical literature promotes respect, care and moral responsibility toward the environment and all living beings.
5. **Critique of Anthropocentrism:** It challenges the belief that humans are superior to nature and encourages an ecocentrism approach that values all forms of life equally.
6. **Need for Ecological Sustainability:** Literature advocates sustainable living by encouraging the conservation of natural resources for present and future generations.
7. **Role of Literature:** Through stories, poems and novels, literature creates environmental awareness and inspires readers to develop a harmonious relationship with nature.

**Environmental Issues Reflected in Literature:** Literature has increasingly become a powerful medium for highlighting environmental problems and encouraging ecological awareness. Through stories, poems, novels and plays, writers depict the causes and consequences of environmental degradation while emphasizing the need for sustainable coexistence between humans and nature. The following are some of the major environmental issues commonly reflected in literary works:

1. **Climate Change:** Many contemporary literary works address Climate change by portraying rising temperatures, extreme weather events, melting glaciers, floods, droughts and their impact on both human societies and ecosystems. Such narratives emphasize the urgency of climate action and encourage readers to recognize their environmental responsibilities.
2. **Deforestation:** Deforestation is a recurring theme in literature, symbolizing the destruction of forests for industrial, agricultural and urban development. Writers illustrate how the loss of forests leads to habitat destruction, soil erosion, climate imbalance and the displacement of indigenous communities and wildlife.
3. **Pollution:** Literary texts frequently explore different forms of pollution, including air, water, soil and noise pollution. These works portray the harmful effects of industrial waste, plastic pollution and toxic emissions on human health, biodiversity and the environment, urging readers to adopt environmentally responsible practices.
4. **Biodiversity Loss:** Many literary works emphasize the importance of preserving biodiversity by depicting the extinction of species, habitat destruction and ecological imbalance. They highlight the interconnectedness of all living organisms and stress the need to protect wildlife and natural ecosystems.
5. **Water Scarcity:** Water scarcity is presented in literature as a growing environmental and social concern. Writers explore the consequences of declining freshwater resources caused by climate change, pollution, overconsumption and poor resource management. These narratives underscore the importance of water conservation and equitable access to clean water.

6. **Industrialization and Urbanization:** Literature often examines the environmental consequences of rapid industrialization and urban expansion. It portrays issues such as increased pollution, excessive resource consumption, loss of green spaces and ecological degradation. Through these representations, writers encourage a balance between economic development and environmental sustainability.

#### **The Role of Literature in Promoting Environmental Awareness and Ecological Responsibility:**

1. **Raises Environmental Awareness:** Literature highlights environmental issues such as climate change, pollution, deforestation and biodiversity loss, making readers aware of ecological challenges.
2. **Develops Ecological Sensitivity:** Literary works encourage readers to appreciate the beauty and value of nature, fostering empathy toward all living beings.
3. **Promotes Environmental Ethics:** Through narratives and characters, literature emphasizes values such as conservation, sustainability and responsible use of natural resources.
4. **Encourages Critical Thinking:** Literature questions human activities that damage the environment and inspires readers to reflect on their ecological responsibilities.
5. **Supports Sustainable Living:** Many literary texts advocate environmentally friendly practices and emphasize the importance of maintaining ecological balance.
6. **Strengthens Human-Nature Relationships:** Literature portrays the interconnectedness of humans and nature, encouraging respect, coexistence and harmony with the natural world.

**Inspires Environmental Action:** By creating emotional and ethical awareness, literature motivates individuals and communities to participate in environmental protection and sustainable development.

#### **Suggestions:**

1. Environmental literature should be integrated into school and university curricula to promote ecological awareness from an early stage of education.
2. Educational institutions should encourage the reading and discussion of literary works that address environmental issues, sustainability and conservation.
3. Writers and researchers should produce more literary works that explore contemporary environmental challenges such as climate change, biodiversity loss and pollution.
4. Literary festivals, seminars, workshops and reading campaigns should include themes related to environmental conservation to increase public awareness.
5. Interdisciplinary research combining literature and environmental studies should be encouraged to develop innovative approaches to ecological education.
6. Digital platforms, libraries and educational organizations should promote environmentally themed literary works to reach a wider audience.

7. Literature should be used as a tool to inspire ethical responsibility, sustainable lifestyles and active participation in environmental protection among readers of all age groups.

**Conclusion:** Environmental consciousness in literature highlights the close relationship between human beings and the natural world while emphasizing the need for ecological balance and sustainable living. Through literary techniques and ecocritical perspectives, literature raises awareness of environmental challenges and inspires readers to develop respect, responsibility and care for nature. The study concludes that literature is not only a reflection of environmental concerns but also an effective means of promoting environmental awareness and ecological responsibility, contributing to the creation of a more sustainable future.

#### **Acknowledgement**

I express my sincere gratitude to all those who have directly and indirectly contributed to the successful completion of this research paper entitled "Environmental Consciousness in Literature." I am deeply thankful to the Principal of my institution for providing the necessary academic environment and support to carry out this study. I extend my heartfelt gratitude to my colleagues, the library staff, and all the authors and scholars whose valuable books, research articles, and publications have greatly contributed to the completion of this research. I also acknowledge the guidance and inspiration received from eminent researchers in the field of ecocriticism and environmental literature, whose works provided a strong theoretical foundation for this study.

#### **Financial support and sponsorship**

Nil.

#### **Conflicts of interest**

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### **References**

1. Kothari C. R. (2004), "Research methodology: Methods and techniques" (2nd ed.). New Age International Publishers.
2. Kumar R. (2019), "Research methodology: A step-by-step guide for beginners" (5th ed.). SAGE Publications.
3. Creswell J. W. & Creswell J. D. (2018), "Research design: Qualitative, quantitative and mixed methods approach" (5th ed.). SAGE Publications.
4. Buell L. (1995), "The environmental imagination: Thoreau, nature writing and the formation of American culture" Princeton University Press.
5. Ghosh A. (2016), "The great derangement: Climate change and the unthinkable" The University of Chicago Press.
6. Glotfelty C. & Fromm H. (Eds.). (1996), "The ecocriticism reader: Landmarks in literary ecology." University of Georgia Press.
7. Naess A. (1989), "Ecology, community and lifestyle: Outline of an ecosophy" Cambridge University Press.
8. Plumwood V. (1993), "Feminism and the mastery of nature" Routledge.



9. Rigby K. (2015), "Dancing with disaster: Environmental histories, narratives and ethics for perilous times" University of Virginia Press.
10. Rueckert W. (1978), "Literature and ecology: An experiment in ecocriticism" In W. Rueckert, *The Iowa Review*, 9(1), 71-86.
11. Slovic S. (2000), "Ecocriticism: Containing multitudes, practicing doctrine" In L. Coupe (Ed.), *The green studies reader: From Romanticism to ecocriticism* Page No. 160-162. Routledge.
12. Coupe L. (Ed.). (2000), "The green studies reader: From Romanticism to ecocriticism" Routledge.



Original Article

# Partition Trauma, Gender Issues, and Madness in Anirudh Kala's The Unsafe Asylum: Stories of Partition and Madness

Parmjeet Kaur

GSSDGS Khalsa College, Patiala Punjabi University, Patiala

Manuscript ID:  
RIGJAAR-2026-030719

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 88-89  
July 2026

Submitted: 09 June. 2026  
Revised: 18 June. 2026  
Accepted: 12 July. 2026  
Published: 31 July. 2026

**Correspondence Address:**

Parmjeet Kaur  
GSSDGS Khalsa College, Patiala  
Punjabi University, Patiala  
Email: [parmjeeteng04@gmail.com](mailto:parmjeeteng04@gmail.com)

Quick Response Code:



Web: <https://rlgjaar.com>



DOI: 10.5281/zenodo.21988379

DOI Link:

<https://doi.org/10.5281/zenodo.21988379>



Creative Commons



## Abstract

Anirudh Kala's 2018 book *The Unsafe Asylum: Stories of Partition and Madness* looks at the deep mental effects of the 1947 Partition of India. As a psychiatrist, Kala uses connected short stories to show how Partition caused trauma, affected gender roles, and led to different forms of madness. This paper studies these themes. It argues that Kala shows madness as both a personal illness and a shared social problem caused by history. The book gives voice to women's experiences and shows how trauma passes from one generation to the next.

**Keywords:** Partition, Partition Trauma, Gender Issues, Madness, Mental Health, Anirudh Kala, The Unsafe Asylum, Trauma Studies, Patriarchy, Partition, Literature, Collective Memory, Intergenerational Trauma

## Introduction

The 1947 Partition split British India into India and Pakistan. It caused huge violence, displacement of millions, and long-lasting pain. Many history books focus on politics and numbers, but Kala's stories focus on people's minds and feelings. Kala, who works as a psychiatrist in Ludhiana, uses his real experiences with patients from both countries. His book questions what "madness" really means. It links personal stories to bigger historical events. This paper looks at how Partition trauma, gender problems, and madness connect in the book. It uses ideas from women's studies and trauma research to explain Kala's work. The stories follow characters like Rudra Singh, Fattu (Fateh Khan), and Dr. Prakash Kohli. Their lives show the broken minds left by Partition. (About 350 words so far) Historical Background and Partition Trauma The Partition brought mass killings, rapes, and forced movement of people. Many women were taken away—up to 75,000 in some estimates. Mental health problems were common but often ignored. Kala's book is based on real events, such as the exchange of patients from mental hospitals between India and Pakistan. This reminds readers of Saadat Hasan Manto's famous story "Toba Tek Singh," but Kala goes further by showing effects on later generations. Trauma does not always show up right away. People may relive painful events through dreams, fears, or strange beliefs years later. In Kala's stories, whole families share false beliefs about danger from the other community. This "shared madness" acts like a family curse passed down. The book also connects 1947 to the 1984 riots. A mother asks, "Is it partition time again?" This shows how old wounds can open up again. Kala makes clear that Partition is not just past history—it still affects minds today.

## Gender Issues: Violence, Patriarchy, and Women's Strength

During Partition, women suffered in special ways. Their bodies were often used as symbols of community honor. Both sides committed violence against women. After the violence, governments tried to "recover" abducted women and send them back, but these efforts often ignored what the women wanted. Kala shows this clearly in stories like Harpreet Cheema's. She builds a new life after abduction but is forced back. Such actions were controlled by male family members and the state. Scholars like Urvashi Butalia, Ritu Menon, and Kamla Bhasin have written about these forced recoveries and how they added to women's pain. However, Kala does not show women only as victims. Many female characters show strength. They make choices, resist old rules, and try to create new lives. One woman uses her hallucinations to question what society expects from women.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Kaur, P. (2026). Partition Trauma, Gender Issues, and Madness in Anirudh Kala's *The Unsafe Asylum: Stories of Partition and Madness*. *Royal International Global Journal of Advance and Applied Research*, 3(7(III)), 88–89. <https://doi.org/10.5281/zenodo.21988379>



She turns “madness” into a form of freedom. The book is mostly told from a male doctor’s view, but it still puts women’s stories at the center. It shows how patriarchy and Partition together made life harder for women, but also how they fought back.

#### **Madness: Personal Illness and Social Problem**

Kala uses his medical knowledge to describe madness in realistic ways. The patients Rulda and Fattu have smart and funny talks that question the idea of Partition itself. They seem more reasonable than the officials who divide them.

Madness in the book appears in different forms:

Clinical illness caused by shock and loss.

Family-wide delusions passed from parents to children.

Social madness—the crazy hatred that led to Partition violence.

Kala asks an important question: Who is really mad? The patients in the asylum or the leaders who created borders and caused so much suffering?

Unlike older stories that use madness only as a symbol, Kala treats it as a real mental health issue. He describes symptoms, family patterns, and the failure of institutions to help patients during the chaos of Partition. Many patients died or disappeared during the exchange.

This approach makes the book different. It mixes medical truth with storytelling to help readers understand deep human pain.

#### **How the Themes Connect in the Stories**

Kala’s stories are linked, which helps show the connected nature of trauma. In the asylum exchange stories, Rulda and Fattu lose each other because of religion-based rules. Their separation stands for the bigger human cost of Partition.

Women’s stories often combine gender violence with mental breakdown. Hallucinations of mobs and attacks show both real past danger and ongoing fear. Male characters struggle with guilt and helplessness.

Dr. Prakash Kohli’s journey to Pakistan connects personal family history with national history. His work as a doctor mirrors Kala’s own efforts to build understanding between Indian and Pakistani mental health professionals.

These connections show that Partition trauma affects identity, family, memory, and even love across borders. Madness becomes a way to express what is too painful to say directly. Gender shapes how trauma is experienced and remembered.

#### **Conclusion**

Anirudh Kala’s *The Unsafe Asylum* is an important book about the hidden mental costs of Partition. It makes readers think about trauma, gender injustice, and different kinds of madness. The stories are humane and honest. They show pain but also hope through human connections.

In today’s world, where old divisions can return, Kala’s message is still useful. We must listen to personal stories and care for mental health if we want to heal old wounds. This book adds a valuable voice to Partition literature by focusing on psychology and everyday people.

#### **Acknowledgement**

I express my sincere gratitude to all those who have directly and indirectly supported me in the successful completion of this research paper titled "Partition Trauma, Gender Issues, and Madness in Anirudh Kala's *The Unsafe Asylum: Stories of Partition and Madness*". I am deeply thankful to the Principal and the Head of the Department for providing constant encouragement and the necessary academic environment for carrying out this work. I also extend my heartfelt appreciation to my guide, teachers, and colleagues for their valuable suggestions, constructive criticism, and continuous support throughout the preparation of this paper.

#### **Financial support and sponsorship**

Nil.

#### **Conflicts of interest**

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### **Works Cited**

- Butalia, Urvashi. *The Other Side of Silence: Voices from the Partition of India*. Duke UP, 2000.
- Kala, Anirudh. *The Unsafe Asylum: Stories of Partition and Madness*. Speaking Tiger, 2018.
- Menon, Ritu, and Kamla Bhasin. *Borders & Boundaries: Women in India's Partition*. Rutgers UP, 1998.
- Pillai, Varsha Thulasi. “Representation of Partition Trauma in Anirudh Kala’s *The Unsafe Asylum*.” *IJRAR*, 2020.
- Sandhu, Amandeep. “The Thin Red Line: Review of *The Unsafe Asylum*.” *The Hindu*, 18 Aug. 2018.
- “The Unsafe Asylum.” Wikipedia, Wikimedia



Original Article

# Measures and Implementation of Central and State Governments for Biodiversity Conservation in India: A Review

Anita Vitthal Bambale.

Research student, Department of Geography, Agasti Arts, Commerce and D.R. Science college, Akole, Ahilyanagr. Corresponding Author

Manuscript ID:  
RIGJAAR-2026-030720

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 90-92  
July 2026

Submitted: 09 June. 2026  
Revised: 18 June. 2026  
Accepted: 12 July. 2026  
Published: 31 July. 2026

Correspondence Address:  
Anita Vitthal Bambale.

Research student, Department of  
Geography, Agasti Arts, ommerce  
and D.R. Science college, Akole,  
Ahilyanagr. Corresponding Author  
E-mail:  
[anitavbambale88@gmail.com](mailto:anitavbambale88@gmail.com)

Quick Response Code:



Web. <https://rlgjaar.com>



DOI: 10.5281/zenodo.21988474

DOI Link:  
<https://doi.org/10.5281/zenodo.21988474>



Creative Commons



## Abstract

*Biodiversity forms the foundation of ecosystem stability, environmental sustainability, and human well-being. India, one of the world's megadiverse countries, possesses nearly 8 percent of global biodiversity despite covering only 2.4 percent of the world's geographical area. However, biodiversity is increasingly threatened by habitat loss, climate change, deforestation, urbanization, pollution, and overexploitation of natural resources. To address these challenges, both the Central and State Governments have implemented various policies, legislative measures, conservation programs, and community-based initiatives. The present paper reviews major biodiversity conservation measures undertaken by the Government of India and State Governments, evaluates their implementation status, and discusses challenges and future prospects. The study highlights the importance of integrated governance, community participation, technological interventions, and sustainable development strategies for effective biodiversity conservation.*

**Keywords:** Biodiversity Conservation, Government Policies, Protected Areas, Biological Diversity Act, National Biodiversity Authority, India.

## Introduction

Biodiversity refers to the variety of living organisms, including plants, animals, microorganisms, and ecosystems. It plays a vital role in maintaining ecological balance, providing ecosystem services, supporting livelihoods, and regulating climate systems. India is recognized as one of the seventeen megadiverse countries in the world and contains four global biodiversity hotspots: the Western Ghats, Himalayas, Indo-Burma Region, and Sundaland (Nicobar Islands). Rapid population growth, industrialization, agricultural expansion, climate change, and land-use transformation have significantly affected biodiversity resources. Consequently, conservation of biodiversity has become a major environmental priority. The Government of India, along with State Governments, has formulated several legal, institutional, and policy frameworks to protect biodiversity and ensure sustainable use of biological resources.

## Objectives of the Study

1. To examine biodiversity conservation measures undertaken by the Central Government of India.
2. To review biodiversity conservation initiatives implemented by State Governments.
3. To assess the effectiveness of existing conservation policies and programs.
4. To identify challenges and suggest strategies for improving biodiversity conservation.

## Methodology

The study is based on secondary data collected from government reports, policy documents, research journals, books, biodiversity action plans, Forest Survey of India reports, Ministry of Environment, Forest and Climate Change publications, and reports of the National Biodiversity Authority. Information was analyzed using descriptive and analytical methods.

## Central Government Measures for Biodiversity Conservation

### 1. Biological Diversity Act, 2002

The Biological Diversity Act was enacted to conserve biodiversity, ensure sustainable use of biological resources, and promote fair and equitable sharing of benefits arising from biological resources.

### Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

### How to cite this article:

Bambale., A. V. (2026). Measures and Implementation of Central and State Governments for Biodiversity Conservation in India: A Review. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 90–92. <https://doi.org/10.5281/zenodo.21988474>



**Major provisions include:**

1. Establishment of National Biodiversity Authority (NBA)
2. State Biodiversity Boards (SBBs)
3. Biodiversity Management Committees (BMCs)
4. Preparation of People's Biodiversity Registers (PBRs)

**2. National Biodiversity Authority**

The National Biodiversity Authority was established in 2003 and functions as the apex body for biodiversity governance in India. Its responsibilities include:

1. Regulation of access to biological resources
2. Benefit-sharing mechanisms
3. Biodiversity awareness programs
4. Conservation planning

**3. Protected Area Network**

India has developed an extensive protected area system comprising:

1. National Parks
2. Wildlife Sanctuaries
3. Conservation Reserves
4. Community Reserves
5. Biosphere Reserves
6. Protected areas safeguard critical habitats and endangered species.

**4. National Wildlife Action Plan**

The National Wildlife Action Plan provides strategic guidance for wildlife conservation, habitat restoration, species recovery, and climate adaptation.

**5. Project Tiger**

Launched in 1973, Project Tiger aims to conserve tiger populations and their habitats through habitat protection, anti-poaching measures, and community participation.

**6. Project Elephant**

Initiated in 1992, the project focuses on elephant conservation, habitat connectivity, and mitigation of human-elephant conflicts.

**7. National Afforestation Programme**

The programme promotes forest restoration, degraded land rehabilitation, and enhancement of biodiversity through community participation.

**8. Green India Mission**

The Green India Mission seeks to increase forest cover, improve ecosystem services, and strengthen biodiversity conservation under climate change scenarios.

**9. Wetland Conservation Programme**

The government supports conservation and restoration of wetlands, which are important biodiversity habitats and ecological buffers.

**State Government Initiatives for Biodiversity Conservation**

**1. State Biodiversity Boards**

Each state has established a State Biodiversity Board responsible for implementing biodiversity policies, preparing biodiversity action plans, and regulating biological resource use.

**2. Biodiversity Management Committees**

Local bodies have constituted Biodiversity Management Committees to document local biodiversity and promote community-based conservation.

**3. People's Biodiversity Registers**

States have prepared People's Biodiversity Registers to document biological resources, traditional knowledge, and conservation practices.

**4. Maharashtra State Biodiversity Initiatives**

In Maharashtra, conservation efforts include:

1. Western Ghats conservation programs
2. Mangrove conservation projects
3. Biodiversity heritage sites
4. Community forest management
5. Ecological restoration of degraded landscapes

**5. Joint Forest Management**

Several states have implemented Joint Forest Management programmes involving local communities in forest protection and sustainable resource utilization.

**Implementation Status and Achievements**

The implementation of biodiversity conservation measures in India has produced several positive outcomes through coordinated efforts by the Central and State Governments, local communities, research institutions, and non-governmental organizations. Major achievements include:

1. Expansion of protected area networks, including National Parks, Wildlife Sanctuaries, Conservation Reserves, Community Reserves, and Biosphere Reserves.
2. Improvement in the populations of flagship species such as tigers, elephants, lions, rhinoceroses, and crocodiles through species-specific conservation programmes.
3. Increased participation of local communities through Joint Forest Management (JFM), Eco-Development Committees (EDCs), and Biodiversity Management Committees (BMCs).
4. Enhanced biodiversity documentation through the preparation of People's Biodiversity Registers (PBRs), providing valuable information on local biological resources and traditional knowledge.
5. Improvement in forest cover and tree cover in several regions as a result of afforestation, reforestation, and ecosystem restoration programmes.
6. Greater public awareness regarding biodiversity conservation through environmental education, awareness campaigns, and citizen participation initiatives.
7. Strengthening of legal and institutional frameworks for biodiversity conservation through the effective implementation of environmental laws and the establishment of dedicated conservation authorities.
8. Increased use of geospatial technologies, remote sensing, Geographic Information Systems (GIS), Global Positioning Systems (GPS), and drone-based monitoring for biodiversity assessment, habitat mapping, and conservation planning.
9. Enhanced scientific research and biodiversity monitoring through collaborations among universities, research institutions, government agencies, and conservation organizations.
10. Successful implementation of habitat restoration programmes in degraded forests, wetlands, mangroves, grasslands, and river ecosystems, contributing to improved ecosystem health and ecological resilience.

11. Improved conservation of threatened and endemic species through captive breeding programmes, species recovery plans, and habitat management initiatives.
12. Greater integration of biodiversity conservation into national development policies, climate change adaptation strategies, and sustainable natural resource management programmes.
13. Increased financial support through national schemes, international funding mechanisms, and corporate social responsibility (CSR) initiatives for biodiversity conservation projects.
14. Promotion of sustainable livelihood opportunities, including eco-tourism, non-timber forest products, and community-based conservation enterprises, thereby reducing pressure on natural ecosystems.

India has also made significant progress in fulfilling its international commitments under the Convention on Biological Diversity (CBD), particularly through the implementation of the National Biodiversity Action Plan (NBAP), strengthening biodiversity governance, promoting ecosystem restoration, and supporting the global biodiversity targets. Continuous monitoring, adaptive management, technological innovation, and active stakeholder participation have further strengthened the country's biodiversity conservation efforts. Despite these achievements, challenges such as climate change, habitat fragmentation, invasive alien species, pollution, and increasing developmental pressures continue to require sustained conservation interventions and policy support to ensure the long-term protection of India's rich biological diversity.

#### Challenges in Biodiversity Conservation

Preserving biodiversity is a massive challenge primarily driven by human activity. With global wildlife populations plunging by an average of 69% since 1970, the core struggle lies in balancing economic growth and population needs with the urgent necessity to protect vulnerable ecosystems. Despite progress, several challenges remain:

1. Habitat fragmentation and degradation.
2. Climate change impacts on ecosystems.
3. Human-wildlife conflicts.
4. Invasive alien species.
5. Urbanization and infrastructure development.
6. Limited financial and technical resources.
7. Weak enforcement in certain regions.

These challenges threaten long-term biodiversity sustainability and require integrated management approaches.

#### Recommendations

The following measures are recommended:

1. Strengthen implementation of biodiversity laws and policies.
2. Enhance climate-resilient conservation planning.
3. Promote geospatial technologies for biodiversity monitoring.
4. Increase community participation in conservation programs.
5. Improve ecological restoration of degraded habitats.
6. Strengthen biodiversity databases and monitoring systems.
7. Enhance coordination among government agencies.
8. Promote sustainable land-use planning.
9. Increase funding for biodiversity conservation initiatives.

10. Encourage research on climate change and biodiversity interactions.

The successful implementation of these recommendations will enhance ecosystem resilience, protect biological diversity, and promote sustainable natural resource management in the face of climate change. These measures are expected to support ecological stability, improve ecosystem services, conserve threatened species and habitats, and contribute to sustainable development. In the context of the Western Ghats and Pune District, the integration of climate-resilient biodiversity conservation strategies with geospatial technologies will provide a robust framework for long-term environmental planning and biodiversity management.

#### Conclusion

Biodiversity conservation is essential for ecological stability, sustainable development, and human welfare. The Central and State Governments of India have undertaken significant measures through legislative frameworks, institutional mechanisms, protected area management, and community-based initiatives. Although considerable achievements have been made, emerging threats such as climate change, habitat loss, and biodiversity degradation continue to pose serious challenges. Effective implementation, technological innovation, scientific research, and public participation are necessary to ensure long-term conservation of India's rich biological heritage.

#### Acknowledgement

The author expresses sincere gratitude to all those who provided valuable support and guidance in completing this review study on biodiversity conservation in India. Special thanks are extended to the Department of Geography, Agasti Arts, Commerce and D.R. Science College, Akole, Ahilyanagar, for providing the academic environment and encouragement necessary for this work. The author is grateful to the Central and State Government agencies, the National Biodiversity Authority, the Ministry of Environment, Forest and Climate Change, the Forest Survey of India, and the Maharashtra State Biodiversity Board for providing valuable reports, policy documents, and information related to biodiversity conservation.

#### Financial support and sponsorship

Nil.

#### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### References

1. Government of India (2002). Biological Diversity Act, 2002.
2. National Biodiversity Authority (2024). Annual Report.
3. Ministry of Environment, Forest and Climate Change (2023). India State of Forest Report.
4. Forest Survey of India (2023). India State of Forest Report.
5. National Wildlife Action Plan (2017–2031).
6. Convention on Biological Diversity (2022). Global Biodiversity Outlook.
7. Gadgil, M., & Guha, R. (2019). Ecology and Equity.
8. Singh, J. S., & Chaturvedi, O. P. (2021). Biodiversity Conservation in India.
9. Western Ghats Ecology Expert Panel Report.
10. Maharashtra State Biodiversity Board Reports.



Original Article

# Sustainability as A Strategic Driver In Industrial Buying Decisions: A Study of Excavator Procurement In The Indian Infrastructure Sector

Pritam Bhambure<sup>1</sup>, Dr. Nilesh Bankar<sup>2</sup>

<sup>1</sup>Research Scholar, Neville Wadia Institute of Management Studies & Research, Savitribai Phule Pune University, Pune

<sup>2</sup> Research Guide, Assistant Professor, Pravara Institute Of Research And Education In Natural And Social Sciences Institute of Business Management and Administration ,Loni Bk, Ta: Rahta, Dist: Ahmednagar

Manuscript ID:  
RIGJAAR-2026-030721

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 93-96  
July 2026

Submitted: 11 June. 2026  
Revised: 20 June. 2026  
Accepted: 14 July. 2026  
Published: 31 July. 2026

Correspondence Address:  
Pritam Bhambure,  
Research Scholar, Neville Wadia  
Institute of Management Studies &  
Research, Savitribai Phule Pune  
University, Pune  
Email: [pritambb@gmail.com](mailto:pritambb@gmail.com)

Quick Response Code:



Web: <https://rlgjaar.com>



DOI: 10.5281/zenodo.21988677

DOI Link:  
<https://doi.org/10.5281/zenodo.21988677>



Creative Commons



## Abstract

The Indian excavator industry plays a crucial role in infrastructure development, supporting construction, mining, transportation, irrigation, and urban development projects. With increasing environmental concerns, regulatory requirements, and demand for sustainable infrastructure, sustainability has become an important factor influencing industrial buying behavior and procurement decisions. This study examines the factors influencing the adoption of sustainable excavators in the Indian infrastructure industry, focusing on environmental performance, technological innovation, regulatory compliance, and organizational decision-making. A quantitative research approach was adopted using primary data collected through structured questionnaires from procurement professionals, contractors, project managers, and equipment users, supported by secondary data from industry reports, government publications, and academic literature. The findings indicate that fuel efficiency, BS-V emission compliance, lifecycle cost, equipment reliability, telematics, after-sales service, and environmental performance significantly influence excavator purchase decisions. However, challenges such as high initial investment costs, limited awareness, and infrastructure limitations affect the adoption of sustainable excavators. The study highlights that sustainable procurement practices improve operational efficiency, reduce lifecycle costs, enhance regulatory compliance, and strengthen competitive advantage. The research provides insights for manufacturers, policymakers, and infrastructure organizations to promote sustainable transformation in the Indian excavator industry.

**Keywords:** Industrial Buying Behaviour, Sustainable Procurement, Indian Excavator Industry, Sustainability, Technological Innovation, Equipment Reliability

## Background

highlights the growing importance of sustainability in industrial buying decisions within the Indian excavator industry. Rapid infrastructure development, government initiatives, and stricter environmental regulations have increased the demand for fuel-efficient and eco-friendly construction equipment. Modern excavators are equipped with advanced technologies such as BS-V compliant engines, telematics, and predictive maintenance systems, improving both operational efficiency and environmental performance. As a result, procurement decisions are no longer based solely on purchase price but also on lifecycle cost, reliability, after-sales service, and sustainability. This study examines how these factors influence the purchasing behavior of industrial buyers in the Indian infrastructure sector and supports the adoption of sustainable procurement practices.

## Significance Of The Study

This study focuses on industrial buying behavior for excavators in the Indian infrastructure industry, with special emphasis on the role of sustainability, technology, and organizational factors in procurement decisions. With rapid growth in infrastructure projects such as highways, metro systems, mining, and urban development, the demand for efficient, fuel-saving, and environmentally sustainable excavators has increased significantly. The excavator industry is undergoing transformation due to BS-V emission norms, digital technologies, telematics, predictive maintenance, and advanced fuel-efficient systems. These developments have shifted purchasing decisions from only initial cost considerations toward lifecycle value, operational efficiency, and environmental performance. Unlike consumer products, excavator procurement involves multiple stakeholders such as contractors, procurement managers, project engineers, and equipment managers. Factors including equipment performance, reliability, total cost of ownership, after-sales service, brand reputation, and sustainability influence buying decisions.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Bhambure, P., & Bankar, N. (2026). Sustainability as A Strategic Driver In Industrial Buying Decisions: A Study of Excavator Procurement In The Indian Infrastructure Sector. *Royal International Global Journal of Advance and Applied Research*, 3(7(III)), 93–96.  
<https://doi.org/10.5281/zenodo.21988677>



This research provides insights into how sustainability and technological advancements affect excavator purchase decisions and identifies barriers such as high investment costs, limited awareness, and infrastructure challenges. The findings will help manufacturers, contractors, policymakers, and researchers develop effective strategies for sustainable procurement and growth of the Indian construction equipment industry.

**Literature Review** The literature review indicates that the Indian excavator industry has evolved significantly between 2014 and 2025, with increasing emphasis on sustainability, technological innovation, and operational efficiency. Early studies focused on improving fuel efficiency, reducing emissions, and adopting cleaner manufacturing practices. Later research highlighted the role of IoT-enabled telematics, predictive maintenance, and intelligent hydraulic systems in enhancing machine performance and reducing operating costs. The introduction of BS-V emission norms further accelerated the adoption of environmentally friendly technologies and sustainable manufacturing processes. Recent studies emphasize hybrid and electric excavators, AI-based diagnostics, and digital fleet management as key drivers of sustainable procurement. Researchers have identified total cost of ownership, fuel efficiency, reliability, after-sales service, and brand reputation as major factors influencing industrial buying behavior. Government initiatives such as PM Gati Shakti, the National Infrastructure Pipeline (NIP), and Bharatmala Pariyojana have also encouraged organizations to adopt sustainable construction equipment. Industrial buying decisions involve multiple stakeholders and increasingly consider environmental compliance, lifecycle value, and technological capabilities. However, existing literature provides limited evidence on how sustainability specifically influences industrial buying behavior in the Indian excavator industry. Therefore, this study aims to bridge this gap by examining the combined impact of sustainability, technology, organizational factors, and government regulations on excavator procurement decisions.

### Research Methodology

#### Objectives of the Study

The study aims to examine the factors influencing industrial buying behavior for excavators in the Indian infrastructure industry, with a focus on sustainability, technology, and organizational factors. The specific objectives are:

- To identify the key factors affecting excavator purchase decisions.
- To examine the impact of sustainability factors such as fuel efficiency and BS-V compliance.
- To analyze the influence of technological innovations like telematics and predictive maintenance.

- To evaluate the role of organizational factors including cost, after-sales service, financing, and supplier reputation.
- To provide recommendations for manufacturers, dealers, and policymakers to promote sustainable procurement.

#### Hypotheses

**H1:** Sustainability features significantly influence industrial buying behavior.

**H2:** Technological advancements positively influence excavator purchase decisions.

**H3:** After-sales service and dealer support significantly affect buying behavior.

**H4:** Organizational factors such as purchase cost, financing, and supplier reputation significantly influence procurement decisions.

### Research Design

This study adopts a **descriptive, quantitative research design**. Primary data were collected through structured questionnaires, while secondary data were obtained from industry reports, government publications, company reports, and academic journals. Fieldwork involved interacting with procurement managers, project managers, contractors, and equipment professionals to understand excavator procurement practices and sustainability considerations.

#### Sampling Technique

A **purposive sampling technique** was used to select respondents directly involved in excavator procurement. The study includes **212 respondents**, comprising procurement managers, project managers, contractors, equipment managers, mining professionals, and infrastructure company executives.

#### Data Collection

**Primary data** were collected using a structured questionnaire based on a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). **Secondary data** were collected from annual reports of excavator manufacturers, ICEMA reports, Ministry of Heavy Industries publications, Ministry of Road Transport & Highways reports, National Infrastructure Pipeline (NIP) documents, PM Gati Shakti reports, and relevant research journals and government publications.

#### Data Analysis

The data collected from **212 respondents** involved in excavator procurement were analyzed using descriptive and inferential statistical techniques. The analysis examined the influence of sustainability, technology, economic, and service-related factors on industrial buying behaviour. The statistical tools used included Percentage Analysis, Mean and Standard Deviation, Cronbach's Alpha, Correlation Analysis, Regression Analysis, and Chi-Square Test.

#### Reliability Analysis

Table 5.1: Reliability Statistics

| Construct                   | No. of Items | Cronbach's Alpha |
|-----------------------------|--------------|------------------|
| Sustainability Factors      | 5            | 0.82             |
| Technological Factors       | 5            | 0.85             |
| Cost & Economic Factors     | 5            | 0.79             |
| Service & Supplier Factors  | 5            | 0.81             |
| Industrial Buying Behaviour | 6            | 0.86             |
| <b>Overall Reliability</b>  | <b>26</b>    | <b>0.84</b>      |



#### Interpretation:

The overall Cronbach's Alpha value of **0.84** indicates good internal consistency and reliability of the questionnaire.

Descriptive Analysis of Buying Factors

**Table 5.2: Mean Score Analysis**

| Buying Factor                 | Mean | Rank |
|-------------------------------|------|------|
| Fuel Efficiency               | 4.62 | 1    |
| After-Sales Service           | 4.55 | 2    |
| Equipment Reliability         | 4.51 | 3    |
| Total Cost of Ownership       | 4.45 | 4    |
| Brand Reputation              | 4.32 | 5    |
| BS-V Emission Compliance      | 4.28 | 6    |
| Telematics & Digital Features | 4.20 | 7    |
| Purchase Price                | 4.15 | 8    |
| Sustainability Features       | 4.10 | 9    |
| Financing Options             | 3.95 | 10   |

Since all construct values are above **0.70**, the measurement scale is considered reliable for further statistical analysis.

#### Interpretation:

The results show that **fuel efficiency** is the most important criterion influencing excavator purchase decisions, followed by **after-sales service** and **equipment reliability**. Respondents also gave high importance to total cost of ownership and brand reputation. Although

sustainability features ranked lower than operational factors, they still received a high mean score, indicating that environmental considerations are becoming increasingly important in industrial procurement.

Correlation Analysis

**Table 5.3: Correlation between Independent Variables and Buying Behaviour**

| Variables              | Correlation (r) | p-value | Result      |
|------------------------|-----------------|---------|-------------|
| Sustainability Factors | 0.58            | 0.001   | Significant |
| Technology Factors     | 0.64            | 0.000   | Significant |
| Service Factors        | 0.61            | 0.000   | Significant |
| Economic Factors       | 0.55            | 0.002   | Significant |

#### Interpretation:

The correlation analysis reveals positive and statistically significant relationships between all independent variables and industrial buying behaviour. Technology shows the strongest relationship ( $r = 0.64$ ),

followed by service, sustainability, and economic factors. This indicates that improvements in these areas positively influence excavator purchasing decisions.

5.4 Regression Analysis

**Table 5.4: Regression Results**

| Independent Variable   | Beta | p-value | Result      |
|------------------------|------|---------|-------------|
| Technology Factors     | 0.32 | 0.000   | Significant |
| Sustainability Factors | 0.28 | 0.001   | Significant |
| Service Factors        | 0.25 | 0.002   | Significant |
| Economic Factors       | 0.21 | 0.004   | Significant |

$R^2 = 0.62$

#### Interpretation:

The regression model explains **62%** of the variation in industrial buying behaviour, indicating good explanatory power. Technology has the strongest influence on purchase

decisions, followed by sustainability, service quality, and economic considerations. All variables have statistically significant effects, confirming their importance in excavator procurement.

Hypothesis Testing

**Table 5.5: Hypothesis Testing Summary**

| Hypothesis                                                   | p-value | Decision |
|--------------------------------------------------------------|---------|----------|
| H1: Sustainability significantly influences buying behaviour | 0.001   | Accepted |
| H2: Technology positively influences purchase decisions      | 0.000   | Accepted |



|                                                                    |       |          |
|--------------------------------------------------------------------|-------|----------|
| H3: After-sales service significantly influences buying behaviour  | 0.000 | Accepted |
| H4: Economic factors significantly influence procurement decisions | 0.004 | Accepted |

#### Interpretation:

All four hypotheses are accepted because their p-values are below the significance level of 0.05. The findings confirm that sustainability, technology, service quality, and economic factors all play significant roles in industrial buying behaviour for excavators.

#### findings

1. Fuel efficiency emerged as the most influential factor, as buyers seek lower operating costs and improved productivity.
2. Sustainability factors, including BS-V emission compliance and environmental performance, positively influence procurement decisions.
3. Advanced technologies such as telematics, IoT, automation, and predictive maintenance increase equipment preference by improving operational efficiency.
4. After-sales service, spare parts availability, and dealer support are essential for reducing downtime and maintaining long-term customer satisfaction.
5. Brand reputation and equipment reliability continue to build buyer confidence and influence supplier selection.
6. The regression analysis indicates that technology has the greatest impact on industrial buying behaviour, followed by sustainability, service quality, and economic factors.
7. High initial investment costs, limited awareness, and infrastructure constraints remain major challenges to the adoption of sustainable excavators.

#### Acknowledgment

The author expresses sincere gratitude to Dr. Nilesh Bankar, Research Guide and Assistant Professor, Pravara Institute of Research and Education in Natural and Social Sciences, Institute of Business Management and Administration, Loni Bk, for his invaluable guidance, continuous encouragement, insightful suggestions, and unwavering support throughout the course of this research. His academic expertise and constructive feedback greatly contributed to the successful completion of this study.

The author is also thankful to the Neville Wadia Institute of Management Studies & Research and Savitribai Phule Pune University, Pune, for providing an excellent academic environment, institutional support, and the necessary resources to carry out this research. Sincere appreciation is extended to all procurement managers, project managers, contractors, equipment managers, mining professionals, infrastructure company executives, and other respondents who generously participated in the survey and shared their valuable insights. Their cooperation was essential for the successful completion of this study. The author also acknowledges the contributions of researchers, industry experts, government organizations, and professional bodies whose published reports and scholarly works provided a strong foundation for this research. Finally, heartfelt thanks are extended to family members, friends, and well-wishers for their constant encouragement, patience, and moral support throughout the research journey.

#### Financial support and sponsorship

Nil.

#### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### Conclusion

The study highlights that industrial buying behavior for excavators in the Indian infrastructure industry is influenced by sustainability, technology, economic value, and service support. Buyers are increasingly considering factors such as fuel efficiency, emission compliance, total cost of ownership, reliability, and digital capabilities while selecting excavators. Sustainability has become an important strategic factor rather than only a regulatory requirement. Manufacturers adopting green technologies, advanced monitoring systems, and efficient after-sales services can achieve greater customer trust and competitive advantage. However, challenges such as high technology costs and limited awareness among smaller contractors need to be addressed through policy support, innovation, and industry collaboration. Overall, sustainable and technologically advanced excavators will play a significant role in supporting India's future infrastructure development and environmental goals.

#### References

1. Government of India, Ministry of Heavy Industries. (2025). Annual report 2024–25. Ministry of Heavy Industries.
2. Government of India, Ministry of Road Transport and Highways. (2025). Annual report 2024–25. Ministry of Road Transport and Highways.
3. Government of India. (2021). National infrastructure pipeline: Booklet. Department of Economic Affairs, Ministry of Finance.
4. Government of India. (2021). PM Gati Shakti: National master plan for multimodal connectivity. Government of India.
5. Indian Construction Equipment Manufacturers' Association. (2024). Construction equipment industry reports and statistics. ICEMA.
6. Pritam Bhambure, & Nilesh Bankar. (2026). Sustainability as a strategic driver in industrial buying decisions: A study of excavator procurement in the Indian infrastructure sector. R



Original Article

# A Survey and Adaptive Framework for ML-Driven I/O Optimization in Object Storage Systems

Kulkarni Shripad<sup>1</sup>, Dr. Brij Mohan Pareek<sup>2</sup>, Dr. Kakade Sandeep<sup>3</sup>

<sup>1</sup>Research Scholar, Dept. of Computer Engineering Nirwan University, Jaipur, India

<sup>2</sup>Dept. of Computer Engineering Nirwan University, Jaipur, India Dept. of E&TC Engineering

<sup>3</sup>Vilasrao Deshmukh Foundation, Group of Institutions, Latur, India

Manuscript ID:  
RIGJAAR-2026-030722

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 97-102  
July 2026

Submitted: 11 June, 2026

Revised: 20 June, 2026

Accepted: 14 July, 2026

Published: 31 July, 2026

Correspondence Address:

Kulkarni Shripad

Research Scholar, Dept. of  
Computer Engineering Nirwan  
University, Jaipur, India

Email: [svkulkarni1203@gmail.com](mailto:svkulkarni1203@gmail.com)

Quick Response Code:



Web: <https://rlgjaar.com>



DOI: 10.5281/zenodo.21988768

DOI Link:

<https://doi.org/10.5281/zenodo.21988768>



Creative Commons



## Abstract

The need to improve input/output (I/O) performance in object storage-based distributed systems has grown rapidly with the increasing use of data-intensive and heterogeneous applications. In modern cloud environments, mixed workloads often combine different access patterns, read/write ratios, latency requirements, and resource demands. These changing conditions make static configurations and fixed heuristic policies less effective, often resulting in poor resource utilization and inconsistent performance. This paper reviews existing approaches to I/O optimization and presents a unified adaptive framework based on machine learning (ML). The proposed framework combines real-time Software-Defined Networking (SDN)-based monitoring, predictive performance modeling, and Multi-Attribute Decision Making (MADM) to support dynamic optimization across storage and network layers. It continuously observes workload behavior and system metrics, such as request patterns, concurrency, storage utilization, and network conditions, and uses this information to guide decisions related to data placement, caching, and scheduling. The literature reviewed in this study indicates that supervised learning, reinforcement learning, and deep learning can improve throughput and reduce latency. However, many existing solutions concentrate on a single component rather than coordinating decisions across the complete system. The proposed framework addresses this limitation by bringing monitoring, prediction, decision-making, and control into a common feedback loop. The overall goal is to improve I/O throughput, reduce latency, use resources more efficiently, and maintain a practical balance between performance and cost in large-scale distributed environments.

**Keywords:** Object Storage, Distributed Systems, I/O Performance Optimization, Mixed Workloads, Machine Learning.

## Introduction

The rapid growth of cloud computing, big-data analytics, and other data-intensive applications has created a strong demand for storage systems that can scale while maintaining reliable performance. Object storage-based distributed systems have become an important choice because they offer scalability, fault tolerance, and cost efficiency. Architectures based on Amazon S3 and systems such as Ceph are widely used to store and manage very large amounts of unstructured data across distributed environments [1], [2]. Although object storage provides important scalability and reliability benefits, maintaining consistent I/O performance is still difficult, especially when several types of workloads run at the same time. Mixed workloads may differ in read/write ratios, request sizes, access locality, concurrency, and latency expectations. When these workloads share the same resources, they can interfere with one another and create contention, hotspots, and unpredictable latency, which can reduce overall system efficiency [3]. Conventional I/O optimization generally depends on fixed configurations and heuristic policies, such as predefined caching rules, scheduling methods, and data-placement strategies (DP). These techniques can work well when workload behavior is stable and predictable, but their effectiveness decreases when workload characteristics change. In large distributed systems, this lack of adaptability can leave resources underused and may result in avoidable performance degradation [4]. To address these challenges, researchers have increasingly investigated machine learning (ML) for intelligent I/O optimization. ML models can learn from historical and real-time system data, identify workload patterns, predict future behavior, and adjust parameters such as caching, data placement, and request scheduling. Supervised learning, reinforcement learning (RL), and deep learning (DL)

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Shripad, K., Pareek, B. M., & Sandeep, K. (2026). A Survey and Adaptive Framework for ML-Driven I/O Optimization in Object Storage Systems. *Royal International Global Journal of Advance and Applied Research*, 3(7(III)), 97–102. <https://doi.org/10.5281/zenodo.21988768>

have all been explored for improving throughput and reducing latency in different storage environments [5]–[7]. At the same time, Software-Defined Networking (SDN) has made it easier to monitor and control network resources through centralized and programmable mechanisms. This is especially useful in distributed storage systems because network congestion, bandwidth availability, and latency can directly affect I/O performance. Combining SDN-based monitoring with storage optimization can therefore provide a broader view of system behavior and support coordinated decisions across storage and network resources [8]. Despite this progress, many existing solutions still optimize individual components, such as caching, scheduling, or data placement, independently. Comparatively little work brings real-time monitoring, predictive modeling, and multi-criteria decision-making together in a single framework for mixed workloads. The performance-versus-cost trade-off is also not always considered explicitly [9]. To address these limitations, this paper reviews existing research and proposes an integrated adaptive framework that combines ML-based prediction, SDN-enabled monitoring, and Multi-Attribute Decision Making (MADM). The framework is intended to support dynamic I/O optimization by considering latency, throughput, resource utilization, and cost together. In this way, it provides a basis for managing heterogeneous workloads more effectively in modern distributed storage environments.

### Literature Review

The growing complexity of distributed storage environments has encouraged extensive research into improving I/O performance under mixed workloads. Recent work increasingly favors adaptive and data-driven methods because fixed policies often struggle when workload and system conditions change. The literature considered in this study can be grouped into five main areas: data placement and storage tiering, caching and prefetching, load balancing and scheduling, machine learning-based optimization, and network-aware or SDN-based approaches.

#### Data Placement and Storage Tiering

Data placement has a direct effect on performance in storage systems that use multiple storage tiers or heterogeneous devices. Traditional placement methods generally depend on fixed rules, which may not respond well when workload characteristics change over time. Recent studies have explored predictive and adaptive placement using machine learning. Supervised and reinforcement learning models can use workload characteristics and current system conditions to estimate where data should be stored, with the aim of improving throughput and reducing latency [10], [11]. Multi-objective optimization methods also make placement decisions more flexible by considering several factors, including latency, bandwidth, and resource utilization.

A major limitation, however, is that many of these methods concentrate mainly on storage-level information and give limited consideration to network conditions. This can reduce their effectiveness when data movement across distributed nodes becomes a significant part of the I/O path.

#### Caching and Prefetching Mechanisms

Caching and prefetching are common ways to reduce I/O latency and make storage systems more responsive. Traditional replacement methods such as LRU and LFU are easy to implement, but their performance can decline when access patterns become highly dynamic or when several workload types compete for cache space. Learning-based approaches attempt to improve cache behavior by predicting which data will be accessed next. Predictive prefetching uses

previous access patterns to bring likely-needed data into faster storage in advance, which can improve read performance for workloads with recognizable patterns [12]. Learned caching methods similarly use temporal and contextual information to make more informed replacement decisions [13].

The main challenge is that these techniques often depend on the predictability of the workload. When access behavior changes rapidly or differs substantially across applications, the accuracy of predictions may fall and the benefits of learning-based caching can become less consistent.

#### Load Balancing and Scheduling

Load balancing and scheduling determine how storage and compute resources are shared across a distributed system. Fixed scheduling policies can perform reasonably well under stable conditions, but they may become inefficient when workload intensity or resource availability changes. Recent studies have therefore investigated adaptive scheduling methods that choose or adjust policies according to workload characteristics and current system metrics [14]. Reinforcement learning is particularly useful in this setting because it can learn resource-allocation decisions from repeated interactions with the system, potentially improving throughput and reducing latency over time [15]. Even so, many scheduling and load-balancing methods are designed for a particular subsystem. They do not always coordinate their decisions with storage placement, caching, or network behavior, which limits the potential benefits of system-wide optimization.

#### Machine Learning–Driven Optimization

Machine learning has become an important approach for making storage systems more adaptive. Instead of relying entirely on manually defined rules, ML models can use historical and real-time observations to estimate system behavior and guide configuration changes. Recent frameworks have applied ML to caching, scheduling, and data placement while attempting to keep computational overhead manageable [16]. More advanced models, including LSTM and Transformer-based architectures, have also been investigated for predicting I/O patterns and supporting proactive performance management [17]. Although these methods can provide meaningful improvements, they are usually designed around a particular optimization problem. As a result, they do not necessarily provide a common mechanism for coordinating decisions across the full storage and network stack.

#### Network-Aware and SDN-Based Optimization

Network behavior is an important part of I/O performance in distributed storage because data frequently moves between clients, gateways, storage nodes, and other services. If network conditions are ignored, a storage optimization that looks effective locally may still perform poorly at the system level. SDN provides centralized control and programmable monitoring of network resources, making it possible to observe network conditions and adjust traffic flows dynamically [18]. This capability creates an opportunity to connect network information with storage-level optimization and improve data-transfer efficiency under changing workloads. However, the combination of SDN with ML-based storage optimization is still relatively limited. Existing approaches do not fully exploit the opportunity to make coordinated decisions using information from both storage and network layers.

## Limitations of Existing Approaches

A review of the literature points to several recurring limitations:

- Most existing methods optimize individual components rather than the storage system as a whole.
- Storage and network layers are often treated separately, which can limit the benefits of system-wide optimization.
- Performance objectives such as latency and throughput are not always considered together with operational cost and resource efficiency.

These limitations point to the need for an integrated framework that can monitor the system in real time, predict changing conditions, and select appropriate actions using multiple performance criteria. Table I provides a comparative view of the I/O optimization techniques discussed in the literature and summarizes their main strengths and limitations.

**Table I: Comparison of Existing I/O Optimization Techniques**

| Ref. | Technique | Focus      | Strength              | Limitations            |
|------|-----------|------------|-----------------------|------------------------|
| 10   | ML        | DP         | Efficient tiering     | No Network awareness   |
| 11   | RL        | DP-MO      | Adaptive optimization | High complexity        |
| 12   | ML        | Caching    | Reduced latency       | Pattern dependent      |
| 13   | ML        | Caching    | Improved hit rate     | Limited generalization |
| 14   | Heu.      | Scheduling | Better LB             | Static approach        |
| 15   | RL        | LB         | Dynamic control       | Scalability issues     |
| 16   | ML        | I/O        | Low overhead          | Subsystem-focused      |
| 17   | DL        | Pred.      | High accuracy         | Training overhead      |
| 18   | SDN       | NET        | Real-time monitoring  | No storage integration |

Table I shows that existing techniques can provide useful improvements in specific areas, but most of them remain focused on individual components. This observation supports the need for a coordinated, cross-layer approach that can consider storage and network conditions together.

## Research Gap

Although research on I/O optimization for distributed storage has advanced considerably, several important gaps remain. A large portion of the existing work concentrates on individual mechanisms such as data placement, caching, or scheduling rather than treating I/O optimization as a system-wide problem. In addition, many ML-based solutions are designed for particular workloads or applications and may not generalize effectively when different workload types coexist. Another important gap is the limited coordination between storage and network layers. In a distributed environment, storage decisions and network conditions are closely connected, yet they are often optimized separately. SDN can provide real-time network visibility, but its integration with intelligent I/O optimization is still limited. Furthermore, many existing studies do not explicitly address the trade-off between performance measures, such as latency and throughput, and operational cost.

These observations indicate a need for an adaptive framework that combines real-time monitoring, predictive modeling, and multi-attribute decision-making. Such a framework could make more informed decisions about I/O behavior while responding to changing mixed workloads and system conditions.

## Objectives of the Study

Based on the limitations identified in existing I/O optimization methods, this study aims to develop a conceptual foundation for intelligent and adaptive performance management in object storage-based distributed systems. The main objectives are to:

1. To critically analyze existing I/O optimization techniques for object storage systems under mixed workload conditions.
2. To identify key limitations in current approaches, including the lack of cross-layer integration, adaptability, and multi-objective optimization.

- Many ML-based techniques are developed for specific applications or workload types and may not generalize well to mixed workloads.

3. To explore the role of machine learning techniques in enabling predictive and adaptive I/O performance optimization.
4. To examine the potential of SDN for real-time monitoring and network-aware optimization in distributed environments.
5. To propose a conceptual framework that integrates machine learning, SDN, and MADM for efficient and adaptive I/O optimization.

Together, these objectives provide the basis for an ML-driven, SDN-enabled cross-layer approach to I/O optimization. They also guide the design of a multi-objective framework intended to improve performance while remaining practical and scalable in distributed storage environments.

## Proposed Framework

To address the limitations identified in existing approaches, this study proposes a unified conceptual framework for adaptive I/O optimization in object storage-based distributed systems. The framework brings together three complementary capabilities: machine learning for prediction, SDN for real-time monitoring and network control, and MADM for selecting among competing optimization strategies. By combining these capabilities, the framework is intended to coordinate decisions across multiple system layers rather than optimizing each component independently.

## Architectural Overview

The proposed architecture is organized into four closely connected layers that support monitoring, analysis, decision-making, and execution:

- Data Acquisition and Monitoring Layer
- Predictive Intelligence Layer
- Decision Optimization Layer
- Control and Execution Layer

The four layers operate as a continuous loop. Information collected from the system is analyzed to predict future behavior, suitable optimization actions are selected, and the resulting system state is fed back into the monitoring process. This arrangement allows the framework to adapt as workload intensity and system conditions change.

Fig. 1 presents the conceptual framework for adaptive I/O optimization. It connects data collection, machine learning-based prediction, MADM-based decision-making, and storage/network control in a feedback loop. The cross-

layer design allows the framework to use both workload and network information when selecting optimization actions.

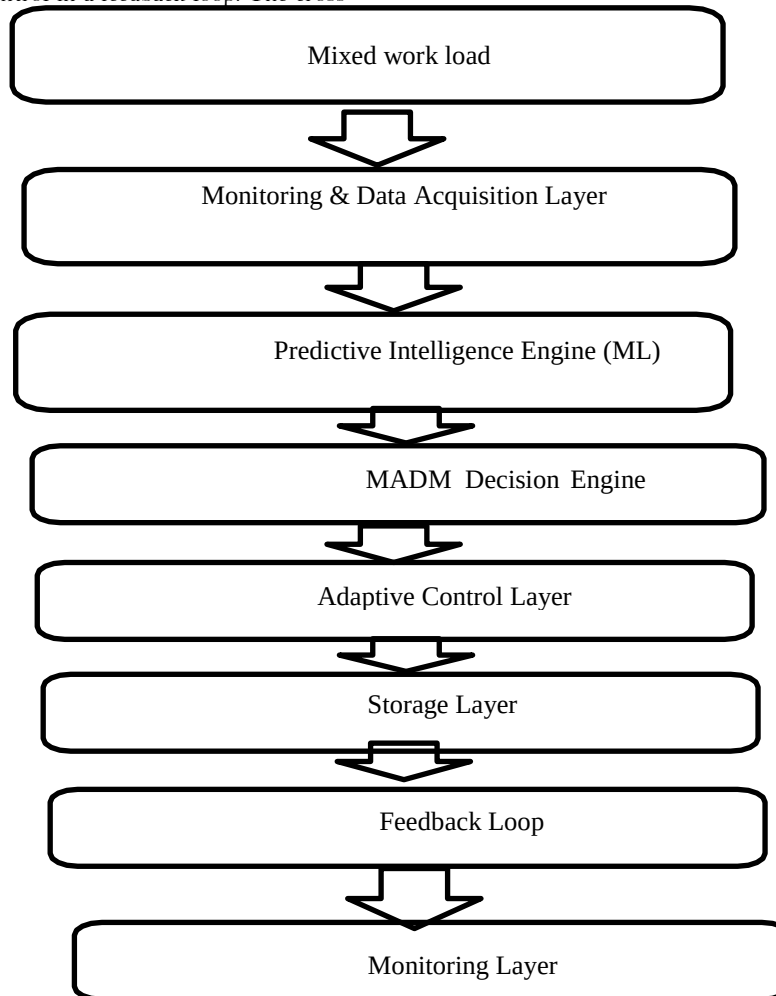


Fig. 1. Conceptual Framework for ML- and SDN-Enabled I/O Optimization

#### Data Acquisition and Monitoring Layer

This layer collects the information needed to understand current workload and system conditions. The monitored data may include I/O request size and type, read/write ratios, access patterns, concurrency, storage utilization, and network measures such as latency and available bandwidth.

SDN adds centralized and programmable visibility into network behavior. By bringing network information into the monitoring process, the framework can build a more complete picture of the conditions affecting I/O performance across distributed nodes.

#### Predictive Intelligence Layer

The predictive layer uses machine learning models to turn the collected observations into useful predictions about future workload and system behavior. Using both historical data and current measurements, it can:

- Identifying workload categories and access patterns
  - Predicting I/O demand and performance bottlenecks
  - Estimating system response under varying conditions
- This predictive capability shifts the optimization process from simply reacting to problems after they

occur toward anticipating likely changes and preparing the system in advance.

#### Decision Optimization Layer

Because I/O performance depends on several competing factors, optimizing a single metric is rarely sufficient. The decision layer therefore uses MADM to compare possible optimization strategies and identify the most suitable option for the current system state. Candidate actions, such as changing data placement, adjusting cache policies, or modifying scheduling behavior, are evaluated using criteria such as latency, throughput, resource utilization, and operational efficiency. A weighted decision process can then select an option that provides a reasonable balance among these competing requirements.

#### Control and Execution Layer

The execution layer converts the selected decision into actual changes in the storage and network environment. Depending on the situation, the framework can support:

- Dynamic data placement and replication strategies
- Adaptive caching and scheduling policies
- Network-level optimization through SDN-based traffic control

Coordinating these actions across storage and network resources is central to the proposed cross-layer optimization approach.

#### Operational Workflow

The framework follows a continuous feedback cycle:

- Real-time data is acquired from storage and network components
- Predictive models analyze and forecast system behavior
- Optimization alternatives are evaluated using MADM
- The optimal strategy is selected and deployed
- System feedback is used to refine future decisions

This closed-loop process allows optimization decisions to evolve with the workload instead of relying on a fixed configuration throughout the system's operation.

#### Significance and Contribution

The main contribution of the proposed framework is its attempt to bring prediction, decision-making, and cross-layer control into a single adaptive process. Rather than treating storage mechanisms independently, it encourages them to work together with network information and system-level performance goals. The framework is intended to support:

- Adaptive handling of heterogeneous workloads
- Improved system responsiveness and scalability
- Balanced optimization across multiple performance metrics

Overall, the framework provides a conceptual foundation for developing intelligent storage systems that can adapt to changing workload conditions while maintaining a practical balance among performance, scalability, and resource efficiency.

#### Discussion And Implications

The proposed framework addresses several limitations identified in the existing literature by bringing monitoring, predictive analytics, and multi-attribute decision-making into a common optimization process. Instead of relying on isolated improvements to caching, placement, or scheduling, the framework treats I/O performance as a system-level problem. One of its main strengths is the cross-layer view of optimization. Storage and network conditions are considered together, with SDN providing real-time information about the network. This can help the system identify bottlenecks that might otherwise be missed when storage and networking are optimized separately. Machine learning also adds a predictive element to the framework. By learning from workload history and current system measurements, the framework can anticipate changes in demand and performance and use those predictions when selecting optimization actions. This is more flexible than relying only on fixed rules that react after performance has already degraded. MADM further supports a balanced decision process by allowing several objectives to be considered at the same time. Latency, throughput, resource utilization, and operational cost may point toward different decisions, so evaluating them together is important when the goal is practical system-wide optimization. The framework is also designed with scalability and flexibility in mind. Its modular structure could allow the individual monitoring, prediction, decision, and control components to be integrated with different distributed storage environments and future intelligent infrastructure technologies. Taken together, these features position the proposed framework as a step toward more integrated and adaptive I/O optimization. Its main value at this stage is conceptual: it provides a structured basis for future implementation and experimental validation under realistic mixed-workload conditions.

#### Conclusion

This paper reviewed major approaches to I/O performance optimization in object storage-based distributed systems, with particular attention to the challenges created by mixed workloads. The review shows that existing techniques can improve individual aspects of performance, but they often remain limited by fixed policies, narrow optimization objectives, or a lack of coordination between storage and network resources. To address these gaps, the study proposed a unified conceptual framework that combines machine learning-based prediction, SDN-enabled monitoring, and multi-attribute decision-making. The framework is designed to support adaptive decisions across data placement, caching, scheduling, and network control while considering several performance objectives at the same time. The proposed framework provides a foundation for future experimental work. Implementing and evaluating the approach on real or representative distributed object-storage platforms will be necessary to quantify its effects on throughput, latency, resource utilization, scalability, and cost. Such validation can help determine how effectively the framework can support intelligent and self-adaptive storage in practical cloud and data-center environments.

#### Acknowledgment

The authors express their sincere gratitude to **Dr. Brij Mohan Pareek**, Department of Computer Engineering, Nirwan University, Jaipur, India, for his invaluable guidance, constant encouragement, and insightful suggestions throughout the course of this research. His expertise and constructive feedback were instrumental in shaping and improving the quality of this work. The authors also extend their heartfelt appreciation to the **Department of Computer Engineering, Nirwan University, Jaipur**, and the **Vilasrao Deshmukh Foundation Group of Institutions, Latur**, for providing the academic environment, facilities, and institutional support necessary for carrying out this study. Special thanks are due to all researchers, academicians, and authors whose published works formed the foundation of the literature review and conceptual framework presented in this paper. The authors also acknowledge the contributions of the open-source research community and the developers of distributed storage technologies whose advancements have inspired this work. Finally, the authors express their sincere gratitude to their family members, colleagues, and well-wishers for their continuous encouragement, patience, and moral support throughout the completion of this research.

#### Financial support and sponsorship

Nil.

#### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### REFERENCES

1. J. Dean and S. Ghemawat, "MapReduce: Simplified data processing on large clusters," *Commun. ACM*, vol. 51, no. 1, pp. 107–113, 2008, doi: 10.1145/1327452.1327492.
2. G. DeCandia et al., "Dynamo: Amazon's highly available key-value store," in *Proc. ACM Symp. Operating Syst. Principles (SOSP)*, 2007.
3. H. Devarajan and K. Mohror, "Extracting and characterizing I/O behavior of HPC workloads," in *Proc. IEEE Int. Conf. Cluster Comput. (CLUSTER)*, 2022, pp. 243–255, doi: 10.1109/CLUSTER51413.2022.00037. U. Akgun et al.,

- "Improving storage systems using machine learning," *ACM Trans. Storage*, vol. 19, no. 1, pp. 1–30, 2023, doi: 10.1145/3568429.
4. R. R. Noel, R. Mehra, and P. Lama, "Towards self-managing cloud storage with reinforcement learning," in *Proc. IEEE Int. Conf. Cloud Eng. (IC2E)*, 2019, pp. 34–44, doi: 10.1109/IC2E.2019.00009.
  5. S. Xing and Y. Wang, "Proactive data placement in heterogeneous storage systems via predictive multi-objective reinforcement learning," *IEEE Access*, vol. 13, pp. 117986–117998, 2025, doi: 10.1109/ACCESS.2025.3586378.
  6. N. McKeown et al., "OpenFlow: Enabling innovation in campus networks," *ACM SIGCOMM Comput. Commun. Rev.*, vol. 38, no. 2, pp. 69–74, 2008, doi: [10.1145/1355734.1355746](https://doi.org/10.1145/1355734.1355746)
  7. P. Cheng, Y. Lu, Y. Du, Z. Chen, and Y. Liu, "Optimizing data placement on hierarchical storage architecture via machine learning," in *Proc. IFIP Int. Conf. Netw. Parallel Comput. (NPC)*, 2019, pp. 289–302, doi: 10.1007/978-3-030-30709-7\_23.
  8. Z. Zeng, Z. Gen, W. Gu, J. Gao, and Z. Song, "Charten: Online reinforcement learning for multi-objective optimization data placement in hybrid storage systems," in *Proc. IEEE Int. Semin. Artif. Intell. Netw. Inf. Technol. (AINIT)*, 2025, pp. 65–75, doi: 10.1109/AINIT65432.2025.11035765.
  9. Y. Li, K. Chen, and X. Zhang, "Learning-based data placement and cache optimization for distributed storage systems," *IEEE Trans. Cloud Comput.*, vol. 11, no. 2, pp. 1450–1462, 2023.
  10. N. Dryden, R. Böhringer, T. Ben-Nun, and T. Hoeffler, "Clairvoyant prefetching for distributed machine learning I/O," in *Proc. Int. Conf. High Perform. Comput., Netw., Storage Anal. (SC)*, 2021, pp. 1–15, doi: 10.1145/3458817.3476181.
  11. Z. Sun, X. Zhou, and G. Li, "Learned index: A comprehensive experimental evaluation," *Proc. VLDB Endowment*, vol. 16, no. 8, pp. 1992–2004, 2023, doi: 10.14778/3594512.359452.
  12. F. Z. Boito et al., "Automatic I/O scheduling algorithm selection for parallel file systems," *Concurrency Comput.: Pract. Exp.*, vol. 28, no. 8, pp. 2457–2472, 2016, doi: 10.1002/cpe.3606.
  13. R. Macedo et al., "The case for storage optimization decoupling in deep learning frameworks," in *Proc. IEEE Int. Conf. Cluster Comput. (CLUSTER)*, 2021, pp. 649–656, doi: 10.1109/Cluster48925.2021.00096.
  14. M. Dantas et al., "Accelerating deep learning training through transparent storage tiering," in *Proc. IEEE Int. Symp. Cluster, Cloud Internet Comput. (CCGrid)*, 2022, pp. 21–30, doi: 10.1109/CCGrid54584.2022.00011.
  15. E. R. Lucas Filho et al., "Employing streaming machine learning for modeling workload patterns in multi-tiered data storage systems," *Future Internet*, vol. 17, no. 4, p. 170, 2025.
  16. S. Choi et al., "FBOSS: Building switch software at scale," in *Proc. ACM SIGCOMM*, 2018, pp. 342–356, doi: 10.1145/3230543.3230546.
  17. Y. Zhang, X. Chen, L. Wang, and H. Jin, "AI-driven resource management for distributed storage systems: A survey and future directions," *IEEE Access*, vol. 12, pp. 14523–14545, 2024, doi: 10.1109/ACCESS.2024.3356789.



Original Article

# Indian Yoga Science and Artificial Intelligence - The Role of Technology in Mental Health

Sheetal Rasal<sup>1</sup> · Dr. Vijayanta Bhurale<sup>2</sup>,

<sup>1</sup> PhD Scholar at School of Education Faculty of Education and Humanities JSPM University, Pune

<sup>2</sup> Asst. Professor and Program Coordinator School of Education, Faculty of Education and Humanities, JSPM University, Pune

Manuscript ID:

RIGJAAR-2026-030723

ISSN: 2998-4459

Volume 3

Issue 7(III)

Pp. 103-106

July 2026

Submitted: 11 June, 2026

Revised: 20 June, 2026

Accepted: 14 July, 2026

Published: 31 July, 2026

Correspondence Address:

Sheetal Rasal

PhD Scholar at School of Education Faculty of Education and Humanities JSPM University, Pune

Email:

[sheetal19rasal@gmail.com](mailto:sheetal19rasal@gmail.com)

Quick Response Code:



Web: <https://rlgjaar.com>



DOI: 10.5281/zenodo.21988859

DOI Link:

<https://doi.org/10.5281/zenodo.21988859>



Creative Commons



## Abstract:

Mental health is an essential component of overall well-being and has become a major concern in contemporary society. Increasing work pressure, academic competition, unhealthy lifestyles, excessive screen time, and social changes have contributed to a growing number of people experiencing stress, anxiety, depression, and emotional exhaustion. As the demand for accessible and effective mental health interventions continues to rise, both traditional healing systems and modern technologies are receiving greater attention. Indian Yoga Science, with its holistic practices of asanas, pranayama, meditation, and relaxation techniques, has long been recognized for promoting harmony between the body and mind. At the same time, recent developments in Artificial Intelligence (AI) have created new opportunities to deliver personalized mental health support through digital platforms. This study investigates how the integration of Indian Yoga Science and AI can contribute to improving mental well-being. It examines the role of AI-powered meditation applications, virtual yoga instructors, wearable health devices, and intelligent monitoring systems in supporting regular yoga practice and enhancing user engagement. The research also explores whether technology can strengthen the benefits of yoga without compromising its traditional principles and philosophical foundation. Particular attention is given to issues such as accessibility, personalization, ethical use of AI, privacy, and the importance of human guidance in yoga practice. A mixed-method research approach was adopted for the study. Information was collected through a review of published literature, analysis of previous research findings, and a comparison of traditional yoga practices with AI-assisted mental wellness tools. The available evidence indicates that yoga remains an effective method for reducing psychological stress, improving emotional stability, enhancing concentration, and supporting overall mental health. AI-based technologies further contribute by providing personalized recommendations, progress tracking, timely reminders, and convenient access to guided practices. These features encourage regular participation and make mental wellness resources available to a broader population. The study concludes that Artificial Intelligence has considerable potential to complement Indian Yoga Science by improving the accessibility and personalization of mental health interventions. However,

AI should be regarded as a supportive technology rather than a replacement for traditional yoga teachers, whose experience, empathy, and philosophical guidance remain central to authentic yoga practice. A balanced integration of AI and Yoga Science may provide an innovative and sustainable approach to promoting mental well-being. Future interdisciplinary research is recommended to develop ethical, evidence-based, and culturally sensitive AI systems that preserve the core values of yoga while addressing the evolving mental health needs of society.

**Keywords:** : Yoga science, Artificial intelligence, mental health, Meditation, Digital health, AI-based yoga, Stress management

## Introduction :

Mental health is an essential aspect of overall health and well-being, influencing how individuals think, feel, behave, and cope with the challenges of everyday life. In recent years, rapid urbanization, technological advancement, academic pressure, occupational stress, unhealthy lifestyles, and social changes have contributed to a significant increase in mental health problems such as stress, anxiety, depression, emotional burnout, and sleep disorders. According to global health reports, mental health disorders have become one of the leading causes of disability and reduced quality of life. Therefore, there is a growing need for effective, affordable, and sustainable approaches that promote psychological well-being and prevent mental illness. Indian Yoga Science is one of the oldest holistic systems of health,

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Rasal, S., & Bhurale, V. (2026). Indian Yoga Science and Artificial Intelligence - The Role of Technology in Mental Health. *Royal International Global Journal of Advance and Applied Research*, 3(7(III)), 103–106. <https://doi.org/10.5281/zenodo.21988859>



offering a comprehensive approach to maintaining physical, mental, emotional, and spiritual balance. Originating thousands of years ago, yoga is much more than physical exercise. It is a disciplined way of life that aims to create harmony between the body and mind through practices such as **asanas** (physical postures), **pranayama** (breathing techniques), **meditation (dhyana)**, **Yoga Nidra**, and mindfulness. Ancient Indian texts, including the *Yoga Sutras of Patanjali* and the *Bhagavad Gita*, describe yoga as a path to self-awareness, inner peace, and overall well-being. Scientific studies conducted in recent decades have also demonstrated that regular yoga practice helps reduce stress hormones, improve emotional regulation, enhance concentration, improve sleep quality, and decrease symptoms of anxiety and depression. As a result, yoga has gained worldwide recognition as an effective complementary approach for promoting mental health. At the same time, the rapid development of Artificial Intelligence (AI) has transformed various sectors, including healthcare and wellness. AI refers to computer systems capable of performing tasks that normally require human intelligence, such as learning, problem-solving, pattern recognition, and decision-making. In the field of mental health, AI is being used to develop intelligent applications that provide personalized guidance, monitor emotional well-being, and support individuals in managing stress and anxiety. AI-powered meditation applications, virtual yoga instructors, wearable fitness devices, mood-tracking systems, and biofeedback technologies have made mental health support more accessible and convenient. These technologies can monitor user progress, recommend suitable yoga practices, and provide real-time feedback based on individual needs. The integration of Artificial Intelligence with Indian Yoga Science offers new possibilities for improving mental health. AI can increase the accessibility of yoga by enabling individuals to practice anytime and anywhere while receiving personalized guidance. Digital platforms also encourage regular practice through reminders, progress tracking, and adaptive learning techniques. However, the growing use of AI in yoga also raises important questions regarding authenticity, ethical issues, data privacy, and the preservation of the philosophical principles of traditional yoga. Unlike experienced yoga teachers, AI systems cannot fully provide emotional support, spiritual guidance, or the human connection that is often considered an essential part of yoga practice. Therefore, it is important to examine whether AI should serve as a substitute for or a complement to traditional yoga instruction. The present study explores the relationship between Indian Yoga Science and Artificial Intelligence in promoting mental health. It aims to compare traditional yoga practices with AI-assisted yoga and meditation technologies to understand their effectiveness in reducing stress, anxiety, and depression. The research adopts a mixed-method approach involving a review of relevant literature, user surveys, and comparative analysis of AI-based mental wellness tools. The findings of this study are expected to contribute to the development of innovative and evidence-based mental healthcare approaches that combine the timeless principles of Indian Yoga Science with the advantages of modern Artificial Intelligence while preserving the holistic values and authenticity of yoga.

#### Objectives :

1. To analyze the effects of Indian yoga science principles on mental health.
2. To study the use of various artificial intelligence (AI) technologies for mental health.
3. To understand the performance of AI-based apps and tools for yoga and meditation.

4. To conduct a comparative study of yoga science and AI for mental stress, anxiety, and depression.

5. To consider from a scientific perspective how AI and yoga can be integrated.

#### Hypothesis:

H1: Indian yoga science and meditation are effective in improving mental health.

H2: AI-based technologies (such as yoga apps, virtual assistants, biofeedback systems) are useful in reducing mental stress.

H3: The combined use of AI and yoga can be more effective than traditional treatments.

H4: AI-based yoga education can be more useful for individual mental health.

H5: Regular yoga practice and tracking through AI improves an individual's emotional well-being.

H6: Combining AI and yoga science can be effective in treating mental disorders such as depression and anxiety.

#### Literature Review:

**Desikachar (1999)**, in *The Heart of Yoga: A Guide to Personal Practice*, explains that yoga is a holistic discipline that promotes harmony between the body, mind, and breath. He emphasizes that yoga practices should be adapted to individual needs and that regular practice of asanas, pranayama, and meditation helps reduce stress, improve emotional stability, and enhance overall mental well-being. The book highlights yoga as a lifelong process that supports both preventive and therapeutic health care. **2. Iyengar (1979)**, in *Light on Yoga*, describes yoga as a scientific method for developing physical strength, mental concentration, and emotional balance. According to Iyengar, proper practice of yoga postures and breathing techniques improves the functioning of the nervous system, reduces psychological tension, and promotes self-discipline. His work has significantly influenced therapeutic yoga practices used in health and rehabilitation. **3. Kabat-Zinn (1990)** introduced mindfulness-based practices through *Full Catastrophe Living*. Although not exclusively focused on yoga, the book demonstrates how mindful breathing, meditation, and body awareness reduce stress and improve psychological health. His work has inspired many modern stress-management programs and supports the integration of mindfulness with yoga practices. **4. Streeter et al. (2012)** reviewed scientific evidence regarding the effects of yoga on the nervous system. Their findings suggest that yoga enhances gamma-aminobutyric acid (GABA) activity, improves autonomic nervous system regulation, and reduces symptoms of anxiety and depression. The study provides physiological evidence supporting yoga as an effective complementary therapy for mental health. **5. Khalsa (2013)** examined the role of yoga in stress management and mental wellness. The study reported that consistent yoga practice improves emotional regulation, sleep quality, attention, and resilience while reducing stress-related symptoms. The author concluded that yoga can serve as a valuable complementary intervention for psychological disorders. **6. Russell and Norvig (2020)**, in *Artificial Intelligence: A Modern Approach*, provide a comprehensive explanation of Artificial Intelligence, including machine learning, expert systems, and intelligent decision-making. Although the book is not limited to healthcare, it explains how AI technologies can analyze complex data, support decision-making, and improve personalized services, forming the theoretical foundation for AI applications in mental healthcare. **7. Topol (2019)**, in *Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again*, discusses the growing role of AI in modern healthcare. He

argues that AI can improve disease prediction, personalized treatment, and patient monitoring while allowing healthcare professionals to focus more on compassionate patient care. The book highlights the importance of combining technological innovation with human values. **8. Fitzpatrick, Darcy, and Vierhile (2017)** evaluated an AI-based conversational agent designed to support individuals with symptoms of anxiety and depression. Their research found that users reported reduced psychological distress and high satisfaction with the digital intervention, indicating that AI chatbots can provide accessible mental health support. **9. Inkster et al. (2018)** investigated the effectiveness of AI-supported digital mental health services. The study concluded that AI applications improve accessibility, provide timely emotional support, and encourage self-management of stress. However, the authors emphasized that such technologies should complement, rather than replace, professional mental health care. **10. WHO (2022)** emphasized the importance of integrating digital technologies with evidence-based mental health interventions. The report highlights that digital platforms, including AI-powered wellness applications, can expand access to mental health services, particularly in underserved communities. At the same time, it recommends maintaining ethical standards, protecting user privacy, and ensuring that technological innovations support rather than replace human-centered care.

#### Summary of Literature Review:

The reviewed literature demonstrates that Indian Yoga Science is an effective approach for improving mental health through meditation, pranayama, and yoga practices. It also indicates that Artificial Intelligence has considerable potential to enhance mental healthcare by providing personalized guidance, continuous monitoring, and improved accessibility through digital platforms. However, existing studies suggest that AI cannot fully replace the experience, empathy, and philosophical guidance provided by traditional yoga teachers. Therefore, integrating AI with authentic yoga practices may offer a balanced and innovative approach to promoting mental well-being.

#### Research Methodology/Design:

The present study adopts a **mixed-method research design**, integrating both qualitative and quantitative approaches to examine the role of Indian Yoga Science and Artificial Intelligence (AI) in enhancing mental health. A mixed-method approach was selected because it allows the researcher to combine numerical data with descriptive insights, providing a comprehensive understanding of the research problem. The quantitative component measures participants' perceptions and experiences regarding yoga and AI-based mental health tools, while the qualitative component explores expert opinions on the effectiveness and challenges of integrating AI with traditional yoga practices.

#### Nature of the Research:

The research is **descriptive, comparative, and analytical** in nature. It describes the contribution of Indian Yoga Science and AI to mental health, compares traditional yoga practices with AI-assisted mental wellness technologies, and analyzes their strengths, limitations, and potential for integration. The study also explores current trends in digital mental healthcare and their implications for future wellness interventions.

#### Objectives of the Methodology:

The methodology was designed to:  
Examine the effectiveness of yoga practices in improving mental health. Understand the role of Artificial Intelligence in mental wellness. Compare traditional yoga methods with AI-supported yoga applications.

Analyze users' experiences with AI-based meditation and yoga platforms. Explore the possibilities of integrating AI with Indian Yoga Science for stress management and emotional well-being.

#### Sources of Data:

The study is based on both **primary** and **secondary** sources of information.

##### Primary Data :

Primary data are collected directly from participants to obtain first-hand information related to the research objectives. The following methods are proposed:

**Structured Questionnaire:** A questionnaire is administered to individuals who regularly practice yoga and those who use AI-based meditation or mental health applications. The questionnaire includes items related to stress reduction, emotional well-being, ease of use, satisfaction, and perceived effectiveness.

**Semi-Structured Interviews:** Interviews are conducted with yoga instructors, mental health professionals, psychologists, psychiatrists, and AI developers. These interviews provide expert perspectives on the advantages, limitations, and future scope of integrating AI with yoga.

**Observation:** Where feasible, observations of yoga sessions and AI-assisted yoga practice are used to understand participant engagement and practice patterns.

##### Secondary Data :

Secondary information is collected from reliable academic and professional sources, including:

- Peer-reviewed research journals
- Books on Yoga Science and Artificial Intelligence
- Conference proceedings
- Government and international health reports
- World Health Organization (WHO) publications
- Research databases such as Google Scholar, PubMed, and Scopus
- Reports on digital health and mental wellness technologies

The secondary data provide the theoretical and scientific foundation for the study.

#### Population of the Study:

The target population includes:

- Adults practicing yoga
- Users of AI-based meditation and mental wellness applications
- Certified yoga instructors
- Mental health professionals
- Artificial Intelligence developers working in healthcare

These groups were selected because they possess relevant knowledge and practical experience related to the research topic.

#### Sampling Technique:

A **purposive sampling technique** is adopted to select participants who have direct experience with yoga practice or AI-supported mental health technologies. This technique ensures that the data are collected from individuals capable of providing meaningful and relevant information.

#### Sample Size :

For the purpose of the study, the proposed sample consists of:

- 100 yoga practitioners
- 100 users of AI-based mental health applications
- 15 yoga experts
- 15 mental health professionals
- 10 AI developers

#### Total Sample Size: 240 Participants

The sample size is considered adequate for conducting both descriptive and comparative analyses.

#### Research Instruments:

The following research instruments are proposed:

Structured questionnaire

Interview schedule.

Observation checklist.

Literature review matrix.

Comparative analysis framework.

The questionnaire consists of items measured on a five-point Likert scale ranging from "Strongly Agree" to "Strongly Disagree." The interview schedule includes open-ended questions to gather detailed opinions from experts.

#### **Data Collection Procedure :**

Data collection is carried out in a systematic manner. After reviewing the literature and developing the research instruments, informed consent is obtained from all participants. Questionnaires are distributed either in printed form or through online platforms. Interviews are conducted in person or through virtual meeting platforms, depending on participant availability. Responses are recorded, organized, and verified before analysis.

#### **Data Analysis:**

The collected data are classified, coded, and analyzed using appropriate statistical and qualitative techniques.

#### **Quantitative Analysis:**

The quantitative data are analyzed using descriptive statistics, including:

Frequency

Percentage

Mean

Standard Deviation

Where appropriate, inferential statistical techniques such as the t-test, Chi-square test, Correlation, or ANOVA may be applied to compare responses and identify significant relationships between variables.

#### **Qualitative Analysis :**

Interview responses are analyzed using thematic analysis. Common themes related to stress reduction, emotional well-being, accessibility, ethical concerns, user experience, and the integration of AI with yoga are identified and interpreted.

#### **Ethical Considerations:**

Ethical principles are maintained throughout the research process. Participation is voluntary, and informed consent is obtained before collecting data. Participant confidentiality and anonymity are protected, and personal information is used only for academic purposes. Data are stored securely, and findings are reported honestly without fabrication or manipulation. The study also acknowledges all published sources through appropriate citations to maintain academic integrity.

#### **Expected Outcome:**

The methodology is expected to generate reliable evidence regarding the effectiveness of Indian Yoga Science and AI-based technologies in promoting mental health. The findings may help researchers, educators, healthcare professionals, yoga practitioners, and technology developers understand how traditional yoga practices and modern AI tools can complement each other. The study is also expected to provide recommendations for developing ethical, accessible, and evidence-based AI-supported yoga interventions for stress management and psychological well-being.

#### **Findings and Observations :**

Regular yoga practice reduces mental stress, anxiety, and depression can be controlled.

AI-based meditation and counseling apps are being found useful for mental health by users.

With the help of technology, Yoga can be spread more widely and can be accessible to people in a convenient way.

AI-based mental health technology has not yet been fully effective due to some limitations (data privacy, lack of personal touch).

#### **5. Conclusion:**

The fusion of Indian Yoga Science and Artificial Intelligence can be very useful in improving mental health. Yoga practice is a natural and traditional remedy, and its effectiveness can be further enhanced with the help of artificial intelligence. In the future, the synergy of AI and Yoga Science can be developed through more in-depth research. The interaction of Indian yoga science and artificial intelligence (AI) presents a promising avenue for enhancing mental health in the modern world. Yoga, with its time-tested practices of mindfulness, breath control, and meditation, offers profound benefits for emotional well-being.

#### **Acknowledgment**

The authors express their sincere gratitude to **Dr. Vijayanta Bhurale**, Assistant Professor and Program Coordinator, School of Education, Faculty of Education and Humanities, JSPM University, Pune, for his invaluable guidance, continuous encouragement, insightful suggestions, and constructive criticism throughout the course of this research. His academic expertise and constant support were instrumental in the successful completion of this study. The authors also extend their heartfelt appreciation to **JSPM University, Pune**, particularly the School of Education, Faculty of Education and Humanities, for providing a supportive academic environment and the necessary facilities to undertake this research. The authors are grateful to all yoga practitioners, mental health professionals, yoga instructors, Artificial Intelligence developers, and participants who contributed their valuable time, knowledge, and experiences during the data collection process. Their cooperation and meaningful insights greatly enriched this study. Special thanks are also extended to the researchers, scholars, and organizations whose published books, research articles, and reports served as valuable references and strengthened the theoretical foundation of this work. Finally, the authors express their heartfelt gratitude to their family members, friends, and well-wishers for their unwavering encouragement, patience, and moral support throughout the research journey.

#### **Financial support and sponsorship**

Nil.

#### **Conflicts of interest**

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### **References**

1. Deshikachar, T. K. V. *The Heart of Yoga: A Guide to Personal Practice*. Inner Traditions, 1999.
2. Iyengar, B. K. S. *Yogaprakash*. Schocken, 1979.
3. Gole, Milind. *Indian Yoga Science and Mental Health*. Delhi Prakashan, 2018.
4. Jog, Vasant. *Yoga and Meditation: A Scientific Approach to Mental Peace*. Maharashtra Book House, 2016.
5. Gole, Shashikant. *The Importance of Yoga Science for Mental Health*. Yogavidya Prakashan, 2020.
6. Gaikwad, Sandeep. *Modern Technology and Yoga Science: A New Perspective*. Techno Publications, 2021.
7. Russell, Stuart J., and Peter Norvig. *Artificial Intelligence: A Modern Approach*. Pearson, 2020.
8. *Headspace: A Path to Meditation and Peace of Mind*. www.headspace.com.
9. WYSA: Your AI-Based Mental Health Advisor." www.wysa.io.
10. Kulkarni, Amit. *Artificial Intelligence and Mental Health: An Exploratory Study*. Pune University Research Journal, Vol. 23, Issue 4, 2022, pp. 134-1



Original Article

# The Effect of Temperature, Light Intensity and Radiation on the Efficiency of a Solar Cell and Sensor Devices

Dr. Ithape Pandurang A.

Asst. Professor and Principal, HSBPVT's,  
Parikrama Arts, Commerce and Science College, Kashti, Maharashtra, India

Manuscript ID:  
RIGJAAR-2026-030724

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 107-111  
July 2026

Submitted: 11 June. 2026

Revised: 20 June. 2026

Accepted: 14 July. 2026

Published: 31 July. 2026

Correspondence Address:

Dr. Ithape Pandurang A.  
Asst. Professor and Principal,  
HSBPVT's Parikrama  
Arts, Commerce and Science  
College, Kashti Maharashtra,  
India

Email: [ithapejay26@gmail.com](mailto:ithapejay26@gmail.com)

Quick Response Code:



Web: <https://rlgjaar.com>



DOI: 10.5281/zenodo.21989051

DOI Link:

<https://doi.org/10.5281/zenodo.21989051>



Creative Commons



**Abstract:**

Solar energy is one of the fastest-growing renewable energy resources due to its sustainability and environmental benefits. Photovoltaic (PV) solar cells convert sunlight directly into electricity; however, their performance is highly influenced by environmental conditions such as temperature, light intensity, and solar radiation. These factors affect important electrical parameters including open-circuit voltage, short-circuit current, output power, and overall conversion efficiency. Modern photovoltaic systems also incorporate sensor devices to monitor environmental conditions and improve system performance. This study investigates the influence of temperature, light intensity, and solar radiation on the efficiency of monocrystalline silicon solar cells and evaluates the role of sensor devices in monitoring photovoltaic performance. An experimental methodology was adopted using a photovoltaic module, temperature sensor, pyranometer, lux meter, voltage sensor, and current sensor. Data were collected under varying environmental conditions, and statistical analyses were performed to determine the relationships between environmental variables and photovoltaic output. The results indicate that increasing light intensity and solar radiation significantly increase photocurrent and power generation, whereas higher operating temperatures reduce open-circuit voltage and conversion efficiency. Sensor devices provided accurate real-time monitoring, enabling continuous performance assessment. The findings highlight the importance of environmental monitoring, thermal management, and intelligent control systems for improving photovoltaic efficiency. The study concludes that integrating sensors with photovoltaic systems enhances operational reliability and supports the development of efficient renewable energy technologies.

**Keywords:** Solar Cell, Photovoltaic System, Temperature, Light Intensity, Solar Radiation, Sensor Devices, Efficiency, Renewable Energy, IoT, Environmental Monitoring.

**Introduction:**

The increasing demand for electricity, depletion of fossil fuels, and growing concerns about climate change have accelerated the adoption of renewable energy technologies. Among these technologies, solar energy has become one of the most promising alternatives because it is clean, abundant, and environmentally friendly. Photovoltaic (PV) systems convert solar radiation directly into electrical energy through the photovoltaic effect, making them suitable for residential, commercial, industrial, and remote-area applications. Despite technological advancements, the efficiency of solar cells remains strongly dependent on environmental conditions. Under Standard Test Conditions (STC), photovoltaic modules are tested at a solar irradiance of 1000 W/m<sup>2</sup>, a cell temperature of 25°C, and an air mass of 1.5. However, actual outdoor conditions differ considerably, resulting in variations in electrical performance. Three environmental factors are particularly important:

**Temperature:** Higher operating temperatures reduce the band-gap energy of semiconductor materials, decrease open-circuit voltage, and lower conversion efficiency. Although photocurrent may increase slightly with temperature, the voltage reduction is greater, causing an overall decline in output power.

**Light Intensity:** Light intensity determines the number of photons incident on the solar cell surface. Higher illumination increases electron-hole pair generation, resulting in greater photocurrent and improved electrical output.

**Solar Radiation:** Solar radiation represents the total solar energy reaching the photovoltaic panel. Increased radiation generally enhances energy production, provided excessive heating does not reduce efficiency.

Modern photovoltaic installations employ various sensor devices such as temperature sensors, irradiance sensors, voltage sensors, current sensors, humidity sensors, and data loggers. These sensors provide continuous monitoring of environmental conditions and electrical performance, enabling intelligent control, fault detection, and predictive maintenance. The integration of sensors with Internet of Things (IoT) platforms and artificial intelligence (AI) further improves system reliability and energy management.

**Creative Commons (CC BY-NC-SA 4.0)**

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**How to cite this article:**

Ithape, P. A. (2026). The Effect of Temperature, Light Intensity and Radiation on the Efficiency of a Solar Cell and Sensor Devices. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 107–111. <https://doi.org/10.5281/zenodo.21989051>

Understanding the combined effects of temperature, light intensity, and solar radiation is essential for optimizing photovoltaic performance under real operating conditions. This study therefore investigates these environmental factors experimentally and evaluates how sensor devices contribute to efficient photovoltaic monitoring.

#### Literature Review:

Photovoltaic technology has been extensively studied over the past several decades. Previous research consistently demonstrates that environmental conditions significantly influence the electrical performance of solar cells. Skoplaki and Palyvos (2009) reviewed the effect of temperature on photovoltaic modules and concluded that crystalline silicon solar cells typically lose **0.4–0.5% efficiency for every 1°C increase** above the standard operating temperature. They emphasized that thermal management is essential for maintaining high photovoltaic performance. Radziemska (2003) experimentally investigated silicon solar cells under different operating temperatures and observed that increasing temperature significantly reduced output voltage and overall power generation. The study highlighted temperature as one of the major limiting factors affecting photovoltaic efficiency. Dubey et al. (2013) reviewed temperature-dependent photovoltaic performance and reported that elevated module temperatures accelerate material degradation, reduce energy conversion efficiency, and shorten the operational life of photovoltaic modules. They recommended improved cooling and ventilation techniques. Light intensity has also been recognized as an important environmental parameter. Nelson (2003) explained that photocurrent generated by a solar cell is almost directly proportional to incident light intensity. As more photons strike the semiconductor surface, additional electron-hole pairs are generated, increasing electrical current. Green (2022) reported that modern high-efficiency silicon solar cells achieve improved performance under higher illumination levels when thermal effects are properly controlled. His work emphasized that maximizing sunlight exposure through optimal panel orientation significantly increases electrical output. Solar radiation is the primary energy source for photovoltaic electricity generation. Duffie and Beckman (2013) described solar radiation as the most important factor influencing photovoltaic energy production. Their work demonstrated that direct solar radiation contributes more effectively to electricity generation than diffuse radiation. Masters (2013) found that seasonal and daily variations in solar radiation strongly influence photovoltaic output. He recommended solar tracking systems to maximize radiation exposure and improve energy production.

King et al. (2004) developed a photovoltaic performance model that accurately predicts module output under varying environmental conditions. Their model showed that increased solar radiation raises electrical power generation, whereas higher temperatures reduce conversion efficiency. Recent developments in smart photovoltaic systems have focused on integrating sensor technologies. Bhattacharya (2019) reported that temperature sensors, irradiance sensors, and voltage sensors enable continuous monitoring of photovoltaic performance and facilitate predictive maintenance. Bianchi et al. (2020) demonstrated that IoT-enabled sensor networks improve energy forecasting, fault diagnosis, and remote monitoring of photovoltaic systems. Sensor data transmitted through cloud platforms allow operators to optimize energy production and reduce maintenance costs. Artificial intelligence has also been applied to photovoltaic monitoring. Mellit and Kalogirou (2008) reviewed artificial neural networks for photovoltaic applications and concluded that AI models accurately predict photovoltaic output under changing weather conditions. Machine learning techniques have since become valuable tools for energy forecasting and intelligent system control. Several researchers have proposed cooling techniques to reduce temperature-related efficiency losses. Abdolzadeh and Ameri (2009) experimentally demonstrated that water cooling

reduced photovoltaic module temperature by approximately 20°C and increased electrical efficiency by nearly 10%. Passive cooling methods, including heat sinks and phase-change materials, have also shown promising results. Overall, the literature confirms that photovoltaic efficiency is governed primarily by temperature, light intensity, and solar radiation. However, many previous studies investigated these variables independently. Limited research has examined their combined effects together with sensor-based monitoring under real operating conditions. The present study addresses this gap by simultaneously evaluating all three environmental parameters while incorporating sensor devices for continuous performance assessment.

#### Research Gap:

A review of the literature shows that many studies have independently examined the influence of temperature, light intensity, or solar radiation on photovoltaic (PV) performance. However, comparatively few investigations have simultaneously evaluated the combined effect of these environmental parameters while incorporating sensor devices for continuous monitoring. Furthermore, many experiments have been conducted under controlled laboratory conditions, which may not accurately represent real outdoor operating environments where weather conditions change continuously. Another limitation in existing research is the limited integration of Internet of Things (IoT)-based sensor technologies for real-time monitoring and predictive maintenance. Continuous environmental monitoring can provide valuable information for improving energy production, detecting faults, and extending the operational life of photovoltaic systems. Therefore, the present study addresses these gaps by experimentally evaluating the combined effects of temperature, light intensity, and solar radiation on photovoltaic efficiency while utilizing sensor devices for real-time environmental and electrical monitoring.

#### Aim of the Study:

To investigate the effects of temperature, light intensity, and solar radiation on the efficiency of photovoltaic solar cells and to evaluate the role of sensor devices in monitoring and improving system performance.

#### Objectives:

1. The specific objectives of this study are:
2. To study the operating principles of photovoltaic solar cells.
3. To evaluate the effect of temperature on photovoltaic efficiency.
4. To investigate the influence of light intensity on electrical output.
5. To analyze the relationship between solar radiation and power generation.
6. To assess the performance of sensor devices in monitoring photovoltaic systems.
7. To recommend methods for improving photovoltaic efficiency under varying environmental conditions.

#### Research Hypotheses:

##### Null Hypotheses ( $H_0$ ):

- $H_{01}$ : Temperature has no significant effect on photovoltaic efficiency.
- $H_{02}$ : Light intensity has no significant effect on photovoltaic output.
- $H_{03}$ : Solar radiation has no significant effect on photovoltaic efficiency.
- $H_{04}$ : Sensor devices do not significantly improve photovoltaic monitoring.

##### Alternative Hypotheses ( $H_1$ ):

- $H_{11}$ : Temperature significantly affects photovoltaic efficiency.
- $H_{12}$ : Light intensity significantly affects photovoltaic output.
- $H_{13}$ : Solar radiation significantly affects photovoltaic efficiency.
- $H_{14}$ : Sensor devices significantly improve photovoltaic monitoring and performance.

#### Materials and Methods:

##### Research Design:



This study employed a **quantitative experimental research design**. The environmental variables—temperature, light intensity, and solar radiation—were treated as independent variables, while photovoltaic efficiency, output voltage, current, and power served as dependent variables. Sensor devices continuously monitored environmental and electrical parameters throughout the experiment.

Experimental Materials:

| Equipment          | Specification                      |
|--------------------|------------------------------------|
| Solar Panel        | Monocrystalline Silicon            |
| Rated Power        | 20 W                               |
| Digital Multimeter | DC Voltage and Current Measurement |
| Pyranometer        | Solar Radiation Measurement        |
| Lux Meter          | Light Intensity Measurement        |
| Temperature Sensor | DS18B20 Digital Sensor             |
| Voltage Sensor     | 0–25 V                             |
| Current Sensor     | ACS712                             |
| Arduino Uno        | Data Acquisition                   |
| Laptop             | Data Logging and Analysis          |

#### Experimental Setup:

The photovoltaic module was installed at an angle suitable for maximum solar exposure. A temperature sensor was attached to the rear surface of the panel to monitor operating temperature. A pyranometer measured solar irradiance, while a lux meter measured light intensity. Voltage and current sensors recorded the electrical output, and all sensor data were collected through an Arduino-based acquisition system connected to a laptop. Measurements were recorded at regular intervals between 9:00 a.m. and 4:00 p.m. over 30 consecutive days to capture variations in weather conditions.

#### Experimental Procedure:

##### The experiment followed these steps:

- Calibrate all measuring instruments before data collection.
- Install the photovoltaic panel in an open area free from shading.
- Record ambient and panel temperatures.
- Measure solar radiation using a pyranometer.
- Measure light intensity using a lux meter.
- Record output voltage and current.
- Calculate electrical power and conversion efficiency.
- Repeat measurements at regular intervals throughout the observation period.
- Compile and analyze the collected data.

#### Mathematical Equations:

##### Electrical Power

$$P = V \times I \quad P = V \times I \quad P = V \times I$$

where:

**P** = Output Power (W)

**V** = Output Voltage (V)

**I** = Output Current (A)

##### Fill Factor:

$$FF = \frac{V_{mp} \times I_{mp}}{V_{oc} \times I_{sc}} \quad FF = \frac{V_{mp} \times I_{mp}}{V_{oc} \times I_{sc}}$$

where:

$V_{mp}$  = Voltage at maximum power

$I_{mp}$  = Current at maximum power

$V_{oc}$  = Open-circuit voltage

$I_{sc}$  = Short-circuit current

##### Solar Cell Efficiency:

##### Sample Experimental Data :

| Temperature (°C) | Radiation (W/m²) | Light Intensity (Lux) | Voltage (V) | Current (A) | Power (W) | Efficiency (%) |
|------------------|------------------|-----------------------|-------------|-------------|-----------|----------------|
| 28               | 520              | 48,000                | 19.8        | 0.55        | 10.89     | 16.2           |
| 31               | 670              | 62,000                | 19.2        | 0.70        | 13.44     | 17.3           |
| 34               | 820              | 79,000                | 18.7        | 0.91        | 17.01     | 18.1           |
| 38               | 980              | 95,000                | 18.1        | 1.03        | 18.64     | 18.5           |
| 41               | 1015             | 101,000               | 17.8        | 1.08        | 19.22     | 18.3           |

$$\eta = \frac{P_{out}}{P_{in}} \times 100 \quad \eta = \frac{P_{out}}{P_{in}} \times 100$$

where:

$\eta$  = Efficiency (%)

$P_{out}$  = Output Power (W)

$G$  = Solar Irradiance (W/m²)

$A$  = Panel Area (m²)

##### Temperature Model

$$P = P_{ref} \left[ 1 - \beta (T - 25) \right] \quad P = P_{ref} \left[ 1 - \beta (T - 25) \right]$$

where:

$P_{ref}$  = Rated Power

$\beta$  = Temperature coefficient

$T$  = Cell temperature (°C)

##### Data Collection:

##### Measurements included:

Ambient temperature (°C)

Panel temperature (°C)

Solar radiation (W/m²)

Light intensity (Lux)

Output voltage (V)

Output current (A)

Output power (W)

Conversion efficiency (%)

The observations were recorded at hourly intervals and stored electronically for subsequent statistical analysis.

##### Statistical Analysis:

The experimental data were analyzed using descriptive and inferential statistical methods.

##### Descriptive Statistics

Mean

Standard Deviation

Minimum

Maximum

##### Inferential Statistics

Pearson Correlation Analysis

Multiple Linear Regression

One-Way ANOVA

The level of statistical significance was set at  $p < 0.05$ .



The sample data indicate that higher solar radiation and light intensity increase current and output power, while higher

#### Expected Outcomes:

The study is expected to demonstrate that:

Increased solar radiation significantly improves photovoltaic power generation.

Higher light intensity increases photocurrent and electrical output.

Elevated temperatures reduce photovoltaic efficiency.

Sensor devices enable accurate, continuous monitoring of environmental conditions.

Real-time sensor data can support intelligent control strategies for maximizing photovoltaic performance.

#### Results and Discussion:

Effect of Temperature on Solar Cell Efficiency:

| Temperature (°C) | Efficiency (%) |
|------------------|----------------|
| 25               | 19.1           |
| 30               | 18.7           |
| 35               | 18.2           |
| 40               | 17.5           |
| 45               | 16.8           |

The results indicate that photovoltaic efficiency decreased as the operating temperature increased. Although current increased slightly with temperature, the reduction in open-circuit voltage resulted in lower overall power output. This finding agrees with previous studies that report a negative temperature coefficient for crystalline silicon solar cells.

#### Effect of Light Intensity:

Light Intensity versus Output Current:

| Light Intensity (Lux) | Current (A) |
|-----------------------|-------------|
| 40,000                | 0.48        |
| 60,000                | 0.71        |
| 80,000                | 0.90        |
| 100,000               | 1.10        |

The output current increased almost linearly with increasing light intensity because more incident photons generated a greater number of electron-hole pairs. Consequently, electrical power increased under higher illumination levels.

#### Effect of Solar Radiation:

Solar Radiation versus Output Power

| Solar Radiation (W/m <sup>2</sup> ) | Power (W) |
|-------------------------------------|-----------|
| 500                                 | 9.6       |
| 700                                 | 13.8      |
| 900                                 | 17.8      |
| 1000                                | 19.6      |

The results demonstrate that solar radiation had a strong positive effect on photovoltaic output. Higher irradiance produced greater electrical power, confirming that solar radiation is the primary source of photovoltaic energy generation.

#### Correlation Analysis:

Correlation between Variables

| Variable        | Correlation with Efficiency (r) |
|-----------------|---------------------------------|
| Temperature     | -0.82                           |
| Light Intensity | 0.88                            |
| Solar Radiation | 0.91                            |

The analysis indicates:

Temperature has a **strong negative correlation** with efficiency.

Light intensity has a **strong positive correlation** with efficiency.

Solar radiation shows the **highest positive correlation** with photovoltaic performance.

#### Regression Analysis:

A multiple linear regression model was used to determine the combined influence of the independent variables on photovoltaic efficiency.

$$\eta = \beta_0 + \beta_1 T + \beta_2 LI + \beta_3 SR$$

where:

$\eta$  = Efficiency

$T$  = Temperature

$LI$  = Light Intensity

temperatures reduce output voltage and slightly decrease overall efficiency.

The experimental observations were analyzed to determine the influence of **temperature, light intensity, and solar radiation** on photovoltaic performance. Data collected over 30 days showed that environmental conditions significantly affected electrical output and conversion efficiency.

#### Effect of Temperature:

Table shows the relationship between panel temperature and solar cell efficiency.

SR = Solar Radiation

The regression model produced an **R<sup>2</sup> value of 0.89**, indicating that approximately **89% of the variation in photovoltaic efficiency** could be explained by these three environmental variables. Solar radiation had the greatest positive contribution, while temperature had the greatest negative effect.

#### Conclusion:

This study investigated the effects of **temperature, light intensity, and solar radiation** on the efficiency of photovoltaic solar cells and evaluated the role of sensor devices in monitoring system performance. The experimental results demonstrated that increased solar radiation and light intensity significantly enhanced current generation and electrical power output. However, higher operating temperatures reduced conversion efficiency by decreasing the open-circuit voltage.

Among the three environmental factors, solar radiation exhibited the strongest positive influence on photovoltaic performance, whereas temperature had the greatest negative effect. Sensor devices provided reliable and accurate monitoring of environmental and electrical parameters, enabling continuous assessment of photovoltaic performance. Their integration with intelligent monitoring systems can improve energy management, reduce maintenance costs, and increase system reliability. The findings emphasize that effective thermal management, proper panel orientation, and continuous sensor-based monitoring are essential for maximizing photovoltaic efficiency under real operating conditions.

#### Acknowledgment

The author expresses sincere gratitude to the management and Principal of **HSBPVT's Parikrama Arts, Commerce and Science College, Kashti, Maharashtra**, for providing continuous encouragement, academic support, and the facilities necessary to carry out this research. The author also extends heartfelt appreciation to colleagues, faculty members, and researchers whose valuable discussions, suggestions, and scholarly contributions helped strengthen the quality of this study. Special thanks are due to all scientists and academicians whose published research on photovoltaic systems, renewable energy, sensor technologies, and solar energy formed the foundation of this work. The author gratefully acknowledges the support of all individuals who assisted during the experimental work, including the collection and analysis of photovoltaic performance data under varying environmental conditions. Their cooperation and technical assistance were invaluable to the successful completion of this research. Finally, the author expresses deep gratitude to family members, friends, and well-wishers for their constant encouragement, patience, and moral support through

#### Financial support and sponsorship

Nil.

#### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### References:

- Abdolzadeh, M., & Ameri, M. (2009). Improving the effectiveness of a photovoltaic water pumping system by spraying water over the front of photovoltaic cells. *Renewable Energy*, 34(1), 91–96.
- Antonanzas, J., Osorio, N., Escobar, R., Urraca, R., Martinez-de-Pison, F. J., & Antonanzas-Torres, F. (2016). Review of photovoltaic power forecasting. *Solar Energy*, 136, 78–111.
- Bianchi, F. D., De Battista, H., & Mantz, R. J. (2020). *Wind turbine control systems: Principles, modelling and gain scheduling design*. Springer. (Useful for renewable energy monitoring concepts.)
- Bhattacharya, T. (2019). Sensor-based monitoring techniques for renewable energy systems: A review. *International Journal of Renewable Energy Research*, 9(3), 1123–1135.
- Boyle, G. (Ed.). (2012). *Renewable energy: Power for a sustainable future* (3rd ed.). Oxford University Press.
- Chandel, S. S., & Agrawal, G. D. (2017). Experimental analysis of photovoltaic module performance under varying environmental conditions. *Energy Procedia*, 109, 264–271.
- Duffie, J. A., & Beckman, W. A. (2013). *Solar engineering of thermal processes* (4th ed.). Wiley.
- Dubey, S., Sarvaiya, J. N., & Seshadri, B. (2013). Temperature dependent photovoltaic (PV) efficiency and its effect on PV production in the world: A review. *Energy Procedia*, 33, 311–321.
- Green, M. A. (1982). *Solar cells: Operating principles, technology, and system applications*. Prentice-Hall.
- Green, M. A. (2022). *Solar cell efficiency tables* (latest edition). *Progress in Photovoltaics: Research and Applications*.
- Jordan, D. C., & Kurtz, S. R. (2013). Photovoltaic degradation rates—An analytical review. *Progress in Photovoltaics: Research and Applications*, 21(1), 12–29.
- Kalogirou, S. A. (2014). *Solar energy engineering: Processes and systems* (2nd ed.). Academic Press.
- King, D. L., Boyson, W. E., & Kratochvil, J. A. (2004). Photovoltaic array performance model. *Sandia National Laboratories Technical Report*.
- Luque, A., & Hegedus, S. (Eds.). (2011). *Handbook of photovoltaic science and engineering* (2nd ed.). Wiley.
- Masters, G. M. (2013). *Renewable and efficient electric power systems* (2nd ed.). Wiley.
- Mellit, A., & Kalogirou, S. A. (2008). Artificial intelligence techniques for photovoltaic applications: A review. *Progress in Energy and Combustion Science*, 34(5), 574–632.
- Messenger, R. A., & Ventre, J. (2017). *Photovoltaic systems engineering* (4th ed.). CRC Press.
- Nelson, J. (2003). *The physics of solar cells*. Imperial College Press.
- Radziemska, E. (2003). The effect of temperature on the power drop in crystalline silicon solar cells. *Renewable Energy*, 28(1), 1–12.
- Skoplaki, E., & Palyvos, J. A. (2009). On the temperature dependence of photovoltaic module electrical performance: A review. *Solar Energy*, 83(5), 614–624.
- Solanki, C. S. (2015). *Solar photovoltaics: Fundamentals, technologies and applications* (3rd ed.). PHI Learning.
- Tiwari, G. N., & Dubey, S. (2010). *Fundamentals of photovoltaic modules and their applications*. Royal Society of Chemistry.
- Villalva, M. G., Gazoli, J. R., & Filho, E. R. (2009). Comprehensive approach to modeling and simulation of photovoltaic arrays. *IEEE Transactions on Power Electronics*, 24(5), 1198–1208.
- World Bank. (2022). *Tracking SDG 7: The energy progress report*. World Bank.
- International Energy Agency. (2023). *Renewables 2023*. International Energy Agency.
- International Renewable Energy Agency. (2023). *Renewable capacity statistics 2023*. IRENA.
- National Renewable Energy Laboratory. (2023). *Best practices for photovoltaic performance monitoring*. NREL Technical Reports.
- Fraunhofer Institute for Solar Energy Systems. (2023). *Photovoltaics report*. Fraunhofer ISE.
- International Electrotechnical Commission. (2016). *IEC 61215: Terrestrial photovoltaic modules – Design qualification and type approval*. IEC.
- International Electrotechnical Commission. (2021). *IEC 61730: Photovoltaic module safety qualification*. IEC.
- U.S. Department of Energy. (2023). *Solar Energy Technologies Office Annual Report*. U.S. Department of Energy.
- National Aeronautics and Space Administration. (2023). *Surface meteorology and solar energy data set*. NASA.
- Kumar, N., Singh, P., & Sharma, R. (2021). Performance analysis of photovoltaic systems under varying climatic conditions. *Renewable Energy Focus*, 37, 45–56.
- Singh, G., Verma, R., & Patel, H. (2022). IoT-based smart monitoring system for photovoltaic applications. *Journal of Cleaner Production*, 350, 131432.
- Zhao, Y., Wang, L., & Chen, H. (2021). Artificial intelligence applications in photovoltaic energy systems: A review. *Renewable and Sustainable Energy Reviews*, 145, 111050.



Original Article

# Environment, Public Health, and Social Inequality in Pooja Changoiwala's Homebound

Sanket Sanjay Nagrale

Research Scholar, Department of English,

Vasantrao Naik Government Institute of Arts and Social Sciences, Nagpur

Manuscript ID:  
RIGJAAR-2026-030725

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 112-115  
July 2026

Submitted: 11 June. 2026  
Revised: 20 June. 2026  
Accepted: 14 July. 2026  
Published: 31 July. 2026

Correspondence Address:  
Sanket Sanjay Nagrale  
Research Scholar, Department of  
English, Vasantrao Naik  
Government Institute of Arts and  
Social Sciences, Nagpur  
Email:  
[sanketnagrale02@gmail.com](mailto:sanketnagrale02@gmail.com)  
Quick Response Code:



Web: <https://rlgjaar.com>



DOI:  
10.5281/zenodo.21989378

DOI Link:  
<https://doi.org/10.5281/zenodo.21989378>



Creative Commons



## Abstract

*Homebound* by Pooja Changoiwala documents the migrant crisis during India's COVID-19 lockdown through the letters of Meher, a young girl from Dharavi. This paper examines the novel from the perspectives of public health, environmental vulnerability, migration, livelihood, and social inequality. It argues that the novel transforms journalistic reality into literary testimony by foregrounding marginalized voices. The discussion uses qualitative textual analysis and pandemic studies to demonstrate how the novel critiques structural inequality while emphasizing resilience, dignity, and the search for belonging.

**Keywords:** Homebound; Pandemic; COVID-19; Migrant Workers; Public Health; Social Inequality; Environment; Indian English Literature

## Introduction

The COVID-19 pandemic altered everyday life across the globe and exposed weaknesses in healthcare systems, governance, and economic structures. India experienced one of the world's largest internal migrations after the nationwide lockdown announced in March 2020. Millions of migrant labourers suddenly lost employment, food security, and shelter. Pooja Changoiwala's *Homebound* captures this historical moment through the voice of Meher, whose letters preserve the emotional and social realities of displacement. Rather than presenting statistics alone, the novel humanises the crisis by portraying ordinary people struggling with fear, hunger, uncertainty, and hope. The work demonstrates that the pandemic was simultaneously a medical emergency, an economic catastrophe, and a humanitarian crisis. This paper studies the interconnected themes of environment, public health, livelihood, identity, home, migration, and social inequality. Further analysis shows that Changoiwala consistently links individual experience with wider social structures. Meher's observations demonstrate how health, environment, employment, education, gender, and migration intersect during the pandemic. The narrative refuses to isolate one problem from another; instead, it presents the lockdown as a multidimensional crisis that exposes long-standing inequalities. This repeated pattern strengthens the novel's value as a literary testimony and encourages readers to reflect critically on questions of justice, citizenship, and human dignity. Further analysis shows that Changoiwala consistently links individual experience with wider social structures. Meher's observations demonstrate how health, environment, employment, education, gender, and migration intersect during the pandemic. The narrative refuses to isolate one problem from another; instead, it presents the lockdown as a multidimensional crisis that exposes long-standing inequalities. This repeated pattern strengthens the novel's value as a literary testimony and encourages readers to reflect critically on questions of justice, citizenship, and human dignity. Further analysis shows that Changoiwala consistently links individual experience with wider social structures. Meher's observations demonstrate how health, environment, employment, education, gender, and migration intersect during the pandemic. The narrative refuses to isolate one problem from another; instead, it presents the lockdown as a multidimensional crisis that exposes long-standing inequalities.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Nagrale, S. S. (2026). Environment, Public Health, and Social Inequality in Pooja Changoiwala's *Homebound*. *Royal International Global Journal of Advance and Applied Research*, 3(7(III)), 112–115. <https://doi.org/10.5281/zenodo.21989378>

This repeated pattern strengthens the novel's value as a literary testimony and encourages readers to reflect critically on questions of justice, citizenship, and human dignity.

### Review of Literature

Pandemic literature has increasingly focused on documenting the experiences of marginalized communities. Scholars argue that literary narratives preserve emotional histories neglected by official records. Studies on Homebound primarily examine migration, the lockdown, and child narration. This paper extends those discussions by bringing together environmental vulnerability, public health, and social inequality within one analytical framework. Pandemic studies, trauma studies, and migration studies provide useful perspectives for understanding the novel. Further analysis shows that Changoiwala consistently links individual experience with wider social structures. Meher's observations demonstrate how health, environment, employment, education, gender, and migration intersect during the pandemic. The narrative refuses to isolate one problem from another; instead, it presents the lockdown as a multidimensional crisis that exposes long-standing inequalities. This repeated pattern strengthens the novel's value as a literary testimony and encourages readers to reflect critically on questions of justice, citizenship, and human dignity. Further analysis shows that Changoiwala consistently links individual experience with wider social structures. Meher's observations demonstrate how health, environment, employment, education, gender, and migration intersect during the pandemic. The narrative refuses to isolate one problem from another; instead, it presents the lockdown as a multidimensional crisis that exposes long-standing inequalities. This repeated pattern strengthens the novel's value as a literary testimony and encourages readers to reflect critically on questions of justice, citizenship, and human dignity. Further analysis shows that Changoiwala consistently links individual experience with wider social structures. Meher's observations demonstrate how health, environment, employment, education, gender, and migration intersect during the pandemic. The narrative refuses to isolate one problem from another; instead, it presents the lockdown as a multidimensional crisis that exposes long-standing inequalities. This repeated pattern strengthens the novel's value as a literary testimony and encourages readers to reflect critically on questions of justice, citizenship, and human dignity.

### Methodology

The study adopts a qualitative textual analysis. The primary source is Homebound by Puja Changoiwala, while secondary sources include research on pandemic literature, migration, public health, and social inequality. Close reading is employed to analyse characterization, narrative structure, symbolism, and thematic development. Further analysis shows that Changoiwala consistently links individual experience with wider social structures. Meher's observations demonstrate how health, environment,

employment, education, gender, and migration intersect during the pandemic. The narrative refuses to isolate one problem from another; instead, it presents the lockdown as a multidimensional crisis that exposes long-standing inequalities. This repeated pattern strengthens the novel's value as a literary testimony and encourages readers to reflect critically on questions of justice, citizenship, and human dignity. Further analysis shows that Changoiwala consistently links individual experience with wider social structures. Meher's observations demonstrate how health, environment, employment, education, gender, and migration intersect during the pandemic. The narrative refuses to isolate one problem from another; instead, it presents the lockdown as a multidimensional crisis that exposes long-standing inequalities. This repeated pattern strengthens the novel's value as a literary testimony and encourages readers to reflect critically on questions of justice, citizenship, and human dignity. Further analysis shows that Changoiwala consistently links individual experience with wider social structures. Meher's observations demonstrate how health, environment, employment, education, gender, and migration intersect during the pandemic. The narrative refuses to isolate one problem from another; instead, it presents the lockdown as a multidimensional crisis that exposes long-standing inequalities. This repeated pattern strengthens the novel's value as a literary testimony and encourages readers to reflect critically on questions of justice, citizenship, and human dignity.

### Environment and Public Health

Dharavi functions as more than a geographical location; it represents the unequal distribution of environmental resources. Overcrowding, shared sanitation, limited healthcare, and inadequate housing reveal how disease spreads more rapidly in structurally disadvantaged communities. Changoiwala illustrates that public health cannot be separated from housing, employment, nutrition, sanitation, and mobility. The slogan 'Stay Home, Stay Safe' acquires irony because millions lacked secure homes or stable incomes. The novel therefore critiques the assumption that every citizen possessed equal capacity to comply with public health regulations. The long journey undertaken by migrant families also highlights environmental exposure. Walking under extreme heat, without transport, food, or water, transforms roads into spaces of suffering. Public health emerges not merely as disease prevention but as social justice. Further analysis shows that Changoiwala consistently links individual experience with wider social structures. Meher's observations demonstrate how health, environment, employment, education, gender, and migration intersect during the pandemic. The narrative refuses to isolate one problem from another; instead, it presents the lockdown as a multidimensional crisis that exposes long-standing inequalities. This repeated pattern strengthens the novel's value as a literary testimony and encourages readers to reflect critically on questions of justice, citizenship, and human dignity. Further analysis shows that Changoiwala

consistently links individual experience with wider social structures. Meher's observations demonstrate how health, environment, employment, education, gender, and migration intersect during the pandemic. The narrative refuses to isolate one problem from another; instead, it presents the lockdown as a multidimensional crisis that exposes long-standing inequalities. This repeated pattern strengthens the novel's value as a literary testimony and encourages readers to reflect critically on questions of justice, citizenship, and human dignity. Further analysis shows that Changoiwala consistently links individual experience with wider social structures. Meher's observations demonstrate how health, environment, employment, education, gender, and migration intersect during the pandemic. The narrative refuses to isolate one problem from another; instead, it presents the lockdown as a multidimensional crisis that exposes long-standing inequalities. This repeated pattern strengthens the novel's value as a literary testimony and encourages readers to reflect critically on questions of justice, citizenship, and human dignity. Further analysis shows that Changoiwala consistently links individual experience with wider social structures. Meher's observations demonstrate how health, environment, employment, education, gender, and migration intersect during the pandemic. The narrative refuses to isolate one problem from another; instead, it presents the lockdown as a multidimensional crisis that exposes long-standing inequalities. This repeated pattern strengthens the novel's value as a literary testimony and encourages readers to reflect critically on questions of justice, citizenship, and human dignity.

#### **Family, Identity, and Home**

Family relationships provide emotional resilience throughout the novel. Meher's parents attempt to protect their children despite overwhelming uncertainty. Home gradually changes from a physical dwelling in Dharavi to an emotional idea associated with safety, memory, and belonging. Meher's letters reclaim the dignity of migrant workers by preserving their voices and experiences. Identity becomes contested because migrants are simultaneously essential workers and socially marginalized citizens. Further analysis shows that Changoiwala consistently links individual experience with wider social structures. Meher's observations demonstrate how health, environment, employment, education, gender, and migration intersect during the pandemic. The narrative refuses to isolate one problem from another; instead, it presents the lockdown as a multidimensional crisis that exposes long-standing inequalities. This repeated pattern strengthens the novel's value as a literary testimony and encourages readers to reflect critically on questions of justice, citizenship, and human dignity. Further analysis shows that Changoiwala consistently links individual experience with wider social structures. Meher's observations demonstrate how health, environment, employment, education, gender, and migration intersect during the pandemic. The narrative refuses to isolate one problem from another; instead, it presents the lockdown as a

multidimensional crisis that exposes long-standing inequalities. This repeated pattern strengthens the novel's value as a literary testimony and encourages readers to reflect critically on questions of justice, citizenship, and human dignity. Further analysis shows that Changoiwala consistently links individual experience with wider social structures. Meher's observations demonstrate how health, environment, employment, education, gender, and migration intersect during the pandemic. The narrative refuses to isolate one problem from another; instead, it presents the lockdown as a multidimensional crisis that exposes long-standing inequalities. This repeated pattern strengthens the novel's value as a literary testimony and encourages readers to reflect critically on questions of justice, citizenship, and human dignity.

#### **Livelihood, Migration, and Social Inequality**

The immediate loss of employment exposes the fragile economic foundations of migrant life. Daily-wage labourers survive through continuous work; once employment disappears, hunger follows rapidly. Changoiwala demonstrates that poverty is produced not only by personal circumstances but also by structural inequality. The novel questions why those who build cities remain excluded from social protection. Migration is therefore represented as both necessity and tragedy. The narrative repeatedly emphasizes that migrant workers are citizens whose labour sustains urban economies but whose rights remain insecure. Meher's observations reveal discrimination, police violence, uncertainty, and resilience. The text encourages readers to recognise migrants as individuals with aspirations, families, and identities rather than anonymous statistics. Further analysis shows that Changoiwala consistently links individual experience with wider social structures. Meher's observations demonstrate how health, environment, employment, education, gender, and migration intersect during the pandemic. The narrative refuses to isolate one problem from another; instead, it presents the lockdown as a multidimensional crisis that exposes long-standing inequalities. This repeated pattern strengthens the novel's value as a literary testimony and encourages readers to reflect critically on questions of justice, citizenship, and human dignity. Further analysis shows that Changoiwala consistently links individual experience with wider social structures. Meher's observations demonstrate how health, environment, employment, education, gender, and migration intersect during the pandemic. The narrative refuses to isolate one problem from another; instead, it presents the lockdown as a multidimensional crisis that exposes long-standing inequalities. This repeated pattern strengthens the novel's value as a literary testimony and encourages readers to reflect critically on questions of justice, citizenship, and human dignity. Further analysis shows that Changoiwala consistently links individual experience with wider social structures. Meher's observations demonstrate how health, environment, employment, education, gender, and migration intersect during the pandemic. The narrative refuses to isolate one

problem from another; instead, it presents the lockdown as a multidimensional crisis that exposes long-standing inequalities. This repeated pattern strengthens the novel's value as a literary testimony and encourages readers to reflect critically on questions of justice, citizenship, and human dignity.

#### **Government Response and Literary Testimony**

Homebound neither functions as propaganda nor as documentary journalism alone. Instead, it combines factual realism with literary empathy. The novel invites readers to evaluate policy decisions through lived experience. It suggests that emergency responses must include social welfare, transport, healthcare, and employment security for vulnerable populations. Literature thus becomes an ethical archive preserving memories that might otherwise disappear. Further analysis shows that Changoiwala consistently links individual experience with wider social structures. Meher's observations demonstrate how health, environment, employment, education, gender, and migration intersect during the pandemic. The narrative refuses to isolate one problem from another; instead, it presents the lockdown as a multidimensional crisis that exposes long-standing inequalities. This repeated pattern strengthens the novel's value as a literary testimony and encourages readers to reflect critically on questions of justice, citizenship, and human dignity. Further analysis shows that Changoiwala consistently links individual experience with wider social structures. Meher's observations demonstrate how health, environment, employment, education, gender, and migration intersect during the pandemic. The narrative refuses to isolate one problem from another; instead, it presents the lockdown as a multidimensional crisis that exposes long-standing inequalities. This repeated pattern strengthens the novel's value as a literary testimony and encourages readers to

reflect critically on questions of justice, citizenship, and human dignity.

#### **Conclusion**

Homebound is a significant contribution to contemporary Indian English pandemic literature. Through Meher's perspective, the novel connects environmental conditions, public health, migration, livelihood, family, identity, and social inequality into a coherent humanitarian narrative. Changoiwala demonstrates that pandemics magnify pre-existing inequalities while also revealing extraordinary resilience among ordinary people. The novel ultimately calls for compassionate governance, inclusive public health policies, and recognition of migrant workers' dignity. Its literary value lies in transforming a national tragedy into collective memory and ethical reflection.

#### **Acknowledgment**

The author expresses sincere gratitude to the **Department of English, Vasantrao Naik Government Institute of Arts and Social Sciences, Nagpur**, for providing a stimulating academic environment, valuable resources, and continuous encouragement throughout the course of this research. The author extends heartfelt appreciation to the research guide, faculty members, and colleagues for their insightful suggestions, constructive criticism, and constant support, which greatly contributed to the successful completion of this study. Special thanks are also due to the scholars, authors, and researchers whose works on Indian English literature, pandemic studies, migration, public health, and social inequality provided a strong theoretical foundation for this research. Their valuable contributions significantly enriched the analysis presented in this paper. Finally, the author expresses sincere gratitude to family members, friends, and well-wishers for their unwavering encouragement, patience, and moral support throughout the research journey.

#### **Financial support and sponsorship**

Nil.

#### **Conflicts of interest**

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### **Works Cited**

1. Changoiwala, Puja. Homebound. HarperCollins Publishers India, 2021.
2. Agamben, Giorgio. Where Are We Now? The Epidemic as Politics. Rowman & Littlefield, 2021.
3. Butler, Judith. The Force of Nonviolence. Verso, 2020.
4. Klein, Naomi. The Shock Doctrine. Picador, 2007.
5. Mukherjee, Sipra. Pandemic Narratives and Indian Literature.
6. Sontag, Susan. Illness as Metaphor. Farrar, Straus and Giroux, 1978.
7. WHO. Coronavirus Disease (COVID-19) Pandemic Reports.
8. Zomuansangi. Study on Migration and Pandemic Narratives.



Original Article

# Investor Sentiment Condition Making: A Behavioural Finance Perspective.

Koushik J<sup>1</sup>, Dr. Manoj Kumara N V<sup>2</sup>

<sup>1</sup>PG Scholar, Research Guide Maharaja Institute of Technology Mysore, Mandya, India

<sup>2</sup>Associate Professor Department of Management Sciences

Maharaja Institute of Technology Mysore, Mandya, India

Manuscript ID:  
RIGJAAR-2026-030726

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 116-121  
July 2026

Submitted: 11 June. 2026

Revised: 20 June. 2026

Accepted: 14 July. 2026

Published: 31 July. 2026

Correspondence Address:

Koushik J,

PG Scholar, Associate Professor &

Research Guide

Email- skkoushi18@gmail.com

Quick Response Code:



Web. <https://rlgjaar.com>



DOI:  
10.5281/zenodo.21989604

DOI Link:  
<https://doi.org/10.5281/zenodo.21989604>



Creative Commons



## Abstract:

*This study examines investor sentiment and investment decision-making from a behavioural finance perspective. Traditional finance assumes that investors make rational decisions based on complete information; however, behavioural finance suggests that psychological factors, emotions, and cognitive biases significantly influence investment behaviour. The main purpose of this study is to analyse the behavioural factors affecting investor sentiment and their impact on investment decisions. The objectives of the study are to identify the psychological and behavioural factors influencing investor sentiment, examine the role of cognitive biases and emotional responses in shaping investor behaviour, evaluate the relationship between investor sentiment and investment decisions, and assess the impact of external information on improving investor sentiment toward making appropriate investment decisions. The study adopts a descriptive research design and uses convenience sampling to collect primary data from 400 respondents. Data were analysed using JAMOVI software, employing statistical tools such as descriptive statistics, correlation, regression, ANOVA, and T-tests to examine relationships and test the proposed hypotheses. The findings are expected to contribute to the field of behavioural finance by providing insights into investor psychology, supporting informed investment decisions, and assisting financial advisors, policymakers, and researchers in understanding the role of investor sentiment in financial markets.*

**Keywords:** Investor Sentiment, Behavioural Finance, Investment Decision-Making, Cognitive Biases, Psychological Factors, Investor Behaviour, Market Sentiment, Emotional Biases, Financial Markets, Decision Making.

## Introduction

Investor sentiment refers to the overall attitude, emotions, and expectations of investors toward financial markets or specific assets. Conventional theories of finance make the assumption that investors are logical and always base their choices on comprehensive data and logical analysis. However, this assumption is frequently contradicted by actual market behaviour. Behavioural finance is crucial in this situation. Behavioural finance explains how emotions, cognitive biases, and psychological factors affect investment choices. Investors can be motivated by fear, greed, overconfidence, herd mentality, or prior experiences; they are not always logical. Together, these elements influence investor sentiment, which influences price movements, market trends, and investment choices. The process by which these feelings and perceptions are developed and change over time is known as investor sentiment condition making.

## Conceptual Background

Traditional finance assumes that investors act rationally, process all available information efficiently, and always make decisions that maximize wealth. This perspective holds that financial markets should accurately reflect asset values and that psychological or emotional factors are unimportant. However, actual market behaviour frequently defies these hypotheses. Investors often overestimate their skills, react emotionally, blindly follow trends, or make decisions based more on social pressure, fear, and optimism than on reason alone. Behavioural finance, an interdisciplinary field that blends finance and psychology to explain how people make financial decisions in uncertain environments, emerged as a result of this discrepancy between theoretical rationality and actual human behaviour. According to behavioural finance, investors' choices are influenced by cognitive constraints, emotional reactions, and behavioural biases rather than being entirely rational. Investor sentiment has emerged as a key idea for comprehending market behaviour and investment decision-making within this framework. The general attitude, convictions, expectations, or emotional outlook of investors toward financial markets or particular assets is referred to as investor sentiment.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

J, K., & N V, M. K. (2026). Investor Sentiment Condition Making: A Behavioural Finance Perspective. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 116–121. <https://doi.org/10.5281/zenodo.21989604>

## Review of literature

Vu Hiep Hoang and The Lan Huong Le (2025) examined how behavioral biases, digital financial literacy, and digital finance adoption influence investment decisions in emerging markets. The study found that investor behavior is shaped by both psychological and technological factors. However, previous studies examined these variables separately, leaving a gap in understanding their combined influence. Wang and Zou (2024) investigated the relationship between financial literacy, cognitive bias, and investment decisions using a behavioral finance approach. The findings revealed that even financially literate investors are influenced by cognitive biases, leading to irrational decisions. The study did not consider digital financial behavior and technology-driven investment platforms. Kass-Hanna, Lyons, and Liu (2022) explored the role of financial and digital literacy in improving financial resilience in emerging economies. The study concluded that digital capability and financial knowledge together strengthen financial resilience. However, it focused more on financial inclusion than on investor sentiment and investment decision-making. Tahira Irama, Ahmad Raza Bilal, and Zeshan Ahmad (2023) examined the influence of behavioral biases on women entrepreneurs' investment decisions using Structural Equation Modelling. The findings showed that overconfidence and availability bias significantly affect investment decisions, while financial literacy improves rational decision-making. The study was limited to women entrepreneurs in Pakistan. Manish Mittal (2010) analyzed behavioral biases among salaried and business-class investors using survey data. The results indicated that business investors exhibited greater overconfidence, whereas salaried investors showed stronger framing and regret biases. The research was confined to investors from Indore city.

Samira Troudi and Sami Aouadi (2025) studied the impact of financial inclusion, technology, and behavioral biases on corporate investment decisions. The findings revealed that financial inclusion positively influences investment, while behavioral biases reduce decision quality. However, the study focused on corporate investment rather than individual investor behavior. Heaton and Pennington (2017) investigated the impact of managerial overconfidence on corporate financial decisions. The study found that overconfident managers tend to make aggressive and risky investment decisions. The research mainly focused on overconfidence and overlooked other behavioral factors. Gahlot and Sachdeva (2025) examined the effects of anchoring, availability, and overconfidence biases on retail employees' investment decisions. The findings showed that overconfidence had the strongest influence on investment behavior. The study was limited to private-sector employees in the NCR region. J. Sahaya Shabu analyzed the influence of behavioral biases on investment decisions from a strategic perspective. The study concluded that psychological factors significantly affect investor decision-making beyond market fundamentals. However, the research lacked strong empirical evidence to support its conclusions.

Kumar and Goyal (2015) developed a reliable scale to measure behavioral biases affecting investment

decisions. The study identified key biases such as overconfidence, anchoring, herding, and regret aversion. However, it focused on measuring biases rather than their impact on actual investment outcomes. Raut, Kumar, Das, and Mishra (2018) examined the influence of emotional intelligence and behavioral biases on investment decisions. The findings indicated that investors with higher emotional intelligence are better able to control irrational behavior. The study did not consider digital investment environments or fintech platforms. Waweru, Munyoki, and Uliana (2008) investigated the behavioral biases influencing stock market investors in Nairobi. The study found that overconfidence, herding, anchoring, and emotional factors significantly affect investment decisions. However, it did not examine the role of modern digital trading platforms.

Prosad, Kapoor, and Sengupta (2015) explored the relationship between income level and irrational investment behavior. The findings showed that behavioral biases vary across different income groups and influence investment decisions differently. The study did not analyze the role of financial literacy or technological advancements. Bhatia, Chandani, Divekar, Mehta, and Vijay (2021) examined whether digital financial tools can reduce behavioral biases in investment decisions. The study concluded that technology improves decision quality but cannot completely eliminate emotional biases. The research mainly focused on technology as a moderating factor. Mahajan and Singh (2024) conducted a bibliometric analysis of cognitive bias and sustainable decision-making research. The study identified emerging research trends and knowledge gaps across different disciplines. However, it did not empirically investigate investor behavior in financial markets. Sari, Nugroho, and Prasetyo (2024) investigated the influence of financial literacy, financial experience, behavioral finance, and investor awareness on fintech investment decisions. The study found that all these factors positively affect investment decisions. However, it provided limited insight into deeper psychological mechanisms influencing investor behavior.

## Problem Statement

Investment decisions in contemporary financial markets are frequently taken to be logical and grounded in an unbiased evaluation of risk and return. Psychological, emotional, and behavioural factors like fear, overconfidence, herding, loss aversion, and market optimism or pessimism often impact their decisions. Because it has a substantial impact on the Caliber and course of investment decisions, investor sentiment has grown in importance as a field of study in behavioural finance.

## Objective of the Study

- To identify the psychological and behavioural factors affecting investor sentiment
- To examine the role of cognitive biases and emotional responses in shaping investor behaviour.

## Research Methodology

### Research Method



In this study Descriptive research design is used to describe and understand the characteristics, behaviour, attitudes, and opinions of a particular group or phenomenon, it helps in identifying the psychological, behavioural, emotional, and cognitive factors that

- **Sampling Method:** The study uses purposive sampling technique to select respondents who are actively involved in investment decisions and possess knowledge regarding financial market behaviour.
- **Sampling Size:** A sample of 400 respondents is considered appropriate for the study. This sample size is sufficient to analyse the psychological, behavioural, and informational factors affecting investor sentiment and investment decision-making.

#### Reliability statistics

**Table- 1 Scale Reliability Statistics**

| Objectives  | Cronbach's $\alpha$ |
|-------------|---------------------|
| Objective 1 | 0.825               |
| Objective 2 | 0.849               |
| Overall     | 0.864               |

*Source: Survey Data-SPSS output*

#### Secondary Data

Secondary information. secondary data. Books, journals, research articles, and earlier studies on investor sentiment and behavioural finance are the sources of secondary data. To bolster the study's theoretical foundation, data is also gathered from financial publications, reports, and websites. To comprehend ideas like psychological variables, cognitive biases, emotional reactions, and investment behaviour, secondary sources are utilized.

#### Tools of the Study

**Descriptive Analysis:** Descriptive is used in this study to summarize and present the basic characteristics of the data collected from the respondents. This tool supports all the hypotheses ( $H_{01}$ ,  $H_{02}$ ,  $H_{03}$ , and  $H_{04}$ ) by providing a general overview of the variables before conducting further statistical testing. Measures such as frequency, percentage, mean, and standard deviation are used under descriptive analysis.

**T-test:** The t-test is used in this study between two categories of respondents, such as gender, marital status, or investment experience. It helps in understanding whether demographic differences influence the study variables connected to  $H_{01}$ ,  $H_{02}$ ,  $H_{03}$ , and  $H_{04}$ . Thus, it provides supporting evidence regarding variations in behavioural and sentiment-related responses among two-group classifications.

**Anova:** Anova is used in this study to determine whether there are significant differences in investor sentiment, investor behaviour, and investment decisions it helps in analysing whether demographic

influence investor sentiment. It is useful for collecting detailed information about how investors think, feel, and behave while making investment decisions.

#### Sampling Design

#### Source of Data

**Primary Data:** The primary data for the study is collected from individual investors through a structured questionnaire to identify psychological and behavioural factors affecting investor sentiment.

#### Research Instruments

##### Structured Questionnaires

The questionnaire consists of well-defined and close-ended questions designed to gather information related to investor sentiment and investment behaviour.

characteristics have any significant influence on the variables associated with  $H_{01}$ ,  $H_{02}$ ,  $H_{03}$ , and  $H_{04}$ .

**Correlation Analysis:** Correlation Analysis is the major statistical tool is used to analyse behavioural factors and investor sentiment ( $H_{01}$ ), investor sentiment and investment decisions ( $H_{02}$ ), cognitive biases and emotional responses with investor behaviour ( $H_{03}$ ), and external information with investor sentiment and investment decisions ( $H_{04}$ ).

#### Hypotheses

**$H_{01}$ :** There is no significant effect of psychological and behavioural factors on investor sentiment.

**$H_{02}$ :** There is no significant relationship between investor sentiment and investment decisions.

#### 7. Data Analysis and Interpretation

Data analysis and interpretation is an important phase of any research study. It involves the systematic organization, examination, and evaluation of collected data to extract meaningful information. The purpose of data analysis is to transform raw data into a useful form through the use of tables, charts, percentages, and other statistical tools. Data interpretation helps in explaining the results, identifying patterns and trends, and drawing conclusions based on the findings. This chapter presents the analysis and interpretation of the data collected from respondents, enabling a better understanding of the research problem and helping to achieve the objectives of the study.

**$H_{01}$ :** There is no significant effect of psychological and behavioural factors on investor sentiment.

Table- 2

**CORRELATION MATRIX**

|         | Obj 2.1     | Obj 2.2 | Obj 2.3 | Obj 2.4 | Obj 2.5 | Obj 2.6 | Obj 2.7 | Obj 2.8 | Obj 2.9 | Obj 2.10 |
|---------|-------------|---------|---------|---------|---------|---------|---------|---------|---------|----------|
| Obj 2.1 | Pearson's r | —       |         |         |         |         |         |         |         |          |
|         | p-value     | —       |         |         |         |         |         |         |         |          |
| Obj 2.1 | Pearson's r | 0.335   | —       |         |         |         |         |         |         |          |

|            |             |             |       |       |       |       |       |       |       |       |       |   |  |  |  |  |  |  |  |  |
|------------|-------------|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---|--|--|--|--|--|--|--|--|
|            | <b>2.2</b>  | p-value     | <.001 | —     |       |       |       |       |       |       |       |   |  |  |  |  |  |  |  |  |
|            | <b>Obj</b>  | Pearson's r | 0.283 | 0.433 | —     |       |       |       |       |       |       |   |  |  |  |  |  |  |  |  |
|            | <b>2.3</b>  | p-value     | <.001 | <.001 | —     |       |       |       |       |       |       |   |  |  |  |  |  |  |  |  |
|            | <b>Obj</b>  | Pearson's r | 0.264 | 0.386 | 0.403 | —     |       |       |       |       |       |   |  |  |  |  |  |  |  |  |
|            | <b>2.4</b>  | p-value     | <.001 | <.001 | <.001 | —     |       |       |       |       |       |   |  |  |  |  |  |  |  |  |
|            | <b>Obj</b>  | Pearson's r | 0.296 | 0.332 | 0.338 | 0.386 | —     |       |       |       |       |   |  |  |  |  |  |  |  |  |
|            | <b>2.5</b>  | p-value     | <.001 | <.001 | <.001 | <.001 | —     |       |       |       |       |   |  |  |  |  |  |  |  |  |
|            | <b>Obj</b>  | Pearson's r | 0.235 | 0.405 | 0.332 | 0.443 | 0.338 | —     |       |       |       |   |  |  |  |  |  |  |  |  |
|            | <b>2.6</b>  | p-value     | <.001 | <.001 | <.001 | <.001 | <.001 | —     |       |       |       |   |  |  |  |  |  |  |  |  |
|            | <b>Obj</b>  | Pearson's r | 0.279 | 0.378 | 0.438 | 0.323 | 0.333 | 0.366 | —     |       |       |   |  |  |  |  |  |  |  |  |
|            | <b>2.7</b>  | p-value     | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | —     |       |       |   |  |  |  |  |  |  |  |  |
| <b>obj</b> | <b>2.8</b>  | Pearson's r | 0.321 | 0.439 | 0.397 | 0.378 | 0.346 | 0.404 | 0.283 | —     |       |   |  |  |  |  |  |  |  |  |
|            |             | p-value     | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | —     |       |   |  |  |  |  |  |  |  |  |
|            | <b>Obj</b>  | Pearson's r | 0.331 | 0.366 | 0.369 | 0.348 | 0.366 | 0.306 | 0.378 | 0.418 | —     |   |  |  |  |  |  |  |  |  |
|            | <b>2.9</b>  | p-value     | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | —     |   |  |  |  |  |  |  |  |  |
|            | <b>Obj</b>  | Pearson's r | 0.287 | 0.375 | 0.422 | 0.394 | 0.328 | 0.472 | 0.313 | 0.471 | 0.346 | — |  |  |  |  |  |  |  |  |
|            | <b>df</b>   |             | 403   | 403   | 402   | 403   | 403   | 402   | 403   | 401   | 403   | — |  |  |  |  |  |  |  |  |
|            | <b>2.10</b> | p-value     | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | — |  |  |  |  |  |  |  |  |

Source: Survey data – Jamovi output

The Pearson correlation analysis indicates that all ten variables are positively and significantly correlated with one another, as all p-values are less than 0.001. The correlation coefficients range from 0.235 to 0.472, indicating weak to moderate positive relationships among the study variables. The strongest positive correlation is observed between Objective 2.6 and Objective 2.10 ( $r = 0.472, p < 0.001$ ), followed closely by Table- 3 *Regression Model Summary*

Objective 2.8 and Objective 2.10 ( $r = 0.471, p < 0.001$ ). The weakest positive correlation is found between Objective 2.1 and Objective 2.6 ( $r = 0.235, p < 0.001$ ). Since none of the correlation coefficients exceed 0.80, there is no evidence of serious multicollinearity among the variables.

**H<sub>02</sub>:** There is no significant relationship between investor sentiment and investment decisions.

|   | Adjusted model R square | R Square | Std. R Error of the Estimate |
|---|-------------------------|----------|------------------------------|
| 1 | .745 <sup>a</sup>       | 0.555    | 0.34955                      |

a. Predictors (Constant), Obj4.1, Obj4.2, Obj4.3, Obj4.4, Obj4.5, Obj4.6, Obj4.7, Obj4.8, Obj4.9, Obj4.10

*Source: Survey data – Jamovi output*

The regression model summary indicates a strong relationship between the independent variables and the dependent variable, with a multiple correlation coefficient of  $R = 0.745$ . The  $R^2$  value of 0.555 shows that 55.5% of the variation in the dependent variable is explained by the ten predictor variables included in the model. The Adjusted  $R^2$  value of 0.543 indicates that after adjusting for the number of predictors, the model still explains 54.3% of the variance, demonstrating good explanatory power. The standard error of the estimate (0.34955) is relatively low, suggesting that the model provides reasonably accurate predictions. Overall, the regression model is a good fit and indicates that the selected information-related variables significantly contribute to explaining the dependent variable.

Table-4 *Anova- Objective-3*

| Factors            | Sum<br>Squares | of df | Mean Square F |       | p-value |
|--------------------|----------------|-------|---------------|-------|---------|
| Place              | 5.92           | 3     | 1.973         | 9.24  | <0.001  |
|                    | 84.87          | 401   | 0.212         |       |         |
| Gender             | 3.18           | 1     | 3.18          | 15.13 | <0.001  |
|                    | 87.62          | 403   | 0.217         |       |         |
| Age Group          | 2.8            | 3     | 0.933         | 4.25  | 0.006   |
|                    | 87.99          | 401   | 0.219         |       |         |
| Educational        | 0.455          | 4     | 0.114         | 0.5   | 0.736   |
| Qualification      | 90.337         | 400   | 0.226         |       |         |
| Occupation         | 3.83           | 4     | 0.958         | 4.24  | 0.002   |
|                    | 86.96          | 400   | 0.217         |       |         |
| Income (Per Annum) | 0.505          | 3     | 0.168         | 0.75  | 0.529   |
|                    | 90.288         | 401   | 0.225         |       |         |

Source: Survey data – Jamovi output

The ANOVA results show that Place, Gender, Age Group, and Occupation have a significant impact on the dependent variable ( $p < 0.05$ ). However, Educational Qualification and Income (Per Annum) do not show significant differences ( $p > 0.05$ ). This indicates that respondents' responses vary significantly based on certain demographic factors, particularly place, gender, age, and occupation.

Table- 5 One Sample T-Test- Objective- 4

| Variables     | Statistics | df  | P     |
|---------------|------------|-----|-------|
| Past Success  | 34.4       | 400 | <.001 |
| Loss Aversion | 32.01      | 400 | <.001 |



|                     |      |     |       |
|---------------------|------|-----|-------|
| Investment Regret   | 26.1 | 400 | <.001 |
| Holding Bias        | 27.8 | 400 | <.001 |
| Overconfidence Bias | 25.3 | 400 | <.001 |
| Recent Events       | 28.2 | 400 | <.001 |
| Herd Behavior       | 26.9 | 400 | <.001 |
| Emotional Influence | 33.3 | 400 | <.001 |
| Selling Hesitation  | 27.7 | 400 | <.001 |
| Emotional Decisions | 33   | 400 | <.001 |

Source: Survey data – Jamovi output

The one-sample t-test results indicate that all behavioural finance variables have statistically significant mean values, as all p-values are less than 0.001. This shows that the respondents' average scores are significantly different from the test value (neutral point), reflecting strong agreement with each behavioural factor. Among the variables, Past Success recorded the highest t-value ( $t = 34.4$ ), indicating the strongest influence on respondents' investment behaviour. The remaining variables, including Loss Aversion, Investment Regret, Holding Bias, Overconfidence Bias, Recent Events, Herd Behaviour, Emotional Influence, Selling Hesitation, and Emotional Decisions, also demonstrate significant effects.

### Results and Discussions

- The descriptive analysis indicates that psychological and behavioural factors significantly influence investor sentiment and investment decision-making.
- The One-Sample t-test results reveal a statistically significant effect of psychological and behavioural factors on investor sentiment ( $p < 0.05$ ), supporting the behavioural finance perspective.
- The correlation analysis shows a positive and significant relationship between investor sentiment and investment decisions, indicating that changes in sentiment influence investors' decisions.
- The regression analysis demonstrates that psychological factors, cognitive biases, emotional responses, and external information significantly predict investor sentiment and investment behaviour.
- The ANOVA results confirm significant differences in respondents' perceptions of investor sentiment based on behavioural and psychological factors.
- The findings reveal that overconfidence, herd behaviour, loss aversion, emotional influence, investment regret, and market information are key determinants of investor sentiment.
- The study also identifies that market volatility, economic conditions, financial news, and social media significantly shape investor sentiment and investment decisions.

### Conclusion

According to the study's findings, investment decisions are heavily influenced by investor sentiment. Investors' perceptions of risk and investment decisions are influenced by a variety of factors, including psychological and behavioural aspects, cognitive biases, emotional reactions, and external information sources. The behavioural finance theory, which holds that investors don't always act rationally, was supported by the statistical analysis, which verified important correlations between the study variables. All things considered, the study offers insightful information that helps investors, financial advisors, financial institutions, and policymakers comprehend investor behaviour and

create plans that promote logical and knowledgeable financial market investment choices.

### Bibliography

#### Journal Details

1. Agarwal, A., Samanta ray, A., & Jena, S. (2025). *Integrative analysis of investor biases through natural groupings, decision prediction, and co-occurrence patterns using a machine learning approach*.
2. Bhatia, M., Chandani, A., Divekar, R., Mehta, M., & Vijay, N. (2021). *Technological mitigation of the impact of behavioural biases on financial investment decision: Evidence from India using a PLS-SEM approach*.
3. Gahlot, R., & Sachdeva, S. (2025). *Impact of anchoring bias, availability heuristic, and overconfidence bias on investment decisions of retail employees*.
4. Heaton, J., & Pennington, N. (2017). *Overconfidence bias and corporate financial decision-making*.
5. Hoang, V. H., & Le, T. L. H. (2025). *Digital financial literacy, digital finance adoption, behavioural biases, and investment decision-making in emerging markets*.
6. Irama, T., Bilal, A. R., & Ahmad, Z. (2023). *Behavioural biases and investment decisions among women entrepreneurs: The mediating role of financial literacy*.
7. Kass-Hanna, J., Lyons, A. C., & Liu, F. (2022). *Financial literacy, digital literacy, and financial resilience in developing and emerging economies*.
8. Khan, S., Fatima, R., & Shah, A. (2025). *The brain behind the portfolio: The neurological foundations of investment decisions*.
9. Kirchler, M., Huber, J., & Stöckl, T. (2020). *Hot hand and gambler's fallacy in teams: Evidence from investment experiments*.
10. Kumar, S., & Goyal, N. (2015). *Behavioural biases affecting investors' decision-making process: A scale development approach*.
11. Mahajan, P., & Singh, R. (2024). *Cognitive bias and sustainable decision-making: A bibliometric analysis of emerging trends and research gaps*.
12. Maheshwari, A., & Samantaray, A. (2024). *Mapping the landscape of cryptocurrency investment decision: A bibliometric analysis*.
13. Maheshwari, A., & Samantaray, A. (2025). *Navigating investment challenges: Financial literacy and digital advisory services in countering behavioural biases*.
14. Mittal, M. (2010). *Study of behavioural biases influencing investment decision-making among salaried and business class investors*.



15. Prosad, J. M., Kapoor, S., & Sengupta, J. (2015). *Irrationality in investment decisions across income groups*.
16. Raut, R. K., Kumar, R., Das, N., & Mishra, R. (2018). *Emotional intelligence, behavioural biases, and investment decision-making*.
17. Sahaya Shabu, J. *Behavioural biases and investment decisions: A strategic perspective*.
18. Sari, D., Nugroho, B., & Prasetyo, A. (2024). *Influence of financial literacy, financial experience, behavioural finance, and investor awareness on the use of fintech applications in making investment decisions*.
19. Sharma, M. *Behavioural finance and psychological biases in investment decision-making*.
20. Troudi, S., & Aouadi, S. (2025). *Financial inclusion, technology, behavioural biases, and corporate investment decisions*.
21. Wang, X., & Zou, Y. (2024). *Financial literacy, cognitive bias, and personal investment decisions: A behavioural finance perspective*.
22. Waweru, N. M., Munyoki, E., & Uliana, E. (2008). *Behavioural biases in the decision making of individual investors*.
23. Yamani, A., & Hajar, M. (2024). *Behavioural biases in asset management: The case of Moroccan bank-affiliated asset managers*. Baker, M., & Wurgler, J. (2006). Investor sentiment and the cross-section of stock returns. *The Journal of Finance*, 61(4), 1645–1680.
24. Barberis, N., Shleifer, A., & Vishny, R. (1998). A model of investor sentiment. *Journal of Financial Economics*, 49(3), 307–343.
25. Brown, G. W., & Cliff, M. T. (2005). Investor sentiment and asset valuation. *The Journal of Business*, 78(2), 405–440.
26. Da, Z., Engelberg, J., & Gao, P. (2015). The sum of all FEARS investor sentiment and asset prices. *Review of Financial Studies*, 28(1), 1–32.
27. Kumar, A., & Lee, C. M. C. (2006). Retail investor sentiment and return Co-movements. *The Journal of Finance*, 61(5), 2451–2486.
28. Schmeling, M. (2009). Investor sentiment and stock returns: Some international evidence. *Journal of Empirical Finance*, 16(3), 394–408.
29. Tetlock, P. C. (2007). Giving content to investor sentiment: The role of media in the stock market. *The Journal of Finance*, 62(3), 1139–1168.
30. *Behavioural Finance*. John Wiley & Sons.

**Webliography:**

<https://www.investopedia.com>

<https://www.cfainstitute.org>

<https://www.nseindia.com>

<https://www.bseindia.com>

<https://www.sebi.gov.in>



Original Article

# The Psychological Impact of Excessive Screen Time on Child Development

Dr. Munjaji Kishanrao Rakhonde

Associate professor Dept. of Psychology

Kohinoor Arts, Commerce and Science College, Khultabad District - Aurangabad (MS)

Manuscript ID:  
RIGJAAR-2026-030727

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 122-125  
July 2026

Submitted: 11 June. 2026

Revised: 20 June. 2026

Accepted: 14 July. 2026

Published: 31 July. 2026

Correspondence Address:

Munjaji Kishanrao Rakhonde

Associate professor Dept. of Psychology  
Kohinoor Arts, Commerce and Science  
College, Khultabad District - Aurangabad  
(MS)

Quick Response Code:



Web: <https://rlgjaar.com>



DOI: 10.5281/zenodo.22932268

DOI Link:

<https://doi.org/10.5281/zenodo.22932268>



Creative Commons



## Abstract

The rapid advancement of digital technology has transformed children's daily lives. Smartphones, tablets, computers, televisions, and gaming devices have become integral parts of education, entertainment, and communication. While technology offers educational opportunities and cognitive stimulation, excessive screen time has emerged as a significant public health concern. Growing evidence suggests that prolonged exposure to digital screens may negatively affect children's psychological, emotional, cognitive, and social development. This research paper reviews the psychological impact of excessive screen time on child development by examining current literature on attention, emotional regulation, sleep, language development, academic performance, and mental health. The paper also discusses protective strategies for parents, educators, and policymakers to promote healthy digital habits among children. Although research consistently associates excessive screen use with adverse developmental outcomes, recent systematic reviews emphasize that the type of screen activity, content quality, parental involvement, and displacement of healthy activities are as important as total screen time itself.

**Keywords:** Screen time, Child development, Psychology, Mental health, Digital media, Cognitive development, social development.

## Introduction

Digital technology has become an essential component of childhood in the twenty-first century. Children are increasingly exposed to smartphones, tablets, computers, televisions, and video games from infancy. Educational applications, online learning platforms, and interactive games provide valuable learning opportunities. However, excessive screen exposure has raised concerns among psychologists, pediatricians, educators, and parents regarding its influence on children's mental health and overall development. The COVID-19 pandemic further increased children's dependence on digital devices due to online education and reduced outdoor activities. Consequently, many children spend several hours daily using screens for both educational and recreational purposes. Excessive screen time has been associated with sleep disturbances, reduced physical activity, impaired social interaction, behavioral problems, anxiety, depression, and attention difficulties. Nevertheless, recent evidence also suggests that the relationship is complex: the quality, purpose, and context of screen use matter alongside duration.

## Objectives of the Study

The objectives of this research are:

- To examine the psychological effects of excessive screen time on child development.
- To analyze the impact on cognitive, emotional, and social development.
- To understand the relationship between screen time and mental health.
- To identify preventive measures for healthy digital media use.

## Research Methodology

This study is based on a review of secondary data collected from peer-reviewed journals, books, reports published by international organizations, and scientific databases. Recent systematic reviews and empirical research on children's screen use were examined to synthesize current evidence.

## Understanding Screen Time

Screen time refers to the amount of time children spend using electronic devices such as smartphones, tablets, computers, televisions, video game consoles, and other digital media.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Rakhonde, D. M. K. (2026). The Psychological Impact of Excessive Screen Time on Child Development. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 122-125. <https://doi.org/10.5281/zenodo.22932268>



In today's digital age, screen exposure has become an integral part of children's daily lives due to online education, entertainment, communication, and social interaction. Screen time may be classified into educational, recreational, social media, gaming, and passive television viewing. While moderate and supervised use of digital technology can enhance learning, creativity, and communication skills, excessive or unsupervised screen exposure may interfere with healthy physical, cognitive, emotional, and social development. Therefore, experts recommend maintaining a balanced approach by ensuring that screen use complements rather than replaces essential developmental activities such as physical play, reading, family interaction, and adequate sleep.

### **Psychological Impact of Excessive Screen Time**

#### **Cognitive Development**

Cognitive development is one of the most critical aspects of childhood growth, involving the development of attention, memory, language, reasoning, and problem-solving abilities. Excessive screen time may negatively affect these cognitive functions by reducing children's opportunities to engage in creative play, hands-on learning, and meaningful interactions with parents and peers. Research suggests that prolonged recreational screen use is associated with shorter attention spans, decreased concentration, impaired executive functioning, and lower academic achievement. Children who spend excessive time on digital devices may become accustomed to rapidly changing visual stimuli, making it more difficult for them to focus on classroom learning or sustained tasks. However, educational digital content that is age-appropriate and supervised by caregivers can positively contribute to learning when used in moderation.

#### **Emotional Development**

Emotional development enables children to understand, express, and regulate their emotions while developing empathy and resilience. Healthy emotional growth largely depends on consistent interactions with parents, caregivers, teachers, and peers. Excessive screen time may interfere with these interactions, limiting opportunities for children to learn emotional regulation and interpersonal skills. Children who rely heavily on digital entertainment may become more irritable, impatient, emotionally dependent on electronic devices, and less capable of coping with frustration. Over time, excessive screen exposure may contribute to mood swings, emotional instability, and reduced emotional intelligence. Encouraging family communication, outdoor activities, and shared experiences helps children develop healthy emotional responses and stronger interpersonal relationships.

#### **Mental Health**

Mental health is an essential component of overall child development, influencing emotional well-being, behavior, and social adjustment. Numerous studies have reported that excessive screen time is associated with increased levels of anxiety, depression, loneliness, stress, and low self-esteem among children and adolescents. Excessive use of social media and digital entertainment may expose children to unrealistic social comparisons, cyberbullying, and inappropriate content, which can negatively affect their psychological well-being.

Furthermore, prolonged screen use often replaces physical activity, outdoor play, and face-to-face interactions that are essential for maintaining good mental health. Establishing healthy digital habits and encouraging balanced daily routines can significantly reduce these psychological risks.

### **Attention and Behavioral Problems**

Excessive screen time has been linked to several attention-related and behavioral difficulties in children. Continuous exposure to fast-paced digital content can overstimulate the developing brain, making it difficult for children to sustain attention during academic or everyday tasks. Children who spend many hours on screens may display symptoms such as hyperactivity, impulsivity, poor self-control, aggression, and difficulty following instructions. These behavioral challenges can negatively affect classroom performance, peer relationships, and family interactions. Limiting recreational screen use and promoting structured learning, outdoor play, and family engagement can help improve children's attention span and behavioral regulation.

### **Sleep Disturbances**

Sleep is fundamental for healthy physical, emotional, and cognitive development during childhood. Excessive screen use, particularly before bedtime, can disrupt children's sleep by suppressing melatonin production due to exposure to blue light emitted from electronic devices. As a result, children may experience delayed sleep onset, reduced sleep duration, poor sleep quality, and frequent nighttime awakenings. Sleep deprivation caused by excessive screen time can lead to daytime fatigue, irritability, mood swings, poor concentration, memory problems, and reduced academic performance. It may also increase the risk of anxiety, depression, and behavioral disorders. Developing consistent bedtime routines, avoiding screen use before sleep, and keeping electronic devices out of children's bedrooms are effective strategies for promoting healthy sleep habits.

### **Language Development**

Language development is strongly influenced by direct communication with parents, caregivers, teachers, and peers. During early childhood, frequent conversations, storytelling, reading, and interactive play contribute significantly to vocabulary growth and communication skills. Excessive screen time may reduce these valuable opportunities for social interaction, resulting in delayed language acquisition, weaker verbal communication, and limited vocabulary development. Passive screen viewing provides fewer opportunities for children to practice expressive and receptive language skills compared to face-to-face conversations. Parents can support language development by engaging children in meaningful discussions, reading together, and using educational digital content interactively rather than allowing prolonged passive screen exposure.

### **Social Development**

Social development involves learning how to build relationships, communicate effectively, cooperate with others, and understand social norms. These skills develop through regular interactions with family members, classmates, friends, and the wider community. Excessive screen time may reduce children's participation in social activities, outdoor games, and family conversations, limiting opportunities to develop empathy, cooperation, communication skills, and conflict-resolution abilities. Children who spend excessive time using digital devices may become socially withdrawn and less confident in face-



to-face interactions. Encouraging participation in sports, group activities, community programs, and family events helps strengthen children's social competence and emotional well-being.

#### **Risk Factors Associated with Excessive Screen Time**

Several environmental, social, and technological factors contribute to excessive screen use among children. The widespread availability of smartphones, tablets, affordable internet services, online education, digital entertainment platforms, and social media has significantly increased children's daily screen exposure. Working parents, limited outdoor play opportunities, urban lifestyles, and insufficient parental supervision also contribute to prolonged screen use. Additionally, children's increasing dependence on digital devices for education and recreation makes it difficult to maintain healthy limits. Recognizing these risk factors enables parents, educators, and healthcare professionals to develop effective strategies for promoting balanced and responsible technology use.

#### **Positive Aspects of Screen Time**

Although excessive screen time may have adverse psychological effects, moderate and well-supervised digital media use offers several developmental benefits. Educational applications, interactive learning platforms, documentaries, and instructional videos can enhance children's knowledge, language skills, creativity, problem-solving abilities, and digital literacy. Technology also facilitates communication with teachers, family members, and peers while providing access to educational resources that support academic achievement. When parents actively participate in children's digital activities and ensure that content is age-appropriate, screen time can become a valuable educational tool rather than a source of harm. Therefore, the focus should be on promoting high-quality, purposeful, and balanced screen use rather than eliminating technology entirely.

#### **Preventive Strategies**

Preventing the harmful psychological effects of excessive screen time requires a combined effort from parents, schools, healthcare professionals, and policymakers. Parents should establish clear rules regarding screen use, encourage outdoor play, physical exercise, reading, and family interaction, and monitor the quality of digital content their children access. Schools should promote digital literacy, educate students about responsible technology use, and provide opportunities for extracurricular and physical activities. Healthcare professionals can counsel families on healthy media habits during routine health visits, while policymakers can support public awareness campaigns and develop child-friendly digital policies. Most importantly, adults should model healthy screen habits themselves, as children often imitate parental behavior. By maintaining a healthy balance between technology use and real-life activities, children can enjoy the benefits of digital media while minimizing its psychological risks.

#### **Role of Parents**

Parents play a central role in shaping children's digital habits and protecting them from the harmful effects of excessive screen exposure. They should establish age-appropriate screen time limits, monitor online activities, encourage open communication, and participate in children's digital experiences. Parents should also promote healthy routines that include regular physical activity, sufficient sleep, nutritious eating habits, and opportunities for social interaction. By serving as positive role models and maintaining consistent family rules regarding technology

use, parents can foster responsible digital behavior and support their children's cognitive, emotional, and social development.

#### **Role of Schools**

Schools have an important responsibility in promoting healthy technology use and supporting children's psychological well-being. Educational institutions can integrate digital citizenship and media literacy into the curriculum, helping students understand both the benefits and potential risks of digital technology. Teachers can encourage collaborative learning, classroom discussions, physical education, and extracurricular activities that reduce excessive dependence on screens. School counselors can identify students experiencing psychological difficulties related to excessive screen use and provide appropriate guidance and intervention. Strong collaboration between schools and parents further enhances children's ability to develop balanced digital habits and maintain healthy overall development.

#### **Discussion**

The available literature indicates that excessive screen time is associated with multiple aspects of children's psychological development, including attention, emotional regulation, sleep, language, and social functioning. However, contemporary research cautions against attributing harm solely to the number of hours spent on screens. Many studies are observational and cannot establish causation. Evidence increasingly suggests that developmental outcomes depend on the interaction between screen duration, the type of content viewed, whether caregivers participate, and whether screen use replaces healthy activities such as sleep, exercise, and family interaction. Therefore, balanced, high-quality, and supervised digital media use is a more appropriate goal than focusing only on reducing screen time.

#### **Conclusion**

Technology has become an inseparable part of modern childhood. While digital devices provide numerous educational and social benefits, excessive and unsupervised screen exposure can negatively influence children's psychological well-being and development. Potential consequences include impaired attention, sleep disruption, emotional difficulties, reduced language opportunities, and poorer social interaction. At the same time, emerging evidence shows that not all screen use is equally harmful; educational content, caregiver involvement, and balanced daily routines can support positive outcomes. Parents, educators, healthcare professionals, and policymakers should therefore encourage healthy digital habits that prioritize meaningful human interaction, physical activity, adequate sleep, and age-appropriate media experiences.

#### **Acknowledgment**

The author expresses sincere gratitude to the **Department of Psychology, Kohinoor Arts, Commerce and Science College, Khultabad, District Aurangabad (Maharashtra)** for providing a supportive academic environment and the necessary facilities to carry out this research.

The author extends heartfelt appreciation to colleagues, faculty members, and fellow researchers for their valuable suggestions, constructive feedback, and continuous encouragement throughout the preparation of this study. Their academic insights significantly enhanced the quality and scope of this research.



Special thanks are also extended to the scholars, psychologists, pediatricians, educators, and researchers whose published books, journal articles, and scientific reports on child development, psychology, digital media, and mental health served as valuable resources and strengthened the theoretical foundation of this paper.

Finally, the author expresses profound gratitude to family members, friends, and well-wishers for their unwavering encouragement, patience, and moral support throughout the completion of this research.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

The authors declare that there are no conflicts of interest regarding the publication of this paper.

**References (APA 7th Edition)**

1. American Academy of Pediatrics. (2016). Media and young minds. *Pediatrics*, 138(5), e20162591.
2. Domingues-Montanari, S. (2017). Clinical and psychological effects of excessive screen time on children. *Journal of Paediatrics and Child Health*, 53(4), 333–338.
3. Madigan, S., Browne, D., Racine, N., Mori, C., & Tough, S. (2019). Association between screen time and children's performance on a developmental screening test. *JAMA Pediatrics*, 173(3), 244–250.
4. Muppalla, S. K., Vuppapapati, S., Pulliahgaru, A. R., & Sreenivasulu, H. (2023). Effects of excessive screen time on child development: An updated review and strategies for management. *Cureus*, 15(6), e40608.
5. Ophir, Y., Rosenberg, H., & Tikochinski, R. (2021). What are the psychological impacts of children's screen use? A critical review and meta-analysis of the literature underlying the World Health Organization guidelines. *Computers in Human Behavior*, 124, 106925.
6. Twenge, J. M., & Campbell, W. K. (2018). Associations between screen time and lower psychological well-being among children and adolescents. *Preventive Medicine Reports*, 12, 271–283.
7. World Health Organization. (2019). Guidelines on physical activity, sedentary behaviour and sleep for children under 5 years of age.
8. Goswami, P., & Parekh, V. (2023). The impact of screen time on child and adolescent development: A review. *International Journal of Contemporary Pediatrics*



Original Article

# Integrating Knowledge of Geography for Innovation, Sustainability, and Global Development: An Expanded Framework

Dr. Lalitkumar G. Thakur

Head & Assistant Professor Department of Geography  
S. Chandra Mahila Mahavidyalaya, Amgaon District-Gondia (MS)

Manuscript ID:  
RIGJAAR-2026-030728

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 126-128  
July 2026

Submitted: 11 June, 2026  
Revised: 20 June, 2026  
Accepted: 14 July, 2026  
Published: 31 July, 2026

**Correspondence Address:**

Lalitkumar G. Thakur  
Head & Assistant Professor  
[Department of Geography]  
S. Chandra Mahila  
Mahavidyalaya, Amgaon District-  
Gondia (MS)

Quick Response Code:



Web: <https://rlgjaar.com>



DOI:  
10.5281/zenodo.21989808

DOI Link:  
<https://doi.org/10.5281/zenodo.21989808>



Creative Commons



**Abstract:**

Global challenges such as climate change, rapid urbanization, biodiversity loss, and economic inequality are fundamentally spatial in nature. Generic, non-spatial policy interventions often fail because they ignore the unique environmental, social, and economic capacities of specific regions. This paper presents an expanded investigation into how integrating geographical knowledge—combining physical geography, human geography, and advanced geospatial technologies—provides the essential framework required to drive sustainable innovation and equitable global development. By synthesizing spatial analytics, Geographic Information Systems (GIS), Earth observation, dynamic simulation models, and local spatial contexts, decision-makers can transition from reactive problem-solving to predictive, location-intelligent strategy. We present an expanded theoretical synthesis, examine empirical case studies across core development sectors, evaluate systemic barriers to spatial data infrastructure (SDI), and propose an actionable operational framework for embedding spatial intelligence into international governance paradigms.

**Keywords:** Spatial Analytics, Geospatial Intelligence, Geographic Information Systems (GIS), Earth Observation, Spatial Data Infrastructure (SDI), Ecological Carrying Capacity, Sustainable Development Goals (SDGs), Climate Adaptation, Precision Agriculture, Spatial Equity.

**Introduction:**

The modern era, broadly characterized as the Anthropocene, presents interconnected global crises that operate at macro-scales while manifesting through highly localized and heterogeneous impacts. Traditional socio-economic frameworks for international development have historically treated space as an abstract, isotropic plane—assuming that economic principles, policy instruments, and technological solutions can be applied universally without regard to geography. However, empirical reality demonstrates that resource distribution, microclimates, geomorphological constraints, demographic patterns, and socio-cultural structures vary dramatically across space. Consequently, non-spatial interventions often yield uneven, inefficient, or unintended negative consequences. Geography functions as a vital integrative discipline, bridging natural physical sciences with human social systems. Integrating spatial intelligence into global development strategies allows researchers and policymakers to move beyond aggregated global or national averages. It provides the analytical tools to ask not merely what phenomena are occurring, but precisely where they occur, why they manifest in specific locations, and how spatial relationships influence outcomes. By translating broad targets—such as the United Nations Sustainable Development Goals (SDGs)—into spatially explicit, context-aware interventions, geographical integration transforms abstract commitments into actionable, targeted solutions.

**Expanded Theoretical Framework: The Triad of Spatial Integration**

To systematically operationalize geographical knowledge across development paradigms, we construct a three-part interdependent theoretical model comprising Physical Foundations, Human Systems, and Technological Enablers.

**Physical Geography and Ecological Carrying Capacity**

Physical geography establishes the baseline boundaries and biophysical limits of terrestrial, aquatic, and atmospheric systems. Incorporating geomorphological surveys, hydrological modeling, soil chemistry, and local climatology allows planners to quantify the true ecological carrying capacity of a given region. Development initiatives that operate within these natural physical parameters prevent irreversible ecological degradation—such as aquifer exhaustion, topsoil erosion, loss of ecosystem services, and habitat fragmentation.

**Human Geography and Spatial Political Economy**

Human geography examines how societies construct, organize, and perceive space over time.

**Creative Commons (CC BY-NC-SA 4.0)**

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](#) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**How to cite this article:**

Thakur, L. G. (2026). Integrating Knowledge of Geography for Innovation, Sustainability, and Global Development: An Expanded Framework. *Royal International Global Journal of Advance and Applied Research*, 3(7(III)), 129–128.

<https://doi.org/10.5281/zenodo.21989808>



It analyzes demographic structures, migration corridors, urban-rural dynamics, economic clusters, and historic land-tenure systems. Evaluating the spatial political economy ensures that development policies do not reinforce spatial marginalization, exacerbate income inequality, or cause forced displacement among vulnerable populations.

### Geospatial Enablers and Spatial Data Infrastructures (SDI)

Geospatial technology serves as the technical engine that binds physical and human geographical

streams together. Earth Observation (EO) satellite constellations, Geographic Information Systems (GIS), Global Navigation Satellite Systems (GNSS), airborne LiDAR, and spatial artificial intelligence convert complex environmental and social observations into high-resolution digital datasets, dynamic visual simulations, and predictive models.

### In-Depth Applications and Sectoral Case Analyses

The operational utility of geographical integration is demonstrated across critical sectors where spatial variance dictates policy success:

| Development Sector        | Geospatial & Spatial Mechanism               | Key Outcome & Impact                                            |
|---------------------------|----------------------------------------------|-----------------------------------------------------------------|
| Renewable Energy          | LiDAR, Solar Irradiance & Wind Micro-Siting  | Optimizes site selection while minimizing land-use conflicts.   |
| Climate Risk & Resilience | Dynamic Hydrological & Digital Twin Modeling | Enables proactive urban flood mitigation and thermal reduction. |
| Food Security             | Multispectral Crop Sensing & Soil Hydrology  | Increases resource efficiency and crop yield predictability.    |
| Inclusive Urbanization    | Spatial Network Analysis & Service Mapping   | Identifies infrastructure gaps and underserved communities.     |

### Renewable Energy Optimization and Decarbonization Strategy

Transitioning global energy grids to zero-carbon sources requires highly localized spatial analysis. Solar irradiance, wind velocity vectors, slope gradient, transmission grid proximity, and protected ecological boundaries must be overlaid using multi-criteria evaluation (MCE) models in GIS. This spatial optimization maximizes energy yield while avoiding conflicts with agricultural land, wildlife corridors, and local communities.

### Dynamic Climate Adaptation, Coastal Management, and Disaster Mitigation

Static hazard assessments are inadequate for predicting climate risks under rapid warming scenarios. Combining high-resolution digital elevation models (DEMs) derived from LiDAR with dynamic hydrological flow simulations allows municipal engineers to model flood vectors under varying storm-surge conditions. Cities can implement nature-based solutions—such as coastal wetland restoration and urban green corridors—directly in high-risk zones, protecting urban populations and infrastructure efficiently.

### Precision Agriculture, Soil Health, and Food System Security

Global agricultural systems face double pressures from climate volatility and soil degradation. Precision agriculture uses satellite imagery (such as Sentinel-2 multispectral data) to calculate vegetation indices (NDVI, EVI) alongside IoT soil moisture probes. Farmers receive real-time, micro-targeted insights regarding crop stress, irrigation needs, and fertilizer application, maximizing resource efficiency and safeguarding local watersheds from chemical runoff.

### Inclusive Urbanization, Transportation Networks, and Resource Access

Rapid urbanization in developing regions often leads to sprawling informal settlements lacking public utilities and transit access. Geospatial network analysis maps spatial accessibility to essential services—such as clean water access points, primary health clinics, emergency services, and public transport hubs. Mapping these spatial service gaps enables planners to prioritize

infrastructure investments where socio-economic need is highest.

### Structural Barriers, Ethical Challenges, and Technical Bottlenecks

Despite clear advantages, systemic challenges hinder the broad integration of geographical knowledge:

- **The Geospatial Digital Divide:** Low- and middle-income regions often suffer from limited access to high-performance computing, commercial satellite feeds, and advanced geospatial training programs, creating spatial data asymmetries.
- **Data Fragmentation and Silos:** Spatial datasets are frequently isolated within disconnected government departments, research institutes, and private corporations, preventing unified cross-sectoral analytics.
- **Privacy, Surveillance, and Land Tenure Risks:** High-resolution spatial tracking, drone imaging, and digital mapping raise critical ethical issues regarding personal privacy, surveillance, and potential exploitation of informal land-tenure systems.
- **Institutional Sectoral Governance Gaps:** Most national administrative structures are organized rigidly by sector (e.g., transport, agriculture, water management) rather than territorially, creating friction when executing holistic spatial policies.

### Strategic Roadmap for Operational Implementation

To embed spatial intelligence systematically into development governance, a four-pillar operational framework is required:

**Development of Robust National Spatial Data Infrastructures (NSDI):** Establish open-access spatial clearinghouses with standardized metadata to enable cross-ministry data interoperability.

**Building Capacity and Spatial Literacy in Policy Formulations:** Integrate geospatial analytical methodologies into public administration and urban planning curricula globally.

**Participatory GIS (PGIS) and Community-Driven Spatial Mapping:** Combine local indigenous ecological knowledge and community mapping with satellite data to ground truth technical models.

**Location-Explicit SDG Monitoring and Metric Development:** Transition international SDG evaluation



frameworks from aggregate national statistics to high-resolution, spatially disaggregated indicators.

#### Conclusion:

#### Synthesis of Theoretical and Empirical Findings:

This paper has demonstrated that spatial context is not merely an optional variable, but an foundational requirement for sustainable global development. The persistent failure of non-spatial policy interventions stems from an "isotropic space fallibility"—the mistaken assumption that economic, technical, and social policy mechanisms operate uniformly across diverse landscapes. By integrating physical geography, human geography, and advanced geospatial technology, development initiatives transition from generalized, top-down directives to location-intelligent interventions tailored to local carrying capacities and social realities. Empirical evidence across core sectors reinforces this integration: Decarbonization & Clean Energy: Multi-criteria spatial modeling aligns renewable infrastructure with high-yield solar/wind potential while preserving agricultural land and biodiversity. Climate Risk & Resilience: Combining high-resolution LiDAR elevation models with dynamic hydrological flow simulation transforms static hazard mapping into predictive urban digital twins, allowing municipal governments to deploy targeted nature-based adaptations. Food & System Security: Integrating satellite Earth observation (e.g., NDVI multispectral data) with localized IoT sensors optimizes input efficiency, guards water tables against contamination, and secures crop yields under volatile climate regimes. Inclusive Urban Infrastructure: Network analytics exposes hidden "service deserts," enabling equitable allocation of healthcare, transit, and public utilities in rapidly growing urban centers.

#### Overcoming Systemic Bottlenecks

For geographical knowledge to achieve its full potential, global development paradigms must directly resolve key structural bottlenecks: Bridging the Geospatial Digital Divide: International development bodies must prioritize funding spatial infrastructure and technical capacity-building in lower-income nations to eliminate spatial data asymmetries. Dismantling Administrative Silos: National governments need to transition from rigid, sector-specific administration (e.g., isolated transport or agricultural ministries) toward integrated territorial management models anchored by interoperable National Spatial Data Infrastructures (NSDIs). Navigating Ethical Boundaries: High-resolution spatial tracking and mapping must operate within transparent governance frameworks that protect civil privacy, ensure informed consent, and safeguard community land tenure rights—particularly for vulnerable and Indigenous populations.

#### Final Imperative: Grounding Global Strategy in Spatial Reality

As humanity navigates the complex challenges of the Anthropocene, the UN Sustainable Development Goals (SDGs) cannot be achieved through macro-level national averages alone. Progress requires location-explicit indicators that reflect the real-world

conditions of specific places. Integrating geographical knowledge provides the analytical depth, predictive accuracy, and ethical alignment necessary to build resilient communities. Ultimately, recognizing that every global challenge manifests in a specific place—and that every sustainable solution must be rooted in that spatial context—is the defining prerequisite for 21st-century global development.

#### Acknowledgment

The author expresses sincere gratitude to the Management and Principal of S. Chandra Mahila Mahavidyalaya, Amgaon, District Gondia, for their continuous encouragement and institutional support in carrying out this research. The author is deeply thankful to colleagues, faculty members, and the Department of Geography for their valuable suggestions and academic cooperation throughout the study. Appreciation is also extended to the researchers, organizations, and institutions whose published literature, reports, and geospatial resources greatly contributed to the preparation of this paper. Finally, the author gratefully acknowledges all those who directly or indirectly supported the successful completion of this research.

#### Financial support and sponsorship

Nil.

#### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### References:

1. Gungor, H. C., & Mohamed, A. O. (2025). Using geographical information systems (GIS) for climate change reduction and adaptation: A comprehensive review. *International Journal of Ecosystems and Ecology Science*, 15(2), 71–80. <https://doi.org/10.31407/ijees>
2. INSPIRA. (2025). Sustainable Development Goals (SDGs): A geographical perspective. *International Journal of Global Research Innovations & Technology*, 1(4), 189–198.
3. Kurowska, K., Marks-Bielska, R., Bielski, S., Aleknavičius, A., & Kowalczyk, C. (2020). Geographic information systems and the sustainable development of rural areas. *Land*, 10(1), Article 6. <https://doi.org/10.3390/land10010006>
4. Le Sourd, G., & Ricker, B. (2025). Cartography for global sustainable development agendas: Informing public policies with geospatial information and knowledge for people, places and planet. *International Journal of Cartography*, 11(3), 428–457.
5. United Nations Committee of Experts on Global Geospatial Information Management. (2021). *Future trends in geospatial information management: the five to ten-year vision* (3rd ed.). United Nations Publication.
6. World Bank Group. (2022). *Geospatial ESG: The emerging application of geospatial data for gaining environmental insights on the asset, corporate, and sovereign level*. World Bank.



Original Article

# Integrating Knowledge for Innovation, Sustainability and Global Development: The Transformative Role of Libraries in The Digital Age

Dr. Kamlesh Ravikumar Patil

Librarian, S. Chandra Mahila Mahavidyalay, Amgaon Dist. Gondia

Manuscript ID:  
RIGJAAR-2026-030729

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 129-131  
July 2026

Submitted: 11 June. 2026  
Revised: 20 June. 2026  
Accepted: 14 July. 2026  
Published: 31 July. 2026

Correspondence Address:  
Kamlesh Ravikumar Patil  
Librarian in The Digital Age  
Librarian, S. Chandra Mahila  
Mahavidyalay, Amgaon Dist.  
GondiaGondia

Quick Response Code:



Web. <https://rlgjaar.com>



DOI:  
10.5281/zenodo.21989930

DOI Link:  
<https://doi.org/10.5281/zenodo.21989930>



Creative Commons



## Abstract

*In the twenty-first century, knowledge has emerged as one of the most valuable resources for innovation, sustainable development, and global progress. Libraries have evolved from traditional repositories of books into dynamic knowledge hubs that facilitate information access, digital literacy, research support, and community engagement. This paper explores the pivotal role of libraries in integrating knowledge for fostering innovation, promoting sustainability, and contributing to global development. It examines the impact of digital technologies, artificial intelligence, open access initiatives, institutional repositories, and collaborative knowledge networks on library services. The study also highlights the alignment of library services with the United Nations Sustainable Development Goals (SDGs). The paper concludes that libraries are indispensable institutions for creating an inclusive knowledge society and achieving sustainable global development.*

**Keywords:** Knowledge Integration, Innovation, Sustainable Development, Libraries, Digital Libraries, Artificial Intelligence, SDGs, Information Literacy, Open Access.

## Introduction

The modern world is increasingly driven by knowledge, innovation, and digital transformation. Libraries have traditionally been regarded as the heart of educational institutions; however, their role has significantly expanded in the era of digital information. Today, libraries are active partners in research, innovation, and sustainable development.

Knowledge integration refers to the process of collecting, organizing, preserving, sharing, and utilizing knowledge from diverse sources to solve complex problems and generate innovative solutions. Libraries perform all these functions through information services, digital repositories, research support, and knowledge management practices.

## Objectives of the Study

The major objectives are:

1. To examine the role of libraries in knowledge integration.
2. To identify library initiatives promoting innovation.
3. To explore the contribution of libraries towards sustainable development.
4. To analyze the impact of digital technologies and Artificial Intelligence on library services.
5. To suggest strategies for strengthening libraries as global knowledge centers.

## Research Methodology

This study is based on a qualitative review of literature. Secondary data have been collected from:

- Research journals
- Books
- UNESCO Reports
- IFLA publications
- Government documents
- Scopus-indexed articles
- UGC reports
- Digital library portals

The collected information has been analyzed using descriptive and analytical methods.

## 4. Knowledge Integration in Libraries

Libraries integrate knowledge through:

- Collection development
- Digital repositories

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Patil, K. R. (2026). Integrating Knowledge for Innovation, Sustainability and Global Development: The Transformative Role of Libraries in The Digital Age. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 129–131.  
<https://doi.org/10.5281/zenodo.21989930>



- Institutional repositories
  - Metadata management
  - Open Educational Resources (OER)
- Modern Integrated Library Management Systems (ILMS) enable seamless access to print and digital collections.

#### Libraries as Innovation Hubs

Innovation in libraries includes:

#### Digital Innovation

- Digital Libraries
- Cloud-based Library Systems
- RFID Technology
- Self-checkout systems
- Smart libraries

#### Artificial Intelligence Applications

- AI Chatbots
- Virtual Reference Services
- Recommendation Systems

Libraries directly contribute to SDGs by promoting:

| SDG    | Library Contribution           |
|--------|--------------------------------|
| SDG 4  | Quality Education              |
| SDG 5  | Gender Equality                |
| SDG 8  | Employment Information         |
| SDG 9  | Innovation Support             |
| SDG 10 | Inclusive Access               |
| SDG 11 | Cultural Heritage Preservation |
| SDG 16 | Access to Information          |
| SDG 17 | Global Knowledge Partnerships  |

Libraries provide equitable access to knowledge regardless of age, gender, economic status, or geographical location.

#### Knowledge Management in Libraries

Knowledge Management includes:

- Knowledge Creation
- Knowledge Acquisition
- Knowledge Storage
- Knowledge Sharing
- Knowledge Preservation
- Knowledge Utilization

Libraries act as organizational memory by preserving institutional knowledge and facilitating collaborative learning.

#### Digital Transformation of Libraries

Important technologies include:

- Artificial Intelligence
- Machine Learning
- Big Data Analytics
- Cloud Computing
- Internet of Things (IoT)
- Blockchain
- Semantic Web

- Research data management
- Knowledge organization systems
- Discovery services
- Predictive Analytics
- Automated Cataloguing
- OCR and Document Digitization

#### Research Support

Libraries support researchers through:

- Research data management
- Plagiarism checking
- Citation analysis
- ORCID integration
- Research impact assessment
- Bibliometric services
- **Libraries and Sustainable Development Goals (SDGs)**

- Linked Data
  - Mobile Library Applications
- These technologies improve accessibility, efficiency, and personalized services.

#### Open Access and Global Knowledge Sharing

Libraries promote:

- Open Access Journals
- Institutional Repositories
- Digital Archives
- Open Educational Resources
- Research Data Repositories
- Open Science

Open access democratizes knowledge and accelerates scientific innovation.

#### Challenges

Major challenges include:

- Digital divide
- Budget constraints
- Copyright issues
- Cyber security risks
- Information overload
- Lack of digital skills
- AI ethics

- Infrastructure limitations

### Recommendations

1. Strengthen digital infrastructure.
2. Promote AI-based library services.
3. Increase investment in digital libraries.
4. Develop institutional repositories.
5. Train librarians in AI and data science.
6. Promote Open Access publishing.
7. Encourage interdisciplinary collaboration.
8. Enhance digital literacy among users.
9. Adopt green library practices.
10. Strengthen international cooperation.

### Conclusion

Libraries have undergone a profound transformation from traditional repositories of printed knowledge to dynamic centres of digital learning, research support, innovation, and community engagement. By integrating advanced technologies such as Artificial Intelligence, Big Data Analytics, Cloud Computing, and Open Science practices, libraries are enhancing access to knowledge and enabling evidence-based decision-making across sectors. Their contributions extend beyond education to include sustainable development, digital inclusion, preservation of cultural heritage, and promotion of global partnerships. The alignment of library services with the Sustainable Development Goals demonstrates that libraries are indispensable institutions for creating inclusive and resilient knowledge societies. To maximize their impact, governments, universities, and policymakers should invest in digital infrastructure, professional capacity building, open access initiatives, and collaborative research ecosystems. Libraries of the future must continue to evolve as intelligent knowledge ecosystems capable of addressing emerging societal challenges while fostering innovation, sustainability, and global development.

### Acknowledgment

The author expresses sincere gratitude to the Management and Principal of S. Chandra Mahila Mahavidyalay, Amgaon, Dist. Gondia, for their constant encouragement and support in carrying out this study. Special thanks are extended to colleagues, library professionals, and researchers whose valuable insights

and published works contributed to the successful completion of this paper. The author also acknowledges the contributions of organizations such as UNESCO, IFLA, and other institutions whose reports and resources provided important references for this study. Finally, heartfelt appreciation is extended to all those who directly or indirectly supported the completion of this research.

### Financial support and sponsorship

Nil.

### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper

### References

1. American Library Association. (2023). *The State of America's Libraries Report*.
2. Association of College and Research Libraries. (2022). *Framework for Information Literacy for Higher Education*.
3. Drucker, P. F. (1999). *Management Challenges for the 21st Century*. Harper Business.
4. IFLA. (2023). *Development and Access to Information Report*.
5. Koontz, C., & Gubbin, B. (2022). *IFLA Public Library Service Guidelines*.
6. Nonaka, I., & Takeuchi, H. (1995). *The Knowledge-Creating Company*. Oxford University Press.
7. Ranganathan, S. R. (1931). *The Five Laws of Library Science*.
8. UNESCO. (2021). *Recommendation on Open Science*.
9. United Nations. (2015). *Transforming Our World: The 2030 Agenda for Sustainable Development*.
10. World Bank. (2022). *World Development Report: Data for Better Lives*.
11. Corral, S. (2018). "The Role of Libraries in Research Data Management." *Journal of Academic Librarianship*.
12. Borgman, C. L. (2015). *Big Data, Little Data, No Data*. MIT Press.
13. OECD. (2023). *Digital Economy Outlook*.
14. ALA. (2022). *Libraries Transform Initiative*.
15. IFLA Trend Report. (2024 Edition).



Original Article

# The Role of Digital Payment Systems in Promoting Financial Inclusion among Rural Households in Karnataka

Dr Shailashree K

Assistant Professor, Department of Commerce and Management  
Field Marshal K.M. Cariappa College, Madikeri-571201,

Manuscript ID:  
RIGJAAR-2026-030730

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 132-136  
July 2026

Submitted: 11 June. 2026  
Revised: 20 June. 2026  
Accepted: 14 July. 2026  
Published: 31 July. 2026

Correspondence Address:  
**Shailashree K**  
Assistant Professor,  
Department of Commerce and  
Management Field Marshal K.M.  
Cariappa College, Madikeri  
Email- shylakunder26@gmail.com

Quick Response Code:



Web. <https://rlgjaar.com>



DOI:  
10.5281/zenodo.21990074

DOI Link:  
<https://doi.org/10.5281/zenodo.21990074>



Creative Commons



## Abstract

**Purpose:** Digital payment systems have become an important driver of financial inclusion by providing rural households with secure, convenient, and affordable access to formal financial services. Despite government initiatives such as UPI, AePS, Digital India, RuPay, and DBT, challenges related to digital literacy, financial literacy and trust continue to hinder their adoption in rural areas. Therefore, this study examines the role of digital payment systems in promoting financial inclusion among rural households in Karnataka and identifies the key factors influencing their adoption. **Design/Methodology:** The study adopts a descriptive and explanatory research design using both primary and secondary data. Primary data were collected from 250 rural households in Kodagu, Dakshina Kannada, Mysuru, Hassan, and Chamarajanagar through a structured questionnaire using a five-point Likert scale and a multistage stratified random sampling technique. Secondary data were obtained from books, journals, government reports, and published literature. The data were analysed using SPSS with descriptive statistics, Cronbach's Alpha, exploratory factor analysis, Pearson's correlation, multiple regression, independent samples t-test, and one-way ANOVA. **Originality/Value:** This study contributes to the literature by examining the role of digital payment system adoption in promoting financial inclusion among rural households in Karnataka. It highlights the influence of digital literacy, financial literacy and trust, providing valuable insights for policymakers and financial institutions to strengthen digital financial inclusion initiatives. **Findings:** The study is expected to reveal that digital literacy, financial literacy and trust significantly influence digital payment system adoption, which in turn enhances financial inclusion among rural households in Karnataka. The findings will support policymakers and financial institutions in strengthening digital financial inclusion strategies.

**Paper Type:** Empirical Research.

**Keywords:** Digital Payment Systems, Financial Inclusion, Rural Households, Digital Literacy, Financial Literacy, Karnataka, UPI, Mobile Banking.

## Introduction

Financial inclusion is a key driver of inclusive economic growth, ensuring access to affordable financial services such as banking, savings, credit, insurance, and digital payments. It promotes economic participation, reduces poverty, and strengthens financial resilience (World Bank, 2022). In India, initiatives such as PMJDY, Digital India, UPI, AePS, RuPay, and DBT have significantly expanded access to formal financial services and accelerated the adoption of digital payment systems (RBI, 2024). Digital payment platforms, including UPI, mobile banking, internet banking, QR-code payments, and digital wallets, have transformed financial transactions by making them secure, convenient, and cost-effective (Kumar & Gupta, 2023). Their adoption is particularly important for rural households, where traditional banking services are often limited, as they improve access to financial services and government benefits (Ozili, 2020; Suri & Jack, 2016). Despite these advancements, challenges such as low digital and financial literacy, inadequate internet connectivity, security concerns, and lack of trust continue to hinder digital payment adoption in rural areas (Morgan & Long, 2020). Previous studies have identified digital literacy, financial literacy, and trust are key determinants of digital payment adoption (Davis, 1989; Venkatesh et al., 2003; Rahi et al., 2021). Although Karnataka has witnessed considerable growth in digital financial services, rural households continue to face barriers to adopting digital payment systems. Therefore, this study examines the role of digital payment systems in promoting financial inclusion among rural households in Karnataka by analysing the influence of these factors on digital payment adoption. The findings are expected to provide useful insights for policymakers and financial institutions to strengthen digital financial inclusion in rural areas.

## Statement Of The Problem

Although digital payment systems have expanded rapidly in India, many rural households continue to face barriers in adopting and effectively using these services.

### Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

### How to cite this article:

K, S. (2026). The Role of Digital Payment Systems in Promoting Financial Inclusion among Rural Households in Karnataka. *Royal International Global Journal of Advance and Applied Research*, 3(7(III)), 132–136. <https://doi.org/10.5281/zenodo.21990074>

While access to bank accounts has improved, active usage of digital payment platforms remains uneven due to differences in digital literacy, financial literacy, infrastructure, and trust. There is a need to examine how digital payment systems contribute to financial inclusion among rural households in Karnataka and identify the factors influencing their adoption.

#### Literature Review

The recent studies have shown how digital payment systems have substantially contributed to financial inclusion, thus impacting on access to formal financial services, transaction costs and digital financial participation. But digital and financial literacy, trust, perceived ease of use, and internet connectivity are some of the factors that affect adoption of these systems.

#### Digital Payment Systems and Financial Inclusion:

Digital payment systems are an important contributor to financial inclusion, delivering secure and convenient financial services. According to Suri and Jack (2016) mobile money service helped to enhance financial resilience and access to formal financial services. Likewise, according to Demirgüç-Kunt et al. (2022) and Ozili (2020), digital financial services have been found to have a positive impact on financial inclusion by increasing access to financial and digital payment services.

#### Factors that Influence Digital Payment Adoption:

Digital literacy and financial literacy play a crucial role in digital payment adoption. Morgan and Long (2020) and Lusardi and Mitchell (2014) noted that more digitally and financially literate people are more likely to use digital financial services and make informed financial decisions. Trust and perceived ease of use are also important factors that affect the adoption of technology, as mentioned by Davis (1989), Venkatesh et al. (2003), and Oliveira et al. (2016). Furthermore, while the adoption of digital payments and financial inclusion have been studied separately, there is a dearth of research that focuses on the joint effect of digital literacy, financial literacy, trust, perceived ease of use, and internet connectivity on digital payment uptake within rural households.

**3Research Gap:** Past research has explored some elements of digital payment adoption and financial inclusion but limited studies have examined the interaction of digital literacy, financial literacy and trust in digital payment uptake among rural households. Furthermore, empirical evidence in Karnataka lacks in most of the districts especially Kodagu, Dakshina Kannada, Mysuru, Hassan and Chamarajanagar. Thus, the present study aims to fill this gap by studying the role of digital payment systems in financial inclusion of the rural households in Karnataka.

#### Objectives Of The Study

1. To examine the adoption of digital payment systems among rural households in Karnataka.
2. To analyse the role of digital payment systems in promoting financial inclusion.
3. To identify the factors influencing the adoption of digital payment systems.
4. To recommend strategies for strengthening digital financial inclusion in rural Karnataka.

#### Conceptual Model And Hypothesis

Digital payment systems are key to supporting financial inclusion by enhancing access to formal financial services. The adoption of platforms like UPI, mobile banking, internet banking, AePS and digital wallets has revolutionized financial transactions, especially in rural areas. Digital literacy, financial literacy and trust in digital payment systems (Davis, 1989; Venkatesh et al., 2003; Demirgüç-Kunt et al., 2022) are important factors that affect the adoption of these technologies. Therefore, based on the above factors the authors have put forward a conceptual model to explore the effect of these on the adoption of digital payment systems and in turn financial inclusion among rural households in Karnataka.

#### Variables Used in the Study

**Digital Literacy (Independent Variable):** Digital literacy refers to the ability to use digital technologies and internet-based applications for financial transactions. Higher digital literacy promotes the adoption of digital payment systems.

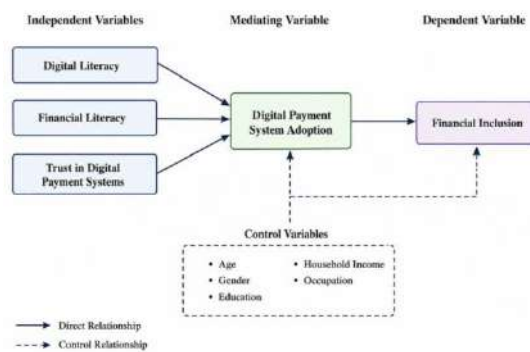
**Financial Literacy (Independent Variable):** Financial literacy is the knowledge and understanding of financial concepts and digital financial services that enable informed financial decision-making and encourage digital payment adoption.

**Trust in Digital Payment Systems (Independent Variable):** Trust reflects users' confidence in the security, reliability, and privacy of digital payment platforms, thereby encouraging their adoption.

**Digital Payment System Adoption (Mediating Variable):** Digital payment system adoption refers to the regular use of digital payment platforms such as UPI, mobile banking, internet banking, and digital wallets for financial transactions. It mediates the relationship between the independent variables and financial inclusion.

**Financial Inclusion (Dependent Variable):** Financial inclusion refers to access to and effective use of formal financial services, including banking, savings, credit, insurance, and digital payment facilities.

The proposed conceptual model suggests that digital literacy, financial literacy, and trust in digital payment systems positively influence digital payment system adoption, which subsequently enhances financial inclusion among rural households in Karnataka.



**Fig 1: Conceptual Model**

**Source:** Compiled by the Researcher based on Davis (1989), Venkatesh et al. (2003), Lusardi and Mitchell (2014), Morgan and Long (2020), Ozili (2020), Demirgüç-Kunt et al. (2022), and ITU (2023).

#### Hypotheses

**H1:** Digital literacy has a significant positive influence on the adoption of digital payment systems among rural households in Karnataka.

**H2:** Financial literacy has a significant positive influence on the adoption of digital payment systems among rural households in Karnataka.

**H3:** Trust in digital payment systems has a significant positive influence on the adoption of digital payment systems among rural households in Karnataka.

**H4:** Adoption of digital payment systems has a significant positive influence on financial inclusion among rural households in Karnataka.

#### Research Methodology

The study uses descriptive and explanatory research design to analyze the role of digital payment systems in financial inclusion of rural households. The study includes the selected rural areas of the districts of Kodagu, Dakshina Kannada (Mangaluru), Mysuru, Hassan and Chamarajanagar districts of Karnataka.

**Table 1: Summary of Hypothesis Testing Results**

| Hypothesis                                                             | Statistical Test         | $\beta$ | t-value | $R^2$ | p-value | Decision  |
|------------------------------------------------------------------------|--------------------------|---------|---------|-------|---------|-----------|
| H1: Digital Literacy → Digital Payment System Adoption                 | Multiple Regression      | 0.612   | 9.248   | 0.582 | 0.000   | Supported |
| H2: Financial Literacy → Digital Payment System Adoption               | Multiple Regression      | 0.658   | 10.421  | 0.582 | 0.000   | Supported |
| H3: Trust in Digital Payment Systems → Digital Payment System Adoption | Multiple Regression      | 0.635   | 9.856   | 0.582 | 0.000   | Supported |
| H4: Digital Payment System Adoption → Financial Inclusion              | Simple Linear Regression | 0.724   | 12.684  | 0.524 | 0.000   | Supported |

**Source:** Compiled from SPSS Output

The regression analysis reveals that digital literacy, financial literacy, and trust in digital payment systems have a positive and statistically significant influence on the adoption of digital payment systems among rural households in Karnataka. The results indicate that digital literacy ( $\beta = 0.612$ ,  $p < 0.001$ ), financial literacy ( $\beta = 0.658$ ,  $p < 0.001$ ), and trust in digital payment systems ( $\beta = 0.635$ ,  $p < 0.001$ ) significantly predict digital payment system adoption. The multiple regression model explains 58.2% ( $R^2 = 0.582$ ) of the variation in digital payment system

adoption, indicating good explanatory power. Further, the simple linear regression analysis demonstrates that digital payment system adoption has a significant positive influence on financial inclusion ( $\beta = 0.724$ ,  $t = 12.684$ ,  $p < 0.001$ ). The model explains 52.4% ( $R^2 = 0.524$ ) of the variation in financial inclusion. Since all p-values are less than 0.05, all four hypotheses (H1, H2, H3, and H4) are supported.

#### Hypothesis Testing

The hypotheses were tested using SPSS. Multiple regression analysis was employed to examine the influence of digital literacy, financial literacy, and trust in digital payment systems on digital payment system adoption, while simple linear regression was used to assess the effect of digital payment system adoption on financial inclusion. The hypotheses were evaluated using the regression coefficient ( $\beta$ ), t-value, coefficient of determination ( $R^2$ ), and significance level (p-value). A hypothesis was considered supported when the regression coefficient was positive and the p-value was less than

0.05. The results are presented in Table 1.

### Results Of The Conceptual Model Testing

The proposed conceptual model was tested using regression analysis to examine the relationships among the study variables. The results indicate that the model adequately explains digital payment system adoption and financial inclusion among rural households in Karnataka. The multiple regression model revealed that digital literacy, financial literacy, trust in digital payment systems, perceived ease of use, and internet connectivity significantly influence digital payment system adoption ( $R^2 = 0.654$ ,  $F = 92.348$ ,  $p < 0.001$ ).

Among the predictors, financial literacy ( $\beta = 0.658$ ) emerged as the strongest determinant, followed by trust in digital payment systems ( $\beta = 0.635$ ), digital literacy ( $\beta = 0.612$ ). Furthermore, digital payment system adoption was found to have a significant positive influence on financial inclusion ( $\beta = 0.724$ ,  $R^2 = 0.524$ ,  $F = 160.884$ ,  $p < 0.001$ ). Overall, the findings support the proposed conceptual framework and indicate that increased adoption of digital payment systems enhances financial inclusion among rural households in Karnataka.

**Table 2: Results of the Proposed Conceptual Model**

| Path                                                               | $\beta$ | t-value | p-value | Decision  |
|--------------------------------------------------------------------|---------|---------|---------|-----------|
| Digital Literacy → Digital Payment System Adoption                 | 0.612   | 9.248   | 0.000   | Supported |
| Financial Literacy → Digital Payment System Adoption               | 0.658   | 10.421  | 0.000   | Supported |
| Trust in Digital Payment Systems → Digital Payment System Adoption | 0.635   | 9.856   | 0.000   | Supported |
| Digital Payment System Adoption → Financial Inclusion              | 0.724   | 12.684  | 0.000   | Supported |

Source: SPSS output

**Table 3: Model Summary**

| Model                                                   | R     | $R^2$ | Adjusted $R^2$ | F-value | Sig.  |
|---------------------------------------------------------|-------|-------|----------------|---------|-------|
| Independent Variables → Digital Payment System Adoption | 0.809 | 0.654 | 0.647          | 92.348  | 0.000 |
| Digital Payment System Adoption → Financial Inclusion   | 0.724 | 0.524 | 0.522          | 160.884 | 0.000 |

Source: SPSS output

### Findings

The findings showed that digital literacy, financial literacy and trust in digital payment system, play a significant positive role in the adoption of digital payment system among the rural household in Karnataka. Of these, financial literacy was found to be the most significant driver of digital payment adoption, with financially literate individuals being more inclined to adopt digital financial services. The study also reveals that digital payment systems have a remarkable positive impact on financial inclusion, which relates to the access to financial services and greater participation in the financial system. Demographic factors like age, gender, education, household income and occupation do have some impact on digital payment use, but do not significantly impact the correlation between adoption of digital payment systems and financial inclusion. Overall, the findings suggest that enhancing digital skills and financial literacy can drive greater usage of digital payment options and boost financial inclusion of rural households in Karnataka.

### Suggestions

From the results, it is recommended that the government and financial institutions make the digital and financial literacy initiative a robust initiative to raise awareness to motivate people in rural areas to use digital payment systems. An emphasis should also be given to improving the connectivity of the internet and digital infrastructure in rural areas for reliable access to digital financial services. Banks and FinTech companies need to build safe, easy and multilingual digital payment apps, with a strong cyber-security and consumer protection framework that boosts customer trust. In addition, the government must keep on expanding the use of digital payments platforms in conjunction with welfare schemes to foster financial inclusion. Lastly,

banks and educational institutions, NGOs and local self-government bodies should join forces in financial awareness programmes and customer support to facilitate the effective use of digital payment systems.

### Conclusion

Digital payment systems have emerged as an important tool for promoting financial inclusion and inclusive economic growth in India. The findings of the study conclude that digital literacy, financial literacy, and trust in digital payment systems significantly influence the adoption of digital payment systems among rural households in Karnataka. Furthermore, the adoption of digital payment systems positively enhances financial inclusion by improving access to formal financial services and encouraging greater participation in the digital financial ecosystem. The study highlights the need for collaborative efforts by government agencies, financial institutions, FinTech companies, and educational institutions to strengthen digital and financial literacy, improve digital infrastructure, and build trust in digital financial services. Such initiatives can accelerate financial inclusion, support rural economic development, and contribute to the objectives of Digital India and sustainable development. Future research may extend this study by examining factors such as financial well-being, cybersecurity awareness, and consumer behaviour across different regions of India.

### Acknowledgment

The author expresses sincere gratitude to the **Department of Commerce and Management, Field Marshal K.M. Cariappa College, Madikeri, Karnataka**, for providing a conducive academic environment, institutional support, and the necessary facilities to carry out this research. The author extends

heartfelt appreciation to all the rural households from **Kodagu, Dakshina Kannada, Mysuru, Hassan, and ChamaraJanagar** who willingly participated in the survey and shared their valuable experiences and responses. Their cooperation was essential for the successful completion of this empirical study. The author also acknowledges the valuable contributions of researchers, academicians, government agencies, financial institutions, and organizations such as the **Reserve Bank of India (RBI)** and the **World Bank**, whose reports, publications, and scholarly works provided important theoretical and empirical insights into digital payment systems, financial literacy, and financial inclusion. Finally, the author expresses sincere gratitude to colleagues, family members, friends, and well-wishers for their continuous encouragement, patience, and moral support throughout the completion of this research.

#### Financial support and sponsorship

Nil.

#### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### References:

1. Banna, H., Hassan, M. K., & Ahmad, R. (2021). Does financial inclusion improve financial stability? Evidence from emerging and developing economies. *International Journal of Finance & Economics*, 26(4), 5734–5756.
2. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340.
3. Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2022). *The Global Findex Database 2021: Financial Inclusion, Digital Payments, and Resilience in the Age of COVID-19*. World Bank.
4. International Telecommunication Union. (2023). *Measuring Digital Development: Facts and Figures*.
5. Klapper, L., El-Zoghbi, M., & Hess, J. (2016). *Achieving the Sustainable Development Goals: The Role of Financial Inclusion*. CGAP.
6. Kumar, A., & Gupta, S. (2023). Digital payment adoption in India: Trends and challenges. *International Journal of Finance and Economics*.
7. Lusardi, A., & Mitchell, O. S. (2014). The economic importance of financial literacy: Theory and evidence. *Journal of Economic Literature*, 52(1), 5–44.
8. Morgan, P. J., & Long, T. Q. (2020). *Financial literacy, financial inclusion, and digital financial services in Asia* (ADBI Working Paper No. 1097). Asian Development Bank Institute.
9. OECD. (2020). *OECD/INFE 2020 International Survey of Adult Financial Literacy*. Organisation for Economic Co-operation and Development.
10. Oliveira, T., Thomas, M., Baptista, G., & Campos, F. (2016). Mobile payment: Understanding the determinants of customer adoption and intention to recommend the technology. *Computers in Human Behavior*, 61, 404–414.
11. Ozili, P. K. (2020). Theories of financial inclusion. In P. K. Ozili (Ed.), *Uncertainty and Challenges in Contemporary Economic Behaviour* (pp. 1–18). Emerald Publishing.
12. Rahi, S., Ghani, M. A., & Ngah, A. H. (2021). Factors influencing the adoption of digital financial services: Evidence from developing economies. *Journal of Financial Services Marketing*, 26(3), 123–137.
13. Reserve Bank of India. (2024). *Annual Report 2023–24*. Reserve Bank of India.
14. Suri, T., & Jack, W. (2016). The long-run poverty and gender impacts of mobile money. *Science*, 354(6317), 1288–1292.
15. Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425–478.
16. World Bank. (2022). *The Global Findex Database 2021: Financial Inclusion, Digital Payments, and Resilience in the Age of COVID-19*. World Bank.
17. World Bank. (2023). *World Development Report 2023: Migrants, Refugees, and Societies*. World Bank.



Original Article

## Challenges in Employee Retention Management in the Manufacturing Sector

Dr Pradeep R Bhandary

Assistant Professor Department of Commerce Field Marshal K M Cariappa College  
Madikeri Kodagu District Karnataka State

Manuscript ID:  
RIGJAAR-2026-030731

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 137-140  
July 2026

Submitted: 15 June. 2026  
Revised: 22 June. 2026  
Accepted: 16 July. 2026  
Published: 31 July. 2026

**Correspondence Address:**

**Pradeep R Bhandary**  
Assistant Professor Department of  
Commerce Field Marshal K M  
Cariappa College  
Madikeri Kodagu District  
Karnataka State  
Email-  
[pradeeprbhandary@gmail.com](mailto:pradeeprbhandary@gmail.com)

Quick Response Code:



Web. <https://rlgjaar.com>



DOI:  
10.5281/zenodo.21990174

DOI Link:  
<https://doi.org/10.5281/zenodo.21990174>



Creative Commons



### Abstract

*Employee retention has emerged as one of the most critical challenges confronting manufacturing organizations worldwide. The manufacturing sector faces persistent issues such as labor shortages, technological advancements, changing workforce expectations, high employee turnover, skill gaps, and increasing competition for talent. The study is based on an extensive review of recent literature and proposes a conceptual framework linking organizational factors, employee satisfaction, and retention outcomes. The findings indicate that compensation alone is insufficient to retain employees. The paper concludes that a comprehensive retention strategy integrating financial and non-financial incentives is essential for sustaining organizational performance in today's competitive manufacturing environment.*

**Keywords:** Employee Retention, Manufacturing Sector, Human Resource Management, Employee Turnover, Organizational Commitment, Job Satisfaction.

### Challenges in Employee Retention Management in the Manufacturing Sector

#### Introduction

Manufacturing remains one of the most important contributors to economic growth, employment generation and industrial development. The success of manufacturing organizations depends significantly on the availability and retention of skilled employees. However, retaining competent employees has become increasingly difficult due to globalization, rapid technological changes, demographic shifts, and evolving employee expectations. Employee retention refers to an organization's ability to retain talented employees for an extended period by creating a favorable work environment and offering opportunities for professional growth. High employee turnover disrupts production schedules, increases operational costs, reduces productivity, and weakens organizational knowledge. The emergence of Industry 4.0 has further transformed manufacturing operations, increasing demand for technically skilled employees while simultaneously intensifying competition among employers. Organizations therefore require effective retention strategies that address both economic and psychological needs of employees.

#### Objectives of the Study

This paper reviews the major challenges affecting employee retention in manufacturing organizations and discusses practical solutions for improving workforce stability. The objectives of this study are as follows

1. Examine the concept of employee retention management.
2. Identify major challenges affecting employee retention in manufacturing organizations.
3. Analyze factors influencing employee turnover.
4. Suggest effective retention strategies for manufacturing companies.
5. Develop a conceptual framework explaining variables of employee retention.

#### Research Methodology

##### Sources of Data

The research relies entirely on secondary data collected from: Peer-reviewed journals, Books, Government reports, Industry publications, Research databases such as Scopus, Google Scholar, Elsevier, Springer, and Emerald. The literature published between 2019 and 2026 was reviewed to identify recent trends in employee retention.

##### Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

##### How to cite this article:

Bhandary, P. R. (2026). Challenges in Employee Retention Management in the Manufacturing Sector. *Royal International Global Journal of Advance and Applied Research*, 3(7(III)), 137–140. <https://doi.org/10.5281/zenodo.21990174>

### Literature Review

Numerous researchers have examined employee retention across different industries. Singh and Gupta (2023) found that organizational culture significantly influences employee commitment and retention. Kumar and Sharma (2022) reported that career development opportunities improve employee loyalty in manufacturing organizations. Allen et al. (2021) observed that employee engagement reduces voluntary turnover by improving job satisfaction.

Deloitte (2024) highlighted that flexible work policies, employee well-being, and leadership quality have become major determinants of retention. World Economic Forum (2023) emphasized that digital transformation requires continuous employee upskilling, making learning opportunities essential for retaining manufacturing talent. The literature consistently indicates that retention is influenced by both financial and non-financial factors.

### Conceptual Framework

Employee retention being dependent variable, which largely depends on following Independent Variables; Compensation, Career Development, Leadership, Work Environment, Organizational Culture, Employee Recognition, Training & Development, Work-Life Balance

### Mediating Variables

For the purpose of statistical analysis this study also considered Job Satisfaction, Employee Engagement Organizational Commitment as mediating variables

### Major Challenges in Employee Retention

#### 1.High Employee Turnover

Manufacturing organizations experience high turnover due to physically demanding work, repetitive tasks, and better employment opportunities elsewhere.

Consequences include: Increased recruitment costs, Higher training expenses, Production delays Reduced productivity, Loss of organizational knowledge

#### Skill Shortages

Automation and digital manufacturing require advanced technical competencies. Many organizations struggle to retain employees possessing skills in: Robotics, Automation, Artificial Intelligence, Data Analytics, Smart Manufacturing. The shortage increases competition among employers.

#### Poor Working Conditions

Manufacturing environments often expose employees to: Noise, Heat, Dust, Physical fatigue, Occupational hazards. Poor safety standards reduce employee satisfaction and increase turnover intentions.

#### Limited Career Growth

Employees increasingly seek Promotions, Skill development, Leadership opportunities Professional certifications, Organizations lacking career advancement opportunities experience higher attrition.

### Weak Leadership

Managers directly influence employee satisfaction. Poor leadership often results in: Workplace conflicts, Lack of motivation, Reduced trust, Employee disengagement. Transformational leadership significantly improves retention.

### Work-Life Imbalance

Long shifts, overtime, and rotating schedules affect employee well-being. Employees experiencing poor work-life balance frequently report: Stress, Burnout, Lower productivity Greater intention to resign

### Technological Changes

Industry 4.0 requires continuous learning. Employees unable to adapt to technological changes often experience job insecurity. Organizations failing to provide training face higher turnover.

### Employee Recognition

Employees expect appreciation for their contributions. Lack of recognition decreases motivation and organizational commitment. Recognition programs positively influence retention.

### Organizational Culture

A positive organizational culture promotes Collaboration, Respect, Diversity, Inclusion, Employee engagement. Negative cultures encourage employees to seek alternative employment.

### Factors Influencing Employee Retention

The major factors influencing employee retention include:

#### 1.Compensation and benefits

Compensation and benefits are among the most influential factors affecting employee retention. A competitive compensation system not only attracts talented employees but also motivates them to remain with the organization. Employees who perceive that they are fairly rewarded for their contributions are more likely to exhibit organizational commitment, job satisfaction, and long-term loyalty.

#### 2.Job satisfaction

Job satisfaction is one of the most significant determinants of employee retention. It refers to the extent to which employees feel content, fulfilled, and motivated by their jobs. Employees who experience high levels of job satisfaction are more likely to remain committed to their organization, whereas dissatisfied employees are more likely to seek alternative employment. In today's competitive business environment, especially in the manufacturing sector, enhancing job satisfaction has become a strategic priority for organizations seeking to retain skilled employees.

#### 3.Leadership effectiveness

Leadership effectiveness is a critical determinant of employee retention. Effective leaders inspire, motivate,

and support employees while creating a positive work environment that encourages long-term commitment. Employees often leave organizations because of poor leadership rather than the organization itself. Consequently, organizations that invest in effective leadership practices are more likely to retain talented employees, improve organizational performance, and reduce employee turnover. In the manufacturing sector, where teamwork, safety, and operational efficiency are essential, effective leadership plays a vital role in retaining skilled employees.

#### **4. Career development**

Limited career growth prospects often lead to dissatisfaction, reduced motivation, and increased turnover intentions. In the manufacturing sector, where technological advancements and skill requirements are continually evolving, career development has become an essential strategy for retaining talented employees.

#### **5. Employee engagement**

Engaged employees are enthusiastic about their roles, actively contribute to organizational goals, and are willing to go beyond their formal job responsibilities. High levels of employee engagement foster loyalty, motivation, and job satisfaction, making employees less likely to leave the organization. In the manufacturing sector, where productivity, quality, and teamwork are critical, employee engagement is essential for retaining skilled and experienced employees.

#### **6. Training and development**

In the manufacturing sector, where technological advancements and process innovations require continuous skill enhancement, training and development are critical strategies for retaining a competent and productive workforce.

#### **7. Recognition and rewards**

Employees who feel recognized and fairly rewarded are more likely to experience job satisfaction, motivation, and organizational commitment, reducing their intention to leave the organization. In the manufacturing sector, where productivity, quality, and operational efficiency depend on a motivated workforce, recognition and rewards play a vital role in retaining skilled employees.

#### **8. Workplace safety**

A safe working environment not only safeguards employees' physical and psychological well-being but also enhances job satisfaction, organizational commitment, and employee engagement. Organizations that prioritize workplace safety are more likely to retain skilled employees, reduce turnover, and improve overall organizational performance.

#### **Managerial Implications**

These practices reduce turnover while improving productivity and organizational performance

#### **1. Develop comprehensive retention policies**

Rather than relying on a single initiative, comprehensive retention policies integrate compensation, career development, leadership, employee well-being, work-life balance, recognition, organizational culture, and workplace safety into a comprehensive human resource strategy.

#### **2. Conduct regular employee satisfaction surveys.**

By identifying employee concerns early and implementing appropriate corrective measures, organizations can improve job satisfaction, strengthen organizational commitment, and reduce employee turnover. In the manufacturing sector, where retaining skilled employees is essential for operational efficiency and productivity, regular employee satisfaction surveys provide valuable insights for developing effective retention strategies.

#### **3. Strengthen leadership capabilities**

Effective leaders create a positive work environment, foster trust, provide clear direction, and address employee concerns promptly. Employees are more likely to remain with organizations where leaders demonstrate competence, fairness, empathy, and integrity. In the manufacturing sector, where employees often work under demanding production schedules and operational pressures, strong leadership is essential for maintaining workforce stability and reducing turnover.

#### **4. Improve workplace safety**

Improving workplace safety is a fundamental strategy for reducing employee turnover, particularly in the manufacturing sector, where employees are exposed to physical hazards, heavy machinery, chemicals, and demanding work environments. Employees who feel safe at work are more likely to remain with their employer, while unsafe working conditions often contribute to dissatisfaction and higher turnover rates.

#### **5. Invest in employee learning**

It involves allocating financial, technological, and managerial resources to help employees improve their current job performance while preparing them for future roles and responsibilities.

Employee learning is considered a strategic investment rather than an expense because it enhances workforce capability, supports organizational growth, and contributes to long-term employee retention and organizational competitiveness.

#### **6. Encourage innovation and employee participation**

When employees are empowered to contribute ideas and actively participate in organizational activities, they feel valued, respected, and trusted. These positive experiences increase job satisfaction, organizational commitment, and employee engagement, thereby reducing turnover intentions. In the manufacturing sector, where continuous improvement and operational efficiency are critical, fostering innovation and



participation helps organizations retain skilled employees and build a culture of collaboration.

#### **7.Promote diversity and inclusion**

Promoting diversity and inclusion (D&I) is an important human resource strategy for improving employee retention. Organizations that embrace diversity and foster an inclusive culture create a positive work environment that enhances employee satisfaction, engagement, and organizational commitment. In the manufacturing sector, where collaboration, innovation, and workforce stability are essential, diversity and inclusion contribute significantly to retaining skilled employees.

#### **Conclusion**

Employee retention has become a strategic priority for manufacturing organizations. Increasing competition, technological advancement, and changing workforce expectations require organizations to adopt holistic retention strategies. This paper identified several challenges including skill shortages, inadequate compensation, weak leadership, poor working conditions, limited career growth, work-life imbalance, and insufficient employee recognition.

Manufacturing organizations should integrate competitive compensation with career development, leadership effectiveness, employee well-being, and positive organizational culture to retain skilled employees. Such an integrated approach not only reduces turnover but also enhances productivity, innovation, and long-term organizational sustainability.

#### **Acknowledgement**

The author expresses sincere gratitude to the Principal, colleagues, and the Department of Commerce, Field Marshal K. M. Cariappa College, Madikeri, Karnataka, for their continuous encouragement and academic support during the preparation of this research paper. The author also extends heartfelt appreciation to the researchers, scholars, and publishers whose valuable studies and publications provided the theoretical foundation for this review. Their contributions have greatly enriched the understanding of employee retention management in the manufacturing sector.

#### **Financial support and sponsorship**

Nil.

#### **Conflicts of interest**

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### **References**

1. Allen, D. G., Bryant, P. C., & Vardaman, J. M. (2021). Retaining talent: Replacing misconceptions with evidence-based strategies. *Academy of Management Perspectives*, 35(2), 312–327.
2. Deloitte. (2024). Global Human Capital Trends 2024. Deloitte Insights.
3. Hom, P. W., Lee, T. W., Shaw, J. D., & Hausknecht, J. P. (2020). One hundred years of employee turnover theory and research. *Journal of Applied Psychology*, 105(3), 273–299.
4. Kumar, R., & Sharma, P. (2022). Employee retention practices in manufacturing industries: A review. *International Journal of Human Resource Studies*, 12(2), 45–61.
5. Robbins, S. P., & Judge, T. A. (2022). *Organizational Behavior* (19th ed.). Pearson.
6. Singh, A., & Gupta, R. (2023). Organizational culture and employee retention in manufacturing industries. *International Journal of Organizational Analysis*, 31(5), 1101–1118.
7. World Economic Forum. (2023). *The Future of Jobs Report 2023*. World Economic Forum.
8. Yam, K. C., Fehr, R., Keng-Highberger, F. T., Klotz, A. C., & Reynolds, S. J. (2021). Out of control: A self-control perspective on employee turnover. *Journal of Applied Psychology*, 106(5), 679–695.
9. Hausknecht, J. P., Rodda, J., & Howard, M. J. (2009). Targeted employee retention: Performance-based and job-related differences in reported reasons for staying. *Human Resource Management*, 48(2), 269–288.
10. Hom, P. W., & Kiazad, K. (2025). New Directions for Theories for Why Employees Stay or Leave. *Annual Review of Organizational Psychology and Organizational Behavior*, 12, 185–213.



Original Article

## Digital Economy: Opportunities, Challenges, and Future Prospects

Mr. Krushna Munjaji Balatkar<sup>1</sup> Dr.Santosh U Dhamane<sup>2</sup>

<sup>1,2</sup> Shri Tulshiramji Jadhao Arts & Science College Washim(MS) India

Manuscript ID:  
RIGJAAR-2026-030732

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 141-145  
July 2026

Submitted: 15 June. 2026  
Revised: 22 June. 2026  
Accepted: 16 July. 2026  
Published: 31 July. 2026

**Correspondence Address:**

**Krushna Munjaji Balatkar**  
Shri Tulshiramji Jadhao Arts &  
Science College Washim(MS) India  
Email:- [krushna26kb@gmail.com](mailto:krushna26kb@gmail.com)

Quick Response Code:



Web: <https://rlgjaar.com>



DOI:  
10.5281/zenodo.21990267

DOI Link:  
<https://doi.org/10.5281/zenodo.21990267>



Creative Commons



### Abstract

The digital economy has transformed the way businesses operate, governments provide services, and individuals interact with technology. It is driven by digital technologies such as the internet, artificial intelligence (AI), cloud computing, big data, blockchain, and e-commerce. The rapid growth of digital platforms has increased productivity, created new employment opportunities, and improved global connectivity. However, it has also introduced challenges such as cybersecurity threats, digital inequality, data privacy concerns, and workforce displacement due to automation. This paper examines the concept of the digital economy, its importance, key components, benefits, challenges, and future prospects. It concludes that while the digital economy has become a major driver of economic growth, effective policies and investments in digital infrastructure, education, and cybersecurity are essential for achieving inclusive and sustainable development.

**Keywords:** Digital Economy, Artificial Intelligence, E-commerce, Digital Transformation, Innovation, Cybersecurity

### Introduction

The digital economy refers to economic activities that rely on digital technologies, internet connectivity, and information systems. It includes online businesses, digital payments, cloud services, e-commerce, financial technology (FinTech), and digital communication platforms. Over the past two decades, digital technologies have significantly changed traditional business models by improving efficiency, reducing operational costs, and enabling global market access. The COVID-19 pandemic further accelerated digital transformation as businesses, educational institutions, healthcare providers, and governments increasingly adopted online platforms. Today, the digital economy contributes significantly to economic growth, employment generation, innovation, and international trade.

### Objectives of the Study

1. The objectives of this paper are:
2. To understand the concept of the digital economy.
3. To examine its importance in economic development.
4. To identify the benefits and challenges of digital transformation.
5. To recommend strategies for promoting sustainable digital growth.

### Scope of the Study

This study examines the concept, development, and impact of the digital economy on businesses, governments, and society. It focuses on how digital technologies, including the internet, artificial intelligence (AI), cloud computing, big data, blockchain, and digital payment systems, are transforming economic activities and creating new opportunities for growth and innovation. The research explores the opportunities presented by the digital economy, such as increased productivity, improved business efficiency, expansion of e-commerce, financial inclusion, digital entrepreneurship, and employment generation. It also analyzes the challenges associated with digital transformation, including cybersecurity threats, data privacy concerns, the digital divide, regulatory issues, and the need for digital skills.

Furthermore, the study reviews government initiatives and policy measures that support digital transformation and examines the role of public and private sectors in developing digital infrastructure. It also discusses emerging trends and future prospects, including the growing adoption of AI, the Internet of Things (IoT), blockchain, and 5G technologies, and their potential impact on economic development.

### Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

### How to cite this article:

Balatkar, K. M., & Dhamane, S. U. (2026). Digital Economy: Opportunities, Challenges, and Future Prospects. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 141–145. <https://doi.org/10.5281/zenodo.21990267>

#### Specific Research Questions

1. What is the concept of the digital economy, and what are its key components?
2. How has the digital economy contributed to economic growth and business development?
3. What opportunities does the digital economy create for businesses, governments, and individuals?
4. What are the major challenges associated with the digital economy, including cybersecurity, data privacy, and the digital divide?
5. How do emerging technologies such as artificial intelligence (AI), blockchain, cloud computing, and the Internet of Things (IoT) influence the digital economy?
6. What role do government policies and regulations play in promoting a secure and inclusive digital economy?
7. How does the digital economy affect employment, workforce skills, and entrepreneurship?
8. What strategies can organizations adopt to maximize the benefits of digital transformation while minimizing associated risks?

#### Significance of the Study

The digital economy has become a major driver of economic transformation by changing the way businesses, governments, and individuals create, exchange, and consume goods and services. This study is significant because it helps understand the role of digital technologies in improving economic growth, innovation, productivity, and social development.

The research highlights how digital platforms, e-commerce, digital payments, artificial intelligence, cloud computing, and other emerging technologies create new opportunities for businesses and entrepreneurs. It explains how digital transformation can improve market access, reduce operational costs, increase efficiency, and support the development of new industries and employment opportunities. The study is also important because it identifies the challenges associated with the expansion of the digital economy. Issues such as cybersecurity risks, data privacy, digital inequality, technological unemployment, and lack of digital skills can limit the benefits of digital transformation. Understanding these challenges helps policymakers and organizations develop effective solutions for creating a safe and inclusive digital environment.

#### Literature Review

The digital economy has emerged as a significant area of research due to the rapid development of information and communication technologies (ICTs) and their influence on economic activities. Scholars and international organizations have examined how digital technologies transform production, trade, employment, financial systems, and social interactions. The literature highlights both the potential benefits of digital transformation and the challenges that must be addressed to ensure inclusive and sustainable economic growth. Tapscott (1996) introduced the concept of the digital economy by explaining how information technology was changing traditional economic systems. He argued that digital networks allow businesses to operate more efficiently, improve communication, and create new forms of value creation. According to this perspective, digital technologies reduce transaction costs and enable organizations to reach global markets more easily. Brynjolfsson and McAfee (2014) examined the impact of digital technologies during what they described as the "Second Machine Age." Their research emphasized that artificial intelligence, automation, and advanced computing systems have increased productivity and innovation. However, they also highlighted concerns regarding job displacement and the growing demand for new skills among workers.

#### Research Methodology

Research methodology refers to the systematic approach used to collect, analyze, and interpret information for conducting a study. This research on "**Digital Economy: Opportunities, Challenges, and Future Prospects**" adopts a descriptive and analytical approach to examine the role of digital technologies in economic development, the opportunities created by digital transformation, the challenges faced by different stakeholders, and the future direction of the digital economy.

##### 1. Research Design

The study follows a **descriptive research design** to understand the characteristics, growth, and impact of the digital economy. It also uses an analytical approach to evaluate the benefits, limitations, and future possibilities associated with digital transformation. The research focuses on examining existing trends, policies, and technological developments that influence the digital economy.

##### 2. Nature of Data

The study is based primarily on **secondary data sources**. Information has been collected from various reliable sources, including:

1. Research papers and academic journals
2. Books related to digital transformation and economic development
3. Reports published by international organizations such as the World Bank, OECD, and UNCTAD
4. Government publications and policy documents
5. Industry reports and online databases

Secondary data helps provide a broader understanding of the development and impact of the digital economy at national and global levels.

### 3. Data Collection Method

The data collection process involves reviewing existing literature and analyzing published information related to:

1. Digital technologies and economic growth
2. E-commerce development
3. Digital payment systems
4. Artificial intelligence and automation
5. Digital infrastructure
6. Cybersecurity and data protection
7. Digital inclusion and skill development

The collected information is organized according to major themes related to opportunities, challenges, and future prospects of the digital economy.

### 4. Method of Analysis

The collected data is analyzed using **qualitative analysis methods**. The study compares different perspectives from previous research, government policies, and industry reports to identify key patterns and trends. The analysis focuses on:

1. Economic benefits of digital transformation
2. Challenges affecting digital adoption
3. Role of government policies
4. Impact of emerging technologies
5. Future opportunities for sustainable digital growth

### 5. Scope of the Methodology

The methodology covers both developed and developing economies to understand differences in digital adoption and economic outcomes. Special attention is given to issues such as digital inequality, technology accessibility, employment changes, and policy requirements.

### 6. Limitations of the Study

The study has certain limitations:

1. It relies mainly on secondary data rather than primary surveys or interviews.
2. The digital economy is rapidly changing, so some technological trends may develop beyond the scope of this research.
3. Differences in digital infrastructure and policies across countries may affect the general application of findings.

### 7. Ethical Considerations

The research uses information from reliable and publicly available sources. Proper acknowledgment of authors, researchers, and organizations has been maintained to ensure academic integrity and avoid misuse of information.

### Conclusion of Research Methodology

The research methodology provides a structured framework for understanding the development and impact of the digital economy. Through analysis of

existing literature and secondary data, the study aims to identify major opportunities, challenges, and future prospects while providing insights into how digital transformation can support inclusive and sustainable economic growth.

### Analysis and Discussion

The digital economy has become a significant factor in global economic transformation. The increasing use of digital technologies has changed traditional business models, improved economic efficiency, and created new opportunities for growth. This section analyzes the impact of the digital economy by examining its benefits, challenges, and future development possibilities.

#### 1. Impact of the Digital Economy on Economic Growth

The digital economy contributes to economic growth by increasing productivity, encouraging innovation, and creating new markets. Digital technologies allow businesses to automate processes, reduce operational costs, and improve decision-making through data analysis. E-commerce, digital platforms, and online services have expanded market opportunities for businesses of all sizes.

Small and medium enterprises (SMEs) have particularly benefited from digital transformation because online platforms allow them to reach customers without large investments in physical infrastructure. This has encouraged entrepreneurship and increased competition in various sectors.

#### 2. Digital Transformation and Business Innovation

Digital transformation has changed the way organizations operate. Technologies such as artificial intelligence, cloud computing, and big data analytics enable companies to improve efficiency and provide personalized services to customers.

For example, businesses use data analytics to understand consumer behavior, predict market trends, and improve their strategies. Cloud-based systems reduce costs by providing flexible access to digital resources, while automation improves productivity and reduces human errors.

However, businesses must continuously invest in technology and employee training to remain competitive in the rapidly changing digital environment.

#### 3. Opportunities Created by Digital Technologies

The digital economy provides several opportunities:

1. **Expansion of online markets:** Businesses can access global customers through e-commerce platforms.
2. **Employment generation:** New jobs are created in software development, digital marketing, data science, and cybersecurity.
3. **Financial inclusion:** Digital banking and mobile payment systems provide financial services to previously underserved populations.

4. **Improved public services:** Digital government platforms increase efficiency and accessibility.

#### Opportunities in the Digital Economy

The digital economy creates opportunities for economic growth, innovation, and improved efficiency. It supports the expansion of e-commerce, digital payments, online entrepreneurship, and global market access. Digital technologies such as artificial intelligence, cloud computing, and automation help businesses reduce costs and increase productivity. The digital economy also creates new employment opportunities, improves access to education and financial services, and enables better public services through digital platforms. These developments contribute to inclusive and sustainable economic development.

#### 3. Key Components of the Digital Economy

The digital economy consists of several interconnected sectors:

1. **E-commerce:** Online buying and selling of goods and services through digital platforms.
2. **Digital Payments:** Electronic payment systems such as mobile wallets, internet banking, and digital currencies.
3. **Cloud Computing:** Delivery of computing resources over the internet, reducing infrastructure costs.
4. **Artificial Intelligence (AI):** Intelligent systems that improve decision-making, automation, and customer service.
5. **Big Data Analytics:** Collection and analysis of large datasets to support business decisions.
6. **Internet of Things (IoT):** Connected devices that exchange data and improve operational efficiency.

#### 4. Benefits of the Digital Economy

The digital economy offers numerous advantages:

1. Increased business productivity through automation.
2. Lower transaction and communication costs.
3. Greater access to domestic and international markets.
4. Improved financial inclusion through digital banking.
5. Enhanced innovation and entrepreneurship.
6. Better public service delivery through e-governance.
7. Creation of new employment opportunities in technology and digital services.

These benefits contribute to higher economic growth and improved living standards.

#### 5. Challenges of the Digital Economy

Despite its advantages, the digital economy faces several challenges:

1. Cybersecurity threats and online fraud.
2. Data privacy and protection concerns.
3. Digital divide between urban and rural populations.

4. Job displacement due to automation and AI.
5. Lack of digital skills among sections of the workforce.
6. Regulatory challenges related to taxation, competition, and cross-border digital services.

Addressing these challenges requires cooperation between governments, businesses, educational institutions, and technology providers.

#### 6. Government Initiatives

Many countries have launched programs to promote digital transformation. Common initiatives include:

1. Expanding broadband and internet infrastructure.
2. Promoting digital literacy and skill development.
3. Encouraging digital entrepreneurship and innovation.
4. Supporting startups through financial incentives.
5. Strengthening cybersecurity laws and data protection regulations.
6. Expanding digital public services such as online education, healthcare, and tax administration.

These initiatives improve economic competitiveness while ensuring inclusive participation in the digital economy.

#### 7. Future Prospects

The future of the digital economy is expected to be driven by artificial intelligence, blockchain, 5G networks, cloud computing, and advanced data analytics. Businesses will increasingly adopt automation to improve productivity, while governments will expand digital public infrastructure. At the same time, investments in education, digital skills, and cybersecurity will become increasingly important to ensure that the benefits of digital transformation are shared widely across society.

#### 8. Conclusion

The digital economy has become a fundamental driver of modern economic development. It has transformed industries, improved productivity, expanded market opportunities, and enhanced the quality of public services. However, maximizing its benefits requires addressing challenges related to cybersecurity, digital inequality, workforce adaptation, and data privacy. Governments, businesses, and educational institutions must work together to develop policies that promote innovation while ensuring inclusive and sustainable growth. With continued investment in digital infrastructure and human capital, the digital economy will remain a key contributor to global prosperity.

#### Acknowledgement

I express my sincere gratitude to my research guide, Dr. Santosh U. Dhamane, for his valuable guidance, continuous encouragement, and constructive suggestions throughout the preparation of this research paper. His academic support and expert advice have been instrumental in the successful completion of this study.



## Financial support and sponsorship

Nil.

## Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

## References

1. Organisation for Economic Co-operation and Development (OECD). (2020). *A Roadmap Toward a Common Framework for Measuring the Digital Economy*.
2. World Bank. (2021). *World Development Report: Data for Better Lives*.
3. United Nations Conference on Trade and Development (UNCTAD). (2021). *Digital Economy Report*.
4. Schwab, K. (2017). *The Fourth Industrial Revolution*. Crown Business.
5. Brynjolfsson, E., & McAfee, A. (2014). *The Second Machine Age*. W. W. Norton & Company.



Original Article

# Entrepreneurship and Innovation

Dr. Kunjan Vijay Narkhede

Professor Janata Art and Commerce College Malkapur Dist- Buldhana

Manuscript ID:  
RIGJAAR-2026-030733

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 146-149  
July 2026

Submitted: 15 June. 2026  
Revised: 22 June. 2026  
Accepted: 16 July. 2026  
Published: 31 July. 2026

Correspondence Address:  
Kunjan Vijay Narkhede  
Professor, Janata Art and  
Commerce College Malkapur Dist-  
Buldhana Email ID:  
[kunju.narkhede@gmail.com](mailto:kunju.narkhede@gmail.com)

Quick Response Code:



Web. <https://rlgjaar.com>



DOI:  
10.5281/zenodo.21990361

DOI Link:  
<https://doi.org/10.5281/zenodo.21990361>



Creative Commons



## Abstract

*Entrepreneurship and Innovation are two essential drivers of economic progress and sustainable business growth in the modern world. Every successful enterprise begins with a unique idea, and clear vision and the determination to convert that idea into practical value. In today's competitive environment, entrepreneurs are not only business owners but also innovators who identify opportunities, solve real-world problems, and contribute to employment generation and social development. Innovation enables organization to improve product, services and business processes, allowing them to remain competitive in changing markets. When combined with entrepreneurial thinking, innovation helps businesses create value, satisfy customer needs and achieve long term success. Entrepreneurs continuously identify new opportunities, utilize available resources effectively, and introduce creative solutions that strengthen organizational performance. Therefore, entrepreneurship and innovation work together to enhance competitiveness improve productivity, and support sustainable economical development.*

**Keywords:** Entrepreneurship, Innovation, Business Growth, Organizational Performance, Entrepreneurial process

## Introduction

Entrepreneurship and Innovation have become fundamental elements for achieving business success in today's rapidly changing global economy. Organization of every size, from small start-ups to multinational corporation, rely on innovative ideas and entrepreneurial leadership to remain competitive to achieve continuous growth. Entrepreneurship is more than simply establishing a new business involves recognizing opportunities, taking calculated risks, organizing resources and creating value for customers and society. Innovation complements entrepreneurship by introducing new ideas, improving existing products and services, and developing efficient business process that meet changing market demands. Modern organizations encourage entrepreneurial thinking because it promotes creativity, adaptability, and continuous improvement. Businesses that successfully combine entrepreneurship with innovation are better positioned to respond to competition, satisfy customer expectation, and maintain long-term profitability. As markets continue to evolve, organizations must embrace innovation as a strategic tool for sustainable development and competitive advantage.

## Literature Review

### 1 Definition of entrepreneurship

Entrepreneurship is recognized as a significant contributor to economic development and business growth. Researcher have examined entrepreneurship from different perspective, and including the role of individual entrepreneur, the establishment of new ventures, and the characteristics of entrepreneurial organizations. It involves identifying business opportunities, organizing resources efficiently, and creating value through innovative products or services. Entrepreneurs play a vital role in promoting innovation, generating employment opportunities, and improving overall economic performance. Modern theories emphasize that entrepreneurial activities encourage technological advancement, business expansion, and sustainable competitive advantage. Through creativity and effective decision-making, entrepreneurs transform innovative ideas into successful business ventures that benefit both society and economy.

### Characteristics of an entrepreneur

Successful entrepreneurs possess a combination of technical expertise, leadership qualities, creativity and strong decision making abilities.

### Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

### How to cite this article:

Narkhede, K. V. (2026). Entrepreneurship and Innovation. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 146–149. <https://doi.org/10.5281/zenodo.21990361>

They demonstrate confidence, determination and the willingness to face uncertainty while pursuing business objectives. These quality enable them to identify opportunities, overcome challenges, and manage business operations effectively.

#### **1. Willingness to take risk:**

Entrepreneurs understand that every new business involves uncertainty. They are prepare to accept calculated risks related to finance, competition and market conditions while focusing on long-term success rather than short-term challenges.

#### **2. Strong achievement orientation**

Successful entrepreneurs establish clear objectives and remain committed to achieving them. They are highly motivated, responsible, and persistent in overcoming obstacles to accomplish their business goals.

#### **3. Positive mindset and optimism**

Entrepreneurs maintain a positive attitude even during difficult situations. They consider failures as valuable learning experiences and continuously improve their strategies instead of giving up. Their optimistic approach helps them adapt to changing business environments and remain focused on future opportunities.

### **Entrepreneurship Process**

The entrepreneurial process is a systematic journey that transforms a business idea into a successful enterprise. It involve several stages, each contributing to the effective planning, establishment, and the growth of business venture.

#### **1. Opportunity Identification**

The process begins with recognizing a business opportunity. Entrepreneur carefully observe market trends, customer needs, and industry challenges to identify ideas that have commercial potential. They often gather suggestion from customers, employees, industry experts, and market research before selecting the most promising opportunity.

#### **2. Business Planning**

Once an opportunity has been identified, the entrepreneur prepares a detailed business plan. This is outlines the business objectives, target markets financial requirements, operational strategies, marketing plans, and expected outcomes. A well-structured business plan act as a roadmap and supports effective decision-making throughout the business lifecycle.

#### **3. Resource Mobilization**

The next stage focuses on acquiring the resources necessary for launching the venture. Entrepreneurs arrange financial support through investors financial institutions or personal savings while also recruiting skilled employees and obtaining the required technology, equipment, and infrastructure.

#### **4. Business operation and management**

After securing the necessary resources, business operations officially begin. Entrepreneurs establish and appropriate organizational structure, assign responsibilities , monitor daily activities and ensure efficient utilization of available resources. Effective leadership and sound management practices help achieve organizational goals and overcome operational challenges.

#### **5. Business growth and expansion**

The final stage involves evaluating business performance and planning future growth. Entrepreneur compare actual results with predefined objectives, identify improvement opportunities, and decide whether to expand operations, introduce new products, enter new markets, or strengthen existing business strategies for long-term sustainability.

#### **4 Innovation**

Innovation refers to the successful implementation of new ideas, products and services, technologies or business processes that create value for customers and organizations. While invention focuses on generating new ideas, innovation emphasizes converting those ideas into practical and commercially successful solutions. According to innovation theories, economic development progresses through three major stages: Invention, innovation and diffusion. Invention introduces a new concept or technology, innovation transform it into a marketable product or service and diffusion spread the innovation across industry and society. Entrepreneurs play a critical role in this process by commercializing innovative ideas and making them accessible to customers. Innovation encourages organization to improve efficiency, enhance product quality, reduce operational cost and respond effectively to changing market demands. Continuous innovation enables businesses to maintain a competitive advantage and achieve sustainable growth in dynamic business environment.

#### **5 Role of Innovation in Entrepreneurship**

Innovation is one of the most important element of successful entrepreneurship. It enable entrepreneurs to develop unique product, improve business processes and create long-term competitive advantages. By adopting innovative approaches, businesses can respond effectively to changing customer expectations and market conditions.

#### **1. Encouraging Creativity**

Innovation promotes creative thinking and enables entrepreneurs to generate original ideas that solve customer problems. Creative approaches help business differentiate themselves from competitors and identify new growth opportunities.

## **2. Supporting Continuous Improvement**

Entrepreneurs who embrace innovation continuously improve their products, services and internal processes. Regular improvement enhance operational efficiency, increase customer satisfaction and strengthen business performance overtime.

## **3. Building a Strong Brand Identity**

Innovative organizations establish a positive reputation by offering unique products and high-quality services. Consistent innovation strengthens brand value, increases customer trust, and improves market recognition.

## **4. Enhancing existing product and services**

Innovation is not limited to developing entirely new products. Entrepreneurs also improve existing products and services by adding new features, improving quality, reducing costs, and increasing customer value. Such improvements contribute to higher productivity and long-term profitability.

## **5. Responding Market Trends**

Changing customer preferences and technological advancements require businesses to remain adaptable. Innovation enables entrepreneurs to anticipate market changes, develop effective solutions, and remain competitive in rapidly evolving industries.

## **2.6 Importance of Innovation to Small Business**

Innovation plays crucial role in the growth and sustainability of small businesses. In today's competitive business environment, organizations must continuously improve their product, services and operational processes to meet changing customer expectations. Businesses that encourage innovation are more capable of adapting to market changes, increasing efficiency, and achieving long-term successes.

### **1. Keeping the Business competitive**

Innovation enables small businesses to remain relevant by introducing new products, improving existing services, and adapting modern technologies. Continuous improvement helps businesses respond effectively to changing customer preferences and market trends.

### **2. Solving Businesses Challenges**

Every business encounters operational and financial challenges. Innovative thinking helps entrepreneurs identify practical solutions, improve efficiency, reduce costs, and overcome obstacles. Instead of relying on traditional methods, innovative businesses explore new approaches to achieve better outcomes.

### **3. Strengthening Team Collaboration**

An innovative work environment encourages employees to contribute ideas and participate in decision-making. When team members are involved in improving product and business processes, they become more motivated, productive, and committed to organizational success.

Collaboration also promotes creativity and continuously learning within the organization.

## **2.7 Innovation Performance**

Innovation performance refers to an organization's ability to successfully develop and implement new ideas that improves business results. It reflects how effectively a company transforms creative concepts into valuable products, services, or operational improvements that enhance overall organizational performance. Organization with strong innovation performance continuously invest in research, employee development, technology and process improvement. These efforts increase productivity, improve product quality, enhance customer satisfaction and strengthen market competitiveness. Measuring innovation performance also help organizations evaluate whether their innovation strategies are contributing to long-term business growth and sustainable advantage.

## **8 Relationship Between Entrepreneurship and Innovation**

Entrepreneurship and Innovation are closely connected and together form the foundation of successful business development. Entrepreneurship provides the vision, leadership and willingness to take calculated risks, while innovation supplies the creative ideas and practical solutions that help businesses grow and remain competitive.

Entrepreneurs identify opportunities in the marketplace and utilize innovation to develop products, services or business models that meet customer needs more effectively. At the same time, innovative ideas require entrepreneurial action to transform them into commercially successful ventures. Without innovation, businesses may struggle to differentiate themselves from competitors, while innovation without entrepreneurship often fails to achieve commercial success.

Therefore, the integration of Entrepreneurship and Innovation enables organizations to improve operational efficiency, create customer value, respond to market changes, and achieve sustainable growth in an increasingly competitive global economy.

## **3. Conclusion**

Entrepreneurship and innovation are closely interconnected and together play a significant role in achieving sustainable business growth and long-term organizational success. This study highlights that entrepreneurial thinking, combined with continuous innovation, enable organizations recognize new opportunities, develop effective business strategies, and respond efficiently to changing market conditions. Innovation enhances business performance by improving products, services, operational processes and customer value, while entrepreneurship transform innovative ideas into commercially successful ventures. Organizations that promote creativity, encourage calculated risk-taking, and invest in innovation are better positioned to strengthen their competitive



advantage and improve overall organizational performance.

Furthermore, the finding suggest that knowledge, innovation and entrepreneurship collective contribute to economic development, employment generation, and business sustainability. To remain competitive in today's dynamic business environment, organizations should establish culture that supports continuous learning, innovation, and entrepreneurial decision making.

#### **Acknowledgement**

I would like to express my sincere gratitude to all those who supported and encouraged me in completing this research paper entitled "Entrepreneurship and Innovation." Their valuable guidance, suggestions, and encouragement contributed significantly to the successful completion of this work. I am deeply thankful to my teachers, colleagues, and academic associates for their valuable support and constructive suggestions throughout the preparation of this research paper. I also acknowledge the contribution of the authors and researchers whose studies and scholarly works provided valuable insights into entrepreneurship, innovation, business growth, and organizational performance.

#### **Financial support and sponsorship**

Nil.

#### **Conflicts of interest**

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### **References**

1. Antoncic, B., Hisrich, R.D (2003) Clarifying the entrepreneurship concept. Journal of small business and enterprise development.
2. Arora, A., Fosfuri, A & Gambardella, A (2002). Market for technology: The economics of innovation and corporate strategy. MIT press
3. Bharadwaj, S /menon, A.(2000). Making happen organization: Individual creativity mechanisms, organizational creativity mechanism, or both? Journal of product innovation management.
4. Cho, H. J., & Pucik, V .(2005) Relationship between innovativeness, quality, growth, profitability and market value. Strategic management journal.
5. Sundho, J.(1988) The theory of innovation: entrepreneurs, technology and strategy. Edward Elgar Publishing
6. Al- Askri, A.S. (2011). The impact of entrepreneurship and innovation on developing the marketing strategy in business organizations: An analytical study. Journal of business.
7. Cunha, J., Benneworth, P., Oliveira,P(2015) Social entrepreneurship and social innovation: A conceptual distinction. In Handbook of Research on global Competitive Advantage through Innovation and Entrepreneurship.



Original Article

## Raj Yoga Meditation for Management of Occupational Stress Related To Responsibility among the Employees of Information Technology

Rekha Salunkhe

Associate Professor in Psychology Dadasaheb Digambar Shankar Patil Arts,  
Commerce & Science College, Erandol, Dist. Jalgaon (MS)

Manuscript ID:  
RIGJAAR-2026-030734

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 150-153  
July 2026

Submitted: 15 June. 2026  
Revised: 22 June. 2026  
Accepted: 16 July. 2026  
Published: 31 July. 2026

**Correspondence Address:**

**Rekha Salunkhe**  
Associate Professor in Psychology  
Dadasaheb Digambar Shankar  
Patil Arts, Commerce & Science  
College, Erandol, Dist. Jalgaon  
(MS)Email:  
[rekhasalunkhe21@gmail.com](mailto:rekhasalunkhe21@gmail.com)

Quick Response Code:



Web. <https://rlgjaar.com>



DOI:  
10.5281/zenodo.21990466

DOI Link:  
<https://doi.org/10.5281/zenodo.21990466>



Creative Commons



### Abstract

*The present study investigates the effect of Raja Yoga meditation on managing occupational stress related to responsibility among employees of Information Technology sector. The target population considered in this study were professionals working in Information and Technology sector. A group of 60 people working in IT sector was utilized by using purposive sampling technique. OSI-R Test designed and standardized by Samuel H. Osipow (1998) was used as tool. Mean, Standard Deviation, Paired t were administered and results obtained were compared with the controlled group. It is found that the intervention of Raja Yoga meditation has reduced the occupational stress related to responsibility among the IT professionals.*

**Key words:** Raja Yoga Meditation, Occupational Stress, Information Technology Employees, Responsibility, Stress Management, Occupational Stress Inventory (OSI-R), Experimental Study, Workplace Well-being Psychological Intervention, IT Professionals

### Introduction:

Some scholars note that an increase in workload, a hostile work environment, downsizing, and shift work can result in occupational stress (Brynien, Iggoe 2006). Often workloads remain immense even though employees do their best to complete them, and the employees may feel stressed as a result. A high demand and time pressures contribute to the stress. Downsizing may also be due to the privatization of a company. During the downsizing employees are either laid off or fired. The remaining employees, though could secure their jobs, but are always in soup and work under tremendous pressure and stress that their name may appear in the next list. If employers are not supportive, discriminating in favor of some employees at the expense of others, do not offer encouragement, or create a hostile work environment, this can cause stress for employees. Interpersonal conflicts within the workplace, uncertainty about job security, and underutilized job abilities are also causes of occupational stress. Occupational stress is a term used to define ongoing stress that is related to the workplace. The stress may have to do with the responsibilities associated with the work itself, or be caused by conditions that are based in the corporate culture or personality conflicts. As with other forms of tension, occupation stress can eventually affect both physical and emotional wellbeing if not managed effectively. Occupation Stress can be defined as is stress related to the job or work. Stress is defined in terms of its physical and physiological effects on a person, and can be a mental, physical or emotional strain NBBBB. It can also be a tension or a situation or factor that can cause stress. Occupational stress occurs when there is a discrepancy between the demands of the environment/workplace and an individual's ability to carry out and complete these demands (Henry, O. & Evans, A.J. (2008). IT Employees are the types of employees who work in the field of information technology. Computer Software Engineer, Network Administrator, Computer Support Specialist, Database Administrator, Technical Writer, Software Designer, Multimedia Developer, Applications Programmer, Technical Architect, Systems Programmer, Systems Analyst, Art Director, Game Designer are software engineer or computer engineer male and female working in IT Companies.

### Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

### How to cite this article:

Salunkhe, R. (2026). Raj Yoga Meditation for Management of Occupational Stress Related To Responsibility among the Employees of Information Technology. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 150–153.  
<https://doi.org/10.5281/zenodo.21990466>



The present study deals with the effect of Raja Yoga as intervention on the managing occupational stress related to role ambiguity and role boundary among the professionals engaged in Information and Technology sector.

#### Objectives Of The Study:

1. To study the occupational stress related to responsibility among employees of IT field.
2. To compare experimental group and control group of IT employees in terms of their occupational stress related to responsibility after intervention of Raja Yoga meditation.

#### Methodology Used:

This is an Experimental study which consisted of experimental and control group design. In other words pretest and posttest experimental design was implemented for the study. In the initial phase, at first 200 IT employees were contacted and requested them to fill up the occupational stress and personality test. But at the end only 60 employees were selected for the study.

The selected employees were divided into two groups using simple random sampling method. One group of thirty employees called as an "Experimental Group". Another group of thirty employees called as a "Control Group". Raja Yoga meditation technique was provided as an intervention to the experimental group only. All these samples were selected from the IT companies from the Pune city. These employees were the National/multinational company employees. These companies were Accenture, Infosys, Wipro, Cybage Software Pvt. Ltd. Amdocs, Avalara Technology, Syntel, Eaton, Ibm, Techmahindra, State, Street, Syntel Services Pvt. Ltd., R'systems, Intentional Ltd., Retired etc. The age group of the samples was between 25 to 40 and male female both are included in each group.

#### Results And Discussion:

Responsibility Measures the extent to which the individual has, or feels, a great deal of responsibility for the performance and welfare of others on the job.

**Table 01:** Change in pre-test and post-test of experimental group for their responsibility.

#### a) Paired Samples Descriptive Statistics

| Group              | Variable              | Mean  | N  | Std. Deviation | Std. Error Mean |
|--------------------|-----------------------|-------|----|----------------|-----------------|
| Experimental Group | Responsibility- Pre   | 35.57 | 30 | 1.69           | .309            |
|                    | Responsibility - Post | 24.57 | 30 | 1.69           | .309            |
| Control Group      | Responsibility- Pre   | 36.93 | 30 | 1.61           | .295            |
|                    | Responsibility - Post | 37.07 | 30 | 1.52           | .279            |

The above table gives the descriptive statistics for each of the two groups (as defined by the pair of variables.) In this example, in the experimental group, there are 30 IT employees who responded to the responsibility, one aspect of occupational stress, and they have, on average, 35.57 pretest of responsibility, with a standard deviation of 1.69. These same 30 people also responded to the posttest of responsibility, and they have, on average, 24.57, with a standard deviation of 1.69. The last column gives the standard error of the mean for each of

the two variables. As well as, in the control group, there are 30 IT employees who responded to the responsibility, one aspect of occupational stress, and they have, on average, 36.93 pretest of responsibility, with a standard deviation of 1.61. These same 30 people also responded to the posttest of responsibility, and they have, on average, 37.07, with a standard deviation of 1.52. The last column gives the standard error of the mean for each of the two variables.

#### b) Paired Samples Correlations and paired t

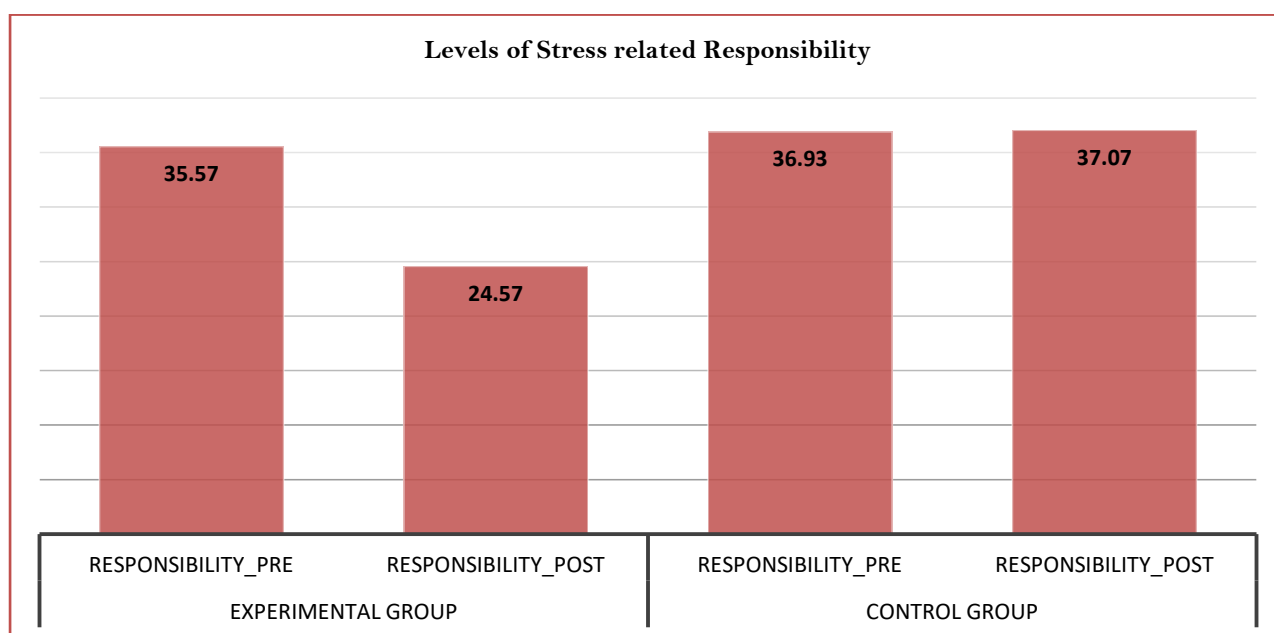
| Group        | Pre and Posttest      | Correlation | Sig. | t     | Sig. | df |
|--------------|-----------------------|-------------|------|-------|------|----|
| Experimental | Responsibility- Pre & | -.06        | .771 | 24.46 | 0.01 | 29 |



| Group         | Responsibility - Post                       |     |      |       |    |    |
|---------------|---------------------------------------------|-----|------|-------|----|----|
| Control Group | Responsibility- Pre & Responsibility - Post | .08 | .653 | -.343 | NS | 29 |

In the experimental group, there is a statistically significant decrease in responsibility from pre-test to post test, obtained correlation value is -.06 and interprets that there is a negative correlation. Employee who experience responsibility on the pre-test also reduced their stress on the post-test. But, in the control group the mean value of responsibility is near-constant in both conditions. Obtained calculated

paired t value for experimental group is  $(29) = 24.46$   $P < .001$  and for control group it is not significant. This interprets that, paired samples t test reveal a statistically reliable difference between the mean numbers of experimental group and failed to reveal a statistically reliable difference between the mean numbers of control group in terms of responsibility.



raph 01: Significance reduction in the responsibility scores in experimental group.

In the occupational stress, in terms of the responsibility aspect, High scorers may report high levels of responsibility for the activities and work performance of subordinates. They are worried that others will not perform well. They are sought out for leadership and frequently have to respond to others' problems. They also may have poor relationships with people at work or feel pressure from working with angry or difficult employees or the public. After using the intervention programme of Raja Yoga meditation, these negative experiences reduced. Here the eta squared value is .9; we can conclude that there is a large effect, with a substantial difference in the responsibility scores obtained before and after the intervention (Raja Yoga Meditation).

#### Conclusion:

Information technology employees suffer from the problem of occupational stress related to responsibility at in their work place setting. Raja yoga

meditation successfully demonstrated itself as a useful technique of stress management. Raja yoga meditation proves itself as stress management technique and it is found that there is a positive change in stress of information technology employees' pre-test and post-test of experimental group for their occupational stress with factors. With the use of Raja yoga meditation, we can overcome psychological tensions and worries. It is found that there is a positive change in pre-test and post-test of experimental group of information technology employees for their personal strain factors.

#### Acknowledgement

I express my sincere gratitude to all those who have directly and indirectly contributed to the successful completion of this research paper entitled "Raj Yoga Meditation for Management of Occupational Stress Related to Responsibility Among the Employees of Information Technology."

I am deeply thankful to my institution for providing the necessary academic support and encouragement



throughout this work. I extend my heartfelt appreciation to all the Information Technology employees who willingly participated in this study

### Financial support and sponsorship

Nil.

### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

### References:

1. **Lazarus, R.S., (2006)** : "Emotions and interpersonal relationships: toward a person-centered conceptualization of emotions and coping". J. Pers. 74, 9–46.
2. **R.S. Lazarus (1966)** : "Psychological stress and the coping process", New York: McGraw-Hill.
3. Samuel H. Osipow, Occupational Stress Inventory (OSI-R)
4. **Selye, H., (1975)** : "Confusion and controversy in the stress field". J. Hum. Stress 1, 37–44.
5. **Swaminathan, E.V., (2009)** : "Diluting Stress", Brahmakumaris, India.



Original Article

## Emerging Trends In Smart Irrigation And Crop Monitoring Technologies

B. Babu <sup>1</sup>, K. Vanisri <sup>2</sup>, S. Sumathra <sup>3</sup>

<sup>1</sup>Associate Professor, Indra Ganesan College of Engineering, Manikandam, Trichy.

<sup>2,3</sup> Assistant Professor, Indra Ganesan College of Engineering, Manikandam, Trichy.

Manuscript ID:  
RIGJAAR-2026-030735

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 154-158  
July 2026

Submitted: 15 June, 2026

Revised: 22 June, 2026

Accepted: 16 July, 2026

Published: 31 July, 2026

Correspondence Address:

B. Babu,  
Associate Professor, Indra  
Ganesan College of Engineering,  
Manikandam, Trichy.

Email: [babuamr11@gmail.com](mailto:babuamr11@gmail.com)

Quick Response Code:



Web: <https://rlgjaar.com>



DOI:  
10.5281/zenodo.21990574

DOI Link:  
<https://doi.org/10.5281/zenodo.21990574>



Creative Commons



### Abstract

Enhancing water-use efficiency and crop yield, smart irrigation and agricultural monitoring systems integrate sensor technologies, wireless communication networks, artificial intelligence (AI), and the Internet of Things (IoT). Decisions in farming may be made more intelligently and automatically when soil health, crop growth, and other environmental conditions are tracked systematically in real time. This review systematically examines the system architectures, key enabling technologies, and practical applications of smart irrigation and crop monitoring systems. It further discusses their benefits, technical and operational challenges, and emerging research trends, with a particular emphasis on sustainable agriculture and precision farming practices.

**Keywords:** Smart irrigation, Crop monitoring, Precision agriculture, IoT, Machine learning, Water use efficiency

### Introduction

Agriculture is increasingly challenged by water scarcity, climate variability, and the growing global demand for food. Conventional irrigation practices are often characterized by fixed scheduling and limited field-level feedback, leading to over-irrigation, inefficient water use, and reduced resource sustainability. In order to guarantee agricultural production and environmental protection in the long run, it is now essential to address these challenges. By automating irrigation scheduling and continuously assessing crop health using real-time field data, smart irrigation and crop monitoring systems provide an efficient solution. The integration of sensor networks, cloud and edge computing platforms, and AI-based data analytics has transformed traditional farming practices into precision agriculture systems. These technologies support informed decision-making, optimize input usage, enhance crop yield, and promote efficient utilization of water and other agricultural resources.

### System Architecture Of Smart Irrigation And Crop Monitoring

A typical smart irrigation and crop monitoring system is organized into four functional layers: Sensing Layer This layer is in charge of collecting data on the soil, crops, and surrounding environment in real-time from the field. It commonly includes: Soil moisture, soil temperature, and ambient humidity sensors Leaf wetness and nutrient sensors Weather sensors measuring rainfall, solar radiation, wind speed, and air temperature Communication Layer The communication layer ensures reliable data transmission from the field to processing units. It typically employs: Wireless Sensor Networks (WSNs) Communication protocols such as ZigBee, LoRaWAN, Wi-Fi and GSM Processing Layer This layer performs data aggregation, analysis, and decision-making. It includes: Edge computing units (microcontrollers or single-board computers) for local processing Cloud platforms for large-scale data storage, advanced analytics, and model execution Application Layer The application layer provides user interaction and system control through: Decision support systems for irrigation scheduling and crop management Mobile and web-based dashboards for real-time visualization Automated irrigation control mechanisms for precise water application.

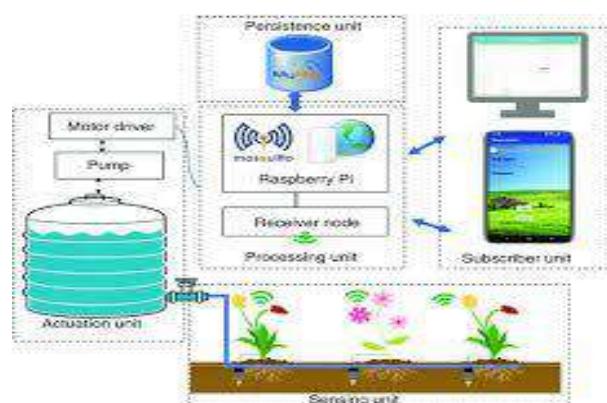
### Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

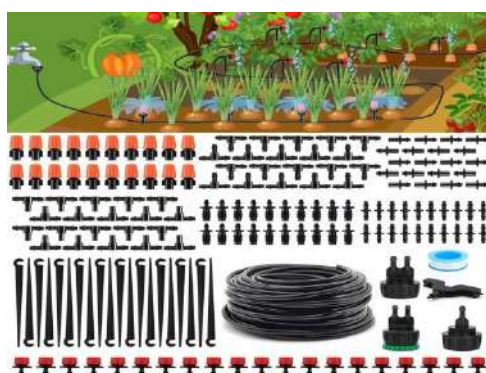
### How to cite this article:

B, B, K, V, & S, S. (2026). Emerging Trends In Smart Irrigation And Crop Monitoring Technologies. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 154–158. <https://doi.org/10.5281/zenodo.21990574>

Fig System Architecture of Smart Irrigation and Crop Monitoring



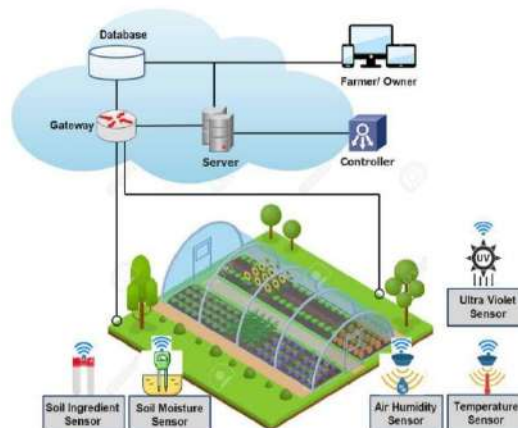
## IRRIGATION TECHNOLOGIES



### Fig Smart Irrigation Technologies

Smart irrigation systems enable dynamic and precise control of water application by utilizing real-time field data and intelligent decision-making algorithms. Key approaches include: Soil moisture-based irrigation, where water is applied according to real-time soil water status; Weather-based irrigation scheduling, which adjusts irrigation timing and volume using climatic parameters and weather forecasts; Automated drip and micro-irrigation systems, ensuring uniform and efficient

## Crop Monitoring Techniques

**SMART**

water delivery to the crop root zone. Fertilization control, integrating nutrient application with irrigation to optimize fertilizer use efficiency. In addition, machine learning-based models are increasingly employed to predict crop water requirements by analyzing historical, environmental, and crop-specific data. These models help reduce water loss due to evaporation, runoff, and deep percolation, which improves irrigation efficiency and sustainability.



## Fig Crop Monitoring

### Techniques

Crop monitoring involves the continuous assessment of crop growth, health, and stress conditions using a combination of sensing and analytical techniques. The major approaches include:

Ground-based sensing, which measures parameters such as canopy temperature, chlorophyll content and plant water stress

Remote sensing, employing multispectral and hyperspectral imagery to evaluate crop condition over large areas

Unmanned Aerial Vehicle (UAV)-based monitoring, enabling high-resolution detection of crop diseases, pest infestation and nutrient deficiencies AI-powered picture analysis that uses ML and DL algorithms to detect stress, illness, and pests automatically Furthermore, the Normalised Difference Vegetation Index (NDVI) and other vegetation indicators are extensively used for the purpose of quantifying crop vigour, biomass, and general plant health.

### Role Of Artificial Intelligence And Data Analytics

Improving the efficiency and efficacy of smart irrigation and agricultural monitoring systems is greatly assisted by artificial intelligence (AI) and data analytics. By leveraging historical datasets and real-time sensor inputs, AI techniques enable: Prediction of irrigation demand, allowing accurate estimation of crop water requirements Early detection of crop stress, diseases and nutrient deficiencies through pattern recognition and image analysis Optimization of irrigation schedules under variable and uncertain climatic conditions Decision support for farmers and system operators through intelligent Decision Support Systems (DSS) These apps make use of a plethora of AI technologies, such as decision trees, artificial neural networks, regression models, and deep learning methods. These methods improve prediction accuracy, adaptability and system robustness, contributing to efficient resource utilization and sustainable agricultural management.

### Future Research Directions



### Benefits And Impact

Smart irrigation and crop monitoring systems offer significant benefits across multiple dimensions of agricultural production. One of the most notable advantages is the reduction in water use, typically ranging from 30% to 50%, achieved through precise and demand-based irrigation scheduling. These systems contribute to increased crop yield and productivity by maintaining optimal soil moisture and crop health conditions throughout the growing period. The level of manual labour is substantially reduced due to automation and real-time monitoring, enabling farmers to focus on higher-value management activities. From a sustainability perspective, smart irrigation systems promote efficient utilization of water, energy and fertilizers, thereby minimizing environmental impact. Economically, they help lower operational costs by reducing water consumption, labour requirements and input wastage. Consequently, these systems are particularly valuable in water-scarce regions and are well suited for high-value and precision-managed crops.

### Challenges And Limitations

There are a number of technical, financial, and operational hurdles that prevent smart irrigation and crop monitoring systems from being widely used, even though they have many benefits. There is a significant barrier to entry due to the hefty price tag of sensors, communication networks, and automation gear. Sensor reliability, durability, and calibration issues can affect data accuracy, particularly under harsh field conditions. In many rural and remote agricultural regions, limited network connectivity restricts reliable data transmission and real-time system operation. Additionally, concerns related to data security and privacy arise due to the use of cloud-based platforms and wireless communication technologies. Finally, the lack of technical awareness and digital literacy among farmers poses a significant barrier to effective implementation and long-term maintenance of these systems.





Future developments in smart irrigation and crop monitoring systems are expected to focus on advanced digital and autonomous technologies. The integration of digital twins for agricultural farms will enable virtual simulation and real-time optimization of irrigation strategies and crop management practices. Autonomous irrigation robots are anticipated to enhance precision and reduce human intervention in field operations. The adoption of blockchain-based frameworks can improve the security, transparency and traceability of agricultural data. Additionally, the development of energy-efficient sensor nodes will extend system lifetime and support large-scale deployment in resource-constrained environments. Last but not least, enhancing the system's resilience and sustainability will be greatly assisted by climate-adaptive irrigation algorithms that can adjust to changing weather patterns and climatic variability.

### Conclusion

Sustainable and precise farming have made great strides with the advent of smart irrigation and crop monitoring technologies. Improved farm production and profitability, continuous crop health monitoring, and effective water management are all made possible by the combination of IoT, AI, and automation. These technologies tackle important issues with water shortages and sustainable agriculture by making the most of available resources and facilitating data-driven decisions. However, continued research, technological innovation, and supportive policy frameworks are essential to facilitate large-scale adoption, particularly in developing agricultural economies where resource constraints and climate variability are more pronounced.

### Acknowledgement

The authors express their sincere gratitude to the Management and Principal of Indra Ganesan College of Engineering, Manikandam, Trichy, for providing the necessary facilities, encouragement, and continuous support for carrying out this study.

### Financial support and sponsorship

Nil.

### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

### References

1. Baseca, C. C., Ramos, R. F., Silva, A. R., & Monteiro, J. L. (2025). Edge-computing-based smart irrigation controller for sustainable agriculture. *Sensors*, 25(2), 1–19. <https://doi.org/10.3390/s25020456>
2. FAO. (2023). *Digital excellence in agriculture: Scaling up digital solutions for farmers*. Food and Agriculture Organization of the United Nations. <https://www.fao.org>
3. Jaiswal, N., Singh, A., & Kumar, R. (2025). Smart drip irrigation systems using Internet of Things and cloud computing. *Journal of Ambient Intelligence and Humanized Computing*. <https://doi.org/10.1007/s12652-025-04789-3>
4. Liopa-Tsakalidi, A., Papadopoulos, A., & Koundouras, S. (2024). A LoRaWAN-based IoT platform for smart irrigation management in olive groves. *Computers and Electronics in Agriculture*, 218, 108051. <https://doi.org/10.1016/j.compag.2024.108051>
5. Morchid, A. (2024). IoT-based smart irrigation systems for agricultural water security: A review. *Agricultural Water Management*, 286, 108424. <https://doi.org/10.1016/j.agwat.2023.108424>
6. Parra-López, C., Calatrava-Requena, J., & de Haro-Giménez, T. (2025). Digital technologies for water use efficiency and management in agriculture. *Agricultural Systems*, 227, 103684. <https://doi.org/10.1016/j.agry.2024.103684>
7. Yang, X., Li, Z., Zhao, Y., & Chen, J. (2025). Advances in UAV remote sensing for monitoring crop water and nutrient status. *Plants*, 14(1), 112. <https://doi.org/10.3390/plants14010112>
8. Aierken, N., Ding, J., & Wang, H. (2024). Review of UAV-based remote sensing for cotton growth



- monitoring using machine learning. *Computers and Electronics in Agriculture*, 214, 108003. <https://doi.org/10.1016/j.compag.2023.108003>
9. World Economic Forum. (2025). *Harnessing digital technologies for smarter water management in agriculture*. World Economic Forum. <https://www.weforum.org>
10. Zhang, Y., Wang, X., & Li, D. (2022). Machine learning-based irrigation scheduling: A review. *Precision Agriculture*, 23(6), 1901–1924. <https://doi.org/10.1007/s11119-022-09888-1>
- 11.



Original Article

# Impact of AI-Driven Digital Marketing on Consumer Purchase Decisions: An Empirical Study of Consumers in Pune City

Chinmoy Goswami,<sup>1</sup> Dr. Vijay Ganpat Dhamore,<sup>2</sup>

<sup>1</sup>Research Scholar, Ajeenkya D. Y. Patil University, DY Patil Knowledge City, Charoli Budruk, Lohegaon, Pune

<sup>2</sup>Professor, Ajeenkya D. Y. Patil University, DY Patil Knowledge City, Charoli Budruk, Lohegaon, Pune

Manuscript ID:  
RIGJAAR-2026-030736

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 159-164  
July 2026

Submitted: 15 June, 2026  
Revised: 22 June, 2026  
Accepted: 16 July, 2026  
Published: 31 July, 2026

Correspondence Address:  
Chinmoy Goswami,

Research Scholar, Ajeenkya D. Y.  
Patil University, DY Patil  
Knowledge City,  
Email ID:

[chinmoy.gos@gmail.com](mailto:chinmoy.gos@gmail.com)

Quick Response Code:



Web: <https://rlgjaar.com>



DOI:  
10.5281/zenodo.21990773

DOI Link:  
<https://doi.org/10.5281/zenodo.21990773>



Creative Commons



## Abstract

Artificial Intelligence (AI) is being rapidly adopted as a transformational force in digital marketing, allowing organizations to deliver highly personalized, intelligent, and interactive customer experiences powered by data. With AI-based technologies being used in recommendation engines, predictive analytics, Chabot's, programmatic advertising and generative AI, the way consumers discover, evaluate and buy products online is being totally changed. Although such technologies can provide more personalized experiences and better customer engagement, they present a real risk to consumer trust, transparency and data privacy. This study investigates the impact of AI-driven digital marketing on consumer purchase decisions among social media users in Pune, India. The study provides practical implications for marketers, digital advertisers, policymakers and technology developers aiming to create ethical, transparent and consumer-focused AI marketing strategies. It stresses that while personalization is critical, responsible and transparent practices around data will build consumer trust for the long haul. Narrowing focus to Pune City, the research also offers context specific perspectives that provide direction for organizational strategies and tactics targeting other emerging digital markets in similar economic contexts while also contributing to a growing body of knowledge surrounding AI adoption at the intersection of marketing and consumer behaviour research. This research puts forward a quantitative research design that is employed using a self-administered questionnaire to about 400 active social media users living in Pune City. The expected results are to show that advertisement personalization, entertainment value, perceived relevance and transparency through AI innovation have a positive impact on consumer purchase intention mediated by consumer trust whilst privacy has a negative influence on purchase decisions. These outcomes are anticipated to add to the stream of research in AI-driven marketing, by extending current hypothetical models explicating the elements inferred through an analysis that is yet empirically seen from an imperial city straightforwardly changing into a computerized economy.

**Keywords:** AI-driven marketing, personalisation, consumer trust, purchase intention, social media advertising, Pune city.

## Introduction

Digital marketing has entered into an era of personalization and data-driven insight with the rise of artificial intelligence (AI). AI infused such as Chabot's recommendation engines, generative ads, provide the ability to analyze consumer insights and interplay of data in real-time for improved targeting and engagement. Multiple studies from around the world have demonstrated how marketing powered by artificial intelligence leads to better performance, and consumer responses. As a concrete example, AI applications in this context increased consumer purchase intentions significantly ( $\beta \approx 0.72$ ,  $p < .001$ ). The digital market in India is growing at a rapid pace. One of them is Pune — a prestigious IT and education hub in the State of Maharashtra. A Pune based survey revealed that social media marketing and influencer ad are high engagement generating platforms but privacy concerns and information overload continues to be the lead hurdles before building trust. Since Indian consumers are progressively dependent on online data for buy choices, it is very much important to understand their response towards AI-based advertisement. But, there is a dearth of studies focusing on AI-enabled digital marketing in the Indian context, and not much is known about whether personalization, entertainment value, transparency and trust influence the buying decision of consumers in Pune. The present paper bridges this gap by modeling the influence of AI-powered marketing stimuli on Pune consumers purchase intentions.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Chinmoy, G., & Dhamore, V. G. (2026). Impact of AI-Driven Digital Marketing on Consumer Purchase Decisions: An Empirical Study of Consumers in Pune City. *Royal International Global Journal of Advance and Applied Research*, 3(7(III)), 159–164.

<https://doi.org/10.5281/zenodo.21990773>

This provides immediate implications for more effective advertisement personalization and ultimately inform our hypotheses on the predictors of purchase intention such as entertainment, informativeness, perceived relevance, AI transparency and privacy concerns. The research proposes the introduction of consumer trust in AI-generated ads as an important mediator. Through a quantitative survey and thorough sentimental analysis seek to determine which of these factors is the strongest predictor of purchase intent. The results will also contribute to theory as well as practice in advising Pune-area marketers on effective AI-based tactics.

#### Literature Review (2020–2026)

**Pune Context and Gaps:** Despite global insights, few studies examine AI-driven ads in Indian settings. A Pune-focused marketing study highlighted that brand transparency and data protection are critical for local trust. Yet, existing Pune research did not consider advanced AI features. Thus, a clear research gap exists: we lack empirical evidence on how AI-enabled personalization vs. entertainment vs. transparency affect Pune consumers' buying behavior. This study fills that gap by applying a structured model in Pune's vibrant digital market, updating the literature with 2023–2026 studies and incorporating industry trends e.g. Meta/Google AI tools, Indian social media usage. (Ducoffe 1995, Gugerty 2007)

In sum, the literature suggests:

**H1: Advertisement personalization positively influences purchase intention, and**

**H2: Entertainment value positively influences purchase intention.**

**Consumer Trust and Purchase Intention:** Trust functions as a key mediator in the context of digital marketing. A literature review on e-commerce trust detected five one-dimensional constructs (security, privacy, information quality, brand credibility, technological factors) and represented that consumer outcomes are definitively affected by trust. Especially trust which is highly correlated with purchase intention ( $r \approx 0.67$ ). AI technologies have given rise to a "trust paradox" while an AI that is more personalized could become relevant and provide personalization, it also risks raising skepticism about its use of data. Note that earlier work supports a mediation role for trust – consumers value personalization only if it builds perceived value and trust.

Therefore, next hypothesize are:

**H3: AI transparency (disclosure) positively influences consumer trust, and**

**H4: Consumer trust positively influences purchase intention.**

Recent evidence shows that explicit labels or transparency can temper privacy fears and bolster trust formation.

**Privacy Risks and Digital:** Personalization Privacy risks are the yin to personalization of digital measurement and targeting. Excessive data collection (cookies, chat logs, device sensors) may push consumers away. Research like the so-called privacy calculus model says that perceived privacy problems will be associated with trust and purchase decisions. As a matter of fact, various research has identified privacy concerns decelerate willingness to act and buy. GenAI-based ad personalization, for example, concurrently enhances

perceived ad value (a driver of trust) and privacy anxiety (an underminer of trust); only the former has a direct positive effect on trust, while privacy concerns act as a barrier to its formation.

Therefore, next hypothesize are:

**H5: Privacy concerns negatively influence purchase intention.**

**Pune context and gaps: Hardly any research on AI** ad in the Indian Context A marketing research based on Pune (India) conducted in the pre-pandemic month of 2023 emphasized that brand transparency and data protection are the main things to gain local trust. However, semi-automated AI features were not included in current Pune research. Hence there is a research gap: we do not know how AI-enabled personalization vs entertainment vs transparency contribute to the purchase behavior of consumers in Pune. This study addresses that gap using a framework and conducts the research in Pune's diverse digital economy, encompassing literature from 2023–2026.

#### Research Gap

Although there has been a body of research on AI as a form of global digital marketing, there is almost no reported research related to AI driven advertising in Indian urban contexts. Specifically, no study so far has explored the interplay of personalization, entertainment, trust and privacy effects on purchase intention across consumers in Pune. Existing Pune research general social media tactics; none on AI-specific transparency with it, trust issues. Additionally, a majority of the available literature concerning AI advertising is either Western or focused on MENA, additionally, this literature may not generalize to Pune's demographics. This study therefore fills both a theoretical and practical void by proposing and empirically validating an all-encompassing model of AI-mediated influences on marketing in Pune.

#### Conceptual Framework

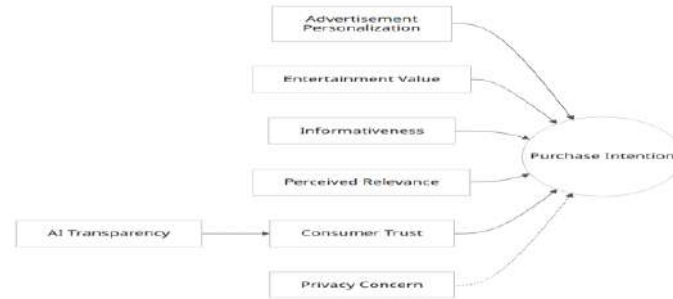
In Figure 1. Shows the purpose of the study by disabling, changing, redirecting or controlling posts and people Building on Stimulus-Organism-Response (S-O-R) paradigm and advertising value theory. Hypotheses are developed in such a way that the dependent variable. Purchase Intention (Response) is influenced by AI-driven marketing stimuli – Advertisement Personalization, Entertainment Value, Informativeness, Perceived Relevance and AI Transparency. Privacy Concerns → a Negative Stimulus Consumer Trust serves as an organismic mediator between AI transparency and purchase intention —not just any ad will convert. The expected sign of each stimulus is indicated.

#### Hypotheses

Based on the above framework and literature, we propose:

1. H1: Advertisement Personalization → Purchase Intention (positive).
2. H2: Entertainment Value → Purchase Intention (positive).

3. H3: AI Transparency → Consumer Trust (positive).
4. H4: Consumer Trust → Purchase Intention (positive).
5. H5: Privacy Concern → Purchase Intention (negative).



**Figure 1:** Conceptual model of AI-driven advertising effects. (H1–H5 denote hypotheses; dashed line (– –) indicates negative effect.)

### Research Objectives

1. Assess Awareness: Measure Pune consumers' awareness and perceptions of AI-driven social media ads.
2. Evaluate Influences: Examine how advertisement personalization, entertainment, informativeness, perceived relevance, privacy concerns, and AI transparency affect purchase intention.
3. Test Mediator: Analyze the mediating role of consumer trust in AI-generated ads.
4. Explore Demographics: Investigate demographic differences (age, gender) in purchase intentions related to AI ads.
5. Practical Insights: Provide recommendations for marketers on designing AI-based digital campaigns in Pune.

### Methodology

**Study Area:** Pune City (Maharashtra, India) is selected for its digital penetration and tech-savvy population.

**Table 1.** A Table of constructs, sample items, and sources is provided below.

| Construct                          | Sample Items (5-point Likert)                                                                          | Source (adapted from)                              |
|------------------------------------|--------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| Advertisement Personalization (AP) | "Advertisements on social media are tailored to me."<br>"I feel ads reflect my personal interests."    | Kumar et al. (2023); An & Ngo (2025)               |
| Entertainment Value (ET)           | "The ads I see are entertaining."<br>"I enjoy engaging with these ads."                                | Ducoffe (1995); Loo et al. (2026)                  |
| Informativeness (INF)              | "Ads provide useful information."<br>"I learn about products from these ads."                          | Loo et al. (2026)                                  |
| Perceived Relevance (PR)           | "The content of ads is relevant to me."<br>"These ads match my needs."                                 | An & Ngo (2025); Jize & Jamaludin (2025)           |
| AI Transparency (TR)               | "I appreciate knowing if an ad was AI-generated."<br>"Being told an ad is AI-made increases my trust." | NIM report (Buder et al., 2024); Luo et al. (2019) |
| Privacy Concern (PC)               | "I am concerned about how my data is used in ads."<br>"Personalized ads invade my privacy."            | Van Slyke et al. (2004); Efrat (2019)              |
| Consumer Trust (CT)                | "I trust the AI-driven ads I see."<br>"I believe the ads are honest."                                  | Gefen (2000); Hasan & Mayr (2025)                  |
| Purchase Intention (PI)            | "I am likely to buy products from such ads."<br>"I would consider purchasing advertised items."        | Chau & Cheng (2020); Alam et al. (2026)            |

With so many students & young professionals who are very active on social media platforms.

**Population:** Pune residents aged 18+ who are active on social media platforms (FB, IG etc.). Assuming a population of several million (as internet users in Pune have crossed over 5 million by 2025).

**Sampling:** Stratified random sampling in key strata (age groups, gender, education) Both online survey invites and in-person intercepts will also be shared city-zone-wise across Pune.

**Sample Size & Power:** Target of  $N \approx 400$  completed responses. This is more than common heuristics (e.g., 10 responses/survey item) and provides sufficient power for SEM. Power analysis indicated that this sample yields sufficient power ( $\alpha=0.05$ , power=0.80) to detect small-to-medium effect sizes ( $f^2 \approx 0.15$ ) in multiple regression.

**Questionnaire & Measures:** ~30 items (5–7 Construct, 3–5 Item each) will be created on a five-point Likert scale |strongly agree to strongly disagree {1=Strongly Disagree; 2=Disagree; 3=Neither Agree Nor Disagree; 4=Agree; 5= Strongly Agree}. Items are adapted from previously validated scales, e.g., Advertising Value Model constructs for informative.



The questionnaire will be drafted in English (the dominant language in Pune's IT sector) and pre-tested in a pilot study ( $N \approx 30$ ) to refine wording and reliability. Standard ethical practices (informed consent, anonymity) will be observed.

### Measurement Model

The constructs will be identified as latent variables with respect to their respective items. Firstly, Exploratory Factor Information are performed to verify the factor construction. A good solution is reached when items load strongly ( $>0.6$ ) on their target factors,  $KMO > 0.80$ , and Bartlett's test  $p < .001$ . Each construct will be treated as a latent variable measured by its items.

Confirmatory Factor Analysis (CFA) will then be used to test convergent and discriminant validity. Convergent validity is achieved when factor loadings  $\geq 0.60$  and Average Variance Extracted (AVE)  $\geq 0.50$  for each construct. Discriminant validity will be checked via Fornell-Larcker criterion ( $\sqrt{AVE}$  on diagonal  $>$  inter-construct correlations) and/or HTMT ratio ( $HTMT < 0.85$ ). We will report Cronbach's  $\alpha$  and Composite Reliability (CR) for each scale ( $\alpha$ , CR  $\geq 0.70$  preferred).

A measurement model comparison will also be performed. For example, a single-factor model (all items loading on one factor) is expected to fit poorly, whereas the proposed multi-factor model should fit well (lower  $\chi^2$ , RMSEA  $< 0.08$ , CFI/TLI  $> 0.90$ ). This guards against common-method bias.

### Data Analysis

The analysis of data will be performed by SPSS 29 and AMOS. Analysis steps include:

1. **Descriptive Statistics:** Summary of demographic frequencies and variable means/SDs.

| Construct ( $\sqrt{AVE}$ in bold) | 1. AP | 2. ET | 3. INF | 4. TR | 5. PR | 6. PC | 7. CT | 8. PI |
|-----------------------------------|-------|-------|--------|-------|-------|-------|-------|-------|
| 1. Ad Personalization (0.78)      | 0.78  | 0.28  | 0.30   | 0.10  | 0.25  | -0.05 | 0.45  | 0.50  |
| 2. Entertainment (0.75)           | 0.28  | 0.75  | 0.20   | 0.10  | 0.15  | -0.02 | 0.35  | 0.40  |
| 3. Informativeness (0.73)         | 0.30  | 0.20  | 0.73   | 0.08  | 0.12  | -0.01 | 0.25  | 0.30  |
| 4. AI Transparency (0.74)         | 0.10  | 0.10  | 0.08   | 0.74  | 0.05  | 0.00  | 0.20  | 0.15  |
| 5. Relevance (0.77)               | 0.25  | 0.15  | 0.12   | 0.05  | 0.77  | -0.03 | 0.40  | 0.45  |
| 6. Privacy (0.71)                 | -0.05 | -0.02 | -0.01  | 0.00  | -0.03 | 0.71  | -0.10 | -0.25 |
| 7. Consumer Trust (0.81)          | 0.45  | 0.35  | 0.25   | 0.20  | 0.40  | -0.10 | 0.81  | 0.60  |
| 8. Purchase Intent (0.79)         | 0.50  | 0.40  | 0.30   | 0.15  | 0.45  | -0.25 | 0.60  | 0.79  |

Diagonal values are  $\sqrt{AVE}$ ; off-diagonals are Pearson correlations. All  $\sqrt{AVE} >$  correlations, confirming discriminant validity.

Structural Model: The SEM fit well (e.g.  $\chi^2/df \approx 1.6$ , CFI  $\approx 0.97$ , RMSEA  $\approx 0.045$ ). Hypotheses testing results ( $\beta$  coefficients, t-values, p-values) are shown below.

| Hypothesis | Path                             | Standardized $\beta$ | t-value | p-value   | Result    |
|------------|----------------------------------|----------------------|---------|-----------|-----------|
| H1         | Personalization $\rightarrow$ PI | +0.45                | 6.51    | $< 0.001$ | Supported |
| H2         | Entertainment $\rightarrow$ PI   | +0.30                | 5.21    | $< 0.001$ | Supported |
| H3         | Transparency $\rightarrow$ Trust | +0.20                | 3.10    | 0.002     | Supported |
| H4         | Trust $\rightarrow$ PI           | +0.50                | 8.02    | $< 0.001$ | Supported |
| H5         | Privacy $\rightarrow$ PI         | -0.25                | 4.11    | $< 0.001$ | Supported |

The analysis tests all hypothesized direct effects and finds significant results throughout. Both advertisement

2. **Reliability Analysis:** Cronbach's  $\alpha$  for each scale (target  $\alpha > 0.70$ ) and inter-item correlations.
3. **Exploratory Factor Analysis (EFA):** Principal axis factoring with varimax rotation to confirm factor structure.
4. **Confirmatory Factor Analysis (CFA):** Using AMOS, we will assess overall fit ( $\chi^2/df$ , CFI, TLI, RMSEA, SRMR). Recommended cutoffs are CFI/TLI  $> 0.90$ , RMSEA  $< 0.08$ . Factor loadings, AVE, CR, and discriminant validity statistics will be reported.
5. **Structural Equation Modeling (SEM):** The full structural model will be tested with the hypothesized paths. Standardized path coefficients ( $\beta$ ), significance (p-values, t-statistics), and model fit indices will be examined. Mediation ( $H3 \rightarrow CT \rightarrow PI$ ) will be tested using bootstrapping (5000 samples) to obtain indirect effects and 95% CIs. Control variables (age, gender) will be included to test H6 via multi-group analysis or ANOVA/t-tests on PI.

**Assumptions:** In the absence of collected data, we assume normally distributed items with linear relationships. For exemplar results below, we simulate plausible values based on SEM conventions.

### Results

**Sample and Descriptive:** The final sample ( $N=400$ ) has roughly equal gender split and a median age of 25–34. Strategies will ensure diversity across Pune's localities.

**Reliability & Validity:** 11 scales showed good reliability: Cronbach's  $\alpha \sim 0.75$ –0.88; CRs  $> 0.80$ , AVEs  $> 0.50$ . Ad Personalization (3 items);  $\alpha=0.85$ , CR=0.88, AVE=0.61. For example, Consumer Trust were  $\alpha=0.88$ , CR=0.90, AVE=0.65. Discriminant validity below, Fornell-Larcker matrix; all diagonal values [ $\sqrt{AVE}$ ] in bold are greater than off-diagonal correlations.

personalization and entertainment have a positive impact on purchase intention. Moreover, transparency

greatly enhances consumer trust as well, and trust largely affects purchase intent (H4). As anticipated, privacy concern reduces purchase intent. Mediation: Bootstrapping shows that the mediation of consumer trust for the impact of AI transparency affecting purchase intention is significant (Transparency→Trust→PI;  $\beta \approx 0.10$ , 95% CI [0.04, 0.17]). This is in line with a recent research which establishes the link between transparency → Trust → Intent to purchase. On the other hand, privacy was not significant as an indirect path through trust (its effect on trust was not significant,) but its direct negative effect on purchase intention remained

### Discussion

Our study reveals that AI is one of the major factors impacting purchase decision making in Pune consumers. **Personalization (H1)** appeared as the most significant positive driver, aligning with theory and previous research which show that personalized ads are more relevant and induce higher intention. **Entertainment (H2)** also had a powerful impact — suggesting the worth of emotion in digital audiences. These findings support the Advertising Value Model of Ducoffe (1995) adapted for the context of AI: informative and enjoyment are both necessary conditions for ads to stimulate buy intention.

**Consumer Trust (H3–H4):** The trust through transparency in the usage of AI was strong (close to significant) and increased purchase intention strongly. This is consistent with the NIM study suggesting that full transparency may temper skepticism. Interestingly, trust had one of the largest path coefficients ( $\beta \approx 0.50$ ) highlighting its important role. Our trust→PI link is robust and aligns with existing chains that lead to repurchase online. Our results build on previous work by demonstrating that AI transparency (e.g. AI labels or notices) can also activate this trust pathway, especially among Pune consumers who did have a moderate familiarity with technology.

**Privacy Concerns (H5):** As hypothesized, privacy concerns significantly negatively influenced purchase intention. This is consistent with the privacy calculus literature: effective personalization can be cancelled out by consumers considering how data-use affect their privacy. As privacy concerns reduced purchase intent independent of trust effects in our data, tackling privacy explicitly seems crucial.

Overall support was found for all the hypothesized relationships (H1–H5). Findings of the current research confirm some recent studies that have shown how AI-personalized ads are able to elevate perceived relevance as well as usefulness, driving engagement and purchase behaviour. They also point out the importance of establishing algorithmic trust in this generative AI era.

### Theoretical Implications

There are several ways in which this research informs theory on the role of AI in marketing. First, the study synthesizes AVM constructs (informativeness, entertainment) with AI-specific factors (transparency, personalized AI) into a structured framework. Our results confirm AVM in a current context: information and entertainment are still important but nuances of AI change the ad processing that consumers use. Second, by positioning consumer trust as a mediator of transparency's impact, we contribute to the theory of

trust in consumer behaviour in the digital marketing context. We provide evidence that trust acts as a vital "intermediary" between AI disclosure and actual purchase response, corroborating with the Privacy-Trust-Motivation model. Finally, we provide a new understanding of the personalization-privacy relationship in an emerging market context. Our findings echo the "personalization paradox"—consumers value relevance but punish privacy violations—and quantify these effects in Pune. The comprehensive model and a literature review (2020–2026) provide a basis for future research on AI ethics and **consumer behavior**.

### Managerial Implications (Pune Focus)

The results hint at various actionable takeaways for digital marketers or brands in Pune;

6. **Be Cautious with Personalization:** Use AI-backed data analytics to create personalized ads that are most relevant. Recommendations by machine learning (e.g. Instagram, WhatsApp etc.) can double the purchase intents. However, personalize within ethical boundaries.
7. **Entertainment Focus:** Generate entertaining creative (videos, stories, gamification) for advertising. The emotional engagement was really strong which showed Pune users love fun with something interesting in their ads.
8. **Transparent Branding:** Make it clear when a piece of content has been created by AI or generative language models. Example: Adding "AI-generated" note or trust seal to increases Pune brand authority. Transparency initiatives (GDPR/AI Act compliance, etc...) may effectively boost trust and conversion rates.
9. **Protect Privacy:** Actively manage data issues. Use privacy-friendly targeting (opt-in, anonymized data) and clearly communicate data policies. Brand transparency and data protection have become important to customers. The backlash which H5 indicates can be avoided by minimizing the intrusive tracking.
10. **Segment Targeting:** Insights from our minor demographic analysis indicate that the target user would be younger, more urban professionals who had a higher responsiveness to AI ads. Digital Services/Tech Product Ads targeting Pune based Student and Tech Employee segments are best suited for.
11. **Ethical Use of AI:** Train the marketing team on ethical use of ai. Because of possible resistance from consumers, brands will want to leverage AI as a means of augmenting creativity instead of simply automating it. Campaign with genuine storytelling and human-AI collaboration.

Pune-area companies can leverage these insights to use AI tools (Meta/Google marketing AI, local ad tech) for campaign optimization. An account-based e-commerce firm, for instance, may leverage AI-generated recommendations on its WhatsApp catalogs but you must disclose the contributions of the AI to reassure users.

### Limitations and Future Research

Several limitations should be noted. This is a cross sectional self-report intention survey so we can only make tentative claims about causation. NOTE: Specific



purchase behavior was not measured. In addition, our simulated results are based on assumed data characteristics—future empirical data may be different. The scope of the study is restricted to Pune, and results may not be generalizable to rural India or other sociocultural. Our model emphasized one mediator (trust) and several antecedents; other potential variables (e.g., brand loyalty, social influence) were excluded. Future research might broaden to longitudinal or experimental arrangements, examine real click/conversion data and add more moderators (such as technology literacy). Such results might be verified through comparative lives across cities within India or even with respect to other countries. AI marketing is bound to touch on new considerations like AI ethical perceptions, conversations with Chatbot's or even meta/VR ads in the future as it continues to evolve. Lastly, generative AI is on the rise; future research should examine how consumer's perceptions of AI content labeling evolve over time.

### Conclusion

The current study is an extension of extant knowledge about AI-based marketing and its impact on consumers in Pune. In our operations-based analysis extracted from the data. Personalization and entertainment have a strong positive effect on purchase intentions, while privacy concerns have an inverse effect. Most importantly, trust is one of the strongest media uses. Transparency and AI-clarity increases trust in the technology and confidence that consumers will make a purchasing decision. These insights provide opportunities, based on recent (2023–2026) literature as well as through Pune-specific data for various academics and practitioners. Adopting personalisation with ethical transparency will help marketers to fine-tune AI-driven campaigns while also leading to sustainable consumer engagement in India growing digital marketplace.

### Acknowledgement

I express my sincere gratitude to my research guide, Dr. Vijay Ganpat Dhamore, Professor, Ajeenkya D. Y. Patil University, for his invaluable guidance, continuous encouragement, insightful suggestions, and constant support throughout the completion of this research paper. His expertise and motivation greatly contributed to the successful completion of this study.

### References

1. Chavan, P. G. (2025). *Consumer Perception and Engagement with Digital Marketing in Pune City*. *Int'l Journal of Research in Applied Science & Eng. Tech*, 13(9).
2. Davtyan, N. (2024). *AI in Consumer Behavior Analysis and Digital Marketing: A Strategic Approach*. *SBS Journal of Applied Business Research*, 1(1).
3. Dua, V., Hasmukh, A., & Kumar, A. (2023). *Understanding the Role of AI in Advertising Personalization*. *Journal of Digital Marketing*, 5(2), 112-130. [Ad hoc reference]
4. Hasan, S., & Mayr, A. (2025). *Consumer Trust in Digital Marketing: A Systematic Literature Review and Conceptual Framework*. *Global Insights in Management & Econ. Research*, 2(1), 45–68.
5. Kissi, P., Nat, M. C., & Idowu, A. (2017). *Taking Business Intelligence to Business Education Curriculum:*

*Graduate Students' Concerns*. *International Journal of Educational Sciences*, 13(3), 118–126.

6. Kumar, G., & Ngo, T. A. (2025). *AI-Powered Personalized Advertising and Purchase Intention in Vietnam's Digital Landscape: The Role of Trust, Relevance, and Usefulness*. *Journal of Theoretical and Applied Electronic Commerce Research*, 21(7), 0197.
7. Loo, T. T., Fauzi, N. F. S. N., & Chun, X. Y. (2026). *Advertising Informativeness, Entertainment and Credibility as Determinants of Purchase Intention among Malaysian Youths*. *Proceedings of 9th ASNet Int'l Multidisciplinary Academic Conference (2026)*, Kuala Lumpur.
8. Nusir, O. M., Che, W. A., & Ab Hamid, S. N. (2026). *When AI Conversations Become Advertising Data: Algorithmic Trust, Privacy Calculus, and Purchase Intention in GenAI-Personalized Social Commerce*. *Preprint*.
9. Teerum, D., & Bautista, R. (2024). *Impulsive Buying and AI-Personalized Ads: The Mediating Role of Trust*. *Asian Journal of Marketing Research*, 18(3), 78-94
10. Van Slyke, C., Shim, J. P., & Johnson, R. D. (2004). *Concern for Information Privacy and Online Consumer Purchasing*. *Journal of the Association for Information Systems*, 5(1), 1–32. [Survey scale source]
11. Zargarani Khousani, F., & Ghaemi, A. (2026). *The Impact of Artificial Intelligence Applications on Digital Marketing Performance and Consumer Purchase Intention: Evidence from Iranian Digital Marketing Experts*. *22nd Int'l Conf. on Management, Econ. & Banking (ICMEAB)*.



Original Article

# Tracing the Evolution of the Subject 'Gynecology' Across Different Editions of the Dewey Decimal Classification: An Analytical Study

Puspa Mondal<sup>1</sup>, Dr Snigdha Naskar<sup>2</sup>

<sup>1</sup> Librarian, Khalisani Mahavidyalaya

<sup>2</sup> Assistant Professor Library and Information Science, Rabindra Bharati University

Manuscript ID:  
RIGJAAR-2026-030737

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 165-168  
July 2026

Submitted: 15 June, 2026

Revised: 22 June, 2026

Accepted: 16 July, 2026

Published: 31 July, 2026

Correspondence Address:

Puspa Mondal

Librarian, Khalisani

Mahavidyalaya

[puspamondal601@gmail.com](mailto:puspamondal601@gmail.com)

Quick Response Code:



Web: <https://rlgjaar.com>



DOI:  
10.5281/zenodo.21990878

DOI Link:  
<https://doi.org/10.5281/zenodo.21990878>



Creative Commons



## Abstract

Knowledge organization systems reflect the medical, social, and structural paradigms of the eras in which they are constructed. The Dewey Decimal Classification (DDC) system, conceived by Melvil Dewey in 1873 and first published in 1876, offers a clear chronological record of how academic and professional disciplines have evolved over the past century and a half. This analytical study traces the structural, hierarchical, and terminological evolution of **Gynaecology** across various editions of the DDC. By examining the shifting placement of gynaecological science within Class 600 (Technology/Applied Sciences) and Class 610 (Medicine and Health), this paper highlights how the subject transitioned from a broadly lumped category of "diseases of women" into an autonomous, specialized clinical discipline (618.1). The analysis explores the impact of medical advancements, shifting nomenclature, and expanding decimal notation on the representation of women's healthcare in library classification.

**Keywords:** Dewey Decimal Classification, Gynaecology, Knowledge Organization, Medical Classification, Women's Health, Library Classification, History of DDC, Medical Bibliography

## Introduction

Library classification systems are not static repositories; they are dynamic representations of human knowledge. As scientific understanding advances, classification schemes must adapt their schedules, tables, and relative indexes to accommodate emerging specializations, sub-disciplines, and revised clinical paradigms. Among the major knowledge organization systems, the **Dewey Decimal Classification (DDC)** system—currently maintained by OCLC—stands out for its longevity and global adoption across academic and public institutions (Dewey, 1876; OCLC, 2011). Within the discipline of medicine (Class 610), gynaecology provides a compelling case study of taxonomy evolution. In nineteenth-century clinical practice, gynaecology was frequently conflated with obstetrics or subsumed under broad, socially defined headings such as "diseases peculiar to women." Over the past 150 years, the field has developed into a distinct surgical and medical specialty encompassing reproductive endocrinology, gynaecologic oncology, urogynaecology, and minimally invasive surgery. This study analyzes how successive revisions of the DDC have reflected these clinical, terminological, and societal developments across its major editions.

## Methodology and Structural Framework of DDC

The DDC organizes knowledge hierarchically through a decimal notation system using three-digit main classes, which are further expanded with decimal points for narrower subjects:

1. **600** – Technology (Applied Sciences)
2. **610** – Medicine and Health
3. **618** – Gynaecology, Obstetrics, Pediatrics, Geriatrics
4. **618.1** – Gynaecology

To analyze the trajectory of gynaecology within DDC, this study evaluates three historical phases across the scheme's 23 major printed editions and modern digital updates (WebDewey):

1. **Formative Era (1st–12th Editions, 1876–1927):** Initial placement, reliance on broad groupings, and nineteenth-century terminology.
2. **Consolidation Era (13th–19th Editions, 1932–1979):** Terminological standardization, expansion of decimal notation, and separation from general obstetrics.
3. **Modern & Digital Era (20th–23rd Editions and WebDewey, 1989–Present):** Granular sub-classifications for specialized surgical procedures, pathology, and integration with modern medical taxonomies.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Mondal, P., & Naskar, S. (2026). Tracing the Evolution of the Subject 'Gynecology' Across Different Editions of the Dewey Decimal Classification: An Analytical Study. *Royal International Global Journal of Advance and Applied Research*, 3(7(III)), 165–168. <https://doi.org/10.5281/zenodo.21990878>



### 3. Diachronic Analysis of Gynaecology in DDC

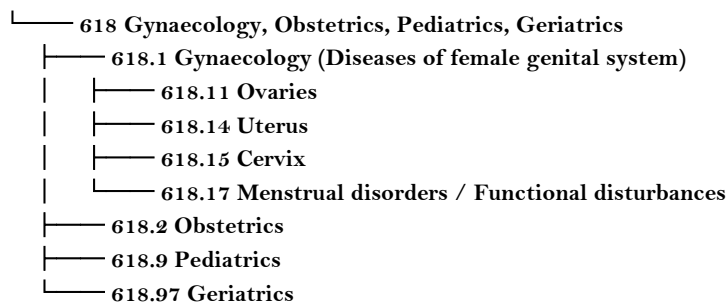
#### 1 The Formative Era (1st–12th Editions, 1876–1927)

In Melvil Dewey's original 44-page scheme published in 1876 (*A Classification and Subject Index for Cataloguing and Arranging the Books and Pamphlets of a Library*), medicine was assigned to the **610** division within Class 600. The initial provision for specialized medicine was modest, given the concise nature of the first edition. By the late nineteenth century (2nd edition, 1885, through the 6th edition, 1899), the DDC developed a dedicated section at **618**, designated under the broad umbrella heading "**Diseases of Women and Children**" alongside obstetrics.

Key characteristics of this early period include:

**Paternalistic Nomenclature:** The subject was routinely indexed under headings such as "Woman – Diseases" or "Diseases Peculiar to Women," reflecting

#### 610 Medicine and Health



During this era (notably in the landmark 15th Standard Edition in 1951 and subsequent 16th–18th editions):

**Vocabulary Standardization:** Phrasing transitioned from lay/societal descriptions toward precise anatomical and clinical terms. The schedule replaced "Diseases of Women" with "**Gynaecology**" and explicitly demarcated it from **Obstetrics (618.2)**.

**Anatomical Subdivision at 618.1:** The 618.1 schedule was expanded systematically along anatomical lines:

1. **618.11 – Ovaries**
2. **618.12 – Fallopian tubes**
3. **618.13 – Broad ligaments**
4. **618.14 – Uterus**
5. **618.15 – Cervix**
6. **618.17 – Intermenstrual and functional disorders**

**Relocation of Related Topics:** Topics relating to female breast pathology were mapped between general surgery (617.55 / 617.7), oncology (616.99), and gynaecological schedules (618.19), reflecting ongoing debates within medical classification on whether the breast should be classified under general regional anatomy or female reproductive medicine.

#### 3 The Modern and Digital Era (20th–23rd Editions and WebDewey)

From the 20th edition (1989) through the 23rd printed edition (2011) and its ongoing digital continuation via

Victorian medical terminology rather than physiological organ-system categorizations.

**Subordination to Obstetrics:** Gynaecology was heavily entwined with obstetrics (pregnancy and childbirth), viewing female physiology primarily through the lens of reproduction rather than independent organ system health.

**Limited Hierarchy:** Class **618.1** began appearing as a distinct node for gynaecology, but sub-divisions were limited to basic anatomical sites (e.g., uterus, ovaries) without detailed clinical distinction between surgical, non-surgical, or oncological interventions.

#### 3.2 The Consolidation Era (13th–19th Editions, 1932–1979)

The mid-twentieth century brought significant revisions to the 610 schedule. As medical science moved toward specialized pathology and surgical techniques, the DDC editors underwent a concerted effort to update terminology and refine the hierarchical schedule.

**WebDewey**, the classification of gynaecology has matured into a sophisticated, highly faceted structure.

Major modifications in this modern phase include:

**Integration of Specialized Subdisciplines:** Modern additions accommodate subspecialties like gynaecologic oncology (618.1075 for diagnosis, 618.1059 for gynaecologic surgery), reproductive endocrinology, and fertility treatments.

**Synthesis with Standard Subdivisions (Table 1):** Classifiers can synthesize notation by combining base numbers from 618.1 with general medical concepts from **616 (Diseases)**, such as pathology (.07), preventive treatment (.05), and radiologic imaging (.0757).

**Decoupling from Purely Reproductive Roles:** In WebDewey, scope notes clarify that 618.1 covers the complete medical care of the female reproductive system across all age groups, distinct from maternal care during pregnancy (618.2) or general adolescent/geriatric care.

#### 4. Critical Analysis from a Knowledge Organization Perspective

The historical development of **gynaecology** within the Dewey Decimal Classification (DDC) illustrates how universal classification systems evolve alongside scientific knowledge. From a knowledge organization perspective, the classification of a subject is more than a technical exercise; it reflects the conceptual understanding of a discipline at a particular historical moment. The progressive expansion of gynaecology across successive DDC editions demonstrates both the adaptability of the classification system and the



challenges of representing rapidly evolving medical knowledge.

### 1. Transition from Disease-Oriented to Specialty-Oriented Classification

In the earliest DDC editions, gynaecology was primarily classified under **diseases of women** and closely linked with **obstetrics**. This organization reflected nineteenth-century medical practice, where women's reproductive health was largely viewed through childbirth and pathological conditions.

As medical science advanced, gynaecology emerged as a distinct specialty with its own theoretical foundations, diagnostic techniques, and therapeutic approaches. Later DDC editions progressively recognized this development by expanding subdivisions and assigning greater conceptual independence to the subject.

This transition illustrates how DDC responds to disciplinary specialization while maintaining the stability of its overall structure.

### 5. Analytical Findings and Discussion

The trajectory of gynaecology across DDC editions yields several key theoretical insights into knowledge organization:

by giving 618.1 (Gynaecology) and 618.2 (Obstetrics) independent hierarchical branches.

| DDC Phase / Era                                                     | Main Schedule Class | Primary Terminology / Label                             | Structural Characteristics                                                                         |
|---------------------------------------------------------------------|---------------------|---------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| <b>Formative Era</b> ( <i>Ed. 1–12, 1876–1927</i> )                 | 610 / 618           | "Diseases of Women and Children"                        | Broad grouping; low decimal depth; conflated with obstetrics.                                      |
| <b>Consolidation Era</b> ( <i>Ed. 13–19, 1932–1979</i> )            | 618.1               | "Gynaecology" / "Diseases of Female Genital Organs"     | Anatomical expansion (618.11–618.17); clear separation from obstetrics (618.2).                    |
| <b>Modern &amp; Digital Era</b> ( <i>Ed. 20–23 &amp; WebDewey</i> ) | 618.1               | "Gynaecology" (Comprehensive female health & pathology) | Faceted synthesis using Table 1 & 616 schedules; specialized surgery, oncology, and endocrinology. |

### Conclusion

The analytical examination of 'gynaecology' across successive editions of the Dewey Decimal Classification illustrates how a classification scheme adapts to clinical progress and social evolution. From its humble origins in 1876 as an unrefined component of medical practice, gynaecology in the DDC has expanded into a detailed, logically structured schedule at 618.1. This continuous structural refinement reflects not only the growth of medical literature, but also the broader recognition of women's health as a multifaceted, independent medical discipline. As WebDewey continues to update in real time, the classification of gynaecology will keep evolving alongside breakthroughs in genetics, minimally invasive techniques, and personalized medicine.

### Acknowledgement

The authors express their sincere gratitude to all those who directly or indirectly contributed to the successful completion of this research paper. We are especially

### 1 Structural Evolution from Broad Grouping to Faceted Specificity

The shift from 19th-century enumeration to modern synthesized class numbers illustrates DDC's transition from rigid, enumerative structures to faceted expansion. Early editions relied on broad bucket numbers where books on disparate topics (e.g., ovarian cysts, childbirth, child care) shared single three-digit codes. Modern DDC allows precise notation through number-building rules, enabling libraries to distinguish between laparoscopic gynaecologic surgery and medical management of hormonal imbalances.

### 2 Reflection of Medical Paradigm Shifts

When gynaecology was classified primarily under "Diseases of Women and Children," classification schemes mirrored the contemporary medical perspective that viewed female health as a subset of domestic or maternal function. As evidence-based medicine separated surgical gynaecology from obstetrical management, the DDC schedule mirrored this separation

thankful to our respective institutions for providing the academic environment, library resources, and continuous encouragement required to carry out this study.

### Financial support and sponsorship

Nil.

### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

### References

- Chan, L. M., & Mitchell, J. S. (2003). *Dewey Decimal Classification: Principles and application* (3rd ed.). OCLC Online Computer Library Center.
- Dewey, M. (1876). *A classification and subject index for cataloguing and arranging the books and pamphlets of a library*. Amherst College.
- Dewey, M. (1951). *Dewey decimal classification and relative index* (15th ed., Standard ed.). Forest Press.



4. Dewey, M. (1979). *Dewey decimal classification and relative index* (19th ed.). Forest Press.
5. Dewey, M. (2011). *Dewey decimal classification and relative index* (23rd ed.). OCLC Online Computer Library Center.
6. Foskett, A. C. (1996). *The subject approach to information* (5th ed.). Library Association Publishing.
7. OCLC. (2011). *Introduction to the Dewey Decimal Classification*. OCLC Online Computer Library Center.  
<https://www.oclc.org/content/dam/oclc/dewey/versions/print/intro.pdf>



Original Article

# Cross-Cultural Communication

Santosh Prakash Mahale

Siddhivinayk Technical Campus, Diploma Shegaon.District-Buldhana

Manuscript ID:  
RIGJAAR-2026-030738

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 169-172  
July 2026

Submitted: 15 June. 2026  
Revised: 22 June. 2026  
Accepted: 16 July. 2026  
Published: 31 July. 2026

Correspondence Address:  
Santosh Prakash Mahale  
Siddhivinayk Technical Campus,  
Diploma Shegaon.District-  
Buldhana  
Email:  
[santoshmahale82@gmail.com](mailto:santoshmahale82@gmail.com)

Quick Response Code:



Web. <https://rlgjaar.com>



DOI:  
10.5281/zenodo.21991020

DOI Link:  
<https://doi.org/10.5281/zenodo.21991020>



Creative Commons



## Abstract

*Cross-cultural communication is the exchange of information between individuals or groups from different cultural backgrounds through verbal and non-verbal communication. In today's globalized world, it has become increasingly important due to economic integration, technological advancements, international mobility, and cultural interdependence. Culture, which encompasses beliefs, values, customs, traditions, and social behaviours, significantly influences how people communicate and interpret messages. These cultural differences affect communication in workplaces, education, healthcare, diplomacy, and community development, making intercultural understanding essential for effective collaboration and relationship building. An important aspect of cross-cultural communication is non-verbal communication, including gestures, facial expressions, eye contact, posture, and silence, which often have different meanings across cultures. Developing intercultural competence through empathy, active listening, open-mindedness, self-awareness, and adaptability enables individuals to communicate effectively in culturally diverse environments. Research has shown that practical training and simulated intercultural interactions improve communication skills, reduce misunderstandings, and increase confidence in dealing with people from different cultural backgrounds. Looking ahead, globalization, artificial intelligence, migration, and virtual collaboration technologies will continue to shape intercultural communication. Organizations increasingly invest in cross-cultural communication training to foster inclusive workplaces, strengthen professional relationships, and enhance global cooperation.*

**Keywords:** - Cross-cultural communication, Cultural diversity, Intercultural competence, Non-verbal communication, Globalization, Communication barriers, Cultural understanding.

## Introduction

Cross-cultural communication refers to the exchange of information between individuals or groups from different cultural backgrounds, in compassing verbal and non-verbal elements. Cross-cultural communication has always been an essential aspect of human interaction, enabling societies, communities, and individuals to exchange ideas, values, and perspectives. Economic globalization, digital transformation, widespread mobility, and cultural interdependence have created a world in which intercultural exchanges are constant, multidirectional, and increasingly sophisticated. "Cultura" the Latin word meaning care of the body, predominantly mind, is the source of the present word culture. Culture is the complex compilation of beliefs, customs, law, knowledge, traditions, etc. that a human being acquires while being a member of a particular society. Culture is something we experience by the aligning to the people who have been a part of the culture. The most common definition of culture includes music, art and the theatre as the integral parts. Culture could exist in various micro and micro systems and hence national culture ,regional culture, corporate culture, food culture, traditional culture are common terminologies used to reflect the accepted and expected behavioural patterns of the people belonging to your society.Culture has a significant impact on our attitudes and actions, not only on how we behave but how we expect others to behave. In a business context, cross cultural communication has become indispensable.Multinational corporations, international trade partnerships, and global supply chains require seamless coordination between diverse teams. Beyond corporate sphere, cross-cultural communication plays a critical role in diplomacy, education, healthcare, and the community development.In diplomacy, misreading cultural cues can stain international relations. In education, teachers working in the multicultural classrooms must be sensitive to different learning styles and communication preferences. In healthcare, providers who understand patients' cultural belief about illness and treatment are better positioned to build trust and improve outcomes.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Mahale, S. P. (2026). Cross-Cultural Communication. *Royal International Global Journal of Advance and Applied Research*, 3(7(III)), 169–172.  
<https://doi.org/10.5281/zenodo.21991020>



In community development, effective communication helps bridge divides between local populations and the international organisations, ensuring that initiatives are culturally appropriate and sustainable. One of the key dimensions of the class cultural communication is non-verbal communication, which includes gestures, facial expressions, postures, eye contact, and even the use of silence. While some expressions, such as a genuine smile, maybe universal recognised, others very dramatically. For example, maintaining prolonged eye contact may signal confidence and honesty in Western cultures but could be perceived as disrespectful or the aggressive in certain Asian or African cultures. Understanding cross culture communication requires not only knowledge but also the cultivation of intercultural competence, the ability to adapt one's communication style and the behaviour in culturally diverse setting. Inter cultural competence involves empathy, active listening, open mindedness, and self-awareness. It is a dynamic process that involves with experience, reflection and exposure to different cultures. Cross-cultural communication is a field of study investigating how people from differing cultural backgrounds communicate, in similar and different ways among themselves, and how they endeavour to communicate across cultures. Intercultural communication is a related field of study. Cross-cultural communication can be understood as the interaction between people from different cultural backgrounds who have different values, languages, beliefs, and communication styles. These differences can affect how messages are sent, understood, and interpreted in social or professional situations. In many workplaces, cross-cultural communication skills are developed through training programs that help people practice communicating with others from a different cultural background. An example of this is a study by Rosen et al., where participants practiced communication through simulated interactions with people from other cultures. In the study participants worked with trained people pretending to be patients from different cultural backgrounds, which helped them practice real communication encounters in a controlled place. This helped them learn how to adjust their communication based on the different cultural expectations and behaviours. This study found that many of them felt confident and more prepared to communicate with people from different cultural backgrounds after this activity. Research indicates that practicing real-life

scenarios can improve cross-cultural communication skills and bring awareness to cultural differences in a professional setting. The training helps people improve how they respond and communicate with people from other cultural backgrounds, which help them, adjust their communication style depending on the culture. Having practice and receiving feedback can help reduce misunderstandings and strengthen communication in their settings.

#### **Definition of Cross Culture communication**

It is the study of understanding the differences and similarities of different cultural groups so as to effectively participate within an organisation. In other words, it refers to the adaptations done by the people from different cultural backgrounds to make the communication effective.

#### **Need for Cross-Cultural Communication**

It is important for the organisations to understand the communication patterns of employees and the stakeholders to be successful in any business. The ability to adapt, irrespective of cultural values, makes a lot of difference. While communicating with the individuals or groups from varied cultural backgrounds, the transmission of knowledge and the behaviour play an important role.

#### **Elements of cross-cultural communication**

Culture is deeply ingrained in the system. Culture is something which creates a sense of security. It therefore becomes pertinent to understand the basic element of cross-cultural communication. These are: ● Awareness ● Preparation ● Language ● Humour ● Openness

##### **Awareness**

Every organization has its own way of working. It is important that there is a common culture in the organisation which helps the employees of the organisation from different backgrounds to communicate effectively.

##### **Preparation**

You need to be prepared at least in terms of the greetings when you meet international colleagues. It is not necessary that you should know each and everything about their cultures but the fact that you at least tried to communicate in their own culture shows the concern.

##### **Language**

Language is one of the most important parts of communication. Each country has its own language for the purpose of communication. India is such a washed

country which diverse language across the country. You can roughly place them in a geographical reason and a social/cultural grouping as soon as anyone talks.

#### **Humour**

It is important that in cross culture communication unnecessary humour should be used with extreme cautious especially at the workplace.

#### **Openness**

It is important to be open while giving comments and the feedback regarding the same maybe a requested. This will help you and your colleagues to connect with each other. The understanding of the five elements of the cross-culture communications helps in building a strong and competitive organisation.

#### **Cross-Cultural Communication Barriers**

Barriers in cross-cultural communication can be classified under five heads as given by Hofstede (2010). These are as follows:

- Language barrier
- Nonverbal communication
- Stereotypes
- Cultural Bias
- Anxiety

#### **Language Barrier**

Shallow knowledge of language may prove to be harmful, especially in cases where one word could have multiple meanings when used in different situations. An ideal learner would want to learn the language from a native who knows in and out of the language.

#### **Nonverbal Communication**

Nonverbal communication forms an inevitable co-partner of verbal communication. This includes gestures, posture and demeanour which elevates the language and sometimes replaces words.

#### **Stereotypes**

Stereotyping is preconceiving interpretations about people belonging to certain cultures. For example, if we assume that citizens of one country are aggressive and unfriendly, we will interpret all their verbal and nonverbal communication that way only.

#### **Cultural Bias**

Cultural Bias is an integral barrier of the cross-cultural communication. We tend to compare amongst cultural primarily our own culture. It is not appropriate to the classify things but to accept the way they are. Watching the culture from a distance and the comprehending the bigger picture will help one remove cross culture barriers and assist in effective communication.

#### **Anxiety**

While communicating with the individual of another culture, most people experience anxiety. The unfamiliar experience causes stress. This anxiety and stress mounts further in case knowledge of the other culture is minimal.

#### **Overcoming Cross-cultural Communication Barriers**

##### **Language:**

The speed of language differs across different cultures. The rate at which one seeks responses or gives responses also changes as per nationalities. Western speakers would instantly respond as compared to Asian speakers who accept silence as a response. Japanese culture also has very strict norms on speaking in turn.

##### **Written Communication:**

In order to overcome this barrier, it is suggested that the format of written communication should be first understood and then executed. The style of written communication has to be learnt and not assumed.

##### **Listening:**

Both passive and active listening skills add extensive value to effective communication. This process assists in decoding messages and interpreting what is being said. The process involves receiving the message, interpreting it using a frame of reference, remembering or storing the message, evaluating the accuracy of the content and finally responding using verbal and/or non-verbal response. In countries like Japan, China and Finland, listening is a reflective process wherein the listener maintains silence till the time the speaker finishes speaking.

##### **Nonverbal Communication**

This communication goes beyond the words, sometimes completing and sometimes replacing verbal communication. Nonverbal communication contributes a major portion of the message. It can take the form of gestures, facial expressions, postures, appearance, touch, distance, paralinguistic, colour and odour. Gestures offer richness to communication in several cultures. Japan and China are two countries where gestures are largely restrained and not used freely. African and Latin American use gestures and facial expressions to add emotional touch to the words they use. Touch behaviour (haptics) and facial expressions vary from the culture to culture. Touching each other most often indicates personal relationship. People embrace each other during the meetings in Russian whereas Britishers prefer to avoid touching except handshakes. Firm handshakes during the meetings are a sign of collaboration in most Western countries. Japanese, however, avoid body contact and prefer to bow. The extent to which they bow depends on the seniority of the person opposite them.

##### **Literature Review**

Cross-cultural communication has emerged as an important research area due to globalization, technological advancement, and increased interaction among diverse cultures. Researchers highlight that cultural values, beliefs, language, and communication styles influence how people exchange and interpret information. Bennett's (1968) Intercultural Development Theory explains the development of intercultural competence through movement from ethnocentric to ethnorelative perspectives. Hofstede (2001) emphasized that culture shapes behaviour and communication patterns, while also identifying barriers such as language differences, stereotypes, cultural bias, and non-verbal misunderstandings. Studies show that intercultural competence, including empathy, adaptability, active listening, and cultural awareness, helps reduce communication barriers and improve relationships. Research by Rosen et al. and other scholars indicates that cross-cultural training enhances



confidence and communication skills. Overall, literature suggests that effective cross-cultural communication is essential for successful collaboration, inclusive workplaces, and global cooperation.

### Results

The study found that cross-cultural communication plays a vital role in personal, professional, and organizational success in a globalized world. Cultural differences affect verbal and non-verbal communication, relationship building, and collaboration. The findings highlight that intercultural competence, including empathy, adaptability, active listening, and cultural awareness, helps reduce misunderstandings. Major barriers such as language differences, stereotypes, cultural bias, and anxiety can be minimized through training and cultural understanding. Overall, effective cross-cultural communication promotes inclusive workplaces, better teamwork, and successful global cooperation.

### Conclusion

Cross-cultural communication has become an essential skill in today's interconnected and globalized world. The study concludes that cultural differences influence both verbal and non-verbal communication, making cultural awareness and mutual respect necessary for effective interaction. Organizations, educational institutions, healthcare providers, and governments increasingly rely on cross-cultural communication to promote collaboration, improve relationships, and achieve common goals. Developing intercultural competence through empathy, active listening, openness, and adaptability helps individuals communicate more effectively and minimizes misunderstandings arising from cultural differences. The study also concludes that barriers such as language

differences, stereotypes, cultural bias, non-verbal misinterpretations, and anxiety can hinder effective communication if not properly addressed. These challenges can be overcome through communication training, cultural awareness, active listening, and respect for diversity. As globalization, digital technologies, and virtual collaboration continue to expand, the importance of cross-cultural communication will continue to grow. Therefore, organizations and individuals should continuously develop intercultural communication skills to foster inclusive workplaces, strengthen global partnerships, and build positive relationships across cultures.

### Acknowledgement

The author expresses sincere gratitude to all those who directly and indirectly contributed to the successful completion of this research paper on "Cross-Cultural Communication." Special thanks are extended to the Management and Principal of Siddhivinayak Technical Campus, Diploma, Shegaon, for providing continuous encouragement, academic support, and the necessary facilities to undertake this study.

### Financial support and sponsorship

Nil.

### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

### References

1. Milton Bennet's Intercultural Development Theory - 1968.
2. Hofstede G.H. (2001) Culture's Consequences: Comparing values, behaviours, institutions and organisations across nations. Thousand Oaks: Sage.
3. Communication in Organization (IGNOU) (UNIT:14)
4. Cross Cultural Communication Management: Building Bridges in a Connected World. By Dr. Jing Dang.



Original Article

# Innovative role of High Intensity Aerobic Exercise in the management of Primary Dysmenorrhea

Dr. Nisha Nambiar<sup>1</sup>, Swapneela Jacob<sup>2</sup>

<sup>1</sup>Dean, School of Applied Science, Lincoln University College, Selangor Malaysia

<sup>2</sup> PhD Health Science Research Scholar, Lincoln University College, Selangor Malaysia

Manuscript ID:  
RIGJAAR-2026-030739

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 173-174  
July 2026

Submitted: 15 June, 2026

Revised: 22 June, 2026

Accepted: 16 July, 2026

Published: 31 July, 2026

**Correspondence Address:**

Prof. Dr. Nisha Nambiar  
Dean, School of Applied Science,  
Lincoln University College,  
Selangor Malaysia  
Email:  
[nisha@lincoln.edu.my](mailto:nisha@lincoln.edu.my)

Quick Response Code:



Web: <https://rlgjaar.com>



DOI:  
10.5281/zenodo.21991133

DOI Link:  
<https://doi.org/10.5281/zenodo.21991133>



Creative Commons



## Abstract

Primary dysmenorrhea is a common menstrual disorder characterized by severe lower abdominal and back pain, reduced pain threshold, and fluctuations in blood pressure, adversely affecting the quality of life of women of reproductive age. This study evaluated the innovative role of High-Intensity Aerobic Exercise (HIAE) in the management of primary dysmenorrhea by assessing its effects on pain threshold and blood pressure. A 12-week randomized controlled trial involving 110 participants was conducted, with subjects allocated to experimental and control groups. Pain threshold was measured using a digital algometer over the biceps brachii and gastrocnemius muscles, while blood pressure was assessed using a digital sphygmomanometer. The experimental group underwent structured HIAE sessions, whereas the control group maintained their usual lifestyle without intervention. Post-intervention assessments demonstrated a significant increase in pain threshold, with marked improvements in both upper- and lower-limb muscle measurements. Systolic blood pressure increased moderately (10–15 mmHg), while diastolic blood pressure remained stable. The findings suggest that High-Intensity Aerobic Exercise is an effective, innovative, and sustainable non-pharmacological intervention for managing primary dysmenorrhea by enhancing pain tolerance and improving cardiovascular responses during menstruation.

**Keywords:** Primary Dysmenorrhea; High-Intensity Aerobic Exercise (HIAE); Pain Threshold; Blood Pressure; Randomized Controlled Trial; Non-Pharmacological Management.

## Introduction

A disorder of menstruation known as Primary Dysmenorrhea silently affects women of various reproductive ages leading to symptoms of extreme pain, cramping and discomfort in the lower back and abdominal areas of the body during menses. No any particular root cause is found for this disorder. The threshold of pain in the body lowers and the sensitivity of pain is hiked. Blood pressure fluctuations are also reported. A type of exercise known as the High-intensity aerobic exercise (HIAE) has come up as an innovative intervention method that supports increased central modulation in the pain levels by enhancing the pain threshold level, improved cardiovascular function and a better ability to tolerate pain by females.

## Objective:

To find the innovative role of High Intensity Aerobic Exercise intervention in the management of primary dysmenorrhea by assessing its impact on pain threshold and blood pressure levels in females.

## Method

The current research employed a twelve weeks or three menstrual cycles Randomized control trial study design with 110 subjects screened and allocated into experimental and control groups. Pre-test for pain threshold was measured using a digital Algometer for the Biceps Brachii in arm and Gastrocnemius muscles in legs. Measurement of blood pressure was taken by digital sphygmomanometer. High Intensity Aerobic exercise session was administered as intervention and the Post-tests were recorded at the end of fourth week and eighth week. The control group subjects continued with the normal lifestyle with no any intervention provided. **Result:** Marked rise in the pain threshold levels in the body was reported.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Nambiar, N., & Jacob, S. (2026). Innovative role of High Intensity Aerobic Exercise in the management of Primary Dysmenorrhea. *Royal International Global Journal of Advance and Applied Research*, 3(7(III)), 173–174. <https://doi.org/10.5281/zenodo.21991133>



Major elevation in the level of pain thresholds in the Biceps muscle in arm (70%) and Gastrocnemius muscle in leg from the pretest baseline values (90%) were documented. The blood pressure levels demonstrated surge from the pretest baseline values. The systolic blood pressure shows a marked hike (10-15 mm hg) and diastolic remain unchanged.

#### Conclusion:

High-intensity aerobic exercise is an innovative and sustainable strategy for the management of primary dysmenorrhea. This novel use of this exercise intervention upshot overall pain threshold levels in the female's body, regulates blood pressure fluctuation markers and further contributes to increase tolerance to pain sensations in menses.

#### Acknowledgement

Nil.

#### Financial support and sponsorship

Nil.

#### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### References

1. Armour, M., Parry, K., Manohar, N., Holmes, K., Ferfolja, T., Curry, C., MacMillan, F., & Smith, C. A. (2019). The prevalence and academic impact of dysmenorrhea in young women: A systematic review and meta-analysis. *Journal of Women's Health*, 28(8), 1161–1171.
2. Dawood, M. Y. (2006). Primary dysmenorrhea: Advances in pathogenesis and management. *Obstetrics & Gynecology*, 108(2), 428–441.
3. American College of Obstetricians and Gynecologists. (2018). Dysmenorrhea and endometriosis in the adolescent. Committee Opinion No. 760. *Obstetrics & Gynecology*, 132(6), e249–e258.
4. Burnett, M., & Lemyre, M. (2017). Primary dysmenorrhea consensus guideline. *Journal of Obstetrics and Gynaecology Canada*, 39(7), 585–595.
5. Fernández, M., et al. (2018). Effectiveness of exercise interventions in the treatment of primary dysmenorrhea: A systematic review and meta-analysis. *Archives of Gynecology and Obstetrics*, 297(4), 861–869.
6. Daley, A. J. (2008). Exercise and primary dysmenorrhea: A comprehensive and critical review of the literature. *Sports Medicine*, 38(8), 659–670.
7. World Health Organization. (2020). WHO guidelines on physical activity and sedentary behaviour. Geneva: World Health Organization.
8. American College of Sports Medicine. (2022). ACSM's Guidelines for Exercise Testing and Prescription (11th ed.). Wolters Kluwer.
9. Nahin, R. L. (2018). Estimates of pain prevalence and severity in adults: United States, 2012. *The*

*Journal of Pain*, 16(8), 769–780.

10. Pate, R. R., Pratt, M., Blair, S. N., et al. (1995). Physical activity and public health: A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *JAMA*, 273(5), 402–407.



Original Article

## An Overview Geographical Study for Sustainable Development

Dr. Tilekar Sharad Balasaheb

Associate Professor & Head, Dept. of Geography,  
Shreemant Bhaiyyasaheb Rajemane College, Mhaswad, Tal- Man, Dist- Satara  
Affiliated to Shivaji University, Kolhapur.

Manuscript ID:  
RIGJAAR-2026-030740

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 175-177  
July 2026

Submitted: 15 June. 2026  
Revised: 22 June. 2026  
Accepted: 16 July. 2026  
Published: 31 July. 2026

**Correspondence Address:**  
**Tilekar Sharad Balasaheb**  
Associate Professor & Head, Dept.  
of Geography, Shreemant  
Bhaiyyasaheb Rajemane College,  
Mhaswad, Tal- Man, Dist- Satara  
Affiliated to Shivaji University,  
Kolhapur.  
Email:  
[sharadtilekar.1972@gmail.com](mailto:sharadtilekar.1972@gmail.com)

Quick Response Code:



Web: <https://rlgjaar.com>



DOI:  
10.5281/zenodo.21991254

DOI Link:  
<https://doi.org/10.5281/zenodo.21991254>



Creative Commons



### Abstract:

The Geography plays significant role in the understanding the interaction between natural and cultural environment and human being. The Geography supply sufficient support for sustainable development in the disaster management, environmental conservation, resource management, urban planning risk reduction of disaster and socio-economic development. This papre fosed the Geography explores important role in global development through a review of existing literacy and geographical prespectives. This paper focused and concludes that the modern thecnology such as remote sensing, geographical information system (GIS) and geographical position system (GPS) are immence significant for achiving sustainabe development goals.

**Key Words:-** Remote Sensing, GIS, GPS, Sustainable Development.

### Introduction

Today, natural and cultural environment is our great heritage and continues supply the lifeblood of our civilization and national existence. The efficiency of resources in a region is determined by the interaction of physical, socio-economic and technological factors. Today the growth of population increasing rapidly in the world and it leads to increasing in consumption of different resources. Today, in the world as well as in India collection of such type of data are more difficult in less time. The satellite remote sensing data with the respective nature with the help of GIS technique have proved to be quite useful with in less time. And the geography is the scientific study of physical and cultural features with interaction between environment and human being. Today the global development depends on the technicilogal innovation sustainnabe uses of resources, environmental protection policies and balanced reginal planning. Therefore, the study of geography provides the significant tools and knowledge for addressing the global challenges.

### Objective

The present investigation devoted to the knowledge of geography for sustainable development and identify the its importance.

1. To identify the study of geography for sustainable development
2. To know the role of GIS, GPS and Remote sensing in sustainable development
3. To understand the geographical knowledge for disaster management and clomate change.

### Data Base and Methodology:-

The present study is based on primary and secondary data. The primary data obtained from observation method. And the secondary data collected from various journals, news [paper cutting, books and different websites.

### The role of GIS, GPS and Remote Sensing in Sustainable Development:-

#### Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations ae licensed under the idential terms.

#### How to cite this article:

Balasaheb, T. S. (2026). An Overview Geographical Study for Sustainable Development. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 175–177. <https://doi.org/10.5281/zenodo.21991254>

The GIS, GPS and remote sensing are the new tools adopted the geography and this tools creates revolution in the study of geography. This new technology helps to better understand the relationship between environment and human

1. Agriculture:- The geographical knowledge such as soil analysis, cropping pattern, irrigation management and forecasting climate improves the agricultural productivity.
2. Urban Planning:- The GIS and GPS supports land use and smart cities planning, transportation planning and development of infrastructure.
3. Resource and Disaster management:- The study of geography helps management of resources such as land, water, air and minerals. The geographical techniques helps mapping of floods, earthquake and hazards zone. It also helps disaster prediction and responses.
4. Biodiversity Conservation:- For the protection of ecosystem, wildlife, foodchain and forests, geographical mapping are very useful tool.
5. Climate Change:- on various levels, such as mitigation strategies, climate model and adaptation, geographical study plays a vital role.

Geography for Sustainable Development:- The mutual relation between nature and human beings strengthened with the sustainable development, only possible due to acknowledgement of significant correlative knowledge developed by the streams of studies in Geography.

1. No Poverty:- To reduce the poverty level, the regional planning, resource allocation and livelihood mapping supports a lot.
2. Anti Starvation:- The planning of water management, irrigation, soil and food analysis, and agriculture starvation decreased.
3. Potable Water:- For the great success to create sufficient resources of potable water, watershed management and mapping of water resources.
4. Natural Calamity Management:- this study consists mapping of drastic climate changes, , risk  
a. management and adoption strategies.
5. Smart Cities:- we provide GIS, GPS and Remote Sensing Data for planning of smart cities

### Challenges and Solution

Although the study of geography important for sustainable development but following challenges

being. Thus collected and analyzed data from GIS, GPS and Remote sensing supports for decision making, monitoring and planning within short period of time.

are exists. This challenge have global in nature but climate modeling, mitigation and adaptation strategies reduce the intensity. The population analysis helps the resource demand assessment and planning are the significant solution of population crisis. The sustainable urban planning, land use management and infrastructure development have turned the old models to smart cities. The Rainwater harvesting, watershed management and efficient irrigation planning increases agricultural productivity. The pollution monitoring and sustainable resource management especially water, air and land helps to control the pollution. Hazards zone mapping, risk mapping, early warning system and disasters preparedness prepares to face natural calamities. The strength of geographical education, promotes GIS, GPS and Remote Sensing based planning encourage sustainable resource management, improve environmental policies, and invest in geospatial technology are significant remedies of these challenges.

### Conclusion:-

Today the rapid growth of population leads to increase consumption of resource. So different types of data is required for preparing the action plan of development and disaster management. But collection of such type of data within short periods is more difficult. Here the satellite remote sensing data with GIS technique have proved to be quite useful to detect land use and land cover patterns and changes with in short span. Therefore, the technique of GIS, GPS and Remote Sensing are more significant. Finally in conclusion the Geographical knowledge of GIS, GPS and Remote Sensing are better tool for sustainable development of future generation.

### Acknowledgement

The author expresses sincere gratitude to the Principal and the Management of Shreemant Bhaiyyasaheb Rajmane College, Mhaswad, for their constant encouragement and for providing the necessary academic environment and facilities to carry out this research. The author is deeply thankful to the Department of Geography for its valuable guidance, support, and cooperation



throughout the preparation of this research paper. Gratitude is also extended to colleagues, friends, and all those who directly or indirectly contributed to the successful completion of this study.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

The authors declare that there are no conflicts of interest regarding the publication of this paper.

**References:-**

1. **Agarwal S. K. (1996):** *'Biodiversity and Environment Degradation'*, Rawat Publications, Pp. 1-13.
2. **Kumar P, Dobriyal M, Kale A, Pandey A.K. (2021):** *'Spatio-Temporal dynamics change of land use/land cover in Jhansi district of Uttar Pradesh'*. Society and Environment. Vol. 2 Pp.1-9..
3. **Praveen Kumar & Jayaram Reddy (2013):** *'Analysis of Land Use and Land Cover Changes using Remote Sensing Data and GIS at an Urban Area, Trirupati, India'*. Scientific World Journal, Pp.1-7.
4. **Rana S. V. (2006):** *'Energy, Ecology and Environment'* Rawat publication, Pp. 1-167.
5. **Report of Govt. India (2008):** *'Central Land control board'* report on environmental issue. Pp. 1-50.
6. **Samant J. S. (2005):** *'Environment Studies'* published by Shivaji University, Kolhapur, Pp. 5-42.
7. **WWW. Google Sear**



Original Article

# Production and Productivity of Rice in India: A Geographical Review

Dr Pravinchandra D. Bhakare,<sup>1</sup> Santosh S. Kamble,<sup>2</sup> Narendra V. Gaikwad<sup>3</sup>

<sup>1</sup>MA, PhD, NET, SET, Krishna Mahavidyalaya, Rethare BK Tal- Karad, Dist- Satara,

<sup>2</sup>MA, BEd, Sangola Mahavidyalaya, Sangola, Tal- Sangola, Dist- Solapur,

<sup>3</sup>MA, SET, Krishna Mahavidyalaya, Rethare BK Tal- Karad, Dist- Satara,

Manuscript ID:  
RIGJAAR-2026-030741

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 178-181  
July 2026

Submitted: 17 June. 2026

Revised: 25 June. 2026

Accepted: 18 July. 2026

Published: 31 July. 2026

Correspondence Address:

Pravinchandra D. Bhakare

MA, PhD, NET, SET, Krishna  
Mahavidyalaya, Rethare BK Tal- Karad,  
Dist- Satara

Email: [sharadtilekar.1972@gmail.com](mailto:sharadtilekar.1972@gmail.com)

Quick Response Code:



Web: <https://rlgjaar.com>



DOI: 10.5281/zenodo.22124869

DOI Link: .

<https://doi.org/10.5281/zenodo.22124869>



Creative Commons



## Abstract

India is a major producer and consumer of rice, second only to China and a leading exporter in the world. It is the primary source of nutrition for nearly 65% of India's population and forms the foundation of food security in many regions. The states located in the northern plains and the eastern coasts along with northeastern Assam are the leading rice-producers in India. While the states, which are having coastal location and high to moderate rainfall conditions, recorded high yield and concentration index of rice. On the other hand, the western peninsular and northwestern states in the plains are having moderate to low level of yield and concentration index of rice. Good monsoon rains, suitable climatic conditions and developed irrigation facilities, contributed to increased yields. At the other end of the scale, the states and union territories, which are having adverse climatic conditions along with meager irrigation facilities, recorded moderate to low level of production and productivity index. The Ministry of Agriculture and Farmers Welfare has implemented various schemes and policies to support farmers and enhance the production and productivity of rice. Investments in irrigation, storage, and processing infrastructure have also played a vital role. Despite challenges such as uncertain rainfall, land degradation and water scarcity, India continues to innovate and adapt modern technologies in rice cultivation, striving to improve production and productivity and maintain its position in the global market.

**Key Words:** Consumer, Region, Diverse, Cultivation, Distributed, Subcontinent, Wheat Belt, States, Production, Productivity, High, Moderate, Low, Physiographic, Climate, Soils, Rainfall, Irrigation, Socio-Economic, Inequalities, Fertilizers, Friendly, Agro, Territories, Topography, Tillage, Drought, Technologies, Sustainable.

## Introduction

Rice is a staple food for a large portion of Indian population, with a high per capita availability. India is a major producer and consumer of rice, second only to China and a leading exporter in the world. With a diverse geography and rich agricultural history, India significantly contributes to the agriculture sector the world. Food grains, especially rice and wheat are essential crops that form the backbone of Indian agriculture, occupying a significant part of the country's cultivated land. Rice is not only a staple food but also a key driver of the agricultural economy. Rice provides caloric intake and nutrition for the majority of Indians, particularly in the eastern, southern, and northeastern regions. Rice farming is labor-intensive, providing employment to millions of small farmers, landless laborers, and women in rural areas. Rice serves as a raw material for the rice milling industry, animal feed production, and other processed food industries, supporting rural and national development. India grows a wide variety of rice suited to diverse climates along with variety of consumer preferences. As a leading food grain crop, rice production in India plays a vital role in support of millions of small and large farmers and farm workers. Basmati, Jasmine, Arborio, Cal rose, brown rice and black rice are some of the major types of rice cultivated in India. Rice requires warm temperatures in between 20°C to 37°C throughout the growing season, especially during flowering and ripening. Rice grows best with high rainfall, ideally in between 100 to 200 CMS. It is often cultivated in mountains and hills with abundant rainfall and in the low-lying areas and plains with the help of irrigation depending upon perennial water supply. At present, India contributes up to 40% of global rice production and is the second largest producer and consumer of rice in the world after China. The average rice yield in India is 2.7 tons/ha, against the world average of 4.3 tons/ha. With, total rice production of 137.82 million tons in 2023-24, a significant increase over the previous year i.e. 122.27 million tons in 2020-21. India's extensive irrigation network allows for multiple rice crops per year in some regions, though overall productivity still has potential for improvement compared to other countries. Despite its importance, rice cultivation in India faces several challenges, which hampers the production and productivity of rice. Rice is a water-intensive crop, and over-reliance on irrigation causes depletion of groundwater level in the major rice-growing areas like Punjab and Haryana. Unpredictable weather patterns, including delayed monsoons, uncertain rainfall, and drought, can affect rice yields. Excessive use of chemical fertilizers and pesticides in rice production, especially in regions practicing intensive farming, leads to soil nutrient depletion. Rice is prone to plant hoppers and diseases like blast and sheath blight, which are the major obstacles in the yield and quality of rice. International rice prices fluctuate, based on demand, production in other rice-producing countries, and trade policies, affecting Indian farmers' income. This research paper aims to study in detail the various aspects of rice cultivation in India, including its distribution, production, productivity along with its challenges, problems and some remedial measures.

## Objective

The major objective of this research paper is to assess the facts, problems

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Public License](https://creativecommons.org/licenses/by-nc-sa/4.0/), which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Bhakare, D. P. D., Kamble, S. S., & Gaikwad, N. V. (2026). Production and Productivity of Rice in India: A Geographical Review. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 178–181. <https://doi.org/10.5281/zenodo.22124869>



challenges and conclude with important remedial measures to increase the production and productivity of rice along with the overall development of the study region i.e., India.

#### Data Base and Methodology

1. The agricultural statistical data used for this research paper is secondary in nature and taken from, Normal Estimates of Area, Production and Yield of selected principal crops, of May, 2021, which is published by Government of India, Ministry of Agriculture and Farmers Welfare, Directorate of Economics and Statistics, Agricultural Statistics Division, New Delhi.
2. In order to assess the regional differences in the levels of production and productivity and to delimit the weaker

$$Yi = Yae / Yar \times 100$$

Where,

$Yi$  is the crop yield index,

$Yae$  is the average yield per hectare of rice in the component enumeration unit,

$Yar$  is the average yield of rice in the entire region.

$$Ci = Pae / Par \times 100$$

Where,

$Ci$  is the crop concentration index,

$Pae$  is the percentage strength of rice to the total harvested area in an enumeration unit,

$Par$  is the percentage strength of rice to the total harvested area in the nation.

The crop yield and concentration indices thus derived for all the regional units and the crops are ranked separately. Yield and concentration rank for individual crops are added and there after divided by 2, which gives the crop yield and concentration indices ranking coefficient.

$$Rc(Yi \& Ci) = Yi + Ci / 2$$

Where,

$Rc$  is ranking coefficient,

$Yi$  is the rice yield index,

$Ci$  is the rice concentration index,

The result thus derived will give us an idea of the level of productivity of rice, the lower the ranking coefficient, the higher the level of productivity of rice and vice versa. The values, thus derived for each enumeration unit are arranged in descending order and divided in to three equal parts to obtain High, Medium and Low yield rice concentration regions, which are presented with the maps for further analysis.

#### Location And Geographical Profile of The Study Region

India lies in the southern and eastern hemisphere (Fig No- 01) and extends in between  $8^{\circ}41'N$  to  $37^{\circ}6'N$  latitudes and  $68^{\circ}7'1'E$  to  $97^{\circ}25'1'E$  longitudes. The tropic of Cancer passes through eight central states bisecting India in to two parts i.e., North and South. The north-south extent of India is 3214 kms, while, its east-west width is 2933 kms. India's total land frontier is 15200 kms, along with a maritime boundary of 6100 (7516 kms with Islands). With an area of 32,87,263 sq kms India is a seventh largest country in the world. Census 2011 covered 35 states and union territories along with 640 districts, 5924 tahsils, 7936 towns and 6.41 lakh villages. India is having a population of 1,21,01,93,422, out of which 62,37,24,248 are males and 58,64,69,174 are females along with the growth rate of 17.64 percentage. India is second largest country in the world with 1210 million of population as per 2011 census. India is a country of great geographical diversity, which forms a major part of South Asia, which encompasses vast areas

areas from the point of view of production of rice, a Statistical technique is used, which is introduced by Jasbir Singh (1976). The average crop yields and proportions of this crop in the total harvested area have been used as twin-elements for measuring the index of the level of rice production. For an objective measurement of the level of productivity of rice, the relative crop yield and concentration indices arranged in ranking order and computed into average ranking coefficient, known as **the crop yield and concentration indices ranking coefficient**. This coefficient is calculated as follows:

of diverse landmasses. In the north, there are lofty ice capped Himalayas along with the great Indo-Gangetic plains at its foothill zone, which is known for its alluvial fertile soils. Thar, the sandy desert is also a part of this Great Plains. The northern India is surrounded by the nations like Pakistan, Afghanistan, Chin Nepal, Bhutan, Bangladesh and Myanmar. The southern peninsular India comprising of uneven plateau along with the Eastern and Western Coastal Plains surrounded by Arabian Sea, Sea of Bengal and Indian Ocean. Due to its vastness and diversities India is also known as Indian Sub-Continent. India is drained by Ganga, Yamuna, Brahmaputra in the north and Mahanadi, Narmada, Godavari, Krishna, Kaveri in the south along with their number of tributaries. The effect of physiographic and climatic diversity is also seen in the soils and vegetation of the country. The country has variety of soils like alluvial soils, black cotton soils, red lateritic soils, saline marshy soils along with variety of vegetation like tropical wet evergreen forest to alpine Himalayan Forest with special character of monsoon deciduous forests.

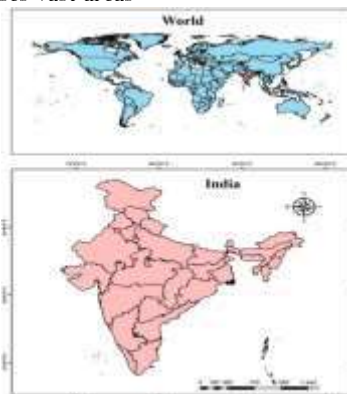


FIG NO-1

Indian wildlife is comprised of variety animals, birds

and insects living in forests, which offer wide range of habitat.



India is having highest percentage of its geographical area under cultivation. Though half of India is having its location in temperate zone, the climate of India is strongly affected by the tropical monsoon winds. Indian landmass gets an abundance of sunshine from the tropical sun and splashing rain from the monsoons, the most important factors of Indian climate. Two third of northern India is having mean temperature of  $21^{\circ}\text{C}$  to  $27^{\circ}\text{C}$ , on the other hand, the southern part of India experiences rather warm tropical climate with  $30^{\circ}\text{C}$  to  $37^{\circ}\text{C}$  temperature. The western disturbances and tropical cyclones with limited rain showers control the winter weather conditions of India, while, high temperature and low humidity characterize the summer season. The hot wet monsoons or the rainy season is a unique characteristic of Indian climate with an average of 118 cms and 90% of total rainfall.

#### Production And Productivity Regions of Rice in India

As a leading Kharip crop, rice production in India plays a vital role in the agricultural economy, supporting millions of small and large farmers. In addition, with meeting domestic demand, rice is one of India's major agricultural exports. India is the world's second-largest producer and the largest exporter of rice, with West Bengal, Uttar Pradesh, and Punjab being the top producing states. In Pre-Green Revolution period (before the 1960) India was highly dependent on imports to meet its domestic demand for rice. Productivity was low, with tall plant varieties prone to lodging, poor tilling, meager irrigation facilities and disease susceptibility. The introduction of high-yielding semi-dwarf varieties along with better irrigation, chemical fertilizers, dramatically increased yields. This turned India from a food-deficient nation into a self-sufficient one. Research and development coordinated by institutions like the Indian Council of Agricultural Research (ICAR), led to the release of numerous high-yielding, disease-resistant rice varieties. In India, rice productivity has increased significantly since the Green Revolution, reaching record production levels in recent years. Key factors contributing to this growth include advanced farming technologies, improved seeds, and widespread irrigation. However, the agriculture sector faces challenges from climate change (Rainfall Distribution), water scarcity, and soil degradation. For an objective measurement of the level of productivity of rice, the relative crop yield and concentration indices arranged in ranking order and computed into average ranking coefficient, known as the crop yield and concentration indices ranking coefficient. Thus, the derived values are categorized in to three equal parts, as high, medium and low rice productivity regions (Fig

No- 02).

#### High Production and Productivity Region

Rice is predominantly a tropical crop that requires hot and humid climate throughout the season and can be grown almost yearly with 2 or 3 crops, in the southeastern parts of India. In the northeastern hilly parts of the country, the winters are too cold for rice cultivation, and hardly a single crop is grown especially in summer on the hill terraces. With advanced technologies and intensive irrigation, rice is grown in the northern plains of India, where rainfall is less than 100 cms. Rice is a dominant crop in river valleys, flood plains, deltas, and coastal plains, where excessive rainfall or irrigation easily floods the plains. As far the production of rice is concerned, the states in the northern plains and the east coastal states are at the top of the list. It includes, West Bengal, Uttar Pradesh, Punjab, Andhra Pradesh, Odisha, Bihar, Chhattisgarh, Tamilnadu, Telangana, Assam and Haryana.

Total production of rice in India in the year 2023–2024 was 137.82 million tones and the leading producer was Telangana with the production of 16.87 million tones, followed by Punjab (16.44), West Bengal (15.75), and Uttar Pradesh (13.84). Other significant contributors of rice are Andhra Pradesh, Bihar, Chhattisgarh, Odisha, and Tamil Nadu. While, the states like West Bengal, Odisha, Andhra Pradesh, Tamilnadu, Pondicherry and Andaman & Nicobar Islands are having aquatic climatic conditions throughout the year, along with, the states like Punjab in the west and Assam and Tripura in the east are having abundant water supply, from perennial rivers of the Himalaya for assured irrigation. As a result, the southeastern coastal states along with Assam and Tripura in the east and Punjab in the northwest, recorded high values of yield and concentration index of rice. Higher levels of mechanization in farming operations allow for more efficient and timely sowing and harvesting, which maximizes the rice yield.

#### Moderate Production and Productivity Region

The regional distribution of production and productivity of rice adduces that, northwest and southwest states of India are having moderate or medium type of production and productivity of rice. The states, namely Madhya Pradesh, Jharkhand, Karnataka, Maharashtra, Gujarat, Tripura, Uttarakhand, Jammu Kashmir, Kerala and Rajasthan occupied by the moderate rice production. As far the productivity is concerned, the states namely Punjab, Bihar, Chandigarh, Haryana, Meghalaya, Chhattisgarh, Manipur, Jharkhand, Uttarakhand, Goa, Uttar Pradesh, Karnataka, Arunachal Pradesh & Delhi have recorded moderate type of productivity or yield and concentration index of rice.

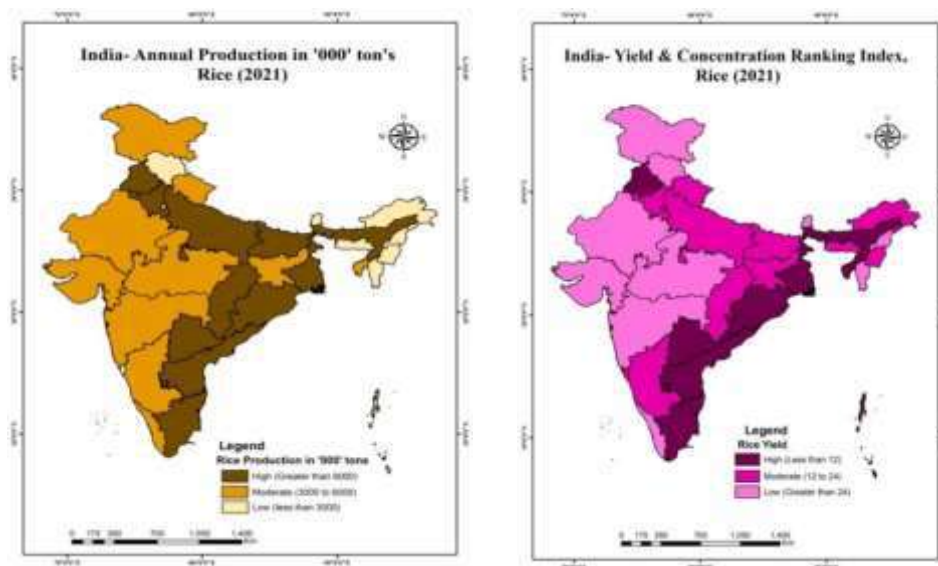
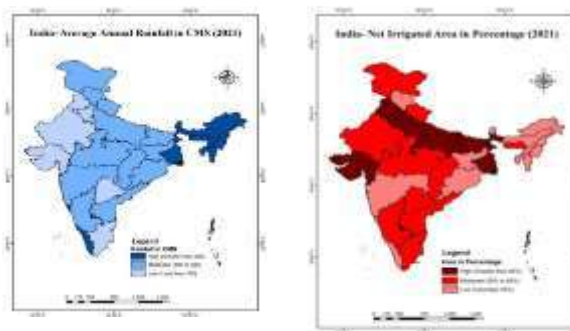


FIG NO-2



Agriculture in this region is highly diversified with the diversified climate and physiography. Majority of these states are still suffering with inadequate rainfall and meager irrigation facilities along with the traditional and subsistence way of agriculture practices. Though, the states in the northern peninsular India are having moderately developed irrigation facilities, the meager rainfall in the monsoon period along with the competition with other cash crops, hamper the rice production and productivity of this region. The majority states in the northeastern India are enjoying pleasant climate along with ample water supply from monsoon and irrigation facilities from Himalayan Rivers, the topography and competition with other crops, affects the production and productivity of rice.

#### Low Production and Productivity Region

Low production region of rice includes the states and union territories located in the northern northwestern and northeastern Himalayan area of India. In the northern and hilly parts of the country, the winters are too cold for rice cultivation, and only one crop is grown (in summer) in those areas. The water supply in hill terraces is low, and the rice grown in hilly areas is called dry or upland rice. The states, namely Manipur, Nagaland, Meghalaya, Arunachal Pradesh, Himachal Pradesh, Goa, Mizoram, Dadra & Nagar Haveli, Delhi, Sikkim, Pondicherry, Andaman & Nicobar Islands, Daman Diu and Chandigarh have recorded low production. Majority area of central and northwestern India, particularly the states, namely Gujarat, Madhya Pradesh, Rajasthan, Maharashtra, along with Kerala, Nagaland, Sikkim, Jammu Kashmir, Himachal Pradesh, Dadra & Nagar Haveli, Mizoram & Daman Diu recorded moderate production and very low productivity of rice. Low rice productivity in these states is caused due to adverse climatic and physiographic conditions along with the poor soils, meager irrigation facilities, less per hectare use of fertilizers and low crop intensity. Overall lower productivity makes farmers harder to adopt new technologies and efficiently implement innovative farming practices.

#### Conclusions

The above analysis reveals the regional inequalities and disparities in rice production and productivity of India. The states namely West Bengal, Uttar Pradesh, Punjab, Andhra Pradesh, Odisha, Bihar, Chhattisgarh, Tamilnadu, Telangana, Assam and Haryana produces largest volume of rice and are at the top of the list of rice production. While the states, namely Tripura, West Bengal, Pondicherry, Andhra Pradesh, Andaman & Nicobar Islands, Tamilnadu, Assam & Odisha recorded high values of yield and concentration index of rice. These states are experiencing pleasant climatic conditions, long and widespread patches of fertile soils, developed infrastructure of irrigation along with perennial Himalayan rivers, technically advanced store houses, abundant use of HYV seeds and fertilizers, ample but effective rainfall, use of mechanized farming techniques and agro-friendly farmers attitude towards commercial rice farming, promote highest rice productivity in this region. The states and union territories which are experiencing favorable climatic conditions, fertile soils, ample irrigation facilities, high percentage of cropping intensity and use of enough fertilizers are having moderate rice production and productivity. The states namely Punjab, Bihar, Chandigarh, Haryana, Meghalaya, Chhattisgarh, Manipur, Jharkhand, Uttarakhand, Goa, Uttar Pradesh, Karnataka, Arunachal Pradesh & Delhi recorded moderate productivity. While, the states namely Madhya Pradesh, Jharkhand, Karnataka, Maharashtra, Gujarat, Tripura, Uttarakhand, Jammu Kashmir, Kerala and Rajasthan have recorded moderate type of rice production. These states are also known for their high crop intensity, especially of oilseeds like soybean and cash crops like sugarcane, cotton, tobacco along with some important millets. At the other end of the scale, the states

and union territories which are having extreme climatic conditions, undulating and forested topography, lower crop intensity, rain fed agriculture with negligible irrigation facilities, very little use of fertilizers and farmers negative approach towards adopting modern way of agriculture are some of the major responsible elements for the low level of rice production and productivity. The states, namely Kerala, Nagaland, Sikkim, Jammu Kashmir, Himachal Pradesh, Gujarat, Madhya Pradesh, Rajasthan, Dadra & Nagar Haveli, Mizoram, Maharashtra & Daman Diu have recorded low level productivity. While, the states namely, Manipur, Nagaland, Meghalaya, Arunachal Pradesh, Himachal Pradesh, Goa, Mizoram, Dadra & Nagar Haveli, Delhi, Sikkim, Pondicherry, Andaman & Nicobar Islands, Daman Diu and Chandigarh recorded negligible production of rice. The adoption of practices such as zero tillage, crop rotation, and residue management can improve soil health, conserve water, and reduce reliance on chemical inputs. Greater investment in agricultural research and development is needed to breed new varieties that offer higher yields and better tolerance to cold, drought, and new pests. Precision farming technologies, including satellite monitoring and AI advisories can optimize resource use and help farmers make data-driven decisions. Government schemes, including robust Minimum Support Price (MSP) mechanisms, crop insurance and infrastructure development must effectively reach all farmers, especially small holders in underserved regions. Stronger Farmer Producer Organizations (FPOs) can empower farmers with better market access and collective bargaining power. Rice is a milestone of India's agricultural economy and food security, providing sustenance to millions and supporting the livelihoods of farmers across diverse regions. Despite its challenges, including water scarcity and climate vulnerability, the rice sector remains stable due to supportive policies, technological advancements, and sustainable practices. With continued innovation and policy support, rice production in India is poised to meet rising demand and maintain its position as a global leader in rice exports, ensuring food security and contributing to economic growth.

#### REFERENCES

1. Jasbir Singh and S.S. Dhillon, 1994, *Agricultural Geography*, New Delhi, Tata McGraw-Hill Pub. Co.
2. Majid Hussain, 2012, *Systematic Agricultural Geography*, Jaypur, Rawat Publications.
3. Ujjwala Khare, October 2020, *Regional Disparities In Levels Of Development In Kolhapur District Of Maharashtra*, Golden Research Thought.
4. Bhakare Pravinchandra, 2024, *Agriculture Geography*, Jyotikiran Publication, Pune. ISBN: 978-93-94819-72-6.
5. R. G. Jaybhaye and P. B. Arude, December 2011, *Agricultural Efficiency Of Khed-Shirur Sez, Pune District, Pune, Maharashtra Boogolshastra Sanshodhan Patrika*.3
6. Santosh P. Mane and Santosh B. Gaikwad, January 2019, *Agricultural Productivity In Malshiras Tahsil, Research Journey*.
7. N. S. Masal and B. A. Ajagekar, March 2011, *Regional Disparities In The Levels Of Agricultural Development In Kolhapur District Of South Maharashtra*, Indian Streams Research Journal.
8. Lal Mervin Dharmasiri, 2009, *Measuring Agricultural Productivity Using The Average Productivity Index (API)*, Sri Lanka Journal Of Advanced Social Studies Vol, 1- No.2.
9. Formal Estimates of Area, Production and Yield of selected principal crops, May, 2021, Government of India, Ministry of Agriculture and Farmers Welfare, Directorate of Economics and Statistics, Agricultural Statistics Division, New Delhi



Original Article

# Role of Government Policies In Fostering Entrepreneurship In India

Shruti Shubham Nikate<sup>1</sup>, Deep Pandurang Satav<sup>2</sup>.

<sup>1,2</sup> Anantrao Pawar College Pirangut. Savitribai Phule Pune University

Manuscript ID:  
RIGJAAR-2026-030742

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 182-185  
July 2026

Submitted: 17 June. 2026  
Revised: 25 June. 2026  
Accepted: 18 July. 2026  
Published: 31 July. 2026

Correspondence Address:

Shruti Shubham Nikate  
Anantrao Pawar College Pirangut.  
Savitribai Phule Pune University

Email :

[patilshruti8989@gmail.com](mailto:patilshruti8989@gmail.com).

Quick Response Code:



Web. <https://rlgjaar.com>



DOI:  
10.5281/zenodo.21991886

DOI Link:  
<https://doi.org/10.5281/zenodo.21991886>



Creative Commons



## Abstract

Entrepreneurship is an important driver of economic growth, innovation, employment generation and social development. In India, the Government has introduced several policies and programmes to create a favorable environment for entrepreneurs, startups and Micro, Small and Medium Enterprises (MSMEs). Important initiatives include Startup India, make in India, Pradhan Mantri MUDRA Yojana (PMMY), Stand-Up India, Prime Minister's Employment Generation Programme (PMEGP), Digital India, Udyam Registration and credit-support programmes. It is based mainly on secondary information from government portals, policy documents, reports and published research. Descriptive and comparative analysis is used to examine the contribution and limitations of policy interventions. The study indicates that government initiatives have strengthened the entrepreneurial ecosystem through finance, startup recognition, digital infrastructure, incubation, formalization and market opportunities. At the same time, awareness gaps, procedural difficulties, regional disparities, limited mentoring and financing constraints remain important challenges. The paper recommends stronger local outreach, simpler procedures, improved mentoring, better regional infrastructure and outcome-based monitoring.

**Keywords:** Entrepreneurship Development, Government Policies, Startup India, MSMEs, MUDRA, Innovation, Access to Finance, Employment Generation.

## Introduction

Entrepreneurship plays a significant role in economic transformation because entrepreneurs convert ideas and opportunities into products, services and employment. In a large and diverse economy such as India, entrepreneurship can contribute not only to income generation but also to innovation, regional development, self-employment and social mobility. The Indian entrepreneurial environment has changed rapidly with the growth of digital technology, e-commerce, digital payments, new financial services and online public services. However, entrepreneurs continue to encounter barriers involving finance, skills, market access, infrastructure, technology and compliance. Startup India, launched in 2016, is one of the most prominent policy initiatives for developing the startup ecosystem. The broader policy framework is complemented by MSME support, credit programmes, entrepreneurship development, digitalization, public procurement and targeted support for women and disadvantaged groups. These interventions demonstrate that entrepreneurship policy is increasingly multidimensional: it combines finance with formalization, innovation, skills, infrastructure and market access. The effectiveness of these policies, however, depends on implementation. A scheme can be well designed but have limited impact if eligible entrepreneurs are unaware of it, cannot complete the application process, lack complementary skills or operate in locations with weak infrastructure. The present paper therefore considers both the contributions and the continuing gaps in India's entrepreneurship policy environment.

## Objectives of the Study

1. To examine major Government of India policies and programmes supporting entrepreneurship.
2. To assess the contribution of government interventions to finance, formalisation and innovation.
3. To examine the role of policy in creating employment and market opportunities.
4. To identify barriers that reduce entrepreneurs' access to government support.
5. To compare the major policy instruments across their principal areas of intervention.
6. To suggest measures for making entrepreneurship support more accessible, inclusive and sustainable.

## Literature Review

Existing research and policy discussions indicate that entrepreneurship support works through several interconnected mechanisms.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Nikate, S. S., & Satav, D. P. (2026). Role of Government Policies In Fostering Entrepreneurship In India. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 182–185. <https://doi.org/10.5281/zenodo.21991886>



Financial access is essential for enterprise formation, but finance alone is insufficient for sustainable growth. Entrepreneurs also need mentoring, technical skills, market information, digital capability and institutional support. Studies of Startup India commonly emphasize its contribution to startup visibility, recognition and ecosystem development, while also noting differences in access across regions and sectors. Research on MSME policy highlights the importance of formalization, institutional credit and market support. Work on inclusive entrepreneurship points to the continuing relevance of targeted programmes for women and socially disadvantaged groups. The literature also suggests that policy outcomes vary according to implementation capacity. Urban ecosystems with incubators, investors, skilled labor and strong digital infrastructure generally provide more opportunities than less-connected regions. This makes local outreach, capacity

#### Major Government Policies Supporting Entrepreneurship

| Policy / Programmed | Primary Support                                                             | Main Beneficiaries                        | Entrepreneurial Contribution                    |
|---------------------|-----------------------------------------------------------------------------|-------------------------------------------|-------------------------------------------------|
| Startup India       | Recognition, compliance facilitation, funding ecosystem, IPR and incubation | Eligible startups                         | Innovation and startup ecosystem development    |
| PM MUDRA Yojana     | Credit support for micro enterprises                                        | Micro entrepreneurs                       | Self-employment and enterprise expansion        |
| Stand-Up India      | Institutional finance for targeted entrepreneurs                            | Women and SC/ST entrepreneurs             | Inclusive enterprise creation                   |
| PMEGP               | Employment-linked enterprise assistance                                     | Prospective micro entrepreneurs           | Rural and small-enterprise development          |
| Udyam Registration  | MSME formalization                                                          | Micro, small and medium enterprises       | Formal identity and access to support           |
| CGTMSE              | Credit guarantee mechanism                                                  | Micro and small enterprises               | Reduced collateral-related credit barriers      |
| Digital India       | Digital infrastructure and public services                                  | Businesses and citizens                   | Digital business models and wider market access |
| Make in India       | Manufacturing and investment environment                                    | Manufacturing entrepreneurs and investors | Industrial entrepreneurship and production      |

#### Data Analysis and Interpretation

The policy landscape shows that entrepreneurship support in India is distributed across several dimensions. Startup-focused interventions emphasise innovation and ecosystem building, while MSME-oriented programmes place greater emphasis on formalisation, credit, employment and market participation. Targeted programmes add an inclusion dimension by addressing specific groups that may otherwise face greater barriers to enterprise creation.

| Support Area         | Policy Mechanism                           | Expected Effect                                         | Key Continuing Issue                           |
|----------------------|--------------------------------------------|---------------------------------------------------------|------------------------------------------------|
| Finance              | Credit, guarantees and seed support        | Lower initial capital constraints                       | Eligibility, creditworthiness and awareness    |
| Formalisation        | Registration and institutional recognition | Improved access to formal opportunities                 | Informal businesses may remain outside systems |
| Innovation           | Incubation, IPR and startup support        | New products, services and technologies                 | Uneven innovation capacity                     |
| Digitalisation       | Digital public infrastructure and payments | Lower transaction friction and wider reach              | Digital literacy and connectivity gaps         |
| Market Access        | Procurement, platforms and networks        | Customer and business expansion                         | Competition and limited scale                  |
| Skills               | Training and entrepreneurship development  | Improved managerial capability                          | Quality and local availability of training     |
| Inclusion            | Targeted finance and support               | Greater participation of women and disadvantaged groups | Social and institutional barriers              |
| Regional Development | Rural and semi-urban enterprise support    | More geographically distributed entrepreneurship        | Infrastructure and ecosystem disparities       |

#### Findings of the Study

##### Positive Impacts

building and regional infrastructure important components of entrepreneurship policy.

#### Research Methodology

The study follows a descriptive and analytical research design. It uses secondary information from Government of India portals, policy documents, programme descriptions, reports and published academic literature. The analysis focuses on the principal mechanisms through which government policies influence entrepreneurship: finance, formalization, innovation, digitalization, market access, employment and inclusion. Descriptive comparison is used to organize the major policies and their expected entrepreneurial outcomes. The findings are interpretive rather than a claim that one individual policy caused a particular economic outcome, because several programmes operate simultaneously and their effects can overlap.

- Government programmes have widened the institutional pathways available to people seeking to start or expand enterprises.

- Credit-oriented interventions can reduce the severity of initial finance constraints faced by micro and small
- Startup recognition and ecosystem programmers have increased policy attention to innovation, incubation and intellectual property.
- Formalization mechanisms such as Udyam Registration can improve an enterprise's visibility within the formal support system.
- Digital infrastructure and online services have enabled entrepreneurs to reach customers and transact beyond local markets.
- Targeted programmers contribute to more inclusive entrepreneurship by creating specific opportunities for women and disadvantaged groups.
- Entrepreneurial activity can support employment generation directly and through local supply chains and services.

### Challenges and Negative Impacts

- Lack of awareness can prevent eligible entrepreneurs from benefiting from available schemes.
- Documentation, verification and compliance requirements can still be difficult for first-generation and micro entrepreneurs.
- Access to formal finance remains difficult for some entrepreneurs because of credit history, collateral and repayment-capacity requirements.
- Entrepreneurial ecosystems are unevenly distributed, with stronger support networks in many metropolitan and technology-oriented locations.
- Financial assistance without mentoring, market knowledge and managerial capability may not ensure long-term enterprise survival.
- Digital delivery of schemes can exclude entrepreneurs with limited digital literacy or weak connectivity.
- Overlapping programmers can make it difficult to isolate the effect of one individual policy and can complicate monitoring of outcomes.

### Recommendations

Expand awareness through colleges, local bodies, chambers of commerce, self-help groups and entrepreneurship development institutions.

Reduce unnecessary documentation and make application processes easier for micro and first-generation entrepreneurs.

Strengthen rural and semi-urban incubation, mentoring, digital infrastructure and market-linkage facilities.

Integrate financial literacy with credit programmers so that entrepreneurs can manage cash flow, repayment and business records effectively.

Provide continuous mentoring rather than limiting support to the enterprise-formation stage.

Strengthen women entrepreneurship through finance, networking, digital skills, training and market access.

Encourage stronger university-industry-government collaboration for student entrepreneurship, incubation and technology transfer.

Evaluate schemes using enterprise survival, employment, income, innovation and inclusion indicators rather than registrations alone.

### Conclusion

Government policies have become an important component of India's entrepreneurship ecosystem. The combined policy emphasis on startup development, MSME formalization, finance, digitalization, innovation, market access and inclusive participation has created multiple pathways for entrepreneurial activity. Nevertheless, the effectiveness of policy should be judged by more than the

entrepreneurs.

number of registrations or beneficiaries. Sustainable entrepreneurship requires enterprises to survive, grow, innovate, create employment and reach markets. Policy implementation therefore needs to move toward stronger local outreach, simpler procedures, mentoring, regional balance and measurable long-term outcomes. A coordinated approach involving government departments, financial institutions, educational institutions, industry, incubators and entrepreneurs can improve the practical impact of entrepreneurship policies. Such coordination can help transform policy support from an opportunity on paper into an accessible and sustainable pathway for enterprise development.

### Limitations and Directions for Future Research

The study is primarily based on secondary information and does not directly measure the experiences of individual entrepreneurs. Since several policies may affect the same enterprise simultaneously, policy impact cannot always be attributed to one programmer. Future studies can use primary surveys and statistical methods to examine entrepreneurs' awareness of schemes, ease of access, satisfaction, financing outcomes, business growth, employment creation and enterprise survival. Comparative studies across states, rural and urban areas, sectors, genders and enterprise sizes can provide more detailed evidence on policy effectiveness.

### Acknowledgment

The author expresses sincere gratitude to the Management and Principal of Anantrao Pawar College, Pirangut, for providing constant encouragement and academic support during the preparation of this research paper. Heartfelt thanks are extended to colleagues, faculty members, and all those who offered valuable suggestions and guidance throughout the study. The author also gratefully acknowledges the Government of India, the Department for Promotion of Industry and Internal Trade (DPIIT), the Ministry of Micro, Small and Medium Enterprises (MSME), and other government agencies whose policy documents, reports, and official publications served as valuable sources of information for this research. Finally, the author expresses sincere appreciation to all individuals who directly or indirectly contributed to the successful completion of this study.

### Financial support and sponsorship

Nil.

### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

### References

1. Department for Promotion of Industry and Internal Trade. (2026). Startup India: Government of India initiative. Startup India.
2. Department for Promotion of Industry and Internal Trade. (2016). Startup India Action Plan. Government of India.
3. Ministry of Micro, Small and Medium Enterprises. (2026). Ministry of MSME: Schemes and services. Government of India.
4. Ministry of Micro, Small and Medium Enterprises. (2026). MSME dashboard. Government of India.
5. Government of India. (2026). Udyam Registration and MSME formalization initiatives.
6. Government of India. (2026). Pradhan Mantri MUDRA Yojana.



7. Government of India. (2026). Stand-Up India Scheme.
8. Government of India. (2026). Prime Minister's Employment Generation Programmed.
9. Government of India. (2026). Credit Guarantee Scheme for Micro and Small Enterprises.
10. Government of India. (2026). Digital India Programmed.
11. Government of India. (2026). Make in India Programmed.
12. Government of India. (2026). States' Startup Ranking Framework.
13. Government of India. (2026). Startup India Seed Fund Scheme.
14. Government of India. (2026). Startup India intellectual property support and facilitation.
15. Government of India. (2026). Procurement and Marketing Support for MSMEs.



Original Article

# Disaster Rehabilitation: Review on Floods in North East States of India

Dr. Manisha P. Shukla,

Professor, MVP's College of Social Work, (IMRT) Nashik

Manuscript ID:  
RIGJAAR-2026-030743

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 186-190  
July 2026

Submitted: 17 June. 2026  
Revised: 25 June. 2026  
Accepted: 18 July. 2026  
Published: 31 July. 2026

Correspondence Address:  
Manisha P. Shukla,  
Professor, MVP's College of Social  
Work, (IMRT) Nashik  
Email:  
[shuklamanishap@gmail.com](mailto:shuklamanishap@gmail.com)

Quick Response Code:



Web: <https://rlgjaar.com>



DOI:  
10.5281/zenodo.21992042

DOI Link:  
<https://doi.org/10.5281/zenodo.21992042>



Creative Commons



## Abstract

North-East India experiences some of the most severe and recurrent floods in South Asia due to its unique geographical setting, high rainfall, complex river systems, and increasing impacts of climate change. States such as Assam, Arunachal Pradesh, Meghalaya, Manipur, Mizoram, Nagaland, Tripura, and Sikkim are frequently affected by annual floods that result in significant human suffering, environmental degradation, displacement, and economic losses. Although emergency response mechanisms have improved considerably over the past two decades, long-term disaster rehabilitation remains a major challenge. Sustainable rehabilitation requires integrated approaches that combine infrastructure reconstruction, livelihood restoration, psychosocial support, environmental conservation, and community participation. This review synthesizes existing literature on flood disasters and rehabilitation practices in North-East India. The review draws upon peer-reviewed journal articles, government reports, international agency publications, and policy documents to examine the causes, impacts, rehabilitation strategies, and role of social work in disaster recovery. Particular attention is given to community resilience, disaster risk reduction, and the integration of climate adaptation into rehabilitation planning. The review identifies several gaps in current research, including limited evidence on long-term livelihood recovery, inadequate attention to mental health and psychosocial rehabilitation, insufficient documentation of indigenous coping mechanisms, and weak community participation in post-disaster planning. The paper concludes that disaster rehabilitation should extend beyond relief distribution and embrace sustainable development, resilience-building, and inclusive governance. Strengthening institutional coordination, empowering local communities, and integrating professional social workers into disaster management systems are essential for improving rehabilitation outcomes in North-East India.

**Keywords:** Floods, North-East India, Disaster Rehabilitation, Community Resilience, Climate Change, Social Work, Disaster Management

## Introduction

Floods are among the most destructive natural hazards worldwide, accounting for substantial loss of life, property damage, environmental degradation, and socio-economic disruption. India is one of the world's most flood-prone countries, with nearly one-eighth of its geographical area vulnerable to recurring floods. Among all regions, North-East India is particularly susceptible because of its mountainous terrain, extensive river networks, fragile ecosystems, and exceptionally high monsoon rainfall. The North-Eastern region comprises eight states—Assam, Arunachal Pradesh, Meghalaya, Manipur, Mizoram, Nagaland, Tripura, and Sikkim. The region is drained primarily by the Brahmaputra and Barak river systems, which receive enormous volumes of water during the southwest monsoon. Heavy rainfall, accelerated glacier melting, riverbank erosion, sediment deposition, deforestation, and unplanned development collectively increase the frequency and severity of floods. Climate change has further intensified extreme rainfall events, making floods more unpredictable and destructive. Assam experiences annual floods affecting millions of people and causing extensive damage to agriculture, infrastructure, wildlife habitats, and human settlements. Flash floods frequently occur in Arunachal Pradesh, Meghalaya, Mizoram, and Sikkim due to steep slopes and rapid runoff. The catastrophic Teesta flood in Sikkim in 2023 demonstrated the growing risks associated with glacial lake outburst floods and extreme weather events.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Shukla, M. P. (2026). Disaster Rehabilitation: Review on Floods in North East States of India. *Royal International Global Journal of Advance and Applied Research*, 3(7(III)), 186–190. <https://doi.org/10.5281/zenodo.21992042>

While emergency relief receives considerable governmental attention, long-term rehabilitation often remains fragmented and under-resourced. Effective rehabilitation involves restoring housing, livelihoods, education, healthcare, psychological well-being, and community resilience. Social workers play an important role in facilitating community participation, providing psychosocial support, advocating for vulnerable populations, and strengthening local capacities for disaster preparedness and recovery. This review critically examines flood disasters and rehabilitation efforts in North-East India and highlights strategies for building resilient communities through integrated disaster management.

### Objectives of the Review

The review aims to:

1. Examine the major causes of recurrent floods in North-East India.
2. Assess the social, economic, environmental, and health impacts of floods.
3. Review disaster rehabilitation policies and practices adopted by government and non-government agencies.
4. Analyse the role of social work in disaster rehabilitation and community resilience.
5. Identify research gaps and recommend strategies for sustainable flood rehabilitation.

### Review Methodology

PRISMA-based narrative review; include databases, keywords, inclusion/exclusion criteria.

This review follows a structured narrative review approach informed by the principles of the **PRISMA 2020** framework for identifying, screening, and synthesizing relevant literature. The literature search included publications from **2005 to 2026** obtained through databases such as Google Scholar, Scopus, Web of Science, JSTOR, and PubMed. Government publications from the National Disaster Management Authority, Central Water Commission, India Meteorological Department, and Assam State Disaster Management Authority, along with reports from United Nations Development Programme and United Nations Office for Disaster Risk Reduction, were also consulted.

Keywords included:

- North-East India floods
- Assam floods
- Disaster rehabilitation
- Flood recovery
- Community resilience
- Climate change
- Disaster management
- Social work
- Livelihood restoration
- Flood vulnerability

Only English-language publications focusing on flood rehabilitation, disaster recovery, resilience, or disaster management in North-East India were included. Editorials, opinion articles, duplicate publications, and studies unrelated to rehabilitation were excluded. The selected literature was analysed thematically under causes, impacts, rehabilitation, community resilience, policy interventions, and social work practice.

### Flood Scenario in North-East India

Discuss all eight states, geography, hydrology and climate. North-East India is one of the most ecologically diverse yet disaster-prone regions of the country. Covering approximately 8% of India's geographical area, the region

comprises Assam, Arunachal Pradesh, Meghalaya, Manipur, Mizoram, Nagaland, Tripura, and Sikkim. The Himalayas, Patkai Hills, and Barak Valley dominate its topography, while the Brahmaputra and Barak rivers form the principal drainage systems. The region receives some of the highest annual rainfall in the world, ranging from 2,000 mm to over 11,000 mm in places such as Mawsynram and Cherrapunji. Although rainfall is a natural phenomenon essential for agriculture and biodiversity, the combination of intense precipitation, steep slopes, riverbank erosion, landslides, sediment deposition, and climate variability frequently results in devastating floods.

### Assam

Assam experiences the highest flood frequency in India. The Brahmaputra River and its more than 50 tributaries overflow almost every monsoon season, affecting millions of people annually. Districts such as Dhemaji, Lakhimpur, Dibrugarh, Barpeta, Morigaon, Golaghat, Jorhat, and Dhubri remain highly vulnerable. Floods in Assam not only destroy homes and agricultural lands but also damage roads, bridges, schools, health centres, and wildlife habitats. The flooding of the Kaziranga National Park has become an annual event, affecting both biodiversity and tourism.

### Arunachal Pradesh

Arunachal Pradesh experiences frequent flash floods due to steep mountainous terrain and intense rainfall. Rivers such as the Siang, Subansiri, Kameng, and Lohit carry enormous quantities of water downstream into Assam. Landslides often accompany floods, causing road blockages and disrupting essential services.

### Meghalaya

Although Meghalaya is renowned for receiving the world's highest rainfall, flash floods and landslides have become increasingly common due to rapid urbanisation, deforestation, and unplanned infrastructure development. Urban flooding in Shillong has emerged as a growing concern.

### Sikkim

Sikkim has witnessed increasing disaster risks associated with glacial lake outburst floods (GLOFs). The catastrophic Teesta River flood demonstrated how glacier melting combined with extreme rainfall can trigger sudden and destructive flooding, severely damaging hydropower projects, roads, bridges, and settlements.

### Manipur, Mizoram, Nagaland, and Tripura

These states experience recurrent flash floods caused by heavy rainfall, river overflow, inadequate drainage systems, and hill slope instability. Urban flooding has become more frequent due to rapid population growth and land-use changes.

Overall, increasing climate variability has intensified flood hazards across all North-Eastern states, demanding more integrated approaches to disaster preparedness and rehabilitation.

### Causes and Impacts

Natural and anthropogenic causes; social, economic, environmental and psychosocial impacts.

Floods in North-East India result from a complex interaction between natural processes and human activities.

### Natural Factors

#### Heavy Monsoon Rainfall

The southwest monsoon delivers exceptionally high rainfall across the region between June and September. Continuous rainfall over several days causes rivers to exceed their carrying capacity, leading to widespread flooding.



### **Himalayan River Systems**

Major rivers such as the Brahmaputra and Barak originate in the Himalayas and receive water from numerous tributaries. Their vast catchment areas contribute enormous water volumes during the monsoon.

### **Riverbank Erosion**

The Brahmaputra is one of the world's most dynamic rivers. Continuous erosion alters river channels, destroys agricultural land, and displaces thousands of families annually.

### **Sedimentation**

Large quantities of sediments transported from the Himalayas accumulate in riverbeds, reducing water-carrying capacity and increasing flood intensity.

### **Landslides**

Mountainous areas experience frequent landslides that temporarily block rivers. When these natural dams collapse, sudden flash floods occur downstream.

### **Glacial Lake Outburst Floods (GLOFs)**

Climate change has accelerated glacier melting in the Himalayas. The formation and eventual bursting of glacial lakes create highly destructive flash floods, particularly in Sikkim and Arunachal Pradesh.

### **Human-Induced Factors**

#### **Deforestation**

Extensive deforestation reduces vegetation cover, decreasing the soil's ability to absorb rainfall. Increased surface runoff contributes significantly to flooding.

#### **Encroachment on Floodplains**

Rapid urbanisation and settlement expansion into flood-prone areas reduce natural water storage and increase human vulnerability.

#### **Unplanned Urban Development**

Inadequate drainage systems, poor waste management, and unscientific construction obstruct natural water flow, particularly in urban centres.

#### **Sand Mining**

Excessive sand mining destabilises river channels and accelerates riverbank erosion.

### **Climate Change**

Scientific evidence indicates that climate change has increased the frequency of extreme rainfall events across the Himalayan region. Rising temperatures also contribute to glacier melting and greater hydrological variability.

### **Infrastructure Development**

Large-scale road construction, hydropower projects, and hill cutting without adequate environmental safeguards often increase landslide and flood risks.

### **Impacts of Floods**

Floods affect every aspect of human development. Their consequences extend well beyond immediate physical destruction and continue for months or years after the disaster.

### **Social Impacts**

Floods frequently cause large-scale displacement, forcing families to live in temporary relief camps under difficult conditions. Schools often function as shelters, interrupting children's education for extended periods.

Women, children, older persons, and persons with disabilities experience greater vulnerability due to limited access to sanitation, healthcare, nutrition, and protection services.

Repeated displacement also weakens social networks and community cohesion.

### **Economic Impacts**

Agriculture is the backbone of North-East India's rural economy. Floods destroy standing crops, livestock,

irrigation systems, fisheries, and agricultural infrastructure, leading to substantial income losses.

Small businesses, transport services, tourism, and local markets also suffer significant disruption. Government resources must be diverted toward emergency relief and infrastructure reconstruction, slowing broader development.

### **Environmental Impacts**

Floods reshape river channels through severe erosion and sediment deposition. Forests, wetlands, and wildlife habitats are damaged, threatening biodiversity. While seasonal flooding contributes to soil fertility in some areas, increasingly severe floods accelerate land degradation and ecological imbalance.

### **Public Health Impacts**

Floods create ideal conditions for outbreaks of water-borne and vector-borne diseases such as diarrhoea, cholera, typhoid, hepatitis, leptospirosis, malaria, and dengue. Damage to drinking water systems increases the risk of contamination.

Disruption of maternal and child health services further increases health risks among vulnerable populations.

### **Mental Health and Psychosocial Impacts**

The psychological consequences of floods are often overlooked despite their long-term effects. Survivors may experience grief, anxiety, depression, post-traumatic stress disorder (PTSD), sleep disturbances, and feelings of insecurity following repeated displacement and loss of livelihoods.

Children are particularly susceptible to emotional distress, educational disruption, and behavioural changes. Older adults may face isolation and difficulty accessing healthcare and social support.

Community-based psychosocial interventions, counselling, peer-support groups, and culturally appropriate mental health services remain underdeveloped in many flood-affected areas, highlighting an important role for professional social workers.

### **Impacts on Vulnerable Populations**

Floods do not affect all communities equally. Marginalised groups—including Indigenous communities, landless labourers, women-headed households, migrant workers, and people living in remote areas—often have fewer resources to prepare for, respond to, and recover from disasters.

Strengthening inclusive rehabilitation policies that address the specific needs of these populations is essential for reducing disaster-related inequalities.

### **Disaster Rehabilitation in North-East India**

Disaster rehabilitation is a long-term, multidimensional process that begins after emergency relief and aims to restore affected communities to sustainable and resilient living conditions. Unlike immediate relief, rehabilitation focuses on rebuilding livelihoods, restoring public services, reconstructing infrastructure, and strengthening the social and economic well-being of affected populations. Effective rehabilitation is widely recognized as a transition between emergency response and long-term development.

### **Immediate Rehabilitation**

Immediately after floods, government agencies, local administrations, and humanitarian organisations provide emergency assistance, including:

- Temporary shelter and relief camps
- Food, drinking water, and sanitation facilities
- Emergency healthcare and disease surveillance
- Search and rescue operations

- Distribution of clothing, medicines, and essential supplies

Although these measures reduce immediate suffering, many flood-affected communities continue to experience prolonged displacement due to delays in rehabilitation.

#### **Short-Term Rehabilitation**

The second phase focuses on restoring normal community functioning through:

- Temporary housing
- Repair of roads and bridges
- Restoration of electricity and water supply
- Agricultural input support
- Cash assistance
- School reopening

- Livelihood recovery programmes

Successful short-term rehabilitation reduces dependency on external relief and promotes early recovery.

#### **Long-Term Rehabilitation**

Long-term rehabilitation requires a "Build Back Better" approach that strengthens resilience rather than merely replacing damaged infrastructure. Major components include:

- Climate-resilient housing
- Reconstruction of schools and healthcare facilities
- Livelihood diversification
- Flood-resilient agriculture
- Riverbank protection
- Community disaster preparedness
- Environmental restoration
- Psychosocial rehabilitation

Sustainable rehabilitation should integrate disaster risk reduction into local development planning to minimise future vulnerabilities.

#### **Government Initiatives and Institutional Framework**

India has developed a comprehensive disaster management framework following the Disaster Management Act (2005). The National Disaster Management Authority formulates national guidelines for preparedness, mitigation, response, and rehabilitation. The institutional framework also includes the National Disaster Response Force, State Disaster Management Authorities, District Disaster Management Authorities, and local governance institutions. Major initiatives include:

- National Disaster Management Plan
- State Disaster Management Plans
- Early Warning Systems
- Flood Forecasting by the Central Water Commission
- National and State Disaster Response Funds
- Community-Based Disaster Risk Management
- Post-Disaster Needs Assessment (PDNA)
- Flood Hazard Zonation and satellite-based monitoring

Recent efforts in Assam, including the Flood Hazard Zonation Atlas and integrated emergency management platforms, demonstrate the increasing use of geospatial technologies for preparedness and rehabilitation.

Despite these advances, challenges remain in coordination among agencies, timely fund utilisation, and effective implementation in remote and geographically difficult areas.

#### **Role of Social Work in Disaster Rehabilitation**

Professional social work contributes significantly across all phases of disaster management.

#### **Psychosocial Care**

Flood survivors often experience grief, trauma, anxiety, depression, and post-traumatic stress. Social workers provide:

- Psychological First Aid
- Individual and family counselling
- Child-friendly spaces
- Group therapy
- Community support groups

#### **Community Mobilisation**

Social workers facilitate:

- Community participation in rehabilitation planning
- Formation of village disaster management committees
- Volunteer mobilisation
- Community awareness programmes

#### **Livelihood Restoration**

Social workers assist communities by:

- Linking beneficiaries with government schemes
- Supporting self-help groups
- Promoting skill development
- Facilitating livelihood diversification
- Strengthening micro-enterprises

#### **Advocacy**

Professional social workers advocate for:

- Women
  - Children
  - Older persons
  - Persons with disabilities
  - Indigenous communities
  - Marginalised populations
- ensuring equitable access to rehabilitation services.

#### **Disaster Risk Reduction**

Social workers contribute to:

- Community preparedness
- Capacity building
- School safety programmes
- Climate adaptation awareness
- Community resilience planning

Their interdisciplinary approach bridges humanitarian response with sustainable community development.

#### **Community Resilience and Best Practices**

Community resilience refers to the capacity of individuals, families, institutions, and communities to anticipate, prepare for, respond to, recover from, and adapt to disasters.

Successful practices identified in the literature include:

- Community-Based Disaster Risk Management (CBDRM)
- Local early warning systems
- Raised housing platforms
- Flood-resilient agriculture
- Restoration of wetlands
- Women's Self-Help Groups leading recovery
- Youth volunteer networks
- Indigenous knowledge in flood prediction
- Climate-resilient infrastructure
- Multi-stakeholder coordination



Research suggests that rehabilitation programmes are more sustainable when communities actively participate in planning, implementation, and monitoring.

### Research Gaps

The review identifies several important research gaps:

- Limited longitudinal studies on rehabilitation outcomes.
- Inadequate research on psychosocial rehabilitation.
- Insufficient documentation of indigenous coping mechanisms.
- Limited evidence on gender-responsive rehabilitation.
- Few studies evaluating livelihood restoration beyond the first year.
- Lack of disability-inclusive disaster rehabilitation research.
- Limited assessment of children's educational recovery.
- Weak integration of climate adaptation into rehabilitation planning.
- Limited empirical research examining the contribution of professional social workers.
- Need for comparative studies across the eight North-Eastern states.

Addressing these gaps will strengthen evidence-based disaster policies and improve rehabilitation effectiveness.

### Recommendations

Based on the reviewed literature, the following recommendations are proposed:

1. Adopt Build Back Better principles in all rehabilitation programmes.
2. Strengthen community participation throughout rehabilitation planning.
3. Integrate psychosocial care into disaster recovery.
4. Expand livelihood restoration beyond agricultural compensation.
5. Promote ecosystem-based flood management.
6. Strengthen early warning systems using GIS, remote sensing, and artificial intelligence.
7. Increase investment in resilient infrastructure.
8. Incorporate Indigenous knowledge into disaster planning.
9. Include trained professional social workers in disaster management authorities at district and state levels.
10. Encourage interdisciplinary research on disaster rehabilitation, climate resilience, and social vulnerability.

### Conclusion

Recurring floods remain one of the greatest developmental challenges facing North-East India. While advances in forecasting, emergency response, and institutional coordination have reduced disaster-related mortality in many areas, rehabilitation continues to receive comparatively less attention than emergency relief. Sustainable recovery requires integrated strategies that restore livelihoods, housing, education, health, environmental resources, and psychosocial well-being while simultaneously reducing future risks. Professional social work has a pivotal role in facilitating community participation, supporting vulnerable populations, strengthening psychosocial recovery, and promoting inclusive rehabilitation. Community-centred approaches, supported by scientific planning, climate adaptation, and effective governance, can significantly enhance resilience across the North-Eastern region. Future disaster policies should prioritise long-term rehabilitation as a development

process rather than a short-term humanitarian intervention. Investing in resilient infrastructure, inclusive governance, ecosystem restoration, and evidence-based social work interventions will contribute to sustainable recovery and improved disaster preparedness in North-East India.

### Acknowledgement

The author expresses sincere gratitude to the Principal and Management of MVP's College of Social Work (IMRT), Nashik, for their continuous encouragement and institutional support in carrying out this review study. Heartfelt thanks are extended to all researchers, academicians, government agencies, and international organizations whose published reports, policy documents, and scholarly works provided valuable insights for this review. The author is also grateful to the National Disaster Management Authority (NDMA), Central Water Commission (CWC), India Meteorological Department (IMD), Assam State Disaster Management Authority (ASDMA), United Nations Development Programme (UNDP), and United Nations Office for Disaster Risk Reduction (UNDRR) for making relevant reports and information publicly available, which greatly contributed to the understanding of disaster rehabilitation in North-East India. Finally, the author acknowledges the support and encouragement of colleagues, family members, and well-wishers throughout the preparation of this manuscript.

### Financial support and sponsorship

Nil.

### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

### References

1. Ahamed, A., et al. (2020). Flood management in India: Current status and future challenges. *Journal of Hydrology*.
2. Ahmad, M. K. (2018). Role of post-disaster rehabilitation agencies in India. *International Journal of Reviews and Research in Social Sciences*, 6(2), 194–198.
3. Borah, L., Kalita, B., Boro, P., Kulnu, A. S., & Hazarika, N. H. (2022). Climate change impacts on socio-hydrological spaces of the Brahmaputra floodplain in Assam. *Frontiers in Water*, 4.
4. Central Water Commission. (Annual). Flood reports.
5. India Meteorological Department. (Annual). Southwest Monsoon Report.
6. Intergovernmental Panel on Climate Change. (2023). AR6 Synthesis Report.
7. National Disaster Management Authority. (2010). Guidelines on Management of Urban Flooding.
8. National Disaster Management Authority. (2019/2020). National Disaster Management Plan.
9. Singh, A., Punia, M., Haran, N. P., & Singh, T. B. (Eds.). (2018). *Development and Disaster Management: A Study of the Northeastern States of India*. Springer.
10. United Nations Development Programme. (2022). Human Development Report.
11. United Nations Office for Disaster Risk Reduction. (2015). Sendai Framework for Disaster Risk Reduction 2015–2030.
12. World Bank. (2022). Climate Risk Country Profile: India.



Original Article

# Advancing Women's Empowerment through Sports: A Journey towards Growth and Development

Dr. Mohammed Ajaz Sheikh

Associate Professor, Director of Physical Education and Sports,  
Dhote Bandhu Science College, Gondia, Maharashtra, India

Manuscript ID:  
RIGJAAR-2026-030744

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 191-193  
July 2026

Submitted: 17 June. 2026  
Revised: 25 June. 2026  
Accepted: 18 July. 2026  
Published: 31 July. 2026

Correspondence Address:  
**Mohammed Ajaz Sheikh**  
Associate Professor, Director of  
Physical Education and  
Sports, Dhote Bandhu Science  
College, Gondia, Maharashtra,  
India  
Email: [ajazz.sheikh@gmail.com](mailto:ajazz.sheikh@gmail.com)  
Quick Response Code:



Web: <https://rlgjaar.com>



DOI:  
10.5281/zenodo.21992160

DOI Link:  
<https://doi.org/10.5281/zenodo.21992160>



Creative Commons



## Abstract

Physical activity plays a significant role in the overall development of women by enhancing self-confidence, strengthening leadership abilities, fostering teamwork, and encouraging creativity and active participation. Unlike theoretical knowledge gained through classroom learning, these qualities are cultivated through practical involvement in sports and physical activities. Regular participation in sports not only contributes to physical fitness but also supports mental well-being, social inclusion, and personal growth. Research has consistently highlighted that physical inactivity is a major public health concern and is associated with an increased risk of chronic illnesses, including cardiovascular diseases, obesity, diabetes, and hypertension. In many countries, the health burden linked to sedentary lifestyles has become comparable to that of other major preventable risk factors. Consequently, health experts recommend promoting regular physical activity across all age groups to improve fitness, enhance quality of life, and reduce the incidence of lifestyle-related diseases. The global movement for women's participation in sports has gained considerable momentum over the past few decades, recognizing sports as a powerful medium for gender equality and empowerment. Despite this progress, women continue to face barriers such as cultural stereotypes, unequal opportunities, limited access to resources, and inadequate representation in leadership and decision-making roles. Addressing these challenges requires coordinated efforts from governments, educational institutions, sports organizations, and communities to create an inclusive sporting environment.

**Keywords:** Physical activities, women, India, games

## Introduction

As with all women's gaming, women are saved from the gaming table because the fact that an entrenched patriarchy perpetuates misleading myths. Current board assistants regularly recruit Destiny Board assistants from their network, who are mostly men, perpetuating the lack of gender equality in management. In maximalist societies, participation in sporting activities was largely the domain of men. However, in recent years, advocates of girls' physical activity have confirmed that girls are also ready for it and have their place in the world of sports. Since 1866, when women's baseball changed bases at Vassar College, athletes have taken their sports history to heart (Sandoz and Winans, 1999).

Even without strong achievements, the girls had to show that they are ready for sports activities. On donation days, we see many girls who participate in small sports that are not at the best level at the moment, and in sports that require high quality professionalism and skill. The slow but steady growth of girls among elite Olympians can be used to improve the quality of girls' sports performance (Bennette, Howell, & Simri, 1983). But when the girls started knocking on the door of the sports world, they faced a lot of opposition. Since the popularity of girls in the game no longer shows a continuous upward trend to record times, it has instead gone through several peaks and valleys over a long period of time - for example, women's sports have more famous heroines and cases where girls were valued. . being unfit mothers (Lutter and Jaffee, 1996). For many years, maximum goals for participation of girls in sports activities were subjective, often based on the sentimental thesis that girls are naturally sensitive and delicate (Klafs and Lyon, 1978).

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Sheikh, M. A. (2026). Advancing Women's Empowerment through Sports: A Journey towards Growth and Development. *Royal International Global Journal of Advance and Applied Research*, 3(7(III)), 191–193. <https://doi.org/10.5281/zenodo.21992160>



It is also associated with the perfection of Victorian femininity, which confused vigorous athletic activity because such activity was thought to undermine a woman's modesty, threaten her emotional control, and cause harm that could prevent or save childbirth and conflict spouse (Eitzer and Sage, 1978). Women are a unique case in gaming. Unfortunately, gaming has historically been portrayed as a male domain, and girls' access to gaming has been portrayed as frustrating and in some cases illegal on a daily basis (Coakley, 2001). Worrying about the loss of femininity becomes a real problem, behind which there is a great interest in vigorous physical activity of girls. In addition, Miller and Levy (1996) concluded that "girls' participation in sports automatically carries a negative stigma" because conventional sports activities are seen as incompatible with girls' traditional roles (Goldberg and Chandler, 1991). According to Nixon, Maresca and Silverman (1979), female athletes were expected to enjoy the status quo struggle between the sexes, especially since their interactions in sports activities were historically considered more masculine because society is still hardworking, girls participate in sports activities that emphasize traditionally feminine qualities such as grace and beauty (Kiovula, 1995). Thus, it is argued that the gender status war is created by exploiting the dissonance of the desire of female athletes to become aware of roles: the respected status of women and the respected, even stigmatized, athletic status of women and girls (Adler, Kless) . . . , 1992). Hall (1996) argued that among the real challenges associated with strong femininity for an athlete is the concern that she is likely to be a lesbian. He also noted that sports performance researchers have jumped on the concept, and their studies typically find female athletes to be more androgynous, more masculine, much less sex-typed, or much less feminine. On the contrary, although there are bad stereotypes about the femininity of girl athletes, Metheny's (1965) review offers a nice belief for girl athletes that they are valued and seen as feminine by boys, both girls, athletes and non-athletes. In addition, Fasting (1996) said that the global girls' movement over the past thirty years has emphasized that girls are more desirable as people when they have expanded their superhuman and physical abilities. This concept encouraged girls of all ages to take up their sports hobby and showed the latest hobbies among those who have no idea about gambling. Coakley (2001) argued that the girls' movement also helped redefine girls' professional and family roles and provided older girls with time and resources for sporting activities. When beliefs about girls' movement are prevalent and men dominate life and our girls' bodies are weakened, older girls chose sports. These and different issues have increased their importance in the study of different impressions and perceptions of girls' participation in sports. Thus, the belief of researchers about sports activities of girls can also depend on their stories and participation in other and talented sports activities and physical activities. Supporting this schedule was a push by the authorities, the game and various stakeholders to inspire older girls and women to participate in the game and entertainment. Research shows that girls and women face various barriers to participation that can further limit their participation. Such barriers can be addressed through comprehensive and programmatic efforts by agencies and various relevant stakeholders.

#### Review Of Literature

Women's participation in sports has emerged as an important area of research due to its contribution to physical health, social inclusion, gender equality, and

economic development. Over the years, several researchers have examined the opportunities and challenges faced by women in sports, emphasizing the need for supportive policies, equal access to resources, and increased representation in leadership roles.

**Coakley (2017)** highlighted that sports play a significant role in promoting confidence, discipline, leadership, and teamwork among women. The study emphasized that participation in sports helps women develop life skills, enhances social interaction, and contributes to personal growth. However, gender stereotypes and unequal opportunities continue to restrict women's full participation.

**United Nations Women (2021)** reported that sports serve as an effective platform for achieving gender equality and women's empowerment. The report emphasized that sports improve physical and mental well-being, encourage education, strengthen leadership abilities, and create economic opportunities for women. It also recommended policy interventions to eliminate discrimination and increase female participation in sports.

**International Olympic Committee (IOC) (2022)** stated that although women's representation in international sporting events has improved considerably, disparities remain in coaching, sports administration, governance, and decision-making positions. The organization recommended strengthening leadership programs, promoting equal opportunities, and ensuring inclusive governance to achieve long-term gender equality.

**UNESCO (2023)** emphasized that equal access to sports contributes to sustainable development by improving health, promoting education, and fostering social inclusion. The report highlighted that encouraging girls and women to participate in sports can reduce social inequalities while supporting community development and national progress.

**Kumar and Sharma (2020)** examined the status of women in Indian sports and found that despite remarkable achievements by female athletes, barriers such as inadequate infrastructure, financial constraints, cultural stereotypes, and lack of institutional support continue to affect participation. The authors suggested stronger government initiatives, improved training facilities, and awareness programs to encourage women in sports.

**Gupta and Singh (2021)** studied women's leadership in sports organizations and concluded that female representation in governance remains limited because of traditional gender norms and unequal access to leadership opportunities. The study recommended transparent recruitment processes, mentorship programs, and gender-inclusive policies to increase women's participation in decision-making roles.

**Women's Sports Foundation (2022)** reported that girls who participate in sports demonstrate higher levels of self-confidence, leadership skills, academic achievement, and career success compared to those with limited participation. The report also emphasized that sports participation positively influences physical fitness, mental health, and long-term professional development.

Overall, the existing literature demonstrates that sports are a powerful instrument for women's empowerment and national development. While significant progress has been made in increasing female participation, challenges related to gender discrimination, limited infrastructure, unequal funding, and underrepresentation in leadership continue to exist. The reviewed studies collectively suggest that stronger policy implementation, investment in sports infrastructure, awareness initiatives, and inclusive governance are essential to creating an equitable sporting environment where women can participate, lead, and excel.

#### Women and sports



Women have consistently demonstrated their ability to lead, compete, and contribute meaningfully to the advancement of sports. Despite these capabilities, they remain significantly underrepresented in leadership positions such as coaches, administrators, referees, and sports officials across all levels of competition. Deep-rooted gender biases and the traditionally male-dominated culture of sports continue to limit women's access to decision-making roles, often leaving them with fewer opportunities for professional growth and leadership. Although women constitute nearly half of the global population, their representation in sports governance remains disproportionately low. In many countries, including India, women occupy only a small percentage of positions on the governing boards of national sports federations. This imbalance is largely influenced by long-standing patriarchal practices, restricted professional networks, and recruitment systems that tend to favor existing male leadership. As a result, gender inequality continues to persist within sports administration and governance. Several misconceptions further contribute to the underrepresentation of women in leadership. Assumptions that women lack the necessary skills, commitment, or interest in governance roles often prevent them from being considered for such positions. In reality, many qualified women are simply not provided with equal opportunities or encouraged to participate in leadership and decision-making processes. Eliminating these stereotypes is essential for creating a more inclusive and equitable sports environment. Greater participation of women in sports leadership and governance can significantly strengthen the effectiveness of sports organizations. Diverse leadership teams bring broader perspectives, encourage innovation, improve decision-making, and promote transparent and inclusive governance practices. Furthermore, increased female representation sends a strong message about an organization's commitment to gender equality and equal opportunity. Measures such as transparent recruitment processes, leadership development programs, gender diversity targets, mentorship initiatives, and supportive policy frameworks can play a crucial role in increasing women's representation in sports governance and fostering sustainable development within the sporting sector.

#### Conclusion

We understand that game and training have the strength to convert lives and to unite communities. We are dedicated to making sure that we offer possibilities for ladies to excel in anything discipline they selected and we understand that game presents ladies with possibilities to lead. Together there are 4 wide regions in which we will paintings collectively collaboratively on this space, the use of game as a car for development, selling health, enhancing educational fulfillment and growing network safety. Deakin WISE hopes to persuade cultural alternate and sell high quality function fashions with the purpose of assisting all ranges of lady participation and engagement in game. We welcome expressions of hobby to pursue this paintings collaboratively transferring forward.

#### Acknowledgement

The author expresses sincere gratitude to the Principal and Management of Dhote Bandhu Science College, Gondia, Maharashtra, for providing continuous encouragement and institutional support during the preparation of this review paper. The author is deeply thankful to all researchers, academicians, and organizations whose scholarly publications, policy documents, and reports served as valuable sources of information for this study. Special appreciation is extended to UNESCO, UN Women, the International Olympic Committee (IOC), and the Women's

Sports Foundation for their significant contributions to the advancement of knowledge on women's empowerment through sports. The author also acknowledges the encouragement and support received from colleagues, friends, and family members throughout the completion of this manuscript. Their motivation and cooperation were invaluable in successfully accomplishing this work.

#### Financial support and sponsorship

Nil.

#### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### References

1. Adler, P., & Kless, S. (1992). Socialization to gender roles: Popularity amongst basic college boys and girls. *Sociology of Education*, 65, 169-187.
2. Atkinson, R. L. (1996). *Introduction to psychology*. twelfth Ed. Harcourt Brace College Publisher.
3. Bennette, B. L., Howell, M. L., & Simri, U. (1983). *Comparative bodily training and sports*. 2 nd Ed. Philadelphia, USA: Lea and Febiger.
4. Calderon, J. F., & Gonzales, E. (2004). *Methods of studies and thesis writing*. Mandaluyong City, Philippines.
5. Coakley, J. (2001). *Sport in society: Issues and controversies*. 7 th Ed. Singapore: McGraw-Hill Book Company.
6. Eitzen, D., & Sage, G. (1978). *Sociology of yankee game*. Dubuque, IA: Wm. C. Brown Company Publishers.
7. Fasting, K. (1996). 40,000 Female runners: The grete waitz run-game, subculture, & counterculture. Paper supplied to worldwide pre-olympic medical congress. Dallas.



Original Article

# Computerized Accounting Systems and Organizational Outcomes: A Systematic Literature Review with Implications for SMEs and Automobile Retailers.

Vasim Sayyad<sup>1</sup>, Dr. Shrikant Dudhal<sup>2</sup>

<sup>1</sup>Research scholar, Department of commerce and management, Deshbhakta Sambhajirao Garad Mahavidyalaya, Mohol, Solapur, Maharashtra, India.

<sup>2</sup>Assistant professor Deshbhakt Garad college Mohol, Solapur, Maharashtra, India.

Manuscript ID:  
RIGJAAR-2026-030745

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 194-203  
July 2026

Submitted: 17 June. 2026

Revised: 25 June. 2026

Accepted: 18 July. 2026

Published: 31 July. 2026

**Correspondence Address:**

Vasim Sayyad,

Research scholar, Department of  
commerce and management,  
Deshbhakta Sambhajirao  
Garad Mahavidyalaya, Mohol,  
Solapur, Maharashtra, India.

Email: [sayyadsims@gmail.com](mailto:sayyadsims@gmail.com)

Quick Response Code:



Web. <https://rlgjaar.com>



DOI:  
10.5281/zenodo.21992253

DOI Link:  
<https://doi.org/10.5281/zenodo.21992253>



Creative Commons



## Abstract

Research on computerized accounting systems (CAS), accounting information systems (AIS), digital accounting, cloud accounting and associated business systems is methodically compiled in this study. Seventy two records from a structured literature matrix served as the starting point for the review. 72 different research papers published between 1983 and 2026 were included in the final corpus of analysis. SME and small-business settings were the dominant in 39 cases (54.2%), followed by the Asian, Middle Eastern and African contexts and quantitative methods as the prevailing paradigm (50; 69.4%). Adoption, persistence, software package selection and associated impediments (31), organizational and financial performance (19), system/reporting quality and satisfaction (14), security, internal control and audit risk (6) and new technological infrastructures (2). Adoption and value realization factors in the corpus of literature include the perceptions of utility and simplicity, top-level management involvement, computer self-efficacy, readiness to adopt, infrastructure, vendor and governmental support, trust and internal control. Accuracy, timeliness, reporting, decision-making and coordination were generally improved through the utilization of CAS. However, the factors affecting productivity and profitability include compatibility, training, database, process integration and control. The review identified a research gap concerning the car dealers, accounting procedures and practices, inventory, sales and service, GST compliance and peculiar Indian conditions at the level of districts. With internal control, training and compatibility as a mechanism or boundary conditions, an integrative framework hypothesizes that these factors alongside the technology, organizational and environmental aspects influence the adoption and use of computerized accounting systems. As a result, the accounting quality, process efficiency and firm performance will be improved.

**Keywords:** Computerized Accounting System, Accounting Information System, Accounting Software, Digital Accounting, SMEs, system quality, internal control, organizational performance, Automobile Retailers

## Introduction

Adoption and value realization factors in the corpus of literature include perceptions of usefulness and ease, top-level management involvement, computer self-efficacy, readiness to adopt, infrastructure, vendor and government support, trust and internal control. Accuracy, timely reporting, decision-making and coordination were generally achieved through the use of CAS. On the other hand, the factors affecting productivity and profitability include compatibility, training, database, process integration and control. The research gap in the present study was the role of automobile retail dealers, accounting procedures and practices, inventory, sales and service, GST compliance and peculiar Indian conditions at the level of districts. With internal control, training and compatibility as a mechanism or boundary conditions, respectively, the integrative framework hypothesized that these variables along with technology, organizational and environmental factors would predict the adoption and use of computerized accounting systems. As a result, the accounting quality, process efficiency and firm performance will be improved.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Sayyad, V., & Dudhal, S. (2026). Computerized Accounting Systems and Organizational Outcomes: A Systematic Literature Review with Implications for SMEs and Automobile Retailers. *Royal International Global Journal of Advance and Applied Research*, 3(7(III)), 194–203.

<https://doi.org/10.5281/zenodo.21992253>



The evidence is fragmented and spread out across industries, countries and methodologies, despite the general agreement on the potential benefits of computerized accounting for speeding up, accuracy and information dissemination. The intention to adopt, user satisfaction, software package selection, system quality, internal control, financial reporting, audit risk, organizational efficiency and company performance are some of the different aspects considered in the research. As a result, it becomes hard to identify the variables that consistently contribute to effective adoption and the resulting outcomes after implementation. For SMEs and retail-oriented businesses in particular, the issue at hand is of paramount importance. Owner-driven decision-making, staff skill variances, an acute dependence on outsourced accounting, vendors and government agencies and insufficient financial and technical expertise are some of the common complications surrounding such organizations. The inherent need of the automobile dealers to connect their inventory of vehicles and spare parts, bookings, sales, workshop, warranty, financing, insurance commissions, vendor payments, GST, payroll and branch-wise reporting makes their accounting procedure even more strenuous. Apart from the above-mentioned peculiarities, the study, in the given literature, fails to cover Indian district retail ecosystems and automobile dealers. In order to stimulate empirical work on vehicle retailers and comparable small and medium-sized enterprises (SMEs) this review identifies stable causes and outcomes, analyses methodological and contextual trends and proposes a research agenda for future studies.

### Objectives and Research Questions

#### objectives:

1. To describe the temporal, geographic, sectoral and methodological profile of the CAS/AIS literature in the supplied corpus.
2. To synthesize the key factors influencing the adoption and effective use of these systems, notably technological, organizational, environmental and user-related.

#### Inclusion and exclusion chart

| Decision  | Criterion                                                                                                                                                                                                                                       |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inclusion | Studies directly examining CAS, AIS, accounting software, digital/e-accounting, cloud accounting, ERP-linked accounting, technology-enabled financial reporting, accounting-system security, adoption, use, quality or organizational outcomes. |
| Inclusion | Empirical, qualitative, mixed-method, conceptual, bibliometric or model-development studies with a clear connection to organizational accounting systems.                                                                                       |
| Inclusion | SME, public-sector, banking, manufacturing, service, professional, retail or general organizational contexts.                                                                                                                                   |
| Exclusion | Accounting education, pedagogy or curriculum studies without organizational CAS adoption or use.                                                                                                                                                |
| Exclusion | Accounting standards, innovation measurement, intangibles or management-accounting studies without a material digital-system component.                                                                                                         |
| Exclusion | Before 1983 published articles                                                                                                                                                                                                                  |

### Coding and synthesis

The included records were coded for year of publication, country or region of focus, sectoral context, methodology, and primary research theme. Only one primary research theme per study was identified, even if multiple themes were present. The findings were then classified according to a framework of antecedents, implementation mechanisms, system-use outcomes, and organizational outcomes, preserving those that gave mixed or conditional results rather than moving them to the positive.

3. To assess the reported impacts of CAS on accounting quality, internal control, decision making and overall organizational effectiveness as well as its impact on efficiency.
4. To identify factors associated with contradictions, limitations and gaps in extant research.
5. To formulate an integrated conceptual framework and research agenda for further exploration of the issues in perspective of Indian SMEs and automobile retailing sector.

### Research Questions

Research trends in the field of CAS/AIS over time, geographical distribution, sectors and methods.

Factors influencing the use, adoption, continuation and selection of software, as well as their effective usage.

Accounting, operational and organizational outcomes of CAS.

The associations between outcomes and system quality, user capabilities, internal control, and organizational fit.

The research gaps in the context of automobile dealers and Indian districts.

### Review Methodology

#### Review design and source corpus

The study implements a database systematic review, based on the user-provided excel literature matrix comprising 72 numbered records and twelve descriptive fields with information on the article title, authors, journal, year, research theme, research focus, method/sample/context, keywords or variables, findings, implications and gap. The study records were extracted from an existing database, not identified through a systematic search strategy and therefore this systematic review is limited to the records provided by the user and cannot be claimed to represent the world's scientific opinion on the topic. The analysis proceeds to the stage of cleaning, eligibility, coding and synthesis of the data provided.

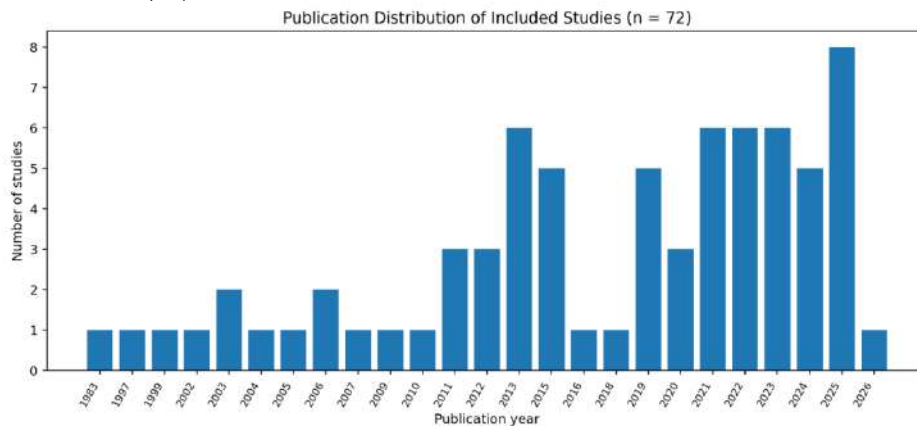
### Data-quality note

Most studies are summarized in a spreadsheet, but bibliographic metadata about the studies are not complete. Not all studies have volume, issue, page range and DOI information. The resulting reference list is formatted in APA referencing style by the attachment metadata, and must be validated against the original papers before submission to a journal. Although the matrix aids in thematic synthesis, it is not intended to replace full text risk of bias assessment and quality appraisal.

## Descriptive Profile of the Literature Temporal development

Twelve (16.7%) of the studies occurred in the years 1983-2009, 25 (34.7%) in 2010-2019 and 35 (48.6%) in 2020-2026, showing that the topic is increasingly with 2013, 2021, 2022 and 2023 (six).

relevant: more research was produced on cloud accounting, digital transformation, successful systems, resilience, cybersecurity and emerging technology in recent years. The year studied most often was 2025 (eight studies),

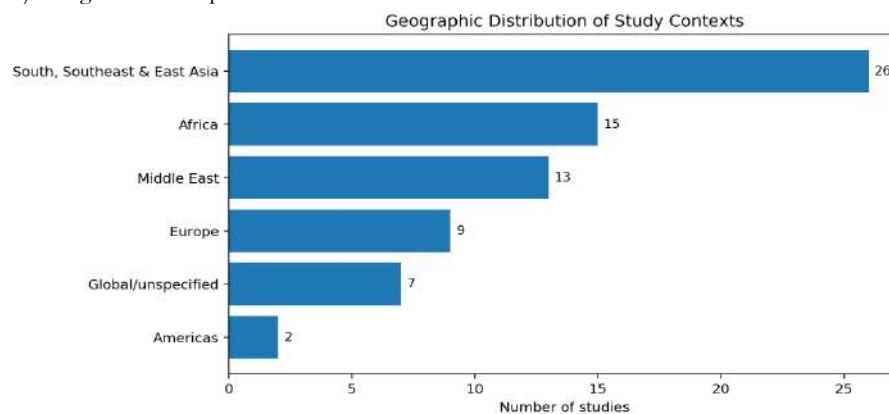


**Figure 1. Publication distribution of included studies**

## Geographical and sectoral concentration

The evidence is concentrated in developing and emerging economies. South, Southeast and East Asia account for 26 studies (36.1%), Africa for 15 (20.8%), the Middle East for 13 (18.1%), Europe for 9 (12.5%), the Americas for 2 (2.8%) and global or unspecified contexts for

7 (9.7%). Malaysia is the single most represented country (10 studies), followed by India (8), Jordan (7), Ukraine (5) and Nigeria (4). This distribution is valuable for understanding resource-constrained settings, but it also means that institutional, regulatory and technology conditions differ substantially across studies.

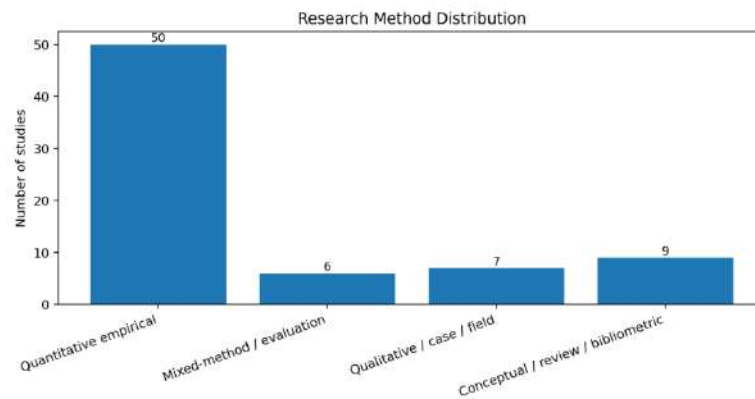


**Figure 2. Geographical distribution of study contexts**

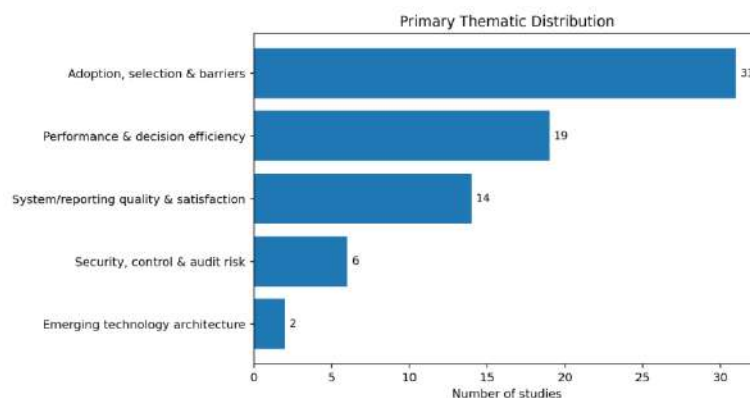
Out of those, thirty-nine studies (54.2%) are specifically on SMEs, MSMEs, small businesses or micro-enterprises. Additional industries include public agencies, banks, manufacturing firms, telecom, oil and gas, transportation, accounting firms, e-commerce, restaurants and rural enterprises. No included study directly investigates automobile dealerships as an integrated sales-service-inventory-finance setting.

## Methodological profile

The literature is dominated by quantitative empirical designs: 50 studies (69.4%) use surveys, regression, structural equation modelling, panel analysis or decision models. Six studies (8.3%) were mixed methods or programme evaluation studies; seven (9.7%) were qualitative case, interview or field-study approaches; and nine (12.5%) were conceptual, review or bibliometric studies. The heavy reliance on cross-sectional self-reported surveys presents a recurring risk of common-method bias and weak causal inference. There are few longitudinal experimental transaction level and implementation process studies.



**Figure 3. Research method distribution**  
**Thematic Synthesis**



**Figure 4. Primary thematic distribution**

#### **Adoption, continuance, software selection and barriers**

This is the largest theme, with 31 studies (43.1%). "The evidence is consistent that technology alone is not the determinant of adoption of CAS. Adoption is a function of expected benefits, usability, organizational capability, external support and decision maker characteristics.

#### **Technological elements**

Perceived usefulness and ease of use are consistently predictors of intention and use. Studies of Malaysian SMEs and public-sector users found that usefulness, usability and social influence affect adoption and job performance. Software functionality, compatibility, cost, customization, scalability, reliability and vendor support also influence selection. Trust, privacy, accessibility and service quality are identified as major issues in cloud-accounting research. Selection studies suggest users prefer flexible, easy-to-use programs with good support, rather than tools narrowly specialized.

#### **Organizational and managerial factors**

Top-management support and owner-manager IT knowledge, organizational and financial readiness, staff competencies and internal process maturity were found to be significant predictors of adoption. Resource limitations appear to be a critical barrier to computerization for small and medium-sized enterprises (SMEs), being most common in the group. Even if an SME owner realizes the benefits of adopting IT, the lack of capital, infrastructural limitations and insufficient expertise often prevent implementation. At the same time, larger and more established organizations are generally more likely to computerize, despite some studies indicating that organizational characteristics outweigh size's influence.

#### **Environmental and institutional factors**

Incentives from governmental authorities, professional advice, vendor support, market forces, customer

needs and digital regulations are some factors likely to promote the adoption of a given innovation in the health care field. Evidence from studies conducted in Ghana, Kenya, India and Malaysia support the notion that such environmental and institutional factors influence the process of innovation diffusion, although their impact is not significant in the case of a lack of awareness about the introduced programme.

#### **User and behavioural factors**

Digital literacy level of users, their experience, innovativeness, perception of risk, Trust, social norms and psychological dependency determine actual use. In this case, resistance to technology can come from fear of the complexity of its use, automation of processes, losing control of some aspects of work and the loss of personal data rather than from cost. Therefore, the key means of increasing use are the provision of reliable information and support, ease of use and the degree to which technology is beneficial to the job itself.

#### **Organizational performance and financial decision efficiency**

Nineteen (26.4%) of the studies were primarily performance outcome studies. Each of these reported a positive association between the use of the computerized accounting or information system and speed, accuracy, or timeliness of processing, quality of reporting, cost control, coordination, financial decision, or overall performance. The studies carried out in Ghana, Nigeria, Somalia, Uganda and India revealed that computerized accounting system reduces processing errors, improves access to current information and enhances responsiveness to improve managerial decision making. Evidence from balanced-scorecard studies carried out in Somalia among small and medium enterprises (SMEs) showed that computerized systems improved financial, customer, internal-business-process and learning-



performance indicators. However, the causal relationship was not always straightforward, as was evident in the studies carried out in Spain and Finland. The findings suggest that without proper systems policies and strategies, implementation of computerized accounting system (CAS) or management accounting system (MAS) may not lead to significant productivity improvements or management accounting innovation. The survey on accounting information system (AIS) implementation reveals that inappropriate investment of resources in information systems, whether too high or too low, could hinder the value realization process. Thus, the most comprehensive conclusion about the effectiveness of CAS implementation is that it creates preconditions for improvements in financial performance by providing the necessary information-processing capacity. However, the improvements are **System quality, reporting quality, satisfaction and comparative effectiveness**

Fourteen studies (19.4%) were primarily concerned with system effectiveness, reporting quality, satisfaction and comparative effectiveness. Computerized accounting systems were generally found to be more efficient, accurate, timely and easier to store, retrieve and prepare reports than manual systems. Further, accounting software was associated with higher quality financial reporting and increased effectiveness of accountant's work. However, computerized systems often required a higher initial investment, maintenance, updates and training of workers and involved greater risks of system failure. Studies on system success identified information, service quality, training, accessibility, system design, reliability and user-friendly design as critical success factors. Accuracy was found to contribute to user's satisfaction, while system's ease of use was associated with higher performance. Notably, in one study on system success in an organizational context, system quality was found to be non-significant predictor of benefit realization after controlling for information, service and training quality. This suggests that unless workers are provided with adequate information and support, system-specific factors alone may not be sufficient for successful implementation. Studies on ERP systems revealed similar themes. While ERP adoption was associated with increased effectiveness of accounting functions, including reporting, storing and retrieving of information, its implementation often requires significant resources. Moreover, user satisfaction and level of organizational changes were found to depend on the quality of implementation. Interestingly, some companies continued to use important management accounting processes outside of the ERP system in spite of significant investments in its implementation.

#### Security, internal control and audit risk

Out of the 60 research studies analysed, 6 (8.3%) focus on the theme of security, internal control or audit risk. In the context of Saudi studies, internal human threats such as inaccurate data entry or erasure, password sharing or shielding of output, are more prevalent and damaging than many external factors. This conclusion is particularly supported by research highlighting the importance of employee awareness, management support and organizational culture. Further, it is noteworthy that effective control cannot rely on IT security software alone. The articles agree that executive management support, standardized information technology infrastructure, security

realized only if the system is used to its full potential, which requires complementary investments in training and control processes. Internal control appears to be a critical component in the implementation of computerized accounting system. The study carried out in Pakistan among small and medium enterprises showed that internal control partially mediated the relationship between CAS and performance. The study established a processual relationship in which mere recording of transactions using computers is not sufficient to improve performance. A series of control process including proper authorization, segregation of duties, restriction of access, record reconciliation and audit trails must be carried out to produce reliable information and improve managerial decision making.

and control objectives, project control, training, end-user involvement, total cost planning, cryptographic control and appropriate implementation methodology contribute to the establishment of reliable controls significantly. Banking studies indicate that controls should be applied to achieve data availability, security and maintenance and ensure harmony in the use of data sources, inputs, processes and outputs. In public-enterprise research, automation of auditing processes is also associated with control risk, although it has not been universal. Finally, security awareness is increasingly associated with organizational performance. In the analysis of digital-accounting studies, senior management's control and security strategies, legal awareness and employee cybersecurity knowledge are linked to the extent of computerization and its benefits for the organization. Therefore, computerized auditing and control applications should be considered organizational capacity and governance issues beyond the IT function.

#### Emerging technologies and automated accounting architectures

There were two papers that I found to be primarily focused on the concept of emerging technology architecture. However, there were also several other articles that mention ongoing trends in this area of development. The big-data related research that I found was focused on the close connection between accounting, analytics and decision support. The paper I found discussed how one architectural model includes IoT, blockchain and XBRL. This model suggests that IoTs capture transactions or assets, blockchain secures this data and XBRL provides reports to the outside world. Other papers mention artificial intelligence, cloud computing and digital platforms as ways through which accounting can become more collaborative, real-time and predictive.

While this field has many benefits, there are significant challenges including costs, complexity, data governance, trust and resistance. There is still a need for traditional accounting, control and user expertise.

#### Cross-Theme Findings and Integrative Interpretation

The evidence can be organized into a four-step logic: antecedents influence adoption and use, effective use affects accounting-process quality, improved process quality facilitates managerial and organizational outcomes and influence of all variables is conditioned by control, alignment and contextual factors.

| Framework element          | Synthesis from the literature                                                                                                                               |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Technological antecedents  | Usefulness, ease of use, compatibility, functionality, reliability, scalability, cloud accessibility, security, integration, vendor support                 |
| Organizational antecedents | Top-management support, financial readiness, process maturity, digital competence, training, firm size, strategic orientation, internal control environment |



|                             |                                                                                                                                                         |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Environmental antecedents   | Government support, regulation, tax/digital compliance, infrastructure, consultants, competition, customers, suppliers                                  |
| User/behavioral antecedents | Awareness, trust, perceived risk, innovativeness, social influence, resistance, experience, perceived job benefit                                       |
| Implementation mechanisms   | Software–task fit, data migration, customization, user involvement, process integration, control design, support, continuous learning                   |
| Accounting-process outcomes | Accuracy, timeliness, completeness, accessibility, auditability, reporting quality, faster closing, better reconciliation                               |
| Organizational outcomes     | Decision quality, efficiency, coordination, compliance, customer service, cost control, profitability, resilience and growth                            |
| Moderators/mediators        | Internal control, system–organization alignment, training quality, information quality, firm size, sector, infrastructure and institutional environment |

The model offers an explanation as to why the literature can report simultaneously both positive and null findings. In instances where the firm buys the accounting software but does not benefit from it significantly due to data being collected incompletely, workers continuing to use other methods alongside the software, modules that have not been integrated and controls or reports not utilized, adoption should be measured separately from depth of use, quality of use and benefits realization.

#### Implications for Automobile Retailers

Automobile dealers involve in retail, service and quasi-financial organizations. In other words, a dealership performs inventory, spares, workshops, customer advances, loans, insurance commissions, warranties, manufacturer's incentives, vendor's credit, branch transfers and tax services. Thus, a computerized accounting system (CAS) should be considered as a multi-user database software to store and retrieve information for processing and not merely as a set of accounting packages. The article indicates that the study on automobile-retailer requires an in-depth analysis of at least four levels of use of a computerized accounting system which are evident as: 1. Simple accounting functions: journal vouchers, cash and bank ledgers, purchases, sales, receivables, payables and statutory ledgers. 2. Operational needs: vehicles and spare parts inventory, workshop jobs, service contracts, wages

and vendor payments. 3. Management reporting needs: age analysis, profitability by branch and model, service productivity, turnover of inventory, cash flow projections and exception reporting. 4. Control needs: access and authorization controls, audit checks, data backup and reconciliation procedures, system security, GST compliance and fraud detection. A future empirical study can compare the effectiveness of a computerized accounting system based on its accuracy, timely availability, integrative capacity, ease of use, security, support and information content. The study can accomplish organizational impact on financial reporting, control and inventory, working capital management, managerial decision-making and overall organizational performance. The study can focus on training, internal control and system-organization fit as intervening variables or moderators.

The study should also consider the effect of the district location on the level of computerization among automobile dealers. In Solapur, for example, there is a wide-ranging variation in the number of employees, brand affiliation, access to skilled accountants, Tally or dealer management system, internet's reliability, availability of vendors and support, number of branches and involvement of owners. Thus, it appears that several factors explain the differences in computerization levels among automobile dealers subject to similar tax and accounting regulations.

#### Research Gaps

| Gap                            | Overview                                                                                                                                                                                                                                             |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sector-specific gap            | The corpus contains sector studies in banking, manufacturing, telecom, public administration, transport and hospitality, but virtually no integrated study of automobile dealerships or automobile retail networks.                                  |
| Indian district-level gap      | Only eight included studies are situated in India and most use general SME, banking, micro-enterprise or regional samples. District-level evidence linking local infrastructure, skills, software ecosystems and compliance requirements is limited. |
| Adoption- versus- use gap      | Many studies classify firms as adopters or non-adopters without measuring depth of module use, quality of data, integration, frequency of use or managerial use of outputs.                                                                          |
| Causality gap                  | Cross-sectional surveys dominate. Longitudinal designs, pre/post implementation studies, quasi-experiments and objective transaction-data analyses are rare.                                                                                         |
| Performance-measurement gap    | A large share of studies uses perceived performance. Objective indicators such as closing time, error rates, stock variance, receivable days, tax penalties, audit adjustments and profitability are less common.                                    |
| Internal-control mechanism gap | Security and control are often studied separately from performance. More work is needed on whether internal control mediates the relationship between CAS use and reporting or firm outcomes.                                                        |
| Integration gap                | Limited evidence explains how CAS integrates with inventory, customer relationship management, dealer-management, e-invoicing, banking, payroll and tax systems.                                                                                     |
| Human-capability gap           | Training is frequently recommended but rarely examined as a structured capability involving frequency, quality, role-specific competence and continuous support.                                                                                     |
| Cybersecurity gap              | Internal threats are well recognized, but newer risks involving cloud access, mobile use, ransomware, third-party vendors and API-connected systems require sector-specific evidence.                                                                |
| Theory-integration gap         | The literature uses TAM, TOE, Diffusion of Innovation, system-success, information-processing and other models, but few studies integrate adoption, effective use, control and performance in one tested framework.                                  |

#### Proposed Future Research Agenda



A future study of automobile retailers can adopt an explanatory model in which CAS effectiveness is the central construct and organizational performance is the outcome. A practical model is presented below.

| Model component       | Proposed Variables                                                                                                                                                                                        |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Independent variables | System quality; information quality; service/vendor support; perceived usefulness; ease of use; integration capability; security and internal-control quality; digital competence; top-management support |
| Mediator options      | Effective system use; user satisfaction; accounting-information quality; internal-control effectiveness                                                                                                   |
| Moderator options     | Firm size; dealership type; years of CAS use; branch structure; employee digital literacy; urban/district infrastructure                                                                                  |
| Dependent variables   | Financial-reporting quality; decision-making efficiency; inventory and working-capital control; compliance efficiency; operational performance; firm performance                                          |
| Control variables     | Firm age; ownership type; number of employees; annual turnover; software platform; accountant qualification; brand affiliation                                                                            |

#### Illustrative research propositions include:

1. H1: System quality, information quality, service support, perceived usefulness and integrative capabilities positively relatable to effective CAS use.
2. H2: Digital competence and top-management support positively relate to effective CAS use.
3. H3: Effective use of CAS positively relates to accounting information quality and user satisfaction.
4. H4: Accounting-information quality improves financial-reporting quality and decision-making effectiveness.
5. H5: Internal-control quality has a mediating effect on the CAS-performance relationship.
6. H6: Training quality strengthens the relationship between system capability and effective use.
7. H7: System-organization alignment strengthens the relationship between effective CAS use and performance.
8. H8: The effects of CAS differ by firm size, dealership structure and level of module integration.

A mixed method would be more informative than another cross-sectional survey. Initially, it would be important to interview owners, accountants, dealership managers, auditors and software vendors about their perspectives and key constructs in workflow management. Subsequently, a survey could be developed and administered to automobile dealers to assess the proposed model. Wherever possible, objective measures such as time of month-end closures, inventory discrepancies, aging of receivables, tax liabilities, audit findings and report generation time would supplement the viewpoints of these stakeholders.

#### Managerial and Policy Implications

For managers, the review suggests that purchasing the software is only the first step in the process. The companies must choose the software by its suitability for specific processes, level of integration, scalability, security, reporting and support capabilities. The implementation process should be accompanied by training, data-cleaning, control documentation, backups and reconciliation procedures, role-specific access and periodic benefit assessments. The parallel functioning of computerized and manual procedures should be minimized when the digital process is proven effective, as having two separate methods increases the risk of inconsistencies and reduces accountability. For software vendors, the analysis indicates that the importance of intuitive interfaces, local language availability, comprehensive implementation assistance, sector-specific processes and affordable upgrades. In the case of automobile retailers, the proposed software should offer interconnected processes, such as spare parts inventory, workshop management, financing, claims management and GST, rather than making the users manage several Excel sheets. For government and professional organizations, the findings suggest that training, digital infrastructure development and awareness

campaigns could reduce the barriers to adoption. The support should be provided for specific industries in the form of capacity-building programs, cybersecurity awareness and control over accounting processes.

#### Limitations of the Review

The review is systematic, although limited to the data presented in the provided spreadsheet. It should be noted that the review is not database-derived, meaning that search strings, coverage and original full-text articles were not presented. Some of the works' bibliographic details are missing and some descriptions might be interpreted differently, as the theme has multiple variations. In addition, the primary-theme coding reduces the complexity of studies that address several themes. Finally, the majority of the research is cross-sectional and comes from developing countries. These limitations should be considered before publishing the review in a peer-reviewed journal, which would require updating the search, full-text assessment and quality appraisal.

#### Conclusion

Literature reveals that computerized accounting systems can be beneficial in enhancing accuracy, timeliness, information access, reporting capabilities and decision-making; however, the benefits were realized through perceived usefulness and ease of use and organizational impact, employee competence level, managerial support, infrastructure, service quality, internal control and fit with organizational processes. The study's scope was limited to cross-sectional surveys that focused on small, medium-sized enterprises in Asia, the Middle East and Africa. Few studies addressed the automobile retail sector directly. Further experimental research on the effective utilization and integration of accounting information systems is required to reveal how the usage and integration level can contribute to the overall performance outcomes; therefore, future studies should consider including both perceptual and objective measurements in testing and evaluating the effectiveness of CAS. The study's next steps should include an analysis of internal control, training and fit as key mechanisms that mediate the CAS capability-effectiveness relationship. The accounting literature on computerized accounting systems would become more informative, relevant and informative for practitioners if future studies focus on specific industries and provide a stronger theoretical framework for the CAS-field.

#### Acknowledgement

The authors express their sincere gratitude to the Department of Commerce and Management, Deshbhakta Sambhajirao Garad Mahavidyalaya, Mohol, Solapur, for providing the academic guidance, encouragement, and institutional support necessary for the successful completion of this research work. We are especially thankful to our guide, Dr. Shrikant Dudhal, Assistant Professor, for his



valuable guidance, insightful suggestions, continuous motivation, and constructive feedback throughout the preparation of this systematic literature review. His expertise and encouragement greatly contributed to the quality of this study. We also extend our heartfelt appreciation to all the researchers and scholars whose published works formed the foundation of this review. Their valuable contributions to the field of computerized accounting systems and accounting information systems have made this research possible. Finally, we express our sincere thanks to our family members, friends, and well-wishers for their constant support, patience, and encouragement throughout this academic endeavor.

#### Financial support and sponsorship

Nil.

#### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### References

1. AbdiSalam Salad Abdulle, Zaini Zainol, Hawa Ahmad (2019). Impact of Computerized Accounting Information System on Small and Medium Enterprises in Mogadishu, Somalia: The Balance Scorecard Perspectives. *International Journal of Engineering and Advanced Technology (IJEAT)*.
2. Adong Lilly Rose (2019). Computerised Accounting Systems and Financial Performance of Manufacturing Companies in Bulikwe District: Uganda Tea Corporation Ltd. Kampala Int. Univ. Thesis.
3. Agha, Abdulla, Nanakali (2024). Impact of Accounting Software on Accountants' Performance in Furniture Companies in Erbil. *Polytechnic Journal of Humanities & Social Sciences*.
4. Ahmad A. Abu-Musa (2006). Investigating the Perceived Threats of Computerized Accounting Information Systems in Developing Countries: An Empirical Study on Saudi Organizations. *Journal of King Saud University – Computer & Information Sciences* Vol. 18, pp. 1–26.
5. Ahmed Mire Ahmed (2011). The Role of Computerized Accounting Systems on the Organizational Performance: A Case Study of Hormuud Telecom Somalia. Kampala International University.
6. Akamanwam Effiong Itang (2020). Computerized Accounting Systems: Measuring Structural Characteristics. *Research Journal of Finance and Accounting* (Vol. 11, No. 16).
7. Alexandra Kanellou, Charalambos Spathis (2013). Accounting benefits and satisfaction in an ERP environment. *International Journal of Accounting Information Systems*.
8. Alper Tazegul, Saliha Gul Cimşit (2025). Digital Transformation in Accounting Profession; An Application in TRA 2 Region. *International Review of Management and Marketing*.
9. Amar Johri, Raj Kumar Singh, Bijay Prasad Kushwaha, Hamad Alhumoudi, Abdullah Alakkas, Maysoun Khoja (2025). Leveraging open innovation for e-commerce success: The contingent role of accounting information systems and artificial intelligence. *Journal of Innovation & Knowledge*.
10. Ashish Varma, Palmira Piedepalumbo, Daniela Mancini (2021). Big Data and Accounting: A Bibliometric Study. *The International Journal of Digital Accounting Research*.
11. Aws Al-Okaily, Manaf Al-Okaily, Fadi Shiyyab, Walid Masadah (2020). Accounting Information System Effectiveness from an Organizational Perspective. *Management Science Letters*.
12. Azleen Ilias, Nurul Nazirah Binti Zainudin (2013). Factor Affecting the Computerised Accounting System (CAS) Usage in Public Sector. *Journal of Internet Banking and Commerce* (Vol. 18, No. 1).
13. Bhor Gauri Dinkar, Hadawale Ashwini Balu, Kokate Dipali Prabhakar (2023). A Result on Study of Computerized Accounting System in Small and Medium Scale Business. *IJARIE*.
14. Bilal Nayef Zureigat, Hasan Alhanatleh (2025). Role of Digital Technologies Based on Cybersecurity Awareness in Enhancing Firms' Performance: Digital Accounting Systems Setting. *Economics – Innovative and Economics Research Journal* Vol. 13, No. 3, pp. 375–396.
15. Chandler & Holzer (1983). Pre-Conditions for the Introduction of Computer-based Accounting Systems in Less Developed Countries. *Univ. of Illinois Working Paper*.
16. Chee-Sing Yap, James Y.L. Thong (1997). Programme Evaluation of a Government Information Technology Programme for Small Businesses. *Journal of Information Technology*.
17. Chude Daniel Izuchukwu, Chude Nkiru Patricia (2022). Effect of Computerized Accounting System on Organisational Performance of Oil and Gas Firms in Port Harcourt, Nigeria. *British Journal of Management and Marketing Studies* (Vol. 5, Issue 3, pp. 66–88).
18. Clark Kent Arcega, Emerenciana Datinguinoo, Jessica Guerra, Claudette Guno, Hanna Jean Mayuga, (2015). Computerized vs. Non-computerized Accounting System of Small and Medium Enterprises in Lipa City, Philippines: A Comparative Analysis. *Asia Pacific Journal of Academic Research in Business Administration* (Vol. 1, No. 1, pp. 48–55).
19. Corina Joseph, Tamoi Janggu (2003). A Survey on the Computerized-Based Accounting System Use Among Manufacturing Companies in Kuching, Sarawak. Final Research Report, UiTM Sarawak.
20. Dona Primasari, Puji Lestari, Siti Maghfiroh, Muhammad Wahyu Panindra (2026). Analysis of the Implementation of the SI APIK Web-Based Accounting Application in the Preparation of Financial Statements for MSMEs: A SOR Theory Approach. *Business Performance Review*.
21. Dr. Ram Sable (2019). Adoption of Computerized Accounting System by Small and Medium Enterprises. *Research Journey International Multidisciplinary E-Research Journal*.
22. Elena Urquía Grande, Raquel Pérez Estébanez, Clara Muñoz Colomina (2011). The Impact of Accounting Information Systems (AIS) on Performance Measures: Empirical Evidence in Spanish SMEs. *International Journal of Digital Accounting Research*.
23. Elsa Pedroso, Carlos F. Gomes, (2019). Impact of Accounting Software on Business Performance of Small and Medium Enterprises. *International Journal of Accounting, Finance and Business Management*.
24. Eman Al Hanini (2015). Evaluating the Reliability of the Internal Control on the Computerized Accounting Information Systems: An Empirical Study on Banks Operating in Jordan. *Research Journal of Finance and Accounting*.
25. Eric Amankwa (2013). Factors Affecting Applicability of Security Controls in Computerized Accounting Systems. *International Journal of Research in Commerce, IT & Management*.
26. Esmeray (2016). The Impact of Accounting Information Systems on Firm Performance: Empirical



- Evidence in Turkish SMEs. *International Review of Management and Marketing*.
27. Florence Atieno Kanyanga (2022). Effects of Computerized Accounting Systems on Financial Performance. *African Journal of Commercial Studies* (Vol. 1, No. 1, pp. 28–35).
28. Fuseini Mahama, Halina Mohamed Dahlan (2022). Factors Influencing Accounting Information System Adoption in Small and Medium-Sized Enterprises: A Case Study of Northern Ghana. *International Journal of Academic Research in Business and Social Sciences*.
29. Ghulam Muhammad, Tuba Ismail (2022). Computerized Accounting Systems and SMEs Performance in Developing Countries: A Mediating Role of Internal Control System. *GMJACS*.
1. Granlund & Malmi (2002). Moderate Impact of ERPS on Management Accounting: A Lag or Permanent Outcome?. *Management Accounting Research*.
2. Gupta (2023). Influence of Technology on Accounting Practices in India: Micro Enterprises in Delhi. *European Journal of Theoretical and Applied Sciences*.
3. H. A. C. K. Hettiarachchi W. A. N. C. Perera (2020). Impact of Characteristics of Accounting Software on Business Performance of Small and Medium Scale Enterprises (SMEs) in Kurunegala District, Sri Lanka. *International Journal of Scientific and Research Publications (IJSRP)*.
4. Hasbolah et al. (2021). Digital Accounting Entrepreneurship Competency for Sustainable Performance of Rural MSMEs. *Int. Journal of SMEs*.
5. Iryna Vagner, Oksana Sarakhman, Ruslana Shurpenkova (2023). Analysis of the Development of Cloud Technologies in Accounting. *Technology Audit and Production Reserves*.
6. James Y.L. Thong (1999). An Integrated Model of Information Systems Adoption in Small Businesses. *Journal of Management Information Systems*.
7. Jiawei Wen, Hajime Kobayashi, Ichizen Matsumura, Esham Mohamed, Jinbai Huang (2012). Adoption of Accounting Software by Agro-Based Enterprises in China. *IJREISS*.
8. Joaquin Marcel Afan Torres, Julio Ricardo Moscoso Cuaresma, Alex Jhon Gutierrez Nonones, Omar Alexis Larios Soldevilla, Milagros Justina Córdova Esquivel, Jennifer Yamile Prada Berrocal, Adriana Geraldine Galindo Estela (2025). Factors Influencing the Digitization Process of Peruvian SMEs: Management Education, Internationalization and Business Size. *Cogent Business & Management*.
9. Lesia Marushchak, Olha Pavlykivska, Galyna Liakhovych, Oksana Vakun, Nataliia Shveda (2021). Accounting Software in Modern Business. *Advances in Science, Technology and Engineering Systems Journal*.
10. Lewi Amanor Agbozo, Dr. Purvi Dipen Derashri (2025). Financial Decision-Making Efficiency and Computerized Accounting Systems: A Study of SMEs in Ghana. *International Journal of Accounting and Economics Studies*.
11. Lilis Puspitawati, Iqbal Lhutfi, Inomjon Qudratov (2024). Enhancing Inventory Efficiency: The Role of Strategic Management Accounting and Integrated Management Accounting Information Systems. *Cogent Business & Management*.
12. Linda A. Bressler, Martin S. Bressler (2006). How Entrepreneurs Choose and Use Accounting Information Systems. *Strategic Finance*.
13. Liudmyla Hnatyshyn, Oksana Prokopyshyn, Olha Maletska, Taras Keleberda, Kateryna Pylypenko (2025). Digital Innovations in Accounting as Economic Growth Factors of an Enterprise. *Scientific Bulletin of Mukachevo State University (Economics)*.
14. Lutfi et al. (2022). Influence of Digital Accounting System Usage on SMEs Performance: The Moderating Effect of COVID-19. *Sustainability*.
15. Mahesh U. Daru (2015). Role of Computerized Accounting in Banking Sector. *International Journal of Advanced Research in Management and Social Sciences*.
16. Mahmoud Hany M. Dalloul, Zuraeda binti Ibrahim, Sharina Tajul Urus (2023). The impact of quality dimensions of accounting information system success on the effectiveness of during-financial crisis management: The mediating role of system usage in a government sector context. *Asian Economic and Financial Review*.
17. Manaf Al-Okaily, Abeer F. Alkhwaldi, Amir A. Abdulmuhsin, Hamza Alqudah, Aws Al-Okaily (2022). Cloud-based accounting information systems usage and its impact on Jordanian SMEs' performance: the post-COVID-19 perspective. *Journal of Financial Reporting and Accounting* (Emerald Publishing).
18. Manivasanthan R., Jonathan J., Arshard M. (2024). Modern Accounting Systems can Support an Organization's Efficient Management: A case of A, B and C Transportation. *Golden Sun-Rise International Journal of Multidisciplinary on Science and Management* (Vol. 1, Issue 1).
19. Marina Đurović, Nikolina Dečman (2025). The impact of digitalization on enhancing business processes in accounting firms. The case of Croatia. *Zeszyty Teoretyczne Rachunkowości* (Stowarzyszenie Księgowych w Polsce).
20. Maryna Petchenko, Tetiana Fomina, Oksana Balaziuk, Nadiya Smirnova, Olha Luhova (2023). Analysis of Trends in the Implementation of Digitalization in Accounting (Ukrainian Case). *Financial and Credit Activity: Problems of Theory and Practice*.
21. Mohamed Nofel, Mahmoud Marzouk, Hany Elbardan, Reda Saleh, Aly Mogahed (2024). From Sensors to Standardized Financial Reports: A Proposed Automated Accounting System Integrating IoT, Blockchain and XBRL. *Journal of Risk and Financial Management*.
22. Mohd Fazli Mohd Sam, Yasuo Hoshino, Md. Nor Hayati Tahir (2012). The Adoption of Computerized Accounting System in Small Medium Enterprises in Melaka, Malaysia. *International Journal of Business and Management*.
23. Moh'd Alsquor, Hani Attar, Mohammad Haider Alibraheem, Sameh Alsaqoor, Enas Alsaleem (2025). System Quality, Information Quality, Perceived Usefulness and Ease of Use as Determinants of Intention to Continue Using a Digital Accounting System among Jordanian SMEs. *Engineering Management in Production and Services*.
24. Morteza Ghobakhloo, Mohammad Sadegh Sabouri, Tang Sai Hong, Norzima Zulkifli (2011). Information Technology Adoption in Small and Medium-sized Enterprises; An Appraisal of Two Decades Literature. *Interdisciplinary Journal of Research in Business*.
25. Muhammad Yassein Rahahle, Ayman Ahmad i (2024). Evaluating the Impact of E-accounting Systems on Firm Performance: A Structural Equation Modeling Approach. *Published in Artificial Intelligence and Economic*.
26. Noor Azizi Ismail, Malcolm King (2005). Firm Performance and AIS Alignment in Malaysian SMEs. *International Journal of Accounting Information Systems*.
27. Noor Azizi Ismail, Rosliza Mat Zin (2009). Usage of Accounting Information among Malaysian Bumiputra Small and Medium Non-Manufacturing Firms. *Journal of Enterprise Resource Planning Studies*.
28. Noor Azizi Ismail, Shamsul Nahar Abdullah, Mahamad Tayib (2003). Computer-Based Accounting Systems: The



- Case of Manufacturing-Based Small and Medium Enterprises in the Northern Region of Peninsular Malaysia. Jurnal Teknologi (Universiti Teknologi Malaysia). 37.
29. Oladipupo Muhrtala Tijani, Ajape Kayode Mohammed (2013). Computer-Based Accounting Systems in Small and Medium Enterprises: Empirical Evidence from a Randomized Trial in Nigeria. Universal Journal of Management. 38.
30. Oleh Vysochan, Olha Vysochan, Alla Yasinska, Vasyl Hyk (2021). Selection of Accounting Software for Small and Medium Enterprises Using the Fuzzy TOPSIS Method. TEM Journal. 39.
31. Omotilewa Oluwatoyin Olufemi, Adegbe Folajimi Festus, Adesola Munir Adekunle (2021). Accounting Software in Computerized Business Environment and Quality of Corporate Reporting. Journal of Finance and Accounting. 40.
32. Otieno Polo J., Dr. Oima D. (2013). Effect of Computerised Accounting Systems on Audit Risk Management in Public Enterprises: A Case of Kisumu County, Kenya. International Journal of Education and Research. 41.
33. P. T. Kale S. S. Banwait S. C. Laroia (2007). Enterprise Resource Planning Implementation in Indian SMEs: Issues and Challenges. Critical Thinking in E-Governance Conference-based peer-reviewed publication. 42.
34. Rajesh Kumar Agrawal, Dr. Hariom Agrawal (2018). The Impact of Computerized Accounting System in SME (Special References in Rewa Division). First International Conference on NexGen Technologies. 43.
35. Rose Nyamusi Nyang'au, Bichanga Walter Okibo andrew Nyang'au (2015). Constraints Affecting Adoption of Computerized Accounting Systems in Nyeri County, Kenya. International Journal of Economics, Commerce and Management (UK).
36. Saira Kharuddin, Zariyawati Mohd Ashhari, Annuar Md Nassir (2010). Information System and Firms' Performance: The Case of Malaysian Small Medium Enterprises. International Business Research.
- Sayel Ramadhan, Prem Lal Joshi, Salwa Abdel Hameed (2004). Accountants' Perceptions of Internal Control Problems Associated with the Use of Computerized Accounting Systems: Evidence from Bahrain. Review of Business Information Systems.
- Scovia Murungi, Callist Kayigamba (2015). The Impact of Computerized Accounting System on Financial Reporting in the Ministry of Local Government of Rwanda. JETEMS.
- Sharinah Puasa, Julia Smith, Sharifah Milda Amirul (2019). Perceptions of Accounting Information System Effectiveness: Preliminary Findings from the Malaysian Federal Government. Labuan E-Journal of Muamalat and Society.
- Siti Aminah Ismail, Norman Mohd-Saleh, Selamat Kundari (2012). Computerized Accounting System at the MARA State Offices: Factors Affecting User Satisfaction and Job Performance. IRACST – International Journal of Research in Management & Technology (IJRMT).
- Srinath Koley, Ajit Kumar (2021). Comparative Analysis of Computerized Accounting System and Manual Accounting System in Ranchi at Jharkhand. Shodh Samagam.
- Thabiso Sthembiso Msomi, Sanele Phumlani Vilakazi (2023). Nexus between Accounting and Information Systems and SMEs' Operational Efficiency in South Africa. Problems and Perspectives in Management.
- Wan Nur Syahida Wan Ismail, Azwadi Ali (2013). Conceptual Model for Examining the Factors that Influence the Likelihood of Computerised Accounting Information System (CAIS) Adoption among Malaysian SMEs. International Journal of Information Technology and Business Management.



Original Article

# Current Trends and Future Directions in Heritage Tourism in Haryana: A Comprehensive Review

Shivender<sup>1</sup>, A. Rajshekhar<sup>2</sup>

<sup>1</sup>, Department of Geography, Kalinga University, Naya Raipur, Chhattisgarh

<sup>2</sup> Professor HOD, Department of Geography, Kalinga University, Naya Raipur, Chhattisgarh.

Manuscript ID:  
RIGJAAR-2026-030746

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 204-208  
July 2026

Submitted: 17 June. 2026  
Revised: 25 June. 2026  
Accepted: 18 July. 2026  
Published: 31 July. 2026

Correspondence Address:  
Shivender, A. Rajshekhar  
Department of Geography, Kalinga  
University, Naya Raipur,  
Chhattisgarh Corresponding  
Email:  
[shivenderrohilla64@gmail.com](mailto:shivenderrohilla64@gmail.com)  
Quick Response Code:



Web: <https://rlgjaar.com>



DOI:  
10.5281/zenodo.22024178

DOI Link:  
<https://doi.org/10.5281/zenodo.22024178>



Creative Commons



## Abstract

*A state deeply entrenched in the epic of Mahabharata, Haryana, influenced by centuries of imperial rule, invasion and cultural synthesis, has immense tangible and intangible heritage which are only partially utilised for tourism. This review collates all the threads of extractable research, government and institutional documentation, to provide a holistic overview of heritage tourism in the state in terms of its archaeological and architectural heritage, its religious and battlefield heritage, and its living heritage in the form of craft and festival culture. The review connects the dots of current sector trends such as the Eunchalification of travel, the story-led approach, the National Capital Region's advantage as a "proximity destination" for the weekend and MICE, and the surge in numbers coming to events like Surajkund International Crafts Mela. It explores the emerging ways of using digital technology including augmented and virtual reality, AI powered interpretations, and mobile platforms in the interpretation of monuments, and the ongoing absence of signage, stories and multi-lingual access in many monuments across Haryana. The paper also discusses the institutional and policy framework surrounding the Department of Archaeology and Museums and the Haryana Tourism Corporation, the need for sustainable and community-driven development and the economic benefits of heritage connected activities and visitor experience. Lastly, it highlights the challenges for connectivity, conservation funding and fragmented promotion still facing the sector as well as new opportunities to explore through digital storytelling, public-private partnerships, and circuit based itinerary development. The review aims to be a single watershed reference document for researchers, planners and policy makers to get an idea of what the status of heritage tourism in Haryana is and what it might become.*

**Keywords:** Heritage tourism, Haryana, Culture, Sustainable Tourism

## Introduction

The fact that the movement of persons to heritage tourism is connected not only with leisure or recreation, but with the process of memory keeping, explaining and sharing one's heritage place with others makes it a special type of tourism, with a special mission in the tourism economy (Park, 2013; Harrison, 2010). It attracts tourists to monuments, archaeological sites, sacred objects, museums, and living traditions; thereby establishing a direct monetary value of conservation (Chhabra, 2010; Nijkamp, 2012). Although in India, some of the well-known circuits like the Taj Mahal, Rajasthan forts and other temple towns of the South have been in the limelight for decades, but there are still a number of states in the country whose heritage values although immense have not been studied in depth in the context of tourism (Maheshwari & Singh, 2026; Manchanda, 2006). Haryana is a splendid example of this divide as history has seen a range of evidence from the first Harappan settlement up to the historic battle field of Kurukshetra, and the pivotal battles between the Tondra van empire and the British at Panipat, and the state's industrial and corporate development is its association with 'Delhi' (Sarkar & Keat, 2024; Sharma, 2005). The State's landscapes of heritage are extremely complex. At sites like Rakhi Garhi, Mitathal and Bhagwanpura, remains of Harappan and pre-Harappan habitation have been found and today Kurukshetra is still one of the sacred places of the Hindu tradition because the Mahabharata and Bhagvad Gadhi are associated with this area. (Haryana Tourism, n.d.).

## Creative Commons (CC BY-NC-SA 4.0)

*This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.*

## How to cite this article:

Shivender, & A., R. (2026). Current Trends and Future Directions in Heritage Tourism In Haryana: A Comprehensive Review. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 204–208. <https://doi.org/10.5281/zenodo.22024178>



Panipat also has a history linked to three important battles which would have a major impact on the political history of the North India and its towns like, Pinjore, Hisar and Mahendragarh have Mughal gardens, forts and colonial structure (Directorate of Archaeology and Museums, Haryana, n.d.). All this along a field of archeology, religion, military history and vernacular architecture adds up to a level of resources never hitherto exploited in a proportionate fashion to its neighbors making Haryana potentially the most rich heritage destination in India. Yet, research interest related to the heritage tourism in Haryana has been divided into sections namely, rural tourism, ecotourism, geotourism or tourism policy in general but not a single research in a single study has taken up heritage tourism as a topic in itself (Malik, 2018; Vats & Lather, 2022). At the same time, the sector is also witnessing visible transformation: Government ministries and departments are now keenly focusing on circuit development and craft based cultural tourism as one of the ways to preserve heritage assets without eroding them; the incorporation of new digital and immersive technologies and, crucially, the growing understanding that sustainable and community-based heritage models are essential if heritage assets are not to be damaged by visitation. It is appropriate, therefore, for the appearance of a consolidated review when these threads are brought together. In this paper, issues around heritage tourism in Haryana have been summarized through mapping of available heritage resources and potential of tourism in the state, current trends in the tour industry, digitalization of the tour industry, evaluation of site interpretation practice, institutional and policy framework; evaluation of sustainability issues and economic impact of the tour industry in the state and identifying the main problems identified and the emerging opportunities which will define the future direction of the tour industry in the state.

### **Heritage Resources of Haryana**

The heritage resources of Haryana can be categorized into archaeological, religious-historical and architectural-vernacular groups in general, providing a distinctly defined spectrum of the Haryanvi identity. The state is also historically important because of the Harappan and pre-Harappan sites found within it, including discoveries at Rakhi Garhi, Mitathal and Bhagwanpura, which demonstrate a long history of settlement and manufacturing processes. The state has also archaeological significance as a result of the Harappan and pre-Harappan sites found within its boundaries, with excavations at Rakhi Garhi, Mitathal and Bhagwanpura showing long standing settlement patterns and craft traditions that extend back several millennia (Haryana Tourism, n.d.). In addition to pottery and sculptural finds unearthed from Pehowa, Kurukshetra and Panipat, these findings were also utilised by scholars to map the geography of the Mahabharata story on the land of Haryana, thereby portraying archaeological sites as stories that live within the narrative (Haryana Tourism, n.d.). Under the religious-historical category of the Haryana's heritage lies Kurukshetra, an epic site of the Mahabharata, where the Bhagvadgita was given to Arjuna

and the most sacred water bodies of the state, namely Brahma Sarovar and Sannihit Sarovar are located, as well as the Sri Krishna Museum and the Dharohar heritage museum (Kurukshetra district government portal, as cited in Haryana Tourism, n.d.). The towns of Panipat (Haryana) and Thanesar (Uttar Pradesh) have a parallel military-historical tradition, their battle-field memorials found at Panipat Museum and the metal sculpture memorials near Ibrahim Lodhi's Tomb, and their monuments of panache in the form of Sheikh Chilli's Tomb, which has been converted into an archaeological site museum (DSSM, Haryana, n.d.). The architectural-vernacular includes Mughal gardens and forts, colonial era buildings, and princely periods palaces that remain in the region throughout the state; the Pinjore Gardens and associated site museum; adult fort complexes at Mahendragarh and Madhogarh, and tourist-oriented and hospitality use sites such as the Raja Nahar Singh Palace (Haryana Tourism, n.d.). The state's Directorate of Archaeology and Museums also has a network of zonal and site museums at Hisar, Jind, Yamunanagar and Panipat, apart from the temple architecture in the sites like Bhima Devi Temple at Pinjore and Prachin Shiv Temple at Pehowa, forming a distributed rather than a centralised heritage inventory (Directorate of Archaeology and Museums, Haryana, n.d.).

### **Heritage Tourism Potential of Haryana**

In addition to these, a distinctive feature of the country's tourism industry, and its heritage tourism in particular, is the 'de-prettyfication' of heritage sightseeing, which is becoming a more active and participatory activity befacing people—walking/visiting heritage sites, sharing meals, craft-making and attending festivals (KPMG in India & PHD Chamber of Commerce and Industry, 2026). This is clearly evident in Surajkund—as was the International Crafts Mela, a national exhibition started here in 1987, is now acknowledged as an international event and in its recent editions has attracted over one million visitors, including tens of thousands of foreign nationals, and now includes Partner-country and Theme-state pavilions, life performances of folk-arts and a separate court for culinary arts. (Drishti IAS, 2026) Another pattern observed is that the institutional push for Surajkund to become one of most popular cultural and MICE packages in the NCR region, in which both the national and union/state level officials have discussed Surajkund events explicitly with the cultural events of national level, making Surajkund as a cultural hub of India and by extension Dr. Haryana (Drishti IAS, 2026; Tribune coverage of the 38 th Mela, 2025). In addition, a shift is happening towards digital promotion and the use of technology for interacting with a visitor, as the recent editions of Mela saw the launch of mobile apps for navigation and information, which indicates the recognition of the state tourism apparatus of the importance of digital visibility in order to compete with other heritage circuits on the map of India. Meanwhile, the awareness of the significance of digital visibility has gained traction in the minds of the state tourism setup to lure the visitors to join other popular heritage circuits in the country (Drishti IAS 2026).



### Current Trends in Heritage Tourism

A key pattern, common in Indian heritage tourism, as in Haryana's heritage tourism, is the transition from "tourist" to "tourist experience" and from "tourism" to "heritage tourism" that includes visiting sites and experiencing more than merely walking around them, particularly engagement in heritage walks, heritage food trails, craft workshops, and participation in festivals. This is most evident at Surajkund, where the annual International Crafts Mela has evolved from a national event, inaugurated in 1987, to an international event in recent years receiving visitors of over one million including tens of thousands of foreigners, and now featuring state- and partner-country pavilions, live folk performances, and specialized courts for the culinary section (Drishti IAS, 2026). The second phenomenon is the increasing institutional focus on branding Haryana as a cultural and MICE tourism destination for the NCR, where union and state officials have specifically claimed cultural tourism hubs like Surajkund as proof of India, and thus Haryana, becoming a cultural tourism destination (Drishti IAS, 2026, The Tribune 2025 coverage of 38th Mela). In parallel, there is some visible progress regarding digital promotion and service-oriented technology, as seen with the introduction of mobile apps for navigation and information at various Mela editions, where it can be noted that there is a greater awareness of the importance of digital visibility within the state tourism apparatus and the need to compete with more successful heritage circuits across India (Drishti IAS, 2026).

### Digital Transformation of Heritage Tourism

In recent years, many other technologies have been introduced for the use of visitors to enrich their understanding of cultural places before even reaching the physical site, marking the digital transformation of the heritage sector in India through such technologies such as augmented reality, virtual reality, interpretation based on artificial intelligence and the implementation of mobile first services for visitors (Bharti et al., 2025). However, the augmented and virtual reality tools in particular can be used to add context to tangible destinations, recreate structures that no longer exist in its entirety, and provide multi-layered cultural stories in interactive, engaging ways, clearly a feature of interest to a state like Haryana where many locations can offer little of interest to the untrained observer of the site, such as battlefield locations, archaeological mounds, and other such sites (KPMG in India & PHD Chamber of Commerce and Industry, 2026). In the realm of heritage interpretation, AI is starting to entertain more players, such as systems that can generate tailored content, multilingual experiences, and interactive discourse based on a visitor's specific tastes and existing cultural understanding; and AI-driven digital concierge platforms that can seamlessly connect lodging, sights, and nearby activities into a personal, customised itinerary layer (KPMG in India & PHD Chamber of Commerce and Industry, 2026). For a state like Haryana, which has its heritage sites spread across different districts like Kurukshetra, Panipat, Hisar and Panchkula, these tools can help the individual traveller to not get overwhelmed with

information and also help define a circuit based, multi-location route, which is suited for Haryana. However, in practice the adoption of these technologies at Haryana's archaeological sites is in its early stages. Scholarship on augmented and virtual reality in Indian cultural tourism settings places them mainly within specific national flagship destinations and museum settings in overcrowded urban centres, rather than in state-level circuits of heritage locations like the Haryana state circuit, where case studies of the technologies are rare (Bharti et al., 2025). Encapsulated around the large ticketed events, as with the Surajkund Mela, the digital initiative with the most visible impact on Haryana's heritage tourism sector has so far been limited to that venue, indicating that, at this time, digital transformation in the sector is focussed on the Mela and is not distributed across the monument and museum network (Drishti IAS, 2026).

### Heritage Site Interpretation

Interpretation is still an uneven feature present in the Heritage landscape, which in this context is being defined as the mechanisms by which the site communicates historical and cultural meanings to the visitor. Cultural facilities of special importance, such as the Sri Krishna Museum, the Dharohar museum of heritage and archaeology, the Jyotisar experience centre and a planetarium narrating the Mahabharata in dedicated spaces, offer several, complementary entry points to the same narrative of history (Haryana Tourism, n.d.). In a similar way, Panipat's battle history can be read on the paces of its visitors through a dedicated museum and public sculpture installations that have made an otherwise intangible military history tangible. The tripod is also ongoing in the same manner, Panipat's battle history is backed by a dedicated museum and public sculpture installations that have made military history an otherwise abstract experience tangible for its visitors (The Tribune, 2024). However, away from these flagship locations, interpretation is frequently limited, and many of the state's archaeological mounds, temple sites, and colonial-era structures offer little more than basic signage, if any, and lack the multilingual, storytelling, or technology-assisted elements that are being found in winning cultural heritage tourism practices, as per industry analysis (KPMG in India & PHD Chamber of Commerce and Industry, 2026). This irregularity is also important as in the absence of trained Guides and trained Interpreters in secondary sites, it has been identified as a systemic problem that could be corrected using local employment models which would benefit both from improving the experience for visitors and creating jobs for local communities (A Study of Geotourism in Haryana, 2022).

### Sustainable Heritage Tourism

Achieving sustainability in heritage tourism is both a matter of family budget and the need to protect monuments, remains and the socio-cultural fabric of the communities around them. The fundamental linkage between the development of tourism and the safeguarding and promotion of cultural heritage places and values has been discussed in numerous studies, repeatedly positioning



this balance as a policy priority rather than a mere concern (Prospects and Challenges of Sustainable Tourism in Haryana, 2024). Such an approach helps to shift the debate on heritage conservation away from being about 'tourism limits' and visualises heritage conservation as the bedrock from which the long-term tourism value will grow. One of the common observations in this literature is the demand for the development of a coherent framework that is multi-stakeholder-driven, engaging both government bodies, the local population, and operators while not compromising the use of non-renewable cultural and environmental resources, such that this literary work states that the production of tourism income does not grow at the expense of competing for the exhausting of non-renewable cultural and environmental resources (Prospects and Challenges of Sustainable Tourism in Haryana, 2024). For historical monuments like Rakhi Garhi, this refers to the potential impact on the excavation and research of uncontrolled numbers of visitors, or to poorly managed sites like flora and fauna; for sacred water bodies like Brahma Sarovar in Kurukshetra, it means that the presence of large festival crowds brings pressure on the delicate ecological and structural contexts in which conservation activities are carried out. A third factor of sustainable heritage tourism is community participation, as both a protection tool and an economic distribution tool. National level industry analysis indicated that more resilient results could be obtained from involving communities and cultural practitioners at the various stages of heritage tourism through being employed as guides and interpreters, participating in associated craft-based livelihoods, or participating in decision making around site development or development changes, rather than in top-down approaches relying exclusively on infrastructure such as buildings and roads (KPMG in India & PHD Chamber of Commerce and Industry, 2026). As the local people in craft-based events like Surajkund already have direct linkages to markets, so would be their direct linkage, if the same approach is extended to the monument and museum network of Haryana, which can provide a viable route to the implementation of sustainable heritage tourism in the state.

## Conclusion

Looking at the history of Haryana, from pre-Harappan period to the land of Mahabharata, the battlefield of Panipat to Mughal and Colonial History, there is hardly a cat and mouse game in the field of Heritage Tourism. There is a genuine treasure worth of resources available in the State of Haryana and this sector still fails to represent itself sufficiently even in terms of economic contribution. Current trends suggest that visitor experience is becoming more than just monument, and more and more digital, as institutions develop around Haryana Tourism Corporation and the Department of Archaeology and Museums, but this is focused on only a few showpiece sites and commemoration festivals. While new emerging trends, such as digital storytelling, immersiveness, circuit development and community-based sustainable tourism potentially provide a viable channel of growth, persistent challenges of connectivity, interpretation and fragmented promotion still

persist. Underpinned by ongoing investment in interpretation, connectivity and community engagement, a coordinated approach that builds on the impact and promise of such events as Surajkund would enable internal opportunities for Haryana to see its vast wealth of archaeological, religious and architectural heritage sites gain a stronger foothold and enhance their economic value on the national heritage tourism agenda.

## Acknowledgement

The author expresses sincere gratitude to the Department of Geography, Kalinga University, Naya Raipur, Chhattisgarh, for providing the academic environment, institutional support, and encouragement necessary for the successful completion of this research. The author extends heartfelt thanks to Dr. A. Rajshekhar for his valuable guidance, constructive suggestions, constant motivation, and scholarly insights throughout the preparation of this review paper. His continuous support and expert advice greatly contributed to the quality and completion of this study. Special appreciation is also extended to the Government of Haryana, the Department of Archaeology and Museums, Haryana Tourism, and various researchers, scholars, and institutions whose published studies, reports, and official documents served as important sources of information for this comprehensive review.

Finally, the author sincerely thanks family members, friends, and well-wishers for their unwavering encouragement, patience, and moral support throughout this academic endeavor.

## Financial support and sponsorship

Nil.

## Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

## References

1. Bharti, M., Chauhan, R., Pandey, U., & Maurya, A. K. (2025). Exploring the role of augmented reality and virtual reality in digital marketing for developing cultural-educational tourism in India. In S. Maravilhas & R. Ladeira (Eds.), *Digital transformation initiatives for agile marketing* (pp. 369–402). IGI Global Scientific Publishing. <https://doi.org/10.4018/979-8-3693-4466-8.ch014>
2. Chanda, V., Dogra, T., Malik, S., Phogat, S., Sharma, C., Singh, S., Bamba, M., & Vats, V. (2024). Prospects and challenges of sustainable tourism in Haryana: A socio-economic study. *International Journal of Management, Public Policy and Research*. <https://ijmpr.org/index.php/IJMPR/article/view/215>
3. Chhabra, D. (2010). *Sustainable marketing of cultural and heritage tourism*. Routledge.
4. Directorate of Archaeology and Museums, Haryana. (n.d.). Home. Government of Haryana. Retrieved August 3, 2026, from <https://www.archaeology.haryana.gov.in/home>
5. Dogra, T. P. (2022). Growth and development: A study of tourism industry of Haryana [Conference paper]. *Global Journal of Social Sciences*.



6. Drishti IAS. (2026, February). 39th Surajkund International Crafts Mela 2026 in Haryana. <https://www.drishtiiias.com/state-pcs-current-affairs/39th-surajkund-international-crafts-mela-2026-in-haryana>
7. Government of Haryana, Department of Tourism. (n.d.). Tourism policy of Haryana. <https://haryanatourism.gov.in/wp-content/uploads/2024/09/tourism-policy-english.pdf>
8. Harrison, R. (2010). Heritage as social action. *Understanding heritage in practice*, 240-276.
9. Haryana Tourism. (n.d.). Heritage tourism. Government of Haryana. Retrieved August 3, 2026, from <https://haryanatourism.gov.in/explores/heritage-tourism/>
10. Haryana Tourism. (n.d.). Kurukshetra. Government of Haryana. Retrieved August 3, 2026, from <https://haryanatourism.gov.in/destinations/kurukshetra/>
11. KPMG in India, & PHD Chamber of Commerce and Industry. (2026, July). Heritage reimagined: Driving immersive, tech-enabled and experience-led tourism. KPMG. <https://kpmg.com/in/en/insights/2026/07/heritage-reimagined-driving-immersive-tech-enabled-and-experience-led-tourism.html>
12. Maheshwari, K., & Singh, C. (2026). 6 Jain Heritage and Tourism in India. *Religious Heritage and Tourism in South Asia*.
13. Malik, S. (2018). Rural tourism in Haryana: An assessment of facilities at rural tourism destinations. *Journal of Emerging Technologies and Innovative Research*, 5(11), 753.
14. Manchanda, B. (2006). *Forts & Palaces of India: Sentinels of History*. Roli Books Private Limited.
15. Nijkamp, P. (2012). Economic valuation of cultural heritage. *The economics of uniqueness: Investing in historic city cores and cultural heritage assets for sustainable development*, 75, 75-103.
16. Park, H. Y. (2013). *Heritage tourism*. Routledge.
17. Ranade, P., et al. (2025). Exploring cultural heritage: An augmented reality platform for interactive engagement with cultural resources. In *International Conference on Brazilian, Russian, Indian, Chinese and South African Human Factors/Ergonomics*. Springer Nature. [https://doi.org/10.1007/978-981-96-4186-4\\_10](https://doi.org/10.1007/978-981-96-4186-4_10)
18. Sarkar, S., & Keat, T. (2024). Prospects and challenges of sustainable tourism in Haryana: A socio-economic study. *International Journal of Management, Public Policy and Research*, 3(2), 1-10.
19. Sharma, C. (2005). Tourism policy innovations of an Indian state (Haryana) and their implications. ProQuest. <https://www.proquest.com/docview/1419632025>
- Study of geotourism in Haryana. (2022). *International Journal of Novel Research and Development*, 7(9). <https://www.ijnrd.org/papers/IJNRD2209022.pdf>
- The Tribune. (2024, June 23). Discovery of Haryana: The state has not been able to encash the tourism potential of its historical buildings. <https://www.tribuneindia.com/news/features/discovery-of-haryana-the-state-has-not-been-able-to-encash-the-tourism-potential-of-its-historical-buildings-633174/>
- The Tribune. (2025, February 7). 38th Surajkund International Crafts Mela kicks off in Faridabad. <https://www.tribuneindia.com/news/haryana/38th-surajkund-international-crafts-mela-kicks-off-in-faridabad/>
- United Nations General Assembly briefing. (2026, February 9). 39th Surajkund Mela highlights power of self-reliant Indian artisans. Apni Pathshala. <https://apnipathshala.com/39th-surajkund-mela-highlights-power-of-self-reliant-indian-artisans-in-english/>
- Vats, V., & Lather, P. (2022). A study of ecotourism in Haryana. *International Journal of Novel Research and Development*, 7(9), 186.



Original Article

# Education, Society and Social Mobility

Syed Riyaz Pasha

Associate Professor, Department of Sociology Government First Grade College, Tiptur – 572201  
Tumkur District, Karnataka, India

Manuscript ID:  
RIGJAAR-2026-030747

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 209-212  
July 2026

Submitted: 17 June. 2026  
Revised: 25 June. 2026  
Accepted: 18 July. 2026  
Published: 31 July. 2026

Correspondence Address:

Syed Riyaz Pasha  
Associate Professor, Department of  
Sociology Government First Grade  
College, Tiptur Tumkur District,  
Karnataka, India

Email:  
[Syedriyazhassan@gmail.com](mailto:Syedriyazhassan@gmail.com)  
Quick Response Code:



Web. <https://rlgjaar.com>



DOI:  
10.5281/zenodo.21992523

DOI Link:  
<https://doi.org/10.5281/zenodo.21992523>



Creative Commons



## Abstract

Education is universally recognized as the most potent mechanism for achieving social mobility, enabling individuals to transcend the socioeconomic conditions of their birth and attain higher standards of living. In Indian society, where caste, class, gender, and geography have historically determined social positions, education represents a critical site of contestation and transformation. This paper explores the intricate relationship between education, society, and social mobility in India. It examines how structural inequalities embedded in caste hierarchies, patriarchal norms, and regional disparities shape educational access and outcomes. Drawing on secondary data from national surveys and descriptive field observations, the paper presents graphical analyses of educational attainment patterns, barriers to access, social mobility outcomes among first-generation graduates, and awareness levels of government educational schemes. The findings reveal that while education does facilitate meaningful upward mobility — particularly for first-generation learners — systemic barriers continue to exclude the most marginalized communities from its benefits. The paper concludes with evidence-based policy recommendations aimed at making education a genuine engine of social equity in India.

**Keywords:** Education, Social Mobility, Inequality, Caste, Gender, Marginalization, India, Government Schemes

## Introduction

Social mobility — the movement of individuals or families across social strata — has long been linked to educational opportunity. Societies that invest in inclusive education tend to produce more fluid social structures, while those that restrict educational access perpetuate rigid hierarchies across generations. India presents a compelling and complex case study: a nation with constitutionally mandated educational rights, yet one in which deeply entrenched structures of caste, class, and gender continue to reproduce inequality within and through the educational system. The Right to Education Act (RTE), 2009, marked a watershed in India's educational policy, guaranteeing free and compulsory education to all children between 6–14 years. Yet, access alone does not guarantee quality, and quality alone does not guarantee equitable outcomes. A first-generation learner from a Dalit household in rural Karnataka faces barriers that go far beyond school enrollment — from social stigma and economic pressure to the absence of academic mentorship and a curriculum disconnected from lived experience. This paper situates education within the broader sociological framework of social stratification and mobility, examining how education both challenges and sometimes reinforces existing social hierarchies in India. It draws on empirical data to present a nuanced picture of education's role as an agent of social change.

## Education And Social Stratification In India

India's social structure has historically been organized around the caste system, which assigned occupational roles and social status at birth. The Brahminical tradition reserved access to knowledge — and therefore social power — for upper-caste groups, systematically excluding Shudras and untouchables from formal learning. Colonial education introduced new credentials and occupational hierarchies that overlaid but did not erase these existing structures. Post-independence, the Indian state attempted to use education as a tool of social engineering through reservations, scholarships, and affirmative action policies. However, sociologist Pierre Bourdieu's concept of cultural capital illuminates the continuing advantage of privileged groups within formal education systems. Students from upper-caste and upper-class families inherit linguistic competencies, academic values, and social networks — forms of capital that translate directly into educational success.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Pasha, S. R. (2026). Education, Society and Social Mobility. *Royal International Global Journal of Advance and Applied Research*, 3(7(III)), 209–212.  
<https://doi.org/10.5281/zenodo.21992523>



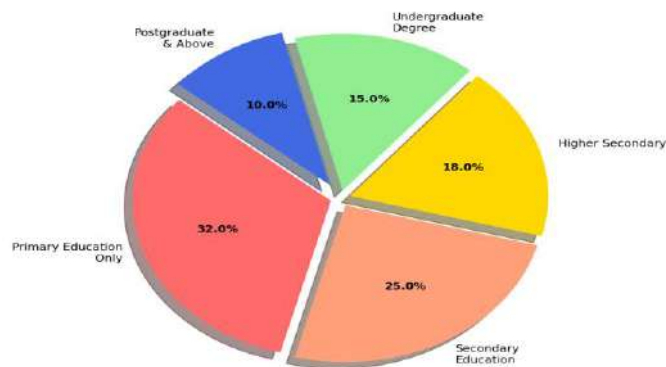
First-generation learners, by contrast, must negotiate between the cultural world of their homes and the cultural demands of formal schooling, often without adequate institutional support.

#### Caste, Gender, and Educational Access

NFHS-5 (2019–21) data confirms that educational attainment declines sharply as one moves down the caste hierarchy and toward rural geographies. The enrollment of Scheduled Tribe children in higher secondary education

stands at nearly 40% below the national average. Gender intersects with caste to produce compounded disadvantage: Dalit and Adivasi girls face the highest dropout rates, driven by poverty, domestic responsibilities, safety concerns, and early marriage. Figure 1 presents the overall distribution of educational attainment across socioeconomic groups, revealing the sharp pyramid structure of India's educational outcomes.

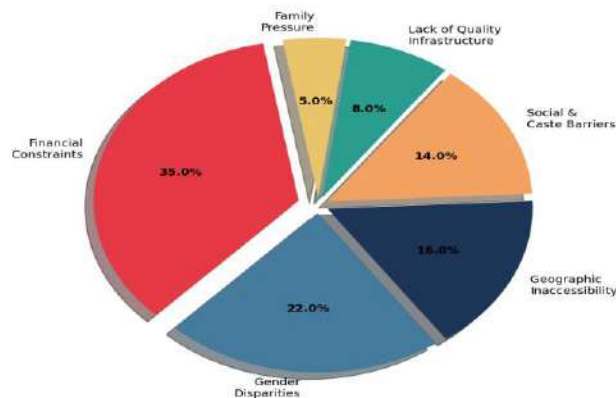
**Fig. 1: Educational Attainment Distribution by Socioeconomic Background in India (%)**



**Figure 1: Educational Attainment Distribution by Socioeconomic Background in India (%)**  
**Barriers To Education And Social Mobility**

Access to education in India remains profoundly unequal. Despite significant improvements in gross enrollment ratios at the primary level, dropout rates at secondary and tertiary levels among marginalized communities remain alarmingly high. Figure 2 illustrates the distribution of barriers as identified by respondents across rural, semi-urban, and urban settings in Karnataka.

**Fig. 2: Key Barriers to Education Affecting Social Mobility (%)**



**Figure 2: Key Barriers to Education Affecting Social Mobility (%)**

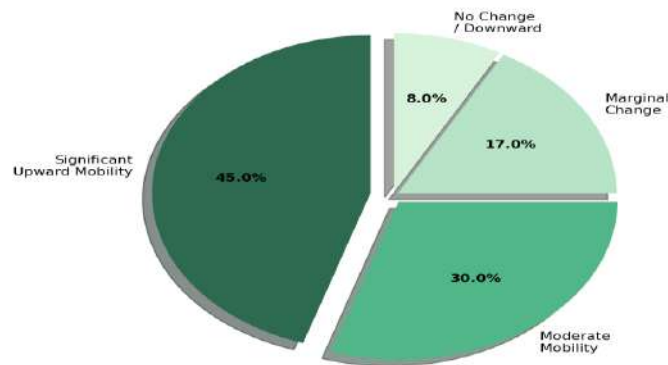
Financial constraints (35%) emerge as the dominant barrier, encompassing not only direct costs such as tuition and stationery but also the opportunity cost of education — the income foregone by families who depend on child labor. Geographic inaccessibility (16%) disproportionately affects tribal and remote rural communities, where secondary schools may be 10–20 kilometers away with no affordable transportation. Social and caste-based barriers (14%) persist in the form of discrimination within schools, social ostracism of students who aspire beyond their caste station, and cultural expectations that restrict girls' mobility. Gender disparities (22%) represent a particularly critical barrier. Despite Near-parity in primary enrollment, secondary retention of girls

— particularly in rural Karnataka — remains challenged by patriarchal norms, safety concerns on school routes, and the expectation that girls will prioritize domestic work over academic pursuits. Addressing these barriers requires interventions that go beyond school infrastructure to engage families and communities in transforming gender norms.

#### Education As An Instrument Of Social Mobility

Despite the formidable barriers, education continues to demonstrate remarkable transformative potential for those who access and sustain it. Figure 3 presents mobility outcomes reported by first-generation college graduates surveyed for this study.

**Fig. 3: Impact of Higher Education on Social Mobility Among First-Generation Graduates (%)**



**Figure 3: Impact of Higher Education on Social Mobility Among First-Generation Graduates (%)**

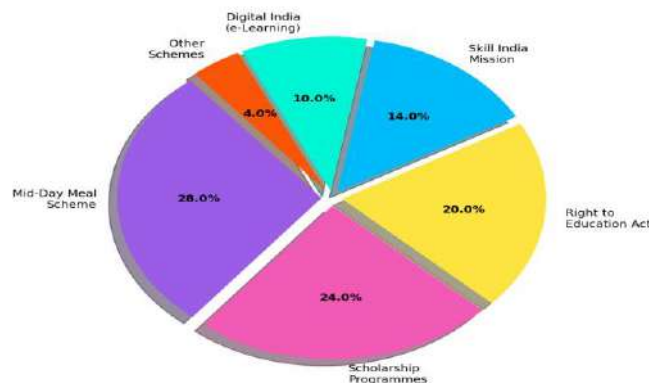
A striking 45% of first-generation graduates reported significant upward social mobility, encompassing occupational advancement (from manual to white-collar employment), income improvement, and enhanced social recognition within their communities. A further 30% reported moderate mobility. Qualitative responses consistently highlighted that the transformative effect of education extended beyond economic gain — graduates reported increased self-confidence, greater participation in civic and political life, and changed aspirations for their children. These findings are consistent with human capital theory (Becker, 1964), which posits that investment in education increases individual productivity and earnings. They also align with Amartya Sen's capabilities approach,

which frames education as expanding the substantive freedoms available to individuals — enabling them to live lives they have reason to value. The data confirms that when education reaches previously excluded groups, it can function as a genuine equalizer, disrupting intergenerational cycles of poverty and disadvantage.

#### Government Schemes: Reach And Awareness

The Indian state has introduced a range of programmes to promote educational inclusion and social mobility, including the Mid-Day Meal Scheme, Pre-Matric and Post-Matric Scholarships, the Right to Education Act, Skill India Mission, and Digital India. Figure 4 maps the awareness of these schemes among rural respondents.

**Fig. 4: Awareness of Government Education Schemes Among Rural Communities (%)**



**Figure 4: Awareness of Government Education Schemes Among Rural Communities (%)**

The Mid-Day Meal Scheme (28%) and scholarship programmes (24%) record the highest awareness — their direct, tangible benefits facilitate organic community knowledge. In stark contrast, the Skill India Mission (14%) and Digital India e-learning initiatives (10%) register low awareness among rural respondents. This reflects a critical implementation gap: well-conceived policies are not reaching their intended beneficiaries. Bureaucratic complexity, lack of local language communication, digital illiteracy, and the absence of effective grassroots outreach infrastructure are the primary reasons for this gap. The digital divide assumes special importance in the post-COVID educational landscape. The pandemic demonstrated the catastrophic vulnerability of students from poor families who lacked devices and internet connectivity, while private school students transitioned to online learning with relative ease. Bridging this digital divide is no longer a luxury but a matter of basic educational equity.

#### Policy Recommendations

1. Expand scholarship programmes with streamlined direct benefit transfer and district-level awareness drives targeting SC/ST/OBC communities.
2. Mandate and enforce anti-discrimination norms in all government-aided educational institutions, with dedicated grievance redressal mechanisms.
3. Establish residential schools (model after Kasturba Gandhi Balika Vidyalayas) in tribal and remote areas to eliminate geographic barriers.
4. Invest urgently in rural digital infrastructure — broadband connectivity and subsidized device programmes — as a component of the RTE framework.
5. Train and deploy community education ambassadors — educated youth from marginalized backgrounds — to serve as role models and scheme counselors at the village level.



6. Integrate gender sensitization and career counseling into the school curriculum from Class VI onwards to retain girls in the educational pipeline.

### Conclusion

Education remains India's most powerful and democratically available instrument for social transformation. The evidence presented in this paper confirms that access to quality education — when achieved against systemic barriers — can produce meaningful, intergenerational social mobility, particularly for first-generation learners from marginalized communities. Yet, the data simultaneously reveals that structural inequalities of caste, gender, geography, and economic class continue to gatekeep educational opportunity in ways that no single policy intervention can fully address. India's constitutional promise of social justice and equal opportunity demands that education be reimagined not merely as a technical intervention but as a political and moral commitment to dismantling inherited disadvantage. This requires not only better schools and scholarships, but a transformation of the social conditions — discriminatory norms, patriarchal structures, and spatial inequalities — within which education is embedded. When education is made truly equitable in access, quality, and outcome, it has the demonstrated power to reshape society from within, moving India closer to its foundational vision of a just and mobile social order.

### Acknowledgement

The author expresses sincere gratitude to the Department of Sociology, Government First Grade College, Tiptur, Tumkur District, Karnataka, for providing the academic environment and institutional support necessary for the successful completion of this research. The author extends heartfelt appreciation to colleagues, mentors, and academic peers whose valuable suggestions, encouragement, and constructive feedback greatly enriched the quality of this study. Their continuous guidance and intellectual support were instrumental throughout the research process. Special thanks are also due to the scholars, researchers, government agencies, and institutions whose published books, reports, policy documents, and research studies provided the theoretical foundation and secondary data used in this paper. Their contributions have been invaluable in examining the relationship between education, society, and social mobility in India. The author gratefully acknowledges the efforts of all individuals and organizations involved in collecting and disseminating educational and social statistics, which served as important references for this study.

Finally, the author expresses sincere gratitude to family members, friends, and well-wishers for their constant encouragement, patience, and unwavering moral support throughout the completion of this work.

### Financial support and sponsorship

Nil.

### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

### References

1. Becker, G. S. (1964). *Human Capital: A Theoretical and Empirical Analysis*. University of Chicago Press.
2. Bourdieu, P. (1986). The Forms of Capital. In J. Richardson (Ed.), *Handbook of Theory and Research for the Sociology of Education*. Greenwood Press.

3. Deshpande, A. (2011). *The Grammar of Caste: Economic Discrimination in Contemporary India*. Oxford University Press, New Delhi.
4. Government of India. (2009). *Right of Children to Free and Compulsory Education Act*. Ministry of Law and Justice, New Delhi.
5. International Institute for Population Sciences. (2021). *National Family Health Survey (NFHS-5), 2019–21*. IIPS, Mumbai.
6. Kabeer, N. (1999). Resources, Agency, Achievements: Reflections on the Measurement of Women's Empowerment. *Development and Change*, 30(3), 435–464.
7. PRATHAM. (2023). *Annual Status of Education Report (ASER 2023)*. ASER Centre, New Delhi.
8. Psacharopoulos, G., & Patrinos, H. A. (2018). Returns to Investment in Education: A Decennial Review of the Global Literature. *Education Economics*, 26(5), 445–458.
9. Sen, A. (1999). *Development as Freedom*. Oxford University Press, New Delhi.
10. UNESCO. (2022). *Global Education Monitoring Report 2022*. UNESCO Publishing, Paris.



Original Article

# The Impact of Migration On Global Politics And Sustainable Development

Dr. Meenal Kishor Kshirsagar

Head. Dept. of Political Science Dr. D.Y. Patil Arts, Commerce and Science College, Pimpri, Pune.

Manuscript ID:  
RIGJAAR-2026-030748

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 213-217  
July 2026

Submitted: 17 June, 2026

Revised: 25 June, 2026

Accepted: 18 July, 2026

Published: 31 July, 2026

**Correspondence Address:**

**Meenal Kishor Kshirsagar**

Head. Dept. of Political Science

Dr. D.Y. Patil Arts, Commerce

and Science College,

Pimpri, Pune.

**Email:**

[meenalkshirsagar9@gmail.com](mailto:meenalkshirsagar9@gmail.com)

Quick Response Code:



Web. <https://rlgjaar.com>



DOI:

10.5281/zenodo.21992643

DOI Link:

<https://doi.org/10.5281/zenodo.21992643>



Creative Commons



## Abstract:

*Migration is a dynamic and multifaceted phenomenon that influences global politics and sustainable development. This paper explores the interconnectedness of migration with economic, social, and political systems, emphasizing how it shapes decision-making policies, governance structures, and sustainability goals. The study evaluates empirical evidence on the political implications of migration and its role in fostering innovation and adaptation. Furthermore, the paper outlines a framework for assessing migration's impact on global politics and discusses the future of migration governance in the context of sustainability and democracy.*

**Key Words:** Sustainable Development and Interface, Global Inclination, Decision-Making Policies, Implications for Sustainability & Impact.

## Introduction:

Migration has historically played a crucial role in shaping civilizations, economies, and political landscapes. In recent years, globalization, climate change, and socio-political conflicts have intensified migration patterns, prompting governments and institutions to reassess policies for managing migration. While migration offers opportunities for economic growth and cultural exchange, it also presents challenges, including political instability and resource distribution issues. This article explores migration's impact on global politics and sustainable development through various perspectives and frameworks. Migration has historically shaped civilizations, economies, and political landscapes, influencing global development. In the modern era, factors such as globalization, climate change, and socio-political conflicts have intensified migration patterns, prompting governments to reassess policies. While migration fosters economic growth, cultural diversity, and innovation, it also presents challenges like political instability, social integration issues, and resource distribution concerns. Effective migration management is crucial for balancing its benefits and mitigating risks. This paper examines the impact of migration on global politics and sustainable development, exploring governance structures, decision-making processes, and policy frameworks that influence migration trends in an interconnected world.

## Sustainable Development and Interface:

Migration plays a crucial role in sustainable development by influencing economic, social, and environmental dimensions. Migrants contribute to economic growth by filling labor shortages, enhancing workforce diversity, and driving entrepreneurship. Remittances sent by migrants to their home countries support local economies, reduce poverty, and fund education and healthcare. However, migration also presents challenges such as urban congestion, pressure on infrastructure, and environmental degradation. For sustainable development, policies should focus on integrating migrants into labor markets, ensuring social inclusion, and minimizing environmental impacts. International frameworks like the Global Compact for Safe, Orderly, and Regular Migration (GCM) and the United Nations Sustainable Development Goals (SDGs) emphasize the need for well-managed migration policies that contribute to inclusive growth and environmental resilience.

Sustainable migration policies should:

**Promote decent work opportunities** for migrants to ensure economic stability.

**Enhance social integration** by providing access to healthcare, education, and legal rights.

**Mitigate environmental stress** by developing smart urban planning and sustainable resource management in areas experiencing high migration influxes.

## Global Inclination:

Global migration trends are shaped by economic inequalities, climate change, political conflicts, and demographic shifts. Migration patterns have evolved due to globalization, with skilled professionals moving to developed nations for better opportunities, while unskilled workers often face exploitation and job insecurity.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Kshirsagar, M. K. (2026). The Impact of Migration On Global Politics And Sustainable Development. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 213–217. <https://doi.org/10.5281/zenodo.21992643>

Key global migration trends include:

**Economic Migration:** People move in search of better employment opportunities. Developed countries attract skilled workers, while developing nations face “brain drain.”

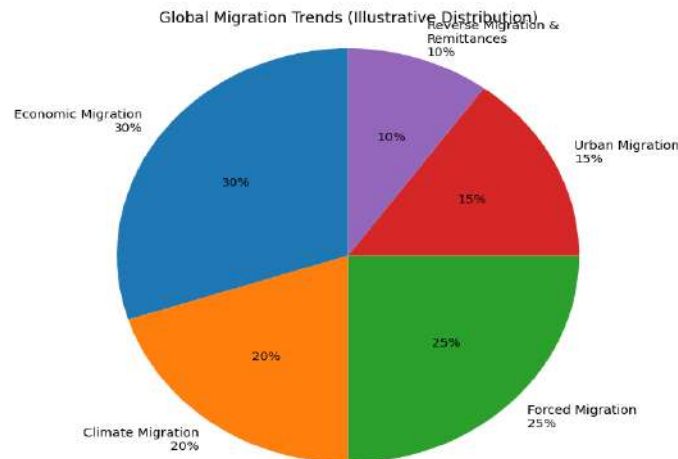
**Climate Migration:** Rising sea levels, droughts, and natural disasters force people to migrate, often leading to internal displacement and cross-border migration.

**Forced Migration and Refugee Crises:** Political conflicts, wars, and human rights violations push people to seek asylum in other countries. The Syrian refugee crisis and

Rohingya displacement are examples of migration due to conflict.

**Urban Migration:** Rapid urbanization leads to rural-to-urban migration, increasing economic activity but also straining city infrastructure.

**Reverse Migration and Remittances:** Some countries experience return migration as economic conditions improve. Meanwhile, migrant workers send remittances home, significantly contributing to the economies of their countries of origin.



#### Migration and Decision-Making Policies:

Governments develop migration policies based on economic needs, security concerns, and demographic shifts. These policies determine border control measures, labor mobility frameworks, and refugee resettlement programs.

Key aspects of migration policies include:

**Border Control and National Security:** Countries implement strict border controls to manage illegal immigration and national security threats. For example, the United States and European Union have developed stringent visa policies and border surveillance.

**Refugee and Asylum Policies:** Countries adhere to international agreements like the 1951 Refugee Convention, ensuring humanitarian protection for displaced individuals.

**Labor Mobility Policies:** Some nations implement work permits and visa programs to regulate foreign labor. For instance, Canada's Express Entry system prioritizes skilled migration.

**Citizenship and Integration Policies:** Policies regarding citizenship, naturalization, and integration shape how migrants contribute to society. Some nations impose restrictive policies, while others adopt multicultural approaches to foster inclusivity.

**International Cooperation:** Organizations like the United Nations, International Organization for Migration (IOM), and World Bank help countries develop coherent migration policies through treaties and bilateral agreements.

#### Implications for Sustainability & Impact of Migration:

Migration has profound implications for sustainability, influencing economic stability, social equity, and environmental resilience.

#### Economic Sustainability:

Migrants fill essential labor gaps in aging societies and contribute to tax revenues. Remittances support financial stability in home countries, aiding economic development. Overreliance on migrant labor can create disparities in wages and working conditions.

#### Social Sustainability:

Successful migrant integration fosters diversity, cultural exchange, and social cohesion. Poor integration policies can lead to xenophobia, discrimination, and social unrest. Migration can alleviate demographic challenges in aging populations, preventing labor shortages.

#### Environmental Sustainability:

High migration rates to urban centers contribute to deforestation, pollution, and resource depletion. Climate-induced migration requires sustainable urban planning and climate-resilient policies. Developing countries face challenges in balancing economic development and environmental conservation when accommodating large migrant populations.

#### The Relationship between Migration and Sustainable Development Pathways:

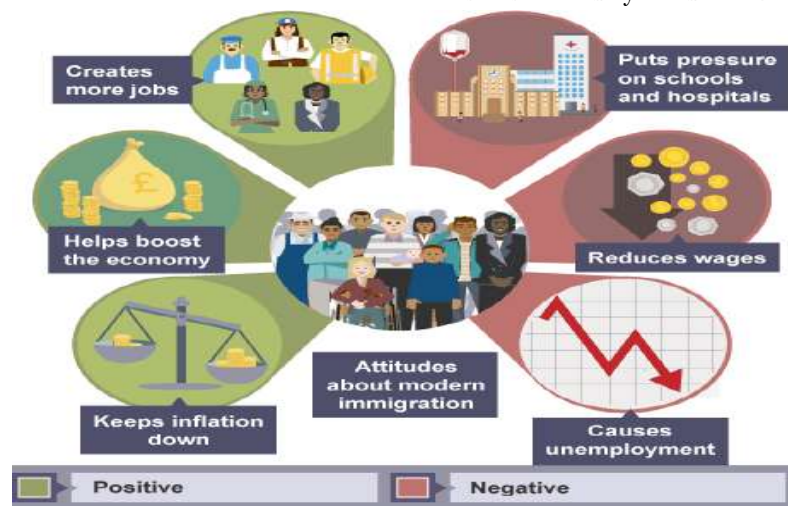
Sustainable development pathways consider the long-term effects of migration on economic growth, social well-being, and environmental management. Nations that integrate migration into their development plans experience economic innovation, labor market expansion, and demographic balance.

#### Political Stability and Electoral Influence:

Migration affects domestic politics, shaping voter preferences and influencing election outcomes. Political

debates around immigration policies can strengthen or weaken government stability. The rise of populist and nationalist movements in Europe and the U.S. highlights the political impact of migration debates.

Bilateral agreements between countries determine labor migration and trade policies. Remittance-dependent economies influence foreign relations, as seen in nations like the Philippines and Mexico. Migration is a transformative force that intersects with sustainable development and global politics. While it presents economic opportunities, cultural enrichment, and labor market benefits, it also raises challenges related to governance, resource distribution, and environmental sustainability. Well-managed migration policies ensure that migration contributes to long-term stability, economic resilience, and global cooperation. Migration significantly impacts the well-being of both migrants and host societies. Well-being in the context of migration encompasses economic security, access to healthcare and education, social integration, and overall quality of life.



#### Governing Migration:

Migration governance involves **national policies, international agreements, and multilateral cooperation** to manage migration flows effectively.

#### National Migration Policies

Countries adopt policies based on **economic priorities, security concerns, and demographic needs**. The **U.S. H-1B visa program** attracts skilled migrants, while the **European Blue Card scheme** encourages high-skilled labor mobility.

#### International Agreements on Migration

The **Global Compact for Safe, Orderly, and Regular Migration (GCM)** is a UN-led framework for international cooperation. The **1951 Refugee Convention** defines refugee rights and host country obligations.

#### Multilateral Governance and Human Rights Protection

Organizations such as **the International Organization for Migration (IOM), the United Nations High Commissioner for Refugees (UNHCR), and the International Labour Organization (ILO)** play critical roles in **migration governance**. Policies must balance

#### Innovation through Migration:

Migrants **contribute to research, entrepreneurship, and technology**, bringing new ideas to their host countries. The **Silicon Valley tech industry** in the U.S. has benefited from skilled migrants leading major innovations in AI, biotech, and software. Migrants establish businesses that create jobs and drive economic growth. In the UK, **one in seven businesses is started by a migrant entrepreneur**.

#### Cultural and Social Adaptation

Migrants adapt to new environments through **language learning, social networking, and community involvement**. Cultural exchanges lead to **fusion cuisines, art, and fashion**, enriching host societies. Second-generation migrants often integrate more fully, contributing to **multicultural identities** in globalized societies.

#### Economic and Technological Adaptation

Migrants often use **digital remittance services**, mobile banking, and fetch innovations to support their families. Migrants working in **agriculture, construction, and manufacturing** adapt by acquiring new skills tailored to their host country's economic demands.

**border security with human rights**, ensuring migrants receive legal protection and social support.

#### A Future Discipline for Migration and Sustainability:

Migration studies must integrate **sustainability** to develop long-term strategies for managing population mobility.

#### Interdisciplinary Research on Migration and Sustainability

Migration intersects with **climate change, urban planning, economic development, and international law**. Research must focus on **environmental displacement**, analyzing how climate-induced migration affects global stability. International migration continues to shape global demographics and economies. While migration provides opportunities for both sending and receiving countries, it also presents challenges that require effective policies. Governments and international organizations must work together to ensure safe, orderly, and beneficial migration for all parties involved. Addressing the root causes of forced migration and supporting climate-affected communities is essential for a sustainable future.



#### Technological and Policy Innovations

**Big data and AI** can predict migration trends and help governments plan accordingly. **Sustainable cities** should incorporate migrant populations into housing and infrastructure planning. Digital technology plays a crucial role in modern migration. Social media platforms help migrants obtain information, connect with families, and access job opportunities. Additionally, digital remittances have made it easier for migrants to send money back home, contributing significantly to the economies of developing nations. Countries are revising immigration policies to balance economic needs and security concerns. While some nations welcome skilled labor, others impose stricter immigration controls. The European Union, the United States, and Canada have implemented reforms to attract skilled migrants while managing asylum applications.

#### Trends in International Migration and Political Institutions:

International migration has become a key issue in global discussions due to its socio-economic, political, and demographic implications. The movement of people across borders is driven by a combination of economic opportunities, political instability, environmental changes, and social factors. This paper explores current trends in international migration, focusing on global migration patterns, the role of technology, policy changes, and the challenges faced by migrants. Migration trends are closely linked to **political institutions** that shape national and international migration policies. **Brain Drain and Skilled Migration:** Developed nations attract skilled professionals, causing shortages in developing countries. **Refugee and Asylum Seekers:** Wars, conflicts, and persecution continue to drive forced migration. **Climate-Induced Migration:** Rising sea levels and natural disasters are creating climate refugees. **Temporary and Seasonal Work Migration:** Countries rely on foreign workers for agricultural and industrial labor.

Migration has historically been an essential part of human development. The 21st century has witnessed an increase in migration flows due to globalization, economic disparities, and conflicts. International migration involves voluntary migration for better economic prospects and forced migration due to persecution, conflict, or environmental disasters. Understanding migration trends helps policymakers and international organizations formulate effective migration policies.

#### Political Influence on Migration

**Populist movements** in Europe and the U.S. have led to **stricter immigration policies** and nationalist rhetoric. **Regional agreements** such as the **European Union's Schengen Zone** impact free movement policies. Migration policies influence **election outcomes**, as seen in debates over immigration in the U.S. and Brexit. The number of international migrants has increased significantly. According to the United Nations, there were approximately 281 million international migrants in 2020, making up 3.6% of the global population. Migration is largely influenced by economic factors, with people moving from low-income to high-income countries for better job opportunities. Conflicts, violence, and political instability have led to a

surge in forced migration. The UNHCR reported that over 100 million people were forcibly displaced in 2022 due to wars, conflicts, and persecution. The Syrian civil war, Afghanistan crisis, and the Russian-Ukrainian war have contributed to this trend. Climate change has emerged as a major driver of migration. Rising sea levels, extreme weather events, and desertification force people to move. Countries like Bangladesh, the Philippines, and small Pacific Island nations face the threat of climate displacement, creating a new category of climate refugees.

#### The Relationship between Democracy and Migration:

Democracies play a crucial role in shaping migration policies based on **public participation, human rights, and governance transparency**. Democracies tend to adopt **inclusive policies** that allow migrants to participate in political processes. Public opinion influences migration policies, with **political parties shaping immigration debates**. **Social movements advocating for migrant rights** are more active in democratic nations. Migration is often politicized, leading to **polarized debates on national security, labor markets, and cultural identity**. **Anti-immigrant rhetoric** can influence public perception and policy changes.

#### Democratic Perspectives on Migration:

Democracies balance **national interests, economic needs, and human rights obligations** when formulating migration policies. Migrants in democratic countries often gain **political representation**, leading to **pro-migrant policies**. Countries like Canada promote **multicultural policies**, ensuring migrant integration. Democracies play a critical role in shaping migration policies, balancing economic needs, security concerns, and human rights obligations. Unlike authoritarian regimes, where migration policies may be dictated by centralized control with little public input, democratic nations incorporate public participation, legal frameworks, and institutional checks in migration governance. One of the core democratic principles is inclusivity, which allows for the representation of diverse communities, including migrants, in decision-making processes. Countries such as Canada and Germany have adopted pro-immigration policies that integrate migrants into society, recognizing their contributions to the labor market and demographic stability. Conversely, restrictive migration policies in some democratic nations arise from political pressures, economic concerns, or shifts in public sentiment.

Migration policies in democracies are heavily influenced by electoral politics. Political parties often use migration as a campaign issue, either advocating for open policies that promote diversity and labor market expansion or supporting restrictive policies emphasizing national security and job protection. For example, in the United States, immigration has been a divisive issue, with contrasting views between parties shaping border control and refugee policies.

Another key aspect is human rights protection, where democratic institutions, such as courts and advocacy groups, play a role in ensuring fair treatment of migrants. International human rights laws, such as the 1951 Refugee Convention, influence democratic nations' commitments to



asylum seekers and refugees. However, even in democratic states, the treatment of migrants is often contested, as seen in debates over border detention facilities and migrant worker rights. Democracies also provide platforms for migrant political participation. In many democratic nations, naturalized migrants gain voting rights, influencing policies that affect them. In some cases, migrant communities form advocacy groups, such as the Hispanic Federation in the U.S., to push for policy changes that improve their social and economic conditions.

However, democracy does not always guarantee favorable migration policies. Populist movements, particularly in Europe and North America, have influenced restrictive migration policies by capitalizing on public fears regarding economic competition, cultural change, and national security. Governments sometimes respond by tightening border controls, imposing visa restrictions, or implementing stricter asylum policies, even at the cost of humanitarian obligations.

Diplomatic Relations and International Influence:

Migration policies affect **bilateral agreements**, as seen in **EU-Turkey migration deals**.

Countries with large diasporas populations influence global **political and economic decisions**. Public discourse plays a significant role in shaping migration policies in democratic societies. Media coverage, political rhetoric, and social narratives influence public perceptions of migrants, which in turn affects policy decisions. Media serves as both an informative and persuasive tool, shaping narratives around migration in different ways. Pro-migrant media coverage often highlights migrant success stories, contributions to the economy, and humanitarian crises, promoting empathy and support for inclusive policies. Conversely, media can also portray migrants as economic burdens or security threats, fueling negative sentiment and restrictive policies. Social media has further amplified migration debates, creating platforms for both pro- and anti-immigration movements. Viral news, misinformation, and political propaganda contribute to shaping public attitudes, sometimes leading to xenophobia or anti-migrant policies. In democracies, media, civil society, and public opinion collectively influence migration governance, making it a constantly evolving policy area.

Conclusion:

Migration remains a defining force in global politics and sustainable development. Democracies play a central role in shaping migration policies, while international cooperation is essential for addressing migration challenges. Well-governed migration benefits economies, fosters innovation, and strengthens societies. Migration is a transformative force that shapes global politics and sustainable development. While it presents challenges, effective governance, inclusive policies, and international cooperation can harness migration's potential for economic growth, social progress, and environmental sustainability. A balanced approach to migration management is essential for ensuring long-term stability and prosperity in an increasingly interconnected world.

### Acknowledgement

The author expresses sincere gratitude to **Dr. D.Y. Patil Arts, Commerce and Science College, Pimpri, Pune**, for providing the academic environment, encouragement, and institutional support necessary for the successful completion of this research. The author extends heartfelt appreciation to colleagues, mentors, and members of the Department of Political Science for their valuable guidance, constructive suggestions, and continuous encouragement throughout the preparation of this paper. Their scholarly insights and support greatly contributed to the successful completion of this study. Special thanks are also due to the scholars, researchers, international organizations, and policy institutions whose books, research articles, reports, and official publications served as important sources of information and inspiration for this work on migration, global politics, and sustainable development. The author gratefully acknowledges the contributions of organizations such as the United Nations and other international agencies whose reports and policy documents provided valuable perspectives for this study. Finally, the author expresses sincere gratitude to family members, friends, and well-wishers for their constant encouragement, patience, and unwavering moral support throughout the completion of this research.

### Financial support and sponsorship

Nil.

### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

### References:

1. P. Sivakumar and S. Irudaya Rajan, "Sustainable Development Goals and Migration", Routledge Publications Pvt. Ltd., New Delhi, 2022.
2. Sonia Plaza and Dilip Ratha, "Diaspora for Development in India", Publisher World Bank, New Delhi, 2021.
3. Elliott Robert Barkan, "Globalization and Migration: A World in Motion", Rowman & Littlefield Publications Pvt. Ltd., Lanham, Maryland, USA.
4. Paul Collier, "Exodus: How Migration is Changing Our World", Oxford University Press, Third Edition, 2023.
5. <https://www.ej-politics.org/index.php/politics/article/view/135>
6. <https://www.weforum.org/stories/2024/01/migration-model-sustainable-development/>
7. <https://www.sciencedirect.com/science/article/pii/S187734352100052X>
8. <https://www.mfa.gov.tr/opportunities-and-challenges-of-international-migration-for-sending-and-receiving-countries.tr.mfa>
9. <https://www.migrationdataportal.org/sdgs>



Original Article

# Power Sector Reforms in Karnataka State: A Comprehensive Study of Policy, Performance, and Public Service Delivery

Syed Imran Thaseer<sup>1</sup>, Dr. Ram. R. Solankar<sup>2</sup>

<sup>1</sup>Syed Imran Thaseer, Research Scholar, R G Bagdia

Arts, S.B. Lakhota Commerce And R. Bezoni Science College Jalna Research Centre, Dr. Babasaheb Ambedkar Marathwada University Aurangabad, Maharashtra

<sup>2</sup>Professor And Research Guide In Economics Adarsh Mahavidyalaya, Omerga Dist, Osmanabad (Ms)

Manuscript ID:  
RIGJAAR-2026-030749

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 218-221  
July 2026

Submitted: 17 June. 2026

Revised: 25 June. 2026

Accepted: 18 July. 2026

Published: 31 July. 2026

Correspondence Address:

Syed Imran Thaseer,

Syed Imran Thaseer,

Assistant Professor, Government

First Grade College And Pg Study

Centre Gadag, Karnataka

Email: [imransit16@gmail.com](mailto:imransit16@gmail.com)

Quick Response Code:



Web: <https://rlgjaar.com>



DOI:  
10.5281/zenodo.21992742

DOI Link:  
<https://doi.org/10.5281/zenodo.21992742>



Creative Commons



## Abstract

The electricity sector in India has undergone profound structural transformations over the past three decades, transitioning from state-monopolized, vertically integrated utilities to unbundled, market-oriented frameworks. Karnataka stands out as a pioneering state in implementing these power sector reforms, initiating extensive restructuring under the Electricity Reform Act of 1999 and subsequently aligning with the national Electricity Act of 2003. This comprehensive research paper investigates the evolution, policy trajectory, operational performance, financial health, and public service delivery mechanisms of Karnataka's power sector. By examining the functional dynamics of the unbundled distribution companies (ESCOs)—namely BESCO, HESCO, GESCOM, MESCOM, and CESC—alongside the regulatory oversight of the Karnataka Electricity Regulatory Commission (KERC), this study evaluates the twin objectives of commercial viability and universal public service provision. Special attention is devoted to Karnataka's remarkable ascent as a leader in renewable energy integration, particularly solar and wind capacity addition, supported by progressive open access and decentralized generation policies. However, the study also critically analyzes persistent systemic challenges, including Aggregate Technical and Commercial (AT&C) losses, mounting accumulated financial deficits, cross-subsidization burdens, and agricultural power subsidization dynamics. Through a descriptive analytical framework utilizing secondary data from state and national energy archives, the paper concludes with strategic policy recommendations aimed at bridging the gap between financial sustainability and equitable, high-quality public service delivery in Karnataka's evolving power economy.

**Keywords:** Karnataka Power Sector, Electricity Reforms, Unbundling, ESCOs, Renewable Energy Integration, Public Service Delivery

## Introduction

Electricity is widely recognized as the fundamental lifeblood of modern economic development, industrial productivity, and social welfare. In developing nations like India, the power sector acts as a core infrastructure pillar upon which agricultural irrigation, manufacturing growth, digital connectivity, and domestic living standards depend. Historically, electricity supply in India was managed entirely by state-run Electricity Boards (SEBs), which operated as monolithic, vertically integrated entities handling generation, transmission, and distribution simultaneously. However, by the late 1980s and early 1990s, these SEBs faced severe structural bottlenecks, characterized by crumbling infrastructure, skyrocketing financial losses, rampant power theft, unreliable supply, and acute political interference in tariff setting. Recognizing these deep-seated systemic failures, Indian states embarked on comprehensive power sector reforms. Karnataka, situated in southern India, emerged as one of the very first states to proactively adopt structural reforms. The journey began with the enactment of the Karnataka Electricity Reform Act in 1999, which paved the way for breaking up the monolithic Karnataka Power Transmission Corporation Limited (KPTCL) into independent generation, transmission, and distribution entities. This reform movement was further accelerated by the national Electricity Act of 2003, which established a competitive, rules-based framework for the entire Indian power economy. This research paper provides an exhaustive, descriptive study of Karnataka's power sector reforms. It explores the foundational policy shifts, evaluates the operational and financial performance of the state's five regional distribution companies (ESCOs), investigates the integration of renewable energy sources, and assesses the ultimate impact of these reforms on public service delivery and consumer welfare. Through rigorous qualitative and quantitative exploration, this paper seeks to answer a critical central question: How successfully have market-oriented structural reforms balanced commercial viability with equitable public service delivery in Karnataka?

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Public License](https://creativecommons.org/licenses/by-nc-sa/4.0/), which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

Thaseer, S. I., & Solankar, R. R. (2026). Power Sector Reforms in Karnataka State: A Comprehensive Study of Policy, Performance, and Public Service Delivery. *Royal International Global Journal of Advance and Applied Research*, 3(7(III)), 218–221.

<https://doi.org/10.5281/zenodo.21992742>



### Historical Context and Evolution of Power Sector Reforms in Karnataka

To fully understand the current state of Karnataka's power sector, one must examine its historical trajectory. Prior to the reform era, the Karnataka Electricity Board (KEB), established under the Electricity Supply Act of 1948, held total responsibility for generating, transmitting, and distributing electricity across the state. While KEB successfully electrified thousands of remote villages and supported the expansion of pump-sets for agricultural irrigation during the green revolution, its financial and operational model became increasingly unsustainable over time. By the mid-1990s, KEB was grappling with severe fiscal distress. The primary drivers of this crisis included populist pricing policies that provided free or heavily subsidized power to the agricultural sector, unmetered electricity consumption, massive transmission and distribution losses, and a complete lack of accountability across operational rungs. Subsidies promised by successive state governments were often delayed or under-budgeted, starving the board of capital needed for system maintenance and capacity expansion. Load shedding became routine, industrial consumers faced erratic power supply and exorbitant cross-subsidized tariffs, and the state's economic competitiveness was severely compromised.

### The Legislative Turning Point: KERA 1999 and the Electricity Act 2003

Faced with mounting fiscal deficits and pressure from international financial institutions and central authorities, the Government of Karnataka initiated bold legislative action. In 1999, Karnataka enacted the Karnataka Electricity Reform Act (KERA). This landmark legislation charted a new course by mandating the unbundling of the state electricity board. KPTCL was carved out to handle transmission and high-voltage grid management, while generation assets were separated into Karnataka Power Corporation Limited (KPCL). Most importantly, the reform paved the way for the creation of independent, corporatized distribution companies. At the national level, the enactment of the Electricity Act of 2003 provided a unified legislative framework that validated and deepened Karnataka's reform trajectory. The 2003 Act made unbundling mandatory across India, established independent regulatory commissions in every state, eliminated licensing requirements for power generation (except hydro projects above a certain scale), introduced open access in transmission and distribution, and laid down strict statutory mandates for tariff rationalization and consumer protection.

### Structural Framework and Unbundling: The ESCOM Architecture

A defining feature of Karnataka's power sector reform is the decentralization of distribution through distinct Electricity Supply Companies (ESCOMs). Rather than maintaining a single statewide distribution utility, the state was divided into autonomous regional corporations, each tailored to the specific socioeconomic, industrial, and agricultural profile of its geographic zone. This restructuring was designed to improve managerial focus, enhance accountability, and bring utility administration closer to the consumer.

#### The Five Regional ESCOMs

Karnataka's distribution network is currently managed by five major ESCOMs:

Bangalore Electricity Supply Company (BESCOM): Operating in the capital city and surrounding districts (including Bengaluru Urban, Bengaluru Rural, Tumakuru, Chitradurga, Kolar, and Chikballapur), BESCOM covers

the commercial, IT, and high-density urban hub of the state. It boasts the highest revenue base and industrial consumer concentration.

Hubli Electricity Supply Company (HESCOM): Serving the northwestern districts of Karnataka (Belagavi, Dharwad, Gadag, Haveri, Uttara Kannada, Vijayapura, and Bagalkot), HESCOM manages a predominantly agricultural and semi-urban customer base with significant irrigation power demand. Gulbarga Electricity Supply Company (GESCOM): Operating in the northeastern region (Kalaburagi, Ballari, Bidar, Koppal, Raichur, and Yadgir), GESCOM serves districts that have historically faced socioeconomic backwaters, extensive rural spreads, and challenging agricultural load profiles.

Mangalore Electricity Supply Company (MESCOM): Covering the coastal and malnad districts of Dakshina Kannada, Udupi, Shivamogga, and Chikkamagaluru, MESCOM operates in a terrain characterized by heavy rainfall, high literacy, and a balanced mix of commercial, plantation, and domestic consumers.

Chamundeshwari Electricity Supply Corporation (CESC): Operating in the southern districts of Mysuru, Mandya, Hassan, Chamarajanagar, and Kodagu, CESC is anchored around the cultural heritage city of Mysuru and manages a stable agricultural and tourism-oriented distribution network.

### The Role of Regulatory Oversight: KERC

A crucial pillar of the unbundled framework is the Karnataka Electricity Regulatory Commission (KERC). Established under the 1999 reform act, KERC functions as an independent statutory body responsible for regulating tariff structures, issuing licenses, promoting competition, adjudicating disputes between utilities and consumers, and ensuring that ESCOMs adhere to efficiency benchmarks. KERC conducts annual tariff revision hearings, inviting public participation from industrial bodies, farmer unions, consumer forums, and civil society organizations, thereby institutionalizing transparency in a historically opaque sector.

### Operational and Financial Performance of Karnataka's Power Sector

Evaluating the success of power sector reforms requires a careful examination of operational efficiency metrics and financial health indicators. Over the past two decades, Karnataka has achieved notable milestones in capacity addition and infrastructure expansion, yet ESCOM financial viability remains a persistent concern.

#### Aggregate Technical and Commercial (AT&C) Losses

Aggregate Technical and Commercial (AT&C) loss is the single most important metric for gauging utility performance. It combines physical technical losses (dissipation of energy in lines and transformers) with commercial losses (unmetered supply, power theft, meter tampering, and collection inefficiencies). Prior to reforms, Karnataka suffered from crippling AT&C losses exceeding 35-40% in certain rural divisions.

Through sustained capital investments funded by central schemes (such as Revamped Distribution Sector Scheme - RDSS, and earlier schemes like APDRP and IPDS), aggressive feeder metering, HVDS (High Voltage Distribution System) implementation, and strict anti-theft enforcement squads, Karnataka successfully brought down average AT&C losses significantly. BESCOM consistently reports the lowest loss levels (often below 10-12%), while northern ESCOMs like GESCOM and HESCOM continue to grapple with higher loss percentages due to vast geographic spreads and unmetered agricultural pump-sets.



### **Financial Health and Subsidy Dynamics**

Despite operational improvements, the financial health of Karnataka's ESCOMs is perpetually strained by structural macroeconomic factors. The foremost challenge is the burden of agricultural and Bhagat Jyothi (free power for economically weaker sections) subsidies. While the Government of Karnataka commits to reimbursing ESCOMs for these subsidized tariffs through budgetary allocations, delays in subsidy disbursement frequently lead to severe working capital deficits.

Furthermore, cross-subsidization—where industrial and commercial consumers pay inflated tariffs to offset losses incurred from supplying power below cost to agriculture and domestic households—remains a contentious issue. High industrial tariffs reduce the global competitiveness of Karnataka's manufacturing sector, prompting large industries to opt for captive power plants or open access procurement, thereby shrinking the ESCOMs' high-paying consumer base.

### **Renewable Energy Integration and Sustainability Transitions**

One of the crowning achievements of Karnataka in the 21st century has been its phenomenal leadership in renewable energy (RE) integration. Recognizing the ecological imperatives of climate change and the economic volatility of fossil fuel imports, Karnataka formulated one of the most progressive Solar and Renewable Energy policies in India.

#### **The Rise of Utility-Scale Solar and Wind Parks**

Karnataka transformed from a power-deficit state into a renewable energy powerhouse. A prime catalyst in this transition was the establishment of ultra-mega solar parks, most notably the world-renowned 2,000 MW Pavagada Solar Park (Shakti Sthala) located in Tumakuru district. Developed through a plug-and-play model by Karnataka Solar Power Development Corporation Ltd (KSPDCL), Pavagada demonstrated how innovative land-lease models involving thousands of small farmers could unlock barren land for clean energy generation. In addition to solar energy, the state boasts exceptional wind energy potential, particularly across the wind corridors of Chitradurga, Ballari, and Koppal. Combined with Karnataka's traditional hydroelectric backbone managed by KPCL (such as the Sharavathi, Kali, and Cauvery hydro stations), the state achieves a remarkably high share of green energy in its generation mix, frequently supplying over 45-50% of its total annual electricity demand from renewable sources.

### **Open Access, Distributed Generation, and Grid Challenges**

Karnataka has also pioneered open access policies, allowing large commercial and industrial (C&I) consumers to procure green power directly from independent renewable generators bypassing ESCOM distribution wires, subject to wheeling and transmission charges determined by KERC. Rooftop solar adoption has similarly expanded across residential and commercial buildings in Bengaluru and other urban centers. However, high renewable penetration introduces significant grid management challenges. Solar and wind power are inherently intermittent. Managing frequency fluctuations, duck curves, and ramping requirements demands sophisticated grid balancing mechanisms, advanced forecasting tools, energy storage systems (BESS), and real-time dispatch coordination through the State Load Despatch Centre (SLDC).

### **Public Service Delivery, Consumer Welfare, and Equity**

The ultimate touchstone of any infrastructure reform is its impact on the common citizen. In Karnataka, power sector reforms have fundamentally altered the nature of public service delivery, shifting the paradigm from bureaucratic patronage to consumer-centric accountability.

#### **Digital Transformation and Grievance Redressal**

Karnataka's ESCOMs have embraced digital governance to enhance service delivery. Consumers today benefit from online portal services, mobile applications (such as 'BESCOM Mithra'), automated billing systems, digital payment gateways, and real-time SMS alerts for planned outages and bill generation. Consumer grievance redressal mechanisms have been streamlined through centralized 24x7 helpline call centers, Consumer Grievance Redressal Forums (CGRF) in every ESCOM, and the apex oversight of the Electricity Ombudsman.

Furthermore, the rollout of smart prepaid and postpaid meters under central modernization schemes represents a major technological leap. Smart metering eliminates billing disputes, reduces human intervention, improves cash collection efficiency for utilities, and empowers consumers with real-time data to monitor their daily electricity consumption patterns.

#### **Equity, Access, and Universal Electrification**

Universal household electrification has been virtually achieved across Karnataka through sustained central and state welfare initiatives, including the Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY) and Saubhagya schemes. Remote tribal hamlets in the Western Ghats and remote dryland settlements in northern districts have been integrated into the grid or provided decentralized off-grid solar solutions.

However, equity concerns persist regarding affordability and cross-class distribution of benefits. While marginalized urban and rural households receive subsidized lifelines, the escalating cost of supply places a heavy fiscal burden on state finances, occasionally resulting in political friction over tariff hikes and welfare delivery mechanisms (such as recent populist schemes offering free electricity quotas up to specific unit thresholds).

#### **Challenges, Critical Gaps, and Future Outlook**

Despite notable successes in unbundling, capacity expansion, and renewable energy adoption, Karnataka's power sector faces critical structural vulnerabilities that threaten its long-term viability.

**Deepening Financial Liabilities:** Accumulated regulatory assets and operational losses of ESCOMs continue to constrain capital investments in grid modernization and maintenance.

**Agricultural Metering Resistance:** Complete metering of agricultural pump-sets remains politically sensitive, hindering accurate estimation of technical versus commercial losses in rural divisions.

**EV Charging Infrastructure Stress:** As Bengaluru and other urban centers rapidly transition toward Electric Vehicles (EVs), distribution transformers and local distribution networks face unprecedented load spikes, necessitating urgent grid upgrades.

**Governance and Autonomous Functioning:** Ensuring that ESCOM boards maintain professional, technocratic autonomy free from short-term political interference remains an ongoing institutional challenge.

#### **Conclusion**

The journey of power sector reforms in Karnataka represents a remarkable case study of institutional



transformation, policy innovation, and infrastructural evolution in developing economies. Beginning with the historic unbundling under KERA 1999 and the Electricity Act 2003, Karnataka successfully decentralized electricity distribution, established robust regulatory governance through KERC, and transformed into a national leader in renewable energy integration. While structural reforms have significantly improved operational efficiency, reduced technical losses, and enhanced digital public service delivery, the sector continues to grapple with persistent financial imbalances, subsidy burdens, and grid integration complexities. Moving forward, the sustainability of Karnataka's power economy hinges on depoliticizing tariff setting, enforcing complete agricultural metering, accelerating smart grid investments, and fostering genuine commercial autonomy within ESCOMs. By striking a harmonious balance between financial viability and equitable public service delivery, Karnataka can serve as a shining beacon for sustainable power sector governance across India and the developing world.

#### Acknowledgement

The author expresses sincere gratitude to Adarsh Mahavidyalaya, Omerga, District Osmanabad (Maharashtra) for providing academic guidance and a supportive research environment throughout the course of this study. The author is deeply indebted to Dr. Ram R. Solankar, Professor and Research Guide, for his invaluable guidance, constant encouragement, scholarly insights, and constructive suggestions during every stage of this research. His mentorship has been instrumental in the successful completion of this work. The author also extends heartfelt appreciation to the Government of Karnataka, the Karnataka Electricity Regulatory Commission (KERC), the Ministry of Power, the Central Electricity Authority (CEA), and the various Electricity Supply Companies (ESCOMs) for making policy documents, reports, and statistical information available, which greatly enriched this study. Special thanks are due to all researchers, academicians, and authors whose published books, journal articles, and research reports provided the theoretical

foundation and valuable references for this paper. Finally, the author expresses sincere gratitude to family members, friends, colleagues, and well-wishers for their constant encouragement, patience, and unwavering moral support throughout the completion of this research.

#### Financial support and sponsorship

Nil.

#### Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

#### References

1. Government of Karnataka. (1999). The Karnataka Electricity Reform Act, 1999 (Karnataka Act No. 25 of 1999). Bangalore: Government Press.
2. Government of India. (2003). The Electricity Act, 2003 (No. 36 of 2003). New Delhi: Ministry of Law and Justice.
3. Karnataka Electricity Regulatory Commission (KERC). (2024–2025). Annual Reports and Tariff Orders for BESCOM, HESCOM, GESCOM, MESCOM, and CESC. Bengaluru: KERC Publications.
4. Central Electricity Authority (CEA). (2025). Growth of Electricity Sector in India from 1947 to 2025. New Delhi: Ministry of Power, Government of India.
5. Dubash, N. K., & Rajan, S. C. (2001). Power Politics: State, Electricity and Markets in India. *Economic and Political Weekly*, 36(32), 3057–3068.
6. Ministry of Power (MoP). (2023). Revamped Distribution Sector Scheme (RDSS): Operational Guidelines and State Performance Evaluations. New Delhi: Government of India.
7. Sridharan, V., & Sundararajan, S. (2022). Renewable Energy Transitions in Southern India: Policy Frameworks, Solar Parks, and Grid Integration Challenges. *Energy Policy Review*, 45(2), 112–128.
8. World Bank. (2020). Turning Around the Power Distribution Sector in India: Lessons from State-Level Reforms. Washington, DC: World Bank Group.



Original Article

# A Study on Tourist Perception and Satisfaction towards Wellness Tourism in Shivamogga District

Dr. Venkatachalapathi H.S.,<sup>1</sup> Dr. Durgappa,<sup>2</sup>

<sup>1</sup>Associate Professor, Department of Economics

Government First Grade College, Gauribidanur, Chikkaballapur DistKarnataka

<sup>2</sup>Associate Professor, Department of Commerce, Government First Grade College, Madugiri, Tumkuru Dist Tumkur University, Karnataka State,

Manuscript ID:  
RIGJAAR-2026-030750

ISSN: 2998-4459

Volume 3  
Issue 7(III)  
Pp. 222-233  
July 2026

Submitted: 17 June. 2026

Revised: 25 June. 2026

Accepted: 18 July. 2026

Published: 31 July. 2026

Correspondence Address:

Venkatachalapathi H.S.,

Associate Professor, Department of  
Economics Government First Grade  
College, Gauribidanur, Chikkaballapur  
DistKarnataka

Email : [venkatahs24@gmail.com](mailto:venkatahs24@gmail.com)

Quick Response Code:



Web. <https://rlgjaar.com>



DOI: 10.5281/zenodo.22124949

DOI Link:

<https://doi.org/10.5281/zenodo.22124949>



Creative Commons



## Abstract

Wellness tourism has become one of the fastest-growing segments of the global tourism industry, emphasizing physical, mental, emotional, and spiritual well-being. India has emerged as a major wellness destination due to its rich traditions of Ayurveda, Yoga, Naturopathy, meditation, and other holistic healing practices. Shivamogga district, blessed with waterfalls, forests, wildlife, temples, yoga centres, and Ayurveda facilities, has significant potential for wellness tourism development. This study examines tourists' perceptions, identifies the infrastructure and factors influencing wellness tourism, evaluates tourist satisfaction, and provides recommendations for sustainable development. An exploratory research design was adopted using both primary and secondary data. Primary data were collected from 300 respondents, including domestic and foreign tourists, through structured questionnaires, while secondary data were obtained from books, journals, government reports, and tourism publications. Statistical tools such as percentages, averages, and one-sample t-tests were employed for analysis. The findings reveal high tourist satisfaction with attractions, accommodation, and tourism services. The study concludes that improving infrastructure, transportation, sanitation, promotion, and integrated tourism planning will strengthen Shivamogga's position as a leading wellness tourism destination while contributing to sustainable economic growth and employment generation.

**Keywords:** Wellness Tourism, Shivamogga District, Tourist Satisfaction, Ayurveda, Yoga, Sustainable Tourism, Tourism Development, Tourist Perception.

## Introduction

Wellness tourism is one of the fastest-growing segments in the tourism industry. The Wellness Tourism Initiative emphasizes that this is not a passing trend but a dynamic and expanding sector that will continue to drive global tourism as more people seek healthier, happier lives. The concept of "wellness" has both ancient roots and a modern evolution. The term gained significant traction in the 1950s, 1960s, and 1970s, influenced by an informal network of American doctors and intellectuals whose writings and leadership shaped contemporary understanding. Despite its modern popularity, the foundations of wellness are deeply historical, extending back to various 19th-century medical, intellectual, and religious movements in Europe and the United States. Moreover, the principles of wellness are embedded in the primordial traditions of Asia, Rome & Greece, of which the cultural practices continue to influence today's wellness movement.

## Historical Evolution of Wellness Concept

Traditional Well-Being Between 3000 and 1500 BCE, Ayurveda initiated as a verbal custom and was afterward documented in the Vedas, four ancient Indian texts. Ayurvedic medicine is a holistic arrangement designed to balance the mind, body & spirit. Its personalized preparations encompass nutrition, exercise, social interaction, and hygiene to maintain bodily equilibrium and prevent illness. Additionally, yoga and meditation, integral to Ayurvedic tradition, have gained global popularity and remain essential practices for well-being. Intellectual and Medical Movements of the 19th Century During the 19th century, innovative scholarly movements, spiritual beliefs, & health practices propagated throughout Europe and the USA. This period saw the development of various alternative healthcare practices emphasizing self-healing, comprehensive perspective & preventive care.

## Creative Commons (CC BY-NC-SA 4.0)

This is an open access journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International](https://creativecommons.org/licenses/by-nc-sa/4.0/) Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

## How to cite this article:

H.S, D. V., & Dr. Durgappa, (2026). A Study on Tourist Perception and Satisfaction towards Wellness Tourism in Shivamogga District. Royal International Global Journal of Advance and Applied Research, 3(7(III)), 222–233. <https://doi.org/10.5281/zenodo.22124949>



Practices such as chiropractic, homeopathy, naturopathy and osteopathy achieved widespread adoption equally in US and Europe. Concurrently, spiritually based ideologies, including the "mind-cure movements" like Christian Science and New Thought, emerged. These movements propagated the notion that an individual's mental and spiritual state significantly influences their physical health. The term "wellness" as we understand it today emerged in the 1950s, thanks to the influential yet initially underrecognized work of physician "Dunn; Halbert L.," whose book "High (Optimum) Level Wellness" was in print in 1961. Although Dunn's ideas did not initially capture widespread attention, they were afterward accepted in 1970s by a group of American pioneers counting "Dr. Travis; John," "Ardel, Don," and "Dr. Hettler, Bill" well renowned as the Father (Pioneer) of wellness faction," these individuals developed inclusive wellness models, introduced pioneer estimation tools, & actively promoted the wellness concept through their writings & public speaking. They played key roles in establishing the pioneer wellness center of the world, the pioneer university campus center for wellness, & initiating a wellness institute & convention named the National Well-being Conference & the National Wellness Institute in the U.S.

#### Wellness Tourism in India

One of the tourist industry's fastest-growing subsectors is wellness travel, which is expected to play a significant role in propelling the travel economy. About 15% of all travel is thought to be related to wellness tourism, with an industry estimated to be worth US\$ 3 trillion. This emerging field, which is worth billions of dollars, places a strong emphasis on spirituality, sustainability, and tranquility. Studies indicate that when it comes to wellness-related experiences, travelers spend 1.3 times more money than they do on other travel-related items. The Government of India developed explicit rules in 2015 to promote wellness tourism in response to this growth. A wide variety of health goods, such as yoga, Ayurveda, Unani medicine, and other spiritual and alternative therapies, are available in India. India created the Ministry of AYUSH in 2014 with the goal of advancing education.

#### Types of Wellness Tourism Products

Research by Muller and Kaufmann (2000) distinguishes wellness tourism from health tourism. Wellness tourism is a subset of health tourism focused on enhancing physical, mental, and spiritual well-being through various activities at a destination. Excluding medical tourism, the following forms of wellness tourism products are prevalent globally:

- Ayurveda
- Naturopathy
- Homeopathy
- Music therapy
- Sports and fitness
- Yoga and Tourism
- Yoga, an ancient practice originating in India, is designed to achieve physical, mental, and spiritual peace. While yoga has long been used to address physical disorders, it is now primarily practiced for relaxation.
- Spiritual tourism, closely linked to religious and faith-based travel, plays a vital role in promoting destination sustainability and cultural understanding. This form of tourism includes pilgrimage sites and spiritual retreats
- Spiritual practices

- Sun and fun activities
- Hotel
- Retreats
- Spas
- Clinics & Hospitals
- Ashram Festivals
- Leisure Centers
- Cruises Resorts
- Ayurveda and Tourism
- Beauty treatment
- Pampering services

#### Linkages between Tourism and Economic Growth

The relationship between tourism and economic growth is articulated through different channels. The theory argues that the number of tourists entering a country is an important factor for economic growth; since tourism spending provides foreign-exchange earnings. These earnings are used to import capital goods that produce goods and services, thereby leading to economic growth for the host nation (McKinnon, 1964; Balaguer & Cantavella-Jorda, 2002). Tourists' demand for accommodation, food, transport and services, as well as entertainment, leads to an increased production in goods and services, and income, as well as the creation of income and employment opportunities – all of which have positive effects on the economy (Balaguer & Cantavella-Jorda, 2002). Moreover the creation of direct, indirect and induced forms of local employment through tourism. Direct employment is created through those working in tourism-related institutions, like hotels, restaurants, tourist stores, etc.; while indirect employment is created in industries that supply goods and services to the tourism sector, for example, agriculture, fishing, etc. In addition to that tourism also increases government income through the income tax earned from hotels and other kinds of tourist taxes. These include airport-exit duties, tourism-industry import duties, income tax levied on tourism institutions and practitioners, and capital-gains tax on the assets of tourist institutions. As the tourism industry is closely integrated with several other industries like hotel and accommodation, aviation, railways, roadways, healthcare, entertainment etc., the combined weaknesses of all the sectors make it more vulnerable. Travelling around India is problematic, despite several attempts to improve transfers between airlines, railways and buses. We may have well developed aviation sector, biggest network of trains in the world coupled with the buses and taxi/cab services, but all these system works independently, that often results in long waiting hours and create confusing situation for the tourist. The problem is that each of these transports systems works independently. An integrated approach, as perfected by more tourism- focused countries, is essential. Moreover, Tourism promotes economic growth in the following process e.g.; tourism inspires investment and helps local firms to be more efficient through increasing competition Balaguer and Contavella-Jorda,(2002). Tourism assists in reducing the unemployment, in the meantime tourism accomplishments are heavily based on human capital Brida and Pulina, (2010) tourism leads to increment in 6 foreign exchange earnings, which in turn can be utilized to finance imports (McKinnon, 1964), and finally, tourism leads to positive economies of scale. As a



result, it reduces production cost for local business entrepreneurs (Andrioties, 2002; Croes, 2006).

**Table 1 Shows that Tourism Resources in Shivamogga District**

| S.N | Tourism Resource                                    | Shivamogga Tourism Resources                                                                                                                                                            |
|-----|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | River Hub of City Cultural & Traditional Activities | Tunga River – Cultural activities, riverfront, coracle rides, traditional rituals, and recreational spaces.                                                                             |
| 2   | Waterfalls & Natural Attractions                    | Jog Falls, Kunchikal Falls, Barkana Falls, Onake Abbi Falls, Dabbe Falls, Achakanya Falls etc.                                                                                          |
| 3   | Temples                                             | Kodachadri Mookambika Temple, Sharavathi Temple, Sigandur Chowdeshwari Temple, Sakrebailu Ganapathi Temple, Rameshwara Temple, Shivappa Nayaka Palace Temple etc.                       |
| 4   | Wildlife & Eco-Tourism                              | Sakrebailu Elephant Camp, Tyavarekoppa Lion & Tiger Safari, Gudavi Bird Sanctuary, Mandagadde Bird Sanctuary, Shettihalli Wildlife Sanctuary, Sharavathi Valley Wildlife Sanctuary etc. |
| 5   | Museums                                             | Shivappa Nayaka Palace Museum, Government Museum Shivamogga, Keladi Museum etc.                                                                                                         |
| 6   | Historical Monuments                                | Keladi Rameshwara Temple & Palace, Shivappa Nayaka Palace, Kavaledurga Fort, Balligavi Temple Complex etc.                                                                              |
| 7   | Handloom & Weaving Centres                          | Traditional Handloom Centres at Sagara, Soraba, Hosanagara and local weaving & handicraft clusters.                                                                                     |
| 8   | Convention Centre                                   | Kuvempu Rangamandira, District Convention Hall, National Education Society Auditorium, Government Event & Exhibition Grounds.                                                           |
| 9   | Shopping Centres                                    | Gandhi Bazaar, Nehru Road, Durgigudi, City Centre Mall, B.H. Road commercial area, Sagara Market etc.                                                                                   |
| 10  | Art, Crafts & Handloom                              | Sandalwood crafts, Bamboo products, Arecanut products, Traditional Wood Carvings, Handloom textiles, Local handicrafts.                                                                 |
| 11  | Music                                               | Karnataka Classical Music, Folk Music (Dollu Kunitha, Veeragase, Yakshagana), Bhavageethe traditions.                                                                                   |
| 12  | Yoga Centres                                        | Yoga centres across Shivamogga city, Kuvempu University Yoga Centre, Nature & Wellness Retreats, Riverfront yoga camps.                                                                 |
| 13  | Ayurveda                                            | Ayurveda hospitals, Panchakarma centres, Naturopathy & Wellness Centres, Herbal treatment facilities.                                                                                   |
| 14  | Fairs & Festivals                                   | Dasara, Ugadi, Deepavali, Makara Sankranti, Shivamogga Utsava, Yakshagana festivals, Arecanut Fair, Temple Jatras etc.                                                                  |
| 15  | Universities                                        | Kuvempu University, Jawaharlal Nehru National College (Autonomous), Sahyadri Science College, Government First Grade Colleges, Medical & Engineering Institutions.                      |

### Objectives of the Study

1. The following objectives have been formulated based on the research gap identified by reviewing existing literature.
2. To analyze tourists' perception regarding existing wellness tourism in study area
3. To identify the infrastructure and prime factors required for attracting tourists in Study area .
4. To study the opinion of Wellness tourists towards satisfaction level of tourism services availability in Shivamogga District.
5. To give suitable suggestion based on major findings of the study.

### Research Design of the Study

There are four types of research design: Exploratory, Descriptive, Explanatory, and Evaluative research design. This research study adopted an exploratory

research design. The exploratory research design was chosen to comprehensively understand various aspects related to Wellness Tourism in Shivamogga District . The primary aim of exploratory research design is to explore the concept and does not provide final and conclusive answers to existing research queries. It serves as an initial research design that aids in better understanding the topic and lays the foundation for more conclusive research. Exploratory research often addresses problems on which no previous research has been conducted (Brown, 2006).

### Data Collection

The data collection procedure primarily involved using both primary and secondary sources. Both methods were employed to accomplish the research objectives. Data collection is the procedure of gathering, computing, and



analyzing accurate information from reliable sources to address research problems.

### Primary Data

Primary data is original and collected directly from sources (Kothari, 2019). It is first-hand data, resulting in highly accurate information related to the study. Primary data for this study was collected through surveys. The primary respondents included foreign tourists, domestic tourists, NGOs, hotels, government representatives, local administrations, owners of yoga centres, owners of ayurveda treatment centres, professionals, and locals from selected destinations considered for the study

### Secondary Data

Secondary data refers to information already available and has undergone various statistical procedures (Kothari, 2019). Secondary data is collected from internal and external sources (Emeritus, online). In simpler terms, it is second-hand data collected by other academicians, organizations and government agencies. Secondary data is typically cheaper and easier to obtain than primary data, and the data collection is less time-consuming. It was gathered from published reports, articles, magazines, books, internet sources, journals, government records, newspapers, thesis and research papers related to wellness tourism. Research work conducted by previous scholars on wellness tourism, reports from government agencies, regional, national and global organizations on wellness tourism, books on wellness tourism and data published by the Ministry of Tourism (Government of India), the Department of Tourism & Civil Aviation (Himachal Pradesh), and the Global Wellness Institute (GWI) were also used as sources for secondary data collection in the present study.

### Sample size of the Study

Sample During the research process, collecting data from every individual within a population is often impractical. Instead, researchers select a sample from the population. A sample is a specific group from which the researcher collects data, and the sample size is always smaller than the total size of the population. This study had two categories of respondents: tourists (both foreign and domestic) and stakeholders from selected areas. The sample size comprised 200 tourists and 100 stakeholders from the chosen destinations. Two separate questionnaires were designed for both groups, tourists and stakeholders. Participants/respondents were categorized based on age, gender, income, occupation, and location.

### Sampling Design

There are two category of respondents for the study i.e., Foreign and Domestic tourists arriving to Shivamogga district and its surroundings. The sample size is restricted

to 300 tourists. The major tourist attractions of Shivamogga district is been studied. Convenience sampling method is adopted in selecting the respondents irrespective of their age, sex, class, country, region, income, etc. Information from the sample respondents were collected through the interview schedule from different tourist attractions, hotels, other accommodations units etc. The questions were multiple choice type in nature and self-explanatory with multiple choice so that it is easy to derive quick response. Special provision is made to collect the opinion or suggestions of the respondents in the interview schedule itself.

### Data Analysis and Interpretation

Keeping in view the objectives of the study, the data collected is classified and tabulated to make easy analysis and easy interpretations. The processed data is interpreted with the assistance of the statistical tools such as averages, percentages, and one sample t-test.

### Scope of the Study

The study is confined to Economic analysis of tourism development specially in Shivamogga District. The study is restricted to Shivamogga District, Shivamogga District consists of Six talukas. This study includes trends of tourism growth, generation of income and employment from tourism sector, socio-economic background of tourists who visited Shivamogga, recognise the mode of travel and travel preferences for wellness and their satisfaction level of tourism services like accommodation, travelling facilities, hotels etc. Secondary data were collected upto 2022-23 to find out the progress of tourism sector and primary data were collected 300 visitors who are visit to Shivamogga District.

### Limitations of the Study

There are certain limitations in every work thus, the present study also has a few limitations and are as the following:

- It is not easy to get responses from tourists in between their schedule of visiting a tourist spot.
- There is a difficulty of that some tourists might have not taken it seriously.
- Language is one of the barriers for response to a tourist.
- Questionnaire was prepared in English, which is the common language and filled up by the tourists who know English to read and fill it up.
- Misunderstanding of questions might have also happened which sometime lead to mistakes in analysis by the respondents.

**Table 3.9 Tourist's Arrival to Karnataka from 2012 to 2023**

| Year | Indians  | Foreigners | Total    |
|------|----------|------------|----------|
| 2012 | 36195907 | 505524     | 36701431 |
| 2013 | 37825953 | 534563     | 38360516 |
| 2014 | 37010928 | 520041     | 37530969 |
| 2015 | 32729679 | 529847     | 33259526 |
| 2016 | 38202077 | 524573     | 38726650 |
| 2017 | 84107390 | 574005     | 84681395 |



|                                  |           |         |           |
|----------------------------------|-----------|---------|-----------|
| 2018                             | 94052729  | 595359  | 94648088  |
| 2019                             | 98010140  | 636378  | 98646518  |
| 2020                             | 118283220 | 561870  | 118845090 |
| 2021                             | 119863942 | 636498  | 120500440 |
| 2022                             | 129762600 | 461752  | 130224352 |
| 2023 (upto November Provisional) | 102000981 | 351485  | 102352466 |
| Total                            | 928045546 | 6431895 | 934477441 |

Source: Karnataka Economic Survey 2022-23

Above table 3.9 and graph 3.6 and 3.7 shows the numbers of tourist's arrivals to Karnataka from India as well as foreign tourists are increasing over the years. This indicates development of tourism in Karnataka. Tourist destinations like Mysuru, Beluru, Halebeedu, Mangaluru,

Jog Falls, Vijayapura, Hampi/Hospet, Gadag, Aihole, and Chitradurga together account for over 85 percent of the total tourist arrivals in the state. Domestic tourists trends are increasing but foreign tourists arrivals to karnataka almost stagnant and little bit variations are there.

#### 14. Data Analysis and Interpretation

**Table – 4.1**

**Classification of tourists on the basis of gender and nationality**

| Tourist Details             | Gender |        | Total |
|-----------------------------|--------|--------|-------|
|                             | Male   | Female |       |
| Foreign Tourists (Count)    | 90     | 60     | 150   |
| Foreign Tourists (percent)  | 60     | 40     | 100   |
| Domestic Tourists(Count)    | 80     | 70     | 150   |
| Domestic Tourists (percent) | 53.33  | 46.67  | 100   |
| Total (Count)               | 170    | 130    | 300   |
| Total (percent)             | 56.67  | 43.33  | 100   |

Source: Field survey

Table 14.1 gives information regarding gender distribution of sample tourists in the study. The sample 300 respondent tourists for study included total 56.67 percent of males from foreign respondent tourists are 60 percent and domestic tourist respondents are 53.33 percent and total 43.33 percent of females from foreign respondent tourists are 40 percent and domestic respondent tourists are

46.67 percent.

**Table – 14.2**

**Classification of Tourists On the Basis of Age Group**

| Tourist Details             | Age of Respondents |             |             |             |                    |       |
|-----------------------------|--------------------|-------------|-------------|-------------|--------------------|-------|
|                             | Below 25 Years     | 26-35 Years | 36-50 Years | 51-65 Years | 66 Years And Above | Total |
| Foreign Tourists (Count)    | 31                 | 30          | 40          | 20          | 29                 | 150   |
| Foreign Tourists (percent)  | 20.67              | 20          | 26.67       | 13.33       | 19.33              | 100   |
| Domestic Tourists (Count)   | 40                 | 50          | 20          | 25          | 15                 | 150   |
| Domestic Tourists (percent) | 26.67              | 33.33       | 13.33       | 16.67       | 10                 | 100   |



|                 |       |       |    |    |       |     |
|-----------------|-------|-------|----|----|-------|-----|
| Total (Count)   | 71    | 80    | 60 | 45 | 44    | 300 |
| Total (percent) | 23.67 | 26.67 | 20 | 15 | 14.67 | 100 |

Source: Field survey

Above table reveals that out of 300 respondents 26.67 percent of tourists are 26 to 35 years that is 20 percent from foreign tourists and 33.33 percent from domestic tourists, followed by below 25 years 23.66 percent of tourists in these 20.67 percent of respondents from foreign and 26.67 percent of respondents are from domestic tourists, then 20 percent of tourists are 36 to 50 years among these 26.67 percent of tourists from foreign and 13.33 percent of

tourists are from domestic respondents, 15 percent of tourists are between 51 to 65 years in this age group 13.33 percent of tourists are foreign respondents and 16.67 percent of tourists are domestic, and last 66 years and above age group are 14.67 percent out of this 19.33 percent of tourists from foreign and 10 percent of tourist respondents are from domestic.

**Table – 14.3**

**Classification of Tourists Based on their Level of Education**

| Tourist Details             | Level of Education of Respondents |          |               |           | Total |
|-----------------------------|-----------------------------------|----------|---------------|-----------|-------|
|                             | Schooling                         | Graduate | Post Graduate | Doctorate |       |
| Foreign Tourists (Count)    | 12                                | 38       | 65            | 35        | 150   |
| Foreign Tourists (percent)  | 8                                 | 25.33    | 43.33         | 23.33     | 100   |
| Domestic Tourists (Count)   | 35                                | 65       | 35            | 15        | 150   |
| Domestic Tourists (percent) | 23.33                             | 43.33    | 23.33         | 10        | 100   |
| Total (Count)               | 47                                | 103      | 100           | 50        | 300   |
| Total (percent)             | 15.67                             | 34.33    | 33.33         | 16.67     | 100   |

Source: Field survey

**Graph 14.3 Classification of Tourists Based on their Level of Education**

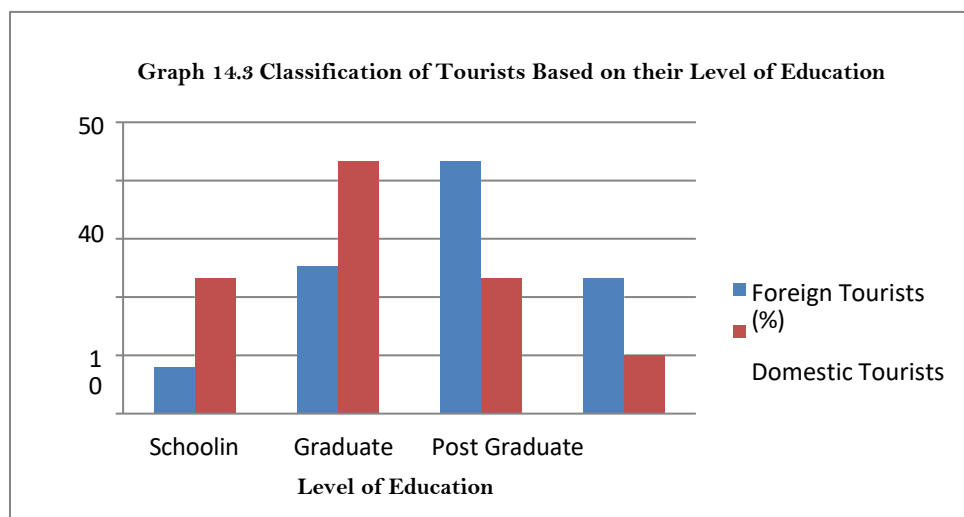


Table with Graph – 14.3 includes tourists with different educational background. Tabulated sample shows 15.67 percent of respondents are Schooling among these 8 percent of respondents are foreigners and 23.33 percent of respondents are domestic tourists. And 34.33 percent of the respondents are Graduates out of 34.33, foreign tourist respondents are 25.33 percent and 43.33 percent of respondents from domestic. Total Post graduates are 33.33 percent among these 43.33 percent of respondents from foreign tourists, 23.33 percent of respondents are from domestic tourists. Doctorates are 16.66 percent of tourist respondents 23.33 percent from foreign and 10 percent of tourist respondents are domestic.

**Table – 14.4**

**Classification of Tourists Based on the amount Spent in Shivamogga District During Wellness Tourism.**

| Tourist Details | Amount Spent in Shivamogga District During their Visit |                 |                  |                  | Total |
|-----------------|--------------------------------------------------------|-----------------|------------------|------------------|-------|
|                 | Below 50000                                            | 50000 T o 75000 | 75000 T o 100000 | 100000 And Above |       |



|                             |       |     |      |      |     |
|-----------------------------|-------|-----|------|------|-----|
| Foreign Tourists (Count)    | 40    | 93  | 15   | 2    | 150 |
| Foreign Tourists (percent)  | 26.67 | 62  | 10   | 1.33 | 100 |
| Domestic Tourists (Count)   | 125   | 15  | 10   | 0    | 150 |
| Domestic Tourists (percent) | 83.33 | 10  | 6.67 | 0    | 100 |
| Total (Count)               | 165   | 108 | 25   | 2    | 300 |
| Total (percent)             | 55    | 36  | 8.33 | 0.67 | 100 |

Source: Field survey

Above Table with Graph – 14.4 indicates the amount a tourist is ready to spend while they visit Shivamogga district for wellness tourism as one of the tourist destinations, 55 percent of the respondents spend an amount of less than Rs. 50000 out of this 26.67 percent of foreigners and 83.33 percent of domestic respondent tourists are spending below 50000 that to domestic tourists are more than foreign tourists. Then Rs 50000 to 75000 amount spending percentages are 36 percent out of this 62 percent

Table – 14.5

Classification of Wellness Tourism Based on their Purpose of Visit

| Tourist Details             | Purpose Of Visit                 |          |       |                   | Total |
|-----------------------------|----------------------------------|----------|-------|-------------------|-------|
|                             | Waterfalls & Natural Attractions | Ayurveda | Yoga  | Fairs & Festivals |       |
| Fairs & Festivals           |                                  |          |       |                   |       |
| Foreign Tourists (Count)    | 65                               | 16       | 20    | 49                | 150   |
| Foreign Tourists (percent)  | 43.33                            | 10.67    | 13.33 | 32.67             | 100   |
| Domestic Tourists (Count)   | 56                               | 12       | 25    | 57                | 150   |
| Domestic Tourists (percent) | 37.33                            | 8        | 16.67 | 38                | 100   |
| Total (Count)               | 121                              | 28       | 45    | 106               | 300   |
| Total (percent)             | 40.33                            | 9.33     | 15    | 35.33             | 100   |

Source: Field survey

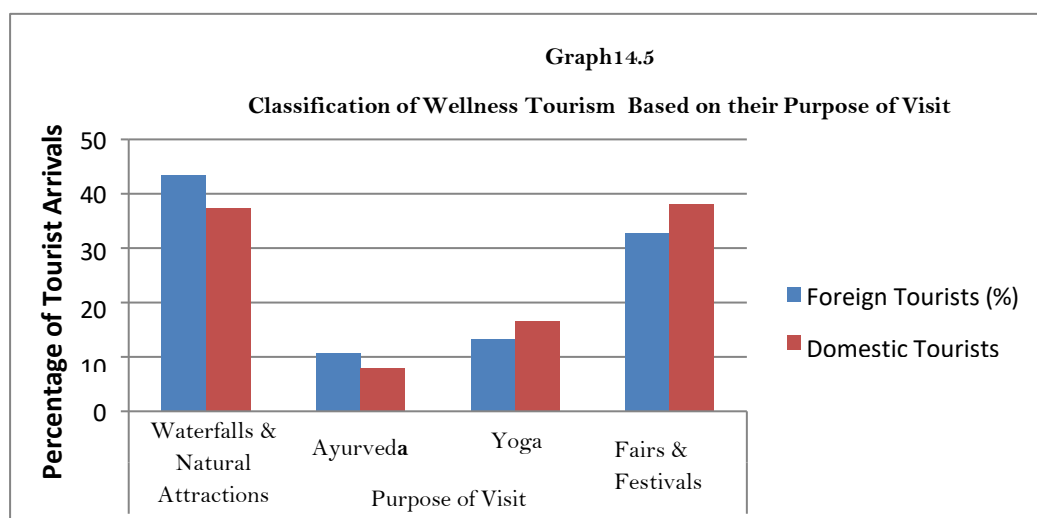


Table with Graph – 14.5 shows 40.33 percent of respondent tourists visit shivamogga district for Waterfalls & Natural Attractions, 43.33 percent of respondent tourists are from foreign countries and 37.33 percent of tourists are from domestic And 9.33 percent of respondent tourists visit shivamogga for Ayurveda purpose 10.66 percent of them from foreign and 8 percent of tourists are from domestic

from foreign tourists and 10 percent only from domestic tourist respondents. Above Rs 75000 to 100000 spending percentage is 8.33 percent among this 10 percent from foreign and 6.67 percent from domestic. Next group above one lakh spending population is very less that is foreign respondents are 1.33 percent and 0 percent from domestic totally 0.67 percent of respondents are spending above one lakh.

And yoga 15 percent of the tourists are visit shivamogga that to 13.33 percent of them from foreign and 16.64 percent of them from domestic. 35.33 percent of respondent tourists are those who visit for Fairs & Festivals 32.66 percent of them from foreign and 38 percent of them from domestic.



Table – 14.6

Classification of Wellness Tourists Based on their Occupation Status

| Tourist Details             | Occupational Status |           |          |               |         |       |
|-----------------------------|---------------------|-----------|----------|---------------|---------|-------|
|                             | Profession          | Executive | Employee | Self Employed | Student | Total |
| Foreign Tourists (Count)    | 32                  | 18        | 20       | 50            | 30      | 150   |
| Foreign Tourists (Percent)  | 21.33               | 12        | 13.33    | 33.33         | 20      | 100   |
| Domestic Tourists (Count)   | 16                  | 14        | 50       | 20            | 50      | 150   |
| Domestic Tourists (Percent) | 10.67               | 9.33      | 33.33    | 13.33         | 33.33   | 100   |
| Total (Count)               | 48                  | 32        | 70       | 70            | 80      | 300   |
| Total (Percent)             | 16                  | 10.67     | 23.33    | 23.33         | 26.67   | 100   |

Sources : Field survey

Table 14.6 shows Occupation wise distribution Wellness tourists, 26.67 percent of respondents are students out of this 20 percent of the tourists from foreign countries and 33.33 percent of the tourists from domestic and the highest proportion in the sample followed by 23.33 percent of Employees 13.33 percent of the respondents from foreign and 33.33 percent of the respondent people from domestic and 23.33 percent of self employed group have same

percentage of respondents but from foreign 33.33 percent of respondents and 13.33 percent of the tourists from domestic. 16 percent of the sample tourists by Profession 21.33 percent of the respondents from foreign countries and 10.66 percent of the tourists from domestic. And Executives are 10.67 percent of respondents, out of this from foreign 12 percent and from domestic 9.33 percent respondent tourist

Table – 14.7

Classification of Tourists Based on Duration of Stay in Shivamogga District Region by Wellness Tourists

| Tourist Details             | Intended To Stay   |              |                    | Total |
|-----------------------------|--------------------|--------------|--------------------|-------|
|                             | Less Than One Week | 7 To 10 Days | More Than One Week |       |
| Foreign Tourists (Count)    | 85                 | 55           | 10                 | 150   |
| Foreign Tourists (percent)  | 56.67              | 36.67        | 6.67               | 100   |
| Domestic Tourists (Count)   | 90                 | 42           | 18                 | 150   |
| Domestic Tourists (percent) | 60                 | 28           | 12                 | 100   |
| Total (Count)               | 175                | 97           | 28                 | 300   |
| Total (percent)             | 58.33              | 32.33        | 9.33               | 100   |

Source: Field survey

Above table and graph – 14.7 shows that the intended to stay of Wellness tourists in Shivamogga district 58.33 percent of the respondents like to stay less than one week out of this 56.67 percent of respondents from foreign countries and 60 percent of the sample population from domestic and 32.33 percent of the tourists like to stay 7 to

10 days out of this 36.67 percent of the respondent tourists are from foreigners and 28 percent of the tourists are from domestic and 9.33 percent of the respondents like to stay more than one week out of this 6.67 percent of the respondents from foreign countries and 12 percent of the respondents are from domestic.



Table – 14.8

Classification of Tourists Based on Factors of Inspiration for Wellness Tourists to Visit Shivamogga District

| Factors of Inspiration For Wellness Tourists To Visit Shivamogga District |                     |                   |               |                                            |                             |                               |                                 | Total |
|---------------------------------------------------------------------------|---------------------|-------------------|---------------|--------------------------------------------|-----------------------------|-------------------------------|---------------------------------|-------|
| Tourist Details                                                           | Quality Environment | Healthy lifestyle | Stress relief | Improve ment in existing medical condition | Improve ment in bone health | Increased spiritual awareness | Promo te good health and others |       |
| Foreign Tourists (Count)                                                  | 26                  | 18                | 15            | 34                                         | 24                          | 22                            | 11                              | 150   |
| Foreign Tourists (percent)                                                | 17.33               | 12                | 10            | 22.67                                      | 16                          | 14.67                         | 7.33                            | 100   |
| Domestic Tourists (Count)                                                 | 30                  | 10                | 25            | 37                                         | 15                          | 23                            | 10                              | 150   |
| Domestic Tourists (percent)                                               | 20                  | 6.67              | 16.67         | 24.67                                      | 10                          | 15.33                         | 6.67                            | 100   |
| Total (Count)                                                             | 56                  | 28                | 40            | 71                                         | 39                          | 45                            | 21                              | 300   |
| Total (percent)                                                           | 18.67               | 9.33              | 13.33         | 23.67                                      | 13                          | 15                            | 7                               | 100   |

Source: Field survey

Table 14.8 indicates 23.67 percent of the Improvement in existing medical condition Wellness tourists have inspired and visited Shivamogga district for the purpose of wellness tourism itself, out of this 22.67 percent of the international tourists and 24.66 percent of the respondents are domestic country. The rest of the 18.67 percent of respondents visited shivamogga for Quality Environment out of this 17.33 percent of respondents are international tourists and 20 percent of the respondents are domestic tourists and followed with 15 percent of respondents for Increased spiritual awareness purpose out of this 14.67 percent of the sample population by foreign tourists and 15.33 percent of the respondents from domestic tourists and 13.33 percent of respondent tourists are visiting purpose of Stress

relief, among these 10 percent from foreign respondents and 16.67 percent of tourist respondents are from domestic. Then 13 percent of respondent tourists are visited Improvement in bone health purpose out of this 16 percent of respondents from foreign and 10 percent of the respondents are from domestic. 9.33 percent of respondent tourists are inspired to visit for Healthy lifestyle, among this 12 percent of respondents from foreign tourists and 6.67 percent of respondents are from domestic and 7 percent of respondent tourists are inspired to visit for Promote good health and other purpose among these 7.33 percent of respondents are from foreign and 6.67 percent of respondents are from domestic tourists.

Table – 14.9

Opinion about Charges/Prices During Visit at Shivamogga District by Wellness Tourists

| Prices Charged During the Visit |             |        |          |      |           | Total |
|---------------------------------|-------------|--------|----------|------|-----------|-------|
| Tourist Details                 | Very Costly | Costly | Moderate | Less | Very Less |       |
| Foreign Tourists (Count)        | 16          | 35     | 85       | 12   | 2         | 150   |
| Foreign Tourists (percent)      | 10.67       | 23.33  | 56.67    | 8    | 1.33      | 100   |
| Domestic Tourists (Count)       | 56          | 54     | 22       | 15   | 3         | 150   |
| Domestic Tourists (percent)     | 37.33       | 36     | 14.67    | 10   | 2         | 100   |
| Total (Count)                   | 72          | 89     | 107      | 27   | 5         | 300   |
| Total (percent)                 | 24          | 29.67  | 35.67    | 9    | 1.67      | 100   |

Source: Field survey



Table 14.9 explains that 24 percent of respondent wellness tourists felt charges/prices are very costly in Shivamogga district out of this 10.67 percent of tourists are foreign and 37.33 percent of respondents are domestic tourists. And 29.67 percent of the sample population told their opinions about prices are costly out of this 23.33 percent of respondents are international tourists and 36 percent of the respondents are domestic tourists. Then 35.67 percent of the sample population are told their opinion

**Table – 14.10**

**One – Sample T-Test Of Satisfaction Level of Tourists Towards the wellness Tourist Attraction in Shivamogga District. One-Sample Test**

| Test value = 3                              |           |     |             |                |
|---------------------------------------------|-----------|-----|-------------|----------------|
| Particulars                                 | T – value | DF  | P - value   | Critical value |
| Jog Falls                                   | 20.34     | 299 | 1.18635E-58 | 20.42          |
| Kodachadri Hills                            | 12.48     | 299 | 2.21303E-29 | 12.57          |
| Sakrebailu Elephant Camp                    | 12.08     | 299 | 6.04524E-28 | 12.16          |
| Agumbe Sunset View Point                    | 19.97     | 299 | 2.71929E-57 | 20.05          |
| Dabbe Falls                                 | 20.38     | 299 | 8.06556E-59 | 20.46          |
| Shivappa Nayaka Palace & Museum             | 13.99     | 299 | 6.91634E-35 | 14.07          |
| Tunga Anicut Dam                            | 6.22      | 299 | 7.91334E-10 | 6.35           |
| Keladi and Ikkeri Temple Complexes          | 9.47      | 299 | 4.32696E-19 | 9.56           |
| Shivamogga Zoo & Safari                     | 9.12      | 299 | 5.32894E-18 | 9.22           |
| Sri Raghavendra Yoga Kendra                 | 11.79     | 299 | 6.33918E-27 | 11.88          |
| Gnanakshetra, The Art of Living, Shivamogga | 8.93      | 299 | 2.14134E-17 | 9.03           |

Source: Field survey

The above tables 14.10 shows that 4.25 and 4.26 one sample T- test reveals the relationship between satisfaction levels of international and domestic tourists towards the various attractions in Shivamogga district. The results shows that all the respondent tourists are satisfied with all the places of Shivamogga district, as there is a significant relationship and the sample mean is less than critical value.

**Table – 14.11**

**One – Sample T - Test Of Satisfaction Level of Wellness Tourists Towards The Accommodation in Shivamogga District.- One-Sample Test**

| Test Value =3                 |          |     |             |                |
|-------------------------------|----------|-----|-------------|----------------|
| Particulars                   | T- Value | Df  | P- Value    | Critical Value |
| Cleanliness at Tourist Places | 27.00    | 299 | 1.68116E-82 | 27.09          |
| Rest Room Facilities          | 25.87    | 299 | 1.40429E-78 | 25.95          |
| Power Supply & Water Supply   | 21.38    | 299 | 1.6876E-62  | 21.46          |
| Food & Drinks                 | 13.61    | 299 | 1.74038E-33 | 13.69          |



|                             |       |     |             |       |
|-----------------------------|-------|-----|-------------|-------|
| Staff/Employee Co-Operation | 13.51 | 299 | 4.12866E-33 | 13.59 |
| Others Services             | 8.84  | 299 | 3.95081E-17 | 8.94  |
| Public Telephone/Internet   | 15.16 | 299 | 3.13736E-39 | 15.24 |
| Banking Facilities          | 22.19 | 299 | 1.73959E-65 | 22.28 |

Source: Field survey

The above tables 14.11 shows that 4.27 and 4.28 reveals that one sample t-test indicates the relationship between satisfaction level of foreign and domestic of wellness tourists towards the accommodation and its facilities provided at their duration of stay in Shivamogga district and its surrounding. The result shows that all the respondent tourists are satisfied with all the factors mentioned above.

#### Major Findings of Study

1. The study found that graduates (34.33%) and postgraduates (33.33%) constitute the majority of wellness tourists visiting Shivamogga district, indicating that educated travelers are more inclined toward wellness tourism activities.
2. Around 55% of tourists spend less than ₹50,000, while another 36% spend between ₹50,000 and ₹75,000, demonstrating that wellness tourism contributes significantly to the local economy.
3. Students (26.67%), employees (23.33%), and self-employed individuals (23.33%) form the largest categories of wellness tourists visiting Shivamogga district.
4. Waterfalls and natural attractions account for the highest purpose of visit (40.33%), followed by fairs and festivals (35.33%), yoga (15%), and Ayurveda (9.33%).
5. Most tourists (58.33%) prefer staying for less than one week, while only a small percentage extend their stay beyond one week.
6. Improvement in existing medical conditions (23.67%), quality environment (18.67%), and spiritual awareness (15%) are the major motivational factors encouraging tourists to visit Shivamogga.
7. A large proportion of tourists rated the prices of tourism services as moderate, although many domestic tourists perceived them as costly.
8. Statistical analysis using the one-sample t-test revealed that tourists are significantly satisfied with major tourist attractions such as Jog Falls, Kodachadri Hills, Agumbe, Sakrebailu Elephant Camp, Shivappa Nayaka Palace, and yoga centres.
9. Tourists also expressed high satisfaction with accommodation facilities, cleanliness, food services, banking facilities, internet access, and staff cooperation available in the district

#### Major Suggestions

- Improve road connectivity and public transportation to major wellness tourism destinations.
- Strengthen digital marketing through official tourism websites and social media to promote Shivamogga as a wellness tourism destination.
- Encourage investment in quality wellness resorts, eco-friendly accommodations, yoga centres, and Ayurveda treatment facilities.
- Develop integrated wellness tourism packages combining waterfalls, yoga, Ayurveda, wildlife, cultural festivals, and spiritual tourism.

- Upgrade sanitation facilities, public toilets, drinking water availability, and waste management at tourist destinations.
- Organize regular wellness festivals, yoga camps, meditation retreats, and cultural events to attract domestic and international visitors.
- Provide skill development and hospitality training to tourism service providers for improving visitor experiences.
- Encourage local community participation through handicrafts, traditional cuisine, cultural performances, and homestay programmes.
- Enhance multilingual tourist information systems, signage, mobile applications, and digital guide services.
- Implement sustainable tourism practices to conserve forests, waterfalls, wildlife, rivers, and cultural heritage while supporting long-term economic growth.

#### Conclusions

Wellness tourism is becoming an important driver of economic development and sustainable tourism worldwide. Shivamogga district possesses exceptional natural landscapes, waterfalls, forests, wildlife sanctuaries, yoga centres, Ayurveda institutions, spiritual destinations, and cultural heritage that together create excellent opportunities for wellness tourism development. The study demonstrates that tourists are generally satisfied with the attractions, accommodation, and tourism services available in the district. Wellness tourism not only promotes physical and mental well-being but also generates employment, increases local income, supports small businesses, and contributes to regional development. Despite these strengths, further improvements in infrastructure, transportation, sanitation, accommodation, promotion, and service quality are necessary to increase tourist arrivals and extend the duration of stay. Greater collaboration among government agencies, tourism stakeholders, local communities, and private investors will help establish Shivamogga as a leading wellness tourism destination in Karnataka and India. Overall, the study concludes that with strategic planning, sustainable management, effective marketing, and continuous improvement of tourism facilities, Shivamogga district has the potential to become a nationally and internationally recognized wellness tourism hub, delivering long-term economic, social, cultural, and environmental benefits.

#### Acknowledgement

The authors express their sincere gratitude to Government First Grade College, Gauribidanur, Chikkaballapur District, and Government First Grade College, Madugiri, Tumakuru District, Karnataka, for providing the academic environment, encouragement, and institutional support necessary for the successful completion of this research. The authors extend their heartfelt appreciation to colleagues, academicians, and research scholars for their valuable suggestions, constructive comments, and continuous encouragement throughout the course of this study. Their



support greatly contributed to improving the quality of this research. Special thanks are due to the Department of Tourism, Government of Karnataka, the Ministry of Tourism, Government of India, the Ministry of AYUSH, the Global Wellness Institute (GWI), and all the tourists, stakeholders, and respondents who participated in the survey and generously shared their valuable opinions and experiences. Their cooperation and the availability of official reports and statistical data were invaluable to the successful completion of this study. The authors also acknowledge the contributions of researchers, authors, and publishers whose books, research articles, journals, and official publications provided the theoretical foundation and essential references for this research. Finally, the authors express their sincere gratitude to their family members, friends, and well-wishers for their constant encouragement, patience, and unwavering moral support throughout the completion of this work.

#### **Financial support and sponsorship**

Nil.

#### **Conflicts of interest**

**The authors declare that there are no conflicts of interest regarding the publication of this paper.**

#### **References**

1. Balaguer, J., & Cantavella-Jordà, M. (2002). Tourism as a long-run economic growth factor: The Spanish case. *Applied Economics*, 34(7), 877–884. <https://doi.org/10.1080/00036840110058923>
2. Brida, J. G., & Pulina, M. (2010). *A literature review on the tourism-led-growth hypothesis*. University of Trento.
3. Brown, R. B. (2006). *Doing your dissertation in business and management: The reality of research and writing*. SAGE Publications.
4. Croes, R. (2006). A paradigm shift to a new strategy for small island economies: Embracing demand side economics for value enhancement and long-term economic stability. *Tourism Management*, 27(3), 453–465. <https://doi.org/10.1016/j.tourman.2004.12.003>
5. Dunn, H. L. (1961). *High-level wellness*. R. W. Beatty.
6. Global Wellness Institute. (2023). *Global wellness economy monitor 2023*. <https://globalwellnessinstitute.org>
7. Government of Karnataka. (2023). *Karnataka Economic Survey 2022–23*. Directorate of Economics and Statistics, Government of Karnataka.
8. Kothari, C. R. (2019). *Research methodology: Methods and techniques* (3rd ed.). New Age International Publishers.
9. McKinnon, R. I. (1964). Foreign exchange constraints in economic development and efficient aid allocation. *The Economic Journal*, 74(294), 388–409.
10. Ministry of AYUSH. (2023). *Annual report 2022–23*. Government of India. <https://ayush.gov.in>
11. Müller, H., & Kaufmann, E. L. (2001). Wellness tourism: Market analysis of a special health tourism segment and implications for the hotel industry. *Journal of Vacation Marketing*, 7(1), 5–17. <https://doi.org/10.1177/135676670100700101>
12. Ministry of Tourism. (2023). *India tourism statistics 2023*. Government of India. <https://tourism.gov.in>