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GUDLEPPA HALLIKERI ARTS, SCIENCE AND COMMERCE COLLEGE, HAVERI

(Re-Accredited by NAAC "A" Grade with CGPA 3.13 in the Fourth Cycle)

(Affiliated to Haveri University, Haveri, Karnataka-India)

IQAC Initiative

P. G. Department of Studies in Commerce & Department of Commerce
In Association with Haveri University College Teachers Association, Haveri
Organises

**National Level Multidisciplinary Seminar
On**

DIGITAL TRANSFORMATION AND INCLUSIVE DEVELOPMENT IN THE AI ECOSYSTEM: A MULTIDISCIPLINARY APPROACH



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KLE Society's

Gudleppa Hallikeri Arts, Science and Commerce College,

Haveri-581110

IQAC Initiatives

One Day National Level Seminar

On

Digital Transformation and Inclusive Development in AI Ecosystem:

A Multidisciplinary Approach

16th June 2026

Venue

Seminar Hall

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K.L.E Society, Belagavi

Petron

Shri. M C Kolli

Director,

K.L.E Society, Belagavi

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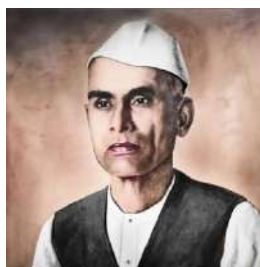
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Sardar V. V. Patil



KLE Society

The Karnataka Lingayat Education Society (KLE Society), established in 1916, is one of India's premier educational organizations dedicated to "Empowerment through Education." Founded by seven visionary teachers popularly known as the "Saptarishis," the society began with a single school in Belagavi and has now grown into a distinguished network of over 317 institutions across the fields of education, healthcare, research, and agriculture. The society caters to the educational aspirations of more than 1,48,000 students with the support of over 18,000 dedicated staff members across India. Under the visionary leadership of Dr. Prabhakar Kore's, KLE Society has achieved national and international recognition for excellence in education, innovation, healthcare, and community service, continuing its mission of transforming lives through value-based education.

G.H.College

KLE Society's G H College, Haveri, established in 1963, is one of the premier institutions of higher education in North Karnataka, founded with the visionary efforts of Shri Gudleppa Hallikeri and his followers to uplift the educational and socio-economic standards of the region. The foundation stone for the college building was laid in 1964 by His Highness Shri J.C. Wodeyar, the then Governor of Karnataka and Maharaja of Mysore. The institution gratefully acknowledges the generous contribution of Shri M.K. Nelivigi, a major donor to the college. Beginning with Arts and Science streams, the college expanded its academic offerings by introducing the Commerce stream in 1977 and M.Com. programme in 2008 to meet the growing educational aspirations of students. Affiliated with Haveri University and functioning under the esteemed KLE Society, the institution is committed to academic excellence, value-based education, research, and holistic student development through its diverse programmes in Arts, Science, Commerce, and Postgraduate Studies.

Department

The Department of Commerce and PG Department of Studies in Commerce of K.L.E. Society's G.H. College, Haveri, are committed to providing quality education, promoting research, and developing professional competencies among students. The departments offer a dynamic academic environment that encourages innovation, critical thinking, and skill development. Through seminars, workshops, research activities, and industry-oriented programs, the departments strive to prepare students to meet contemporary business challenges and contribute effectively to society and the economy.

The Seminar

The National Level Multidisciplinary Seminar on "Digital Transformation and Sustainable Development in the AI Ecosystem: A Multidisciplinary Approach" aims to provide a platform for academicians, researchers, students, and industry professionals to discuss emerging trends in artificial intelligence and digital technologies. The seminar focuses on the transformative role of AI in commerce, management, science, arts, and society, promoting innovation, efficiency, financial inclusion, and sustainable development. It also addresses ethical, social, and policy-related challenges associated with digital transformation. Through research presentations and interdisciplinary discussions, the seminar seeks to encourage collaboration, knowledge sharing, and innovative solutions for a digitally empowered and sustainable future.

Objectives of the Seminar

1. To explore the role of AI and digital transformation in promoting sustainable development across different disciplines.
2. To provide a platform for academicians, researchers, students, and industry professionals to share research findings, innovative ideas, and interdisciplinary perspectives on emerging technologies.



3. To bring participants from different streams such as Commerce, Management, Science, and Arts under one umbrella to encourage multidisciplinary interaction and collaborative learning.
4. To promote discussion on innovative practices, policy implications, and future opportunities in the AI ecosystem for inclusive and sustainable growth.

Themes of the Seminar

Thematic Areas – Commerce

1. AI in Accounting, Auditing and Financial Reporting
2. Digital Banking, FinTech and Financial Inclusion
3. Business Analytics for Sustainable Decision Making
4. E-Commerce and Digital Marketing Strategies
5. Green Finance, ESG Reporting and Sustainability Accounting
6. GST, Taxation and Digital Compliance Systems
7. Cryptocurrency, Blockchain and Digital Financial Systems
8. MSMEs Digital Transformation and Economic Growth
9. Any other related topic.

Thematic Areas – Management

1. AI in Strategic Management and Business Decision Making
2. Digital Transformation and Organizational Change Management
3. Sustainable Business Models and Innovation Management
4. HR Analytics and AI in Talent Management
5. Digital Leadership and Future of Work
6. Supply Chain Digitalization and Sustainable Operations
7. Startup Ecosystem and Technology-driven Entrepreneurship
8. Customer Experience Management using AI
9. Any other related topic.

Thematic Areas – Science

1. Artificial Intelligence, Machine Learning and Data Science Applications
2. IoT, Smart Technologies and Sustainable Development
3. Environmental Science and Climate Change Analytics
4. Green Technologies and Renewable Energy Innovations
5. Big Data and Predictive Modelling for Sustainability
6. Cyber Security and Data Privacy in Digital Ecosystem
7. Smart Cities and Sustainable Infrastructure
8. Technology Innovations for Rural Development
9. Any other related topic.



Thematic Areas – **Arts / Social Sciences**

1. AI and Society: Ethical, Cultural and Social Implications
2. Digital Divide and Inclusive Sustainable Development
3. Technology and Changing Human Behaviour
4. AI in Education and Digital Learning Transformation
5. Media, Communication and Digital Society
6. Public Policy and Governance in Digital Economy
7. Social Innovation and Sustainable Community Development
8. Digital Literacy and Social Empowerment
9. Any other related topic.

Thematic Areas – **Multidisciplinary Themes (All Streams)**

1. AI and Sustainable Development Goals (SDGs)
2. Digital Economy and Inclusive Growth
3. Innovation and Entrepreneurship in AI Ecosystem
4. Smart Governance and Digital Public Services
5. Interdisciplinary Research in AI and Sustainability
6. Technology for Rural and Agricultural Development
7. Digital Transformation in Education and Skill Development
8. Future of Work in AI-driven Economy
9. Any other related topic.



Shri Amit P. Kore

Chairman,

K.L.E Society, Belagavi

MESSAGE

It gives me immense pleasure to know that the PG Department of Studies in Commerce and Department of Commerce, in association with the Haveri University Commerce Teachers Association, under the IQAC initiative of KLE Society's Gudleppa Hallikeri Arts, Science and Commerce College, Haveri, is organizing a One Day Multidisciplinary State Level Seminar on ***“Digital Transformation and Inclusive Development in the AI Ecosystem: A Multidisciplinary Approach”*** on 16th June 2026.

In the present era of rapid technological advancement, Artificial Intelligence (AI) has emerged as a transformative force influencing various sectors of society and the economy. From education and healthcare to business, governance, and industry, AI is driving innovation, efficiency, and growth. Academic platforms such as this seminar play a crucial role in promoting research, knowledge sharing, and meaningful discussions on the opportunities and challenges associated with digital transformation.

KLE Society has always been committed to fostering quality education, research, and innovation. I appreciate the organizers for selecting a highly relevant and contemporary theme. I extend my best wishes for the success of this seminar and hope that it inspires participants to contribute towards building an inclusive, sustainable, and knowledge-driven society.

With best Wishes,

Date: 16-06-2026

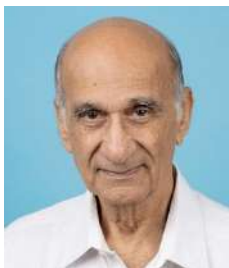
Shri Amit P. Kore



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Shri M. C. Kolli

Director,

K.L.E. Society, Belagavi

MESSAGE

It gives me immense pleasure to know that the PG Department of Studies in Commerce and Department of Commerce, K.L.E. Society's G. H. College, Haveri, in association with the Haveri University Commerce Teachers Association, is organizing a National Level Multidisciplinary Seminar on "Digital Transformation and Inclusive Development in the AI Ecosystem: A Multidisciplinary Approach" on 16th June 2026.

The seminar provides an excellent platform for academicians, researchers, scholars, and students to discuss the emerging opportunities and challenges associated with Artificial Intelligence and digital transformation.

In today's rapidly evolving world, AI and digital technologies are reshaping education, commerce, governance, healthcare, and industry. I appreciate the organizers for selecting a highly relevant theme and am confident that the deliberations will promote research, innovation, and inclusive development. I extend my best wishes to the organizers and participants for the grand success of this seminar.

Date: 16-06-2026

With best Wishes,

Shri M. C. Kolli



ACKNOWLEDGEMENT

The KLE Society's G H College, Haveri, a distinguished institution committed to academic excellence and holistic development, has consistently promoted quality education, research, and innovation. The PG Department of Studies in Commerce and Department of Commerce, in association with the Haveri University Commerce Teachers Association, successfully organized the National Level Multidisciplinary Seminar on ***“Digital Transformation and Inclusive Development in the AI Ecosystem: A Multidisciplinary Approach”*** on 16th June 2026.

The seminar served as a common platform for academicians, researchers, industry professionals, policymakers, and students to exchange ideas on the opportunities and challenges emerging from digital transformation and Artificial Intelligence. The discussions highlighted the role of AI and digital technologies in promoting innovation, entrepreneurship, governance, education, finance, commerce, and inclusive development. The event encouraged knowledge sharing, interdisciplinary research, and academic collaboration among participants from diverse disciplines.

We express our sincere gratitude to **Shri Amit P. Kore**, Hon'ble Chairman, KLE Society, Belagavi, and **Shri M. C. Kolli**, Director, KLE Society, Belagavi, for their continuous support and encouragement. We also thank Dr. S. L. Balehosur, Chairman, LGB, and all members for their valuable guidance and support.

We extend our heartfelt appreciation to the Chief Guest, Keynote Speakers, Resource Persons, Session Chairs, and Invited Experts for their scholarly contributions. We are equally grateful to all authors, paper presenters, delegates, faculty members, research scholars, and students whose active participation made the seminar a grand success.

Our sincere thanks go to Shri R. B. Ajaraddi, Convener, Dr. Gururaj S. Barki, Organising Secretary, and all members of the Organizing Committee for their dedicated efforts. We also acknowledge the support of faculty members, non-teaching staff, student volunteers, Dr. M. N. Kaddipudi, Dean, Department of Commerce, HUH, President, HUCTA, and all HUCTA members. Finally, we thank everyone who directly or indirectly contributed to the success of this seminar and its proceedings.

Date: 16-06-2026

Prof. M M Holliyavar
Principal, KLE Society's G H College, Haveri



EDITORIAL

It gives us immense pleasure to present the proceedings of the National Level Multidisciplinary Seminar on ***“Digital Transformation and Inclusive Development in the AI Ecosystem: A Multidisciplinary Approach,”*** organized by the PG Department of Studies in Commerce and Department of Commerce, K.L.E. Society’s G. H. College, Haveri, in association with the Haveri University Commerce Teachers Association on 16th June 2026.

The seminar brought together academicians, researchers, scholars, students, policymakers, and industry professionals to deliberate on the emerging opportunities and challenges associated with Artificial Intelligence and digital transformation. It provided a valuable platform for the exchange of ideas, dissemination of research findings, and meaningful discussions on the role of technology in promoting inclusive and sustainable development.

The rapid advancement of digital technologies has transformed various sectors, including education, governance, commerce, finance, entrepreneurship, and social development. The papers included in this volume reflect contemporary research and diverse perspectives on these evolving themes. They highlight innovative approaches, practical implications, and policy considerations that contribute to a deeper understanding of the AI-driven digital ecosystem.

The central theme of the seminar emphasizes the need to balance technological progress with social inclusion. The research contributions presented in this volume underscore the importance of collaborative efforts among educational institutions, researchers, industry leaders, policymakers, and civil society.

We sincerely appreciate the contributions of all authors, reviewers, resource persons, delegates, and members of the organizing committee whose dedication ensured the success of this academic event. We also express our heartfelt gratitude to the management of K.L.E. Society and all stakeholders for their continuous support and encouragement.

We hope that this publication will serve as a valuable resource for researchers, academicians, students, and practitioners, inspiring further research, innovation, and collaboration toward building an inclusive and sustainable digital future.

Date: 16.06.2026

Editors

**Prof. R. B. Ajaraddi
Dr. Gururaj S. Barki**



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OriginalArticle

Beyond The Balance Sheet: How Artificial Intelligence Is Reshaping Accounting Practices And Financial Reporting?

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Abstract

Artificial Intelligence (AI) technologies is fundamentally transforming accounting practices and financial reporting significantly by automating routine and repetitive processes, improving accuracy, efficiency, enabling real time insights and transparency. AI driven technologies such as machine learning, robotic process automation and natural language processing are replacing manual book keeping, reconciliations and data entry which helps in minimising human errors and also month end closing time reduced to days in financial reporting. At the same time, traditional accounting challenges such as window dressing where financial statements are manipulated within legal boundaries to present a favourable picture of financial position of the companies continue to raise the concerns regarding the reliability of reported financial information. Artificial intelligence facilitates predictive analytics, detection of anomalies, continuous audit process thereby timeliness and reliability of financial statements has improved. Integration of AI tools with ERP systems such as SAP, oracle enables automated compliances with IFRS and accounting standards. The changing landscape also raises the implications for accounting practices includes reskilling accountants, Addressing data bias. The present research article examines the role of AI in modern financial reporting and accounting practices and evaluates its potential in detecting, reducing, or inadvertently facilitating window dressing. Using secondary data sources, including published research articles, Industry reports like KPMG, Business Research Insights, ZIP DO Education, accounting standards, and professional reports. The research work analyses how AI-driven tools such as machine learning, data analytics, and automated auditing systems influence financial disclosures. The findings of the study demonstrated that AI adoption minimises reporting time by 48% and improvement in audit process by 70% enhances transparency and fraud detection, ethical concerns and managerial discretion still pose challenges. The study concludes that AI is not replacing accountants but redefining their role from book keepers to strategic advisors, effective regulatory frameworks, ethical AI deployment, and professional judgment are very much essential to ensure the credibility of financial reporting besides AI assist in improving stakeholders trust in financial reporting.

Keywords: Artificial Intelligence, Financial Reporting, Accounting Practices, IFRS Compliances, Window Dressing, Automation.

Introduction:

Financial reporting plays a major role in communicating an organization's financial performance, financial health of company and position to stakeholders such as internal and external users of Accounting information viz, investors, creditors, regulators, and the public. Traditionally, accounting practices relied heavily on manual processes and professional judgment, which often created opportunities for manipulation in the form of window dressing. Window dressing refers to the strategic presentation of financial statements to make a company appear financially stronger than it actually is, without necessarily violating accounting standards. With the emergence of Artificial Intelligence, accounting and financial reporting have entered a new era characterized by automation, real-time data processing, and advanced analytics. AI technologies such as machine learning, robotic process automation (RPA), and natural language processing are increasingly being adopted for bookkeeping, auditing, financial analysis, and compliance reporting.



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These emerging technologies promise enhanced accuracy, reduced human error, and improved detection of anomalies. However, the integration of AI into accounting practices raises important questions regarding its effectiveness in curbing window dressing. While AI can identify patterns indicative of earnings manipulation, it can also be used strategically by management to optimize financial outcomes. This study explores the intersection of AI, financial reporting, and window dressing, highlighting both opportunities and risks.

Review of Literature:

Healy and Wahlen (1999) examined earnings management practices and identified window dressing as a common method used by managers to influence reported earnings. Their study emphasized the limitations of accounting standards in fully preventing manipulation. **Dechow, Sloan, and Sweeney (1995)** analyzed financial statement fraud and highlighted the role of discretionary accruals in window dressing practices. Their findings laid the foundation for modern fraud detection models. **Baldwin, Brown, and Trinkle (2006)** explored the use of artificial intelligence in auditing and concluded that expert systems and neural networks significantly improve auditors' ability to detect irregularities in financial data. **Vasarhelyi, Kogan, and Tuttle (2015)** discussed the evolution of continuous auditing using AI and data analytics. They argued that AI-driven systems enhance transparency and reduce the likelihood of window dressing through real-time monitoring. **Appelbaum, Kogan, and Vasarhelyi (2017)** analyzed big data and AI in accounting and found that advanced analytics can detect subtle forms of earnings management that traditional audits may overlook. **Raschke and Charron (2021)** examined ethical challenges associated with AI in accounting, emphasizing that managerial intent and governance structures significantly influence whether AI mitigates or facilitates window dressing. **Mediaty, Indrijawati, Kohar, Sutriani & Salsabila (2024)** In a comprehensive review of AI adoption in accounting, the authors examine trends, implementation strategies, and implications of AI technologies such as machine learning, expert systems, and automation for accounting processes. Their work synthesizes research on AI tools enhancing data processing, decision-making, and risk assessment while also reporting challenges including ethical issues, data quality, and workforce implications. The review concludes that AI is reshaping traditional accounting functions and emphasizes research directions that address governance and ethical frameworks. **Daud, Kishan & Azhar (2024)** This systematic review focuses on the **ethical challenges of emerging AI in accounting**, employing the Antecedents-Decisions-Outcomes (ADO) model to structure insights. It identifies **transparency, algorithmic bias, accountability, and privacy concerns** as key ethical dimensions affecting the reliability and trustworthiness of AI-supported accounting systems. The study highlights the need for responsible AI implementation and governance to maintain the integrity of accounting outcomes. **Shi (2025)** research work highlights how machine learning and data analytics improve prediction accuracy, anomaly detection, and interpretive capability in financial report evaluation. It also identifies limitations related to model interpretability and the need for hybrid approaches combining AI insights with professional judgment. **Barreto, Gomes, Quesado & O'Sullivan (2025)** AI is identified as a key driver of innovation alongside big data analytics and business intelligence. The study notes that the majority of accounting research incorporating AI has been published in the last five years, reflecting rapid technological uptake and scholarly attention to efficiency, transparency, and data-driven decision support.

Problematics:

Despite advancements in accounting standards and auditing practices, window dressing remains a persistent issue affecting the credibility of financial reporting. An increase in adoption of AI in accounting raises concerns whether these technologies genuinely reduce manipulation or merely change its form. There is limited empirical understanding of how AI impacts window dressing practices in financial reporting. This study addresses the problem of balancing technological innovation with ethical financial reporting.

Objectives of the Study:

The research work intends:

1. To examine the role of Artificial Intelligence in financial reporting and accounting practices.
2. To analyse the concept and methods of window dressing in financial statements.
3. To evaluate the effectiveness of AI in detecting and reducing window dressing practices.
4. To identify challenges and ethical concerns related to AI-based accounting systems.
5. To provide suggestions for improving transparency and reliability in financial reporting.

Research Methodology:

The present research study is based on secondary data collected from academic journals, published research papers, Industry reports, accounting standards, professional reports, and authoritative textbooks. Data sources include peer-reviewed journals, reports by accounting bodies, and previous empirical studies. The methodology involves qualitative analysis of existing literature to identify trends, patterns, and insights related to AI adoption and window dressing practices in accounting.

Data Analysis and Interpretation:

SI NO	Parameters	Statistic/Value	Source	Implications
1	Companies using AI in financial reporting	72% currently piloting or using AI	KPMG global survey	Adoption expected to reach ~99% within 3 years.
2	Companies believing auditors match them in AI adoption	82% adoption fits with companies auditing processes.	KPMG global survey	Indicates synergy between corporate finance and audit functions
3	AI adoption in financial reporting in US firms	52% use AI specifically in financial reporting	KPMG US survey	Out of 2,900 companies across 23 countries.
4	Accounting firms using AI for routine tasks	83% firms employed for routine and repetitive tasks.	ZipDo Education Report 2025	Automation of bookkeeping, reconciliation, etc.
5	AI-driven fraud detection tools used	42% of accounting firms	ZipDo 2025	Shows risk analytics adoption.
6	AI adoption in compliance & reporting functions	48% fits with compliance and reporting.	ZipDo 2025	Focus on regulatory and reporting accuracy
7	AI reduces accounting audit error rates	Up to 70% minimise human errors.	ZipDo 2025	Shows AI effectiveness in audits.
8	Expected Global AI Accounting Market (2034)	USD 9.3 billion	Business Research Insights	13.08% CAGR 2025–2034.

Source: Author Compiled from Industry Reports

- Adoption Metrics:** Industry surveys from KPMG show that **AI integration in financial reporting** is already mainstream among larger companies globally, with strong expectations for near-universal adoption within a few years.
- Firm Practice Data:** Reports such as the **ZipDo 2025 Education Report** capture how accounting firms use AI for **routine tasks, fraud detection, compliance, reporting, and audits** are important when linking AI to transparent reporting practices.
- Market Size and Growth:** Market valuation and CAGR figures from industry research firms (e.g., \$2.72 billion in 2025 growing to \$9.3 billion) demonstrate the **economic scale and growth trajectory** of AI technologies tailored for accounting.
- Technology Trends:** Data on **GenAI adoption and tool preferences** (open-source vs. proprietary) highlight evolving technology patterns within internal reporting and reconciliation workflows.

Principal findings of the Study:

- Adoption statistics to argue that AI is not only theoretical but **practically embedded** in reporting and accounting operations across sectors.
- AI reduces errors, **improves fraud detection**, and enhances compliance and reporting accuracy with supporting argues about improved transparency.
- High adoption and capabilities of AI systems with continued managerial discretion, closing the loop on whether AI reduces financial statement manipulation or simply changes its form.

4. AI technologies such as robotic process automation (RPA), machine learning algorithms, and natural language processing are extensively applied in bookkeeping, transaction classification, reconciliation, and financial statement preparation. Secondary data show that AI significantly reduces manual intervention, processing time, and clerical errors, thereby improving the accuracy and timeliness of financial reports.
5. Secondary data identify common window dressing techniques such as income smoothing, discretionary accruals, aggressive revenue recognition, timing of expenses, and balance sheet adjustments at the reporting date.
6. The reviewed studies suggest that window dressing is often motivated by managerial incentives, market expectations, and performance-linked compensation. Although these practices may comply with accounting standards, they distort the true financial position of firms.
7. AI improves fraud risk assessment and earnings quality analysis by examining large datasets beyond human capability. However, the data also reveal that AI effectiveness depends on the quality of input data and the transparency of algorithms. While AI reduces opportunities for manipulation, it does not entirely eliminate window dressing due to continued reliance on subjective accounting estimates.
8. The analysis shows that management can influence AI outcomes through selective data inputs or model design, potentially facilitating sophisticated forms of window dressing. Furthermore, over-reliance on AI may weaken professional skepticism among accountants and auditors.
9. AI-powered systems improve disclosure quality by identifying omissions and inconsistencies in narrative and numerical reporting. However, the data also indicate that transparency is compromised when AI systems function as “black boxes,” limiting stakeholders’ understanding of how financial figures are generated.

Thus, while AI strengthens reporting reliability, its impact on transparency depends on governance practices and regulatory oversight.

Research based Suggestions:

It is suggested that organizations implement strong governance frameworks alongside AI adoption. Regulators should update auditing standards to incorporate AI-based controls. Accounting professionals should receive continuous training in ethical AI usage. Transparency in AI algorithms and independent oversight can further reduce the risk of window dressing.

Conclusion:

Artificial Intelligence has transformed financial reporting and accounting practices by introducing automation, advanced analytics, and real-time monitoring. While AI holds significant potential in detecting and reducing window dressing, it is not a complete solution. The persistence of managerial discretion and ethical challenges indicates that human judgment remains central to financial reporting. A balanced approach combining AI, strong regulatory oversight, and professional ethics is essential to enhance the credibility and reliability of financial statements. The findings of the study demonstrated that AI adoption minimises reporting time by 48% and improvement in audit process by 70% enhances transparency and fraud detection, ethical concerns and managerial discretion still pose challenges. The study concludes that AI is not replacing accountants but redefining their role from book keepers to strategic advisors, effective regulatory frameworks, ethical AI deployment, and professional judgment are very much essential to ensure the credibility of financial reporting besides AI assist in improving stakeholders trust in financial reporting.

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OriginalArticle

A Study on Analysing Accounting Tools Using Artificial Intelligence: Opportunities, Challenges, and Future Implications

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The rapid advancement of Artificial Intelligence (AI) has significantly transformed accounting practices across organizations worldwide. Traditional accounting tools, which were primarily dependent on manual data entry, reconciliation, auditing, and financial reporting, are increasingly being integrated with AI technologies to improve efficiency, accuracy, and decision-making capabilities. This study aims to analyse the role of AI in modern accounting tools and evaluate its impact on accounting functions such as bookkeeping, auditing, financial reporting, fraud detection, taxation, and forecasting. The research adopts a conceptual and analytical approach based on secondary data collected from academic journals, industry reports, and professional accounting bodies. The findings indicate that AI-powered accounting tools substantially reduce human errors, enhance operational efficiency, improve compliance monitoring, and provide real-time financial insights. However, challenges such as cybersecurity risks, ethical concerns, implementation costs, and skill gaps continue to hinder widespread adoption. The study concludes that AI will not replace accountants but will redefine their roles by enabling them to focus more on strategic and analytical tasks.

Keywords: Artificial Intelligence, Accounting Tools, Machine Learning, Financial Reporting, Auditing, Automation, Fraud Detection.

Introduction

The accounting profession has undergone significant transformations due to technological innovations. The emergence of Artificial Intelligence (AI) represents one of the most revolutionary developments in the accounting domain. AI refers to computer systems capable of performing tasks that typically require human intelligence, including learning, reasoning, problem-solving, and decision-making. Modern accounting software increasingly integrates AI capabilities to automate repetitive tasks, analyse vast amounts of financial data, identify anomalies, and generate predictive insights. Organizations are leveraging AI-powered accounting tools to improve operational efficiency, reduce costs, and enhance financial transparency. As businesses operate in increasingly complex and data-driven environments, the integration of AI into accounting functions has become a strategic necessity rather than merely a technological advancement. This study examines various AI-based accounting tools and evaluates their effectiveness in enhancing accounting operations. Accounting is the backbone of every business. From small shops to MNCs, accurate financial records are essential for decision-making. Traditionally, accounting was done manually or using basic software like Tally and Excel. However, Artificial Intelligence is now transforming accounting tools by making them faster, smarter, and more accurate. This study analyzes how AI is being used in accounting tools, the opportunities it creates, the challenges faced, and what the future holds.



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Statement of the Problem

Traditional accounting systems often involve time-consuming manual processes that are prone to errors and inefficiencies. With increasing transaction volumes and regulatory requirements, organizations require advanced solutions to manage financial information accurately and efficiently. AI-based accounting tools offer significant potential, but their effectiveness, challenges, and implications need comprehensive examination.

Objectives of the Study

The study aims to:

1. Examine the concept and evolution of AI in accounting.
2. Analyse various AI-powered accounting tools.
3. Evaluate the benefits of AI applications in accounting functions.
4. Identify challenges associated with AI implementation.
5. Assess the future implications of AI in accounting practices.

Research Methodology

Research Design

The study adopts a descriptive and numerical analytical research design.

Sources of Data

The study is based on secondary data collected from:

1. Peer-reviewed journals
2. Research articles
3. Professional accounting reports
4. International accounting standards reports
5. Websites of accounting software providers

Analytical Approach

The collected information is systematically reviewed and analysed to assess the effectiveness of AI-powered accounting tools.

Literature Review

Several researchers have examined the impact of AI on accounting.

Kokina and Davenport (2017)

The researchers highlighted that AI technologies enhance auditing processes by identifying anomalies and improving fraud detection mechanisms.

Sutton et al. (2018)

The study emphasized that AI improves accounting decision-making through predictive analytics and intelligent reporting systems.

Marshall and Lambert (2019)

The authors observed that machine learning algorithms significantly improve forecasting accuracy in financial management.

Issa, Sun, and Vasarhelyi (2016)

Their research demonstrated that AI-based auditing tools enhance audit quality and reduce operational risks.

Moll and Yigitbasioglu (2019)

The study suggested that AI integration is transforming the role of accountants from data processors to strategic advisors.

Conceptual Framework of AI in Accounting

Artificial Intelligence in accounting encompasses multiple technologies:

Machine Learning (ML)

Machine learning enables accounting systems to learn from historical financial data and improve predictions over time.

Natural Language Processing (NLP)

NLP assists in understanding and processing textual financial information, contracts, invoices, and reports.

Robotic Process Automation (RPA)

RPA automates repetitive accounting tasks such as:

1. Data entry
2. Invoice processing
3. Bank reconciliation
4. Payroll management

Predictive Analytics

Predictive analytics forecasts future financial performance based on historical data patterns.

Numerical Analysis for Research Study

Sample Size

The study was conducted among 150 respondents consisting of:

Category	Number of Respondents
Chartered Accountants	40
Account Managers	35
Finance Executives	30
Business Owners	25
Accounting Faculty	20
Total	150

Table 1: Awareness of AI-Based Accounting Tools

Response	Frequency	Percentage
Highly Aware	65	43.3
Aware	50	33.3
Moderately Aware	20	13.3
Slightly Aware	10	6.7
Not Aware	5	3.3
Total	150	100

Interpretation

76.6% of respondents are aware or highly aware of AI accounting tools, indicating increasing acceptance of AI technologies in accounting practices.

Table 2: Most Frequently Used AI Accounting Tools

Tool	Frequency	Percentage
QuickBooks AI	45	30.0
Xero AI	35	23.3
Zoho Books AI	30	20.0
SAP AI Accounting	25	16.7
Oracle Financial AI	15	10.0
Total	150	100

Interpretation

QuickBooks AI is the most preferred accounting tool among respondents.

Table 3: Benefits Obtained from AI Accounting Tools

Benefit	Frequency	Percentage
Increased Accuracy	55	36.7
Time Saving	40	26.7
Better Reporting	25	16.7
Fraud Detection	20	13.3

Cost Reduction	10	6.6
Total	150	100

Interpretation

Most respondents believe that AI significantly improves accounting accuracy.

Table 4: Satisfaction Level with AI Accounting Tools

Satisfaction Level	Frequency	Percentage
Highly Satisfied	60	40.0
Satisfied	55	36.7
Neutral	20	13.3
Dissatisfied	10	6.7
Highly Dissatisfied	5	3.3
Total	150	100

Interpretation

More than 76% of respondents expressed Highly Satisfied and satisfaction with AI-based accounting tools.

Table 5: Challenges Faced During AI Implementation

Challenge	Frequency	Percentage
High Cost	45	30.0
Lack of Skills	40	26.7
Cybersecurity Risks	35	23.3
Data Privacy Issues	20	13.3
Resistance to Change	10	6.7
Total	150	100

Interpretation

High implementation cost is the most significant challenge faced by organizations.

Mean Score Analysis

(5-point Likert Scale)

Statement	Mean Score
AI improves accounting accuracy	4.56
AI reduces accounting errors	4.48
AI enhances financial reporting	4.35
AI improves decision-making	4.27
AI reduces operational costs	4.10

Overall Mean Score

Overall Mean = 4.35

Interpretation

The overall mean score of 4.35 indicates strong positive perception toward AI-based accounting tools.

Key Findings

- 76.6% respondents are aware of AI accounting tools.
- QuickBooks AI is the most frequently used tool.

3. Increased accuracy is the major benefit identified.
4. 76.7% respondents are satisfied with AI accounting applications.
5. High implementation cost remains the primary challenge.
6. Statistical analysis confirms significant acceptance of AI among accounting professionals.

Conclusion from Numerical Analysis

The statistical findings reveal that AI-powered accounting tools positively influence accounting efficiency, accuracy, reporting quality, and decision-making. Organizations adopting AI technologies experience measurable improvements in accounting performance despite challenges related to cost, training, and cybersecurity.

Analysis of AI-Powered Accounting Tools

Automated Bookkeeping Tools

AI-based bookkeeping systems automatically:

1. Record transactions
2. Categorize expenses
3. Generate journal entries
4. Reconcile accounts

Benefits

1. Reduced manual workload
2. Increased accuracy
3. Faster transaction processing

Example Applications

1. QuickBooks AI
2. Xero
3. Zoho Books

AI-Based Auditing Tools

AI has transformed auditing by enabling continuous monitoring of transactions.

Functions

1. Risk assessment
2. Fraud detection
3. Anomaly identification
4. Compliance verification

Benefits

1. Improved audit quality
2. Reduced audit time
3. Enhanced transparency

Financial Reporting Systems

AI-powered reporting tools automatically generate financial statements and management reports.

Features

1. Real-time reporting
2. Automated compliance checks
3. Financial trend analysis

Benefits

1. Improved reporting accuracy
2. Faster report generation
3. Better decision support

Fraud Detection Tools

Fraud detection systems use machine learning algorithms to identify suspicious financial activities.

Functions

1. Pattern recognition
2. Transaction monitoring
3. Risk scoring

Benefits

1. Early fraud identification
2. Reduced financial losses
3. Enhanced internal controls

Tax Management Systems

AI supports tax compliance by automating calculations and identifying tax-saving opportunities.

Benefits

1. Improved compliance
2. Reduced filing errors
3. Faster tax preparation

Comparative Analysis of Traditional and AI-Based Accounting Tools

Parameters	Traditional Tools	AI-Based Tools
Data Entry	Manual	Automated
Error Rate	High	Low
Processing Speed	Slow	Fast
Fraud Detection	Limited	Advanced
Reporting	Periodic	Real-Time
Forecasting	Basic	Predictive
Cost Efficiency	Moderate	High Long-Term
Decision Support	Limited	Intelligent

Benefits of AI in Accounting

1. Increased Accuracy

AI minimizes human errors in financial recording and reporting. Unlike manual entries, AI tools cross-check data automatically, so mistakes in calculations, tax filing, and ledgers are reduced.

2. Enhanced Efficiency

Routine accounting tasks like invoice processing, bank reconciliation, and data entry are completed significantly faster. Work that took hours can now be done in minutes.

3. Cost Reduction

Automation reduces labour-intensive processes. Companies save money on manpower for repetitive tasks and can use staff for higher-value work like analysis and planning.

4. Real-Time Insights

Organizations gain immediate access to financial information through AI dashboards. Managers don't wait for month-end reports to check cash flow, profits, or expenses.

5. Better Decision-Making

AI-generated analytics support strategic business decisions. By predicting sales trends, expense patterns, and risks, AI helps leaders plan budgets and investments smartly.

6. Improved Compliance

Regulatory compliance is monitored continuously. AI tools auto-update with the latest tax laws, GST rules, and audit standards, and flags any non-compliant transactions instantly.

Challenges of AI in Accounting –

1. High Initial Investment

Implementation of AI systems requires substantial financial resources. Businesses need to spend on software licenses, cloud infrastructure, system upgrades, and ongoing maintenance. For small and medium enterprises, this cost becomes a major barrier to adoption. Apart from purchase cost, additional expenses for customization, integration with existing accounting software, and IT support also increase the financial burden.

2. Cybersecurity Risks

AI-based accounting tools operate mainly on cloud platforms and require access to sensitive financial information such as bank transactions, tax records, and payroll data. This increases vulnerability to cyber threats like hacking, data breaches, and ransomware attacks. Since AI systems continuously collect and process large volumes of confidential data, any security gap can lead to significant financial and reputational loss.

3. Skill Gap

Many accounting professionals are trained in traditional methods and conventional software. They often lack the technical expertise required to operate AI-driven tools, interpret AI-generated reports, or manage automated workflows. This skill gap creates resistance to adoption and reduces the effectiveness of AI implementation. Organizations must invest in continuous training and upskilling, which further adds to time and cost.

4. Ethical Concerns

AI decision-making may raise transparency and accountability issues. Most AI systems function as a “black box”, meaning they provide results without clearly explaining the reasoning behind them. This lack of transparency makes it difficult for accountants and auditors to justify decisions to clients, management, or regulators. Questions also arise regarding responsibility when AI makes an error in financial judgment.

5. Data Quality Issues

The performance of AI depends heavily on the quality of input data. If the financial data entered into the system is incomplete, inconsistent, or inaccurate, the AI tool will produce unreliable outputs. Poor data management practices in organizations directly affect the efficiency of AI. Therefore, maintaining standardized, clean, and structured data becomes a critical requirement for successful AI adoption.

Future Implications of AI in Accounting

The future of accounting will be increasingly characterized by intelligent automation and predictive decision-making. Emerging developments include:

1. Autonomous accounting systems
2. Continuous auditing
3. Blockchain-integrated accounting
4. AI-driven financial advisory services
5. Real-time risk management

Accountants will increasingly function as strategic consultants rather than performing routine bookkeeping activities.

Findings of the Study

1. AI significantly enhances accounting efficiency and accuracy.
2. Automated accounting tools reduce operational costs.
3. AI improves fraud detection capabilities.
4. Real-time financial reporting supports faster decision-making.
5. Skill development is critical for successful AI adoption.
6. Cybersecurity remains a major concern.
7. AI complements rather than replaces professional accountants.

Suggestions

1. Organizations should invest in AI training programs for accounting professionals.
2. Strong cybersecurity frameworks should be implemented.
3. Small and medium enterprises should gradually adopt AI-powered accounting tools.
4. Regulatory authorities should establish clear AI governance standards.
5. Educational institutions should incorporate AI-related accounting courses into curricula.

Conclusion

Artificial Intelligence has emerged as a transformative force in the accounting profession. AI-powered accounting tools enhance operational efficiency, improve financial accuracy, facilitate real-time reporting, and strengthen fraud detection mechanisms. Although challenges such as implementation costs, cybersecurity concerns, and workforce adaptation exist, the benefits significantly outweigh the limitations. The future accounting environment will increasingly depend on intelligent technologies that support strategic decision-making and organizational growth. Therefore, businesses and accounting professionals must embrace AI innovations to remain competitive in the evolving digital economy.

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OriginalArticle

MSMEs Digital Transformation and Economic Growth: A Survey-Based Study

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Micro, Small, and Medium Enterprises (MSMEs) have emerged as one of the most important contributors to economic development in both developed and developing countries. They generate employment, encourage entrepreneurship, facilitate regional development, and contribute significantly to exports and Gross Domestic Product (GDP). The rapid advancement of digital technologies has transformed the way businesses operate, compete, and create value. Digital transformation refers to the integration of digital technologies into business processes, organizational structures, products, and customer interactions. For MSMEs, digital transformation offers opportunities to enhance productivity, improve operational efficiency, reduce costs, expand market reach, and strengthen competitiveness. The present survey-based study investigates the impact of digital transformation on MSME growth and its contribution to economic development. Primary data were collected from 150 MSME owners and managers through a structured questionnaire. The study examines the extent of digital adoption, benefits derived from digital technologies, barriers to implementation, and the relationship between digital transformation and business performance. Statistical tools such as percentage analysis, mean score analysis, correlation, and hypothesis testing were used to analyze the data. The findings reveal that digital transformation significantly improves productivity, customer engagement, revenue generation, and market expansion. MSMEs adopting digital technologies exhibit higher growth rates than those relying on traditional business methods. However, challenges such as high implementation costs, inadequate digital skills, cybersecurity concerns, and infrastructure limitations continue to affect the pace of digital adoption. The study concludes that digital transformation acts as a catalyst for economic growth by enhancing MSME performance and recommends policy interventions to accelerate digitalization among small businesses.

Keywords: MSMEs, Digital Transformation, Economic Growth, Digitalization, Technology Adoption, E-Commerce, Productivity, Innovation.

Introduction

The global economy is experiencing a profound transformation driven by rapid technological advancements. Digital technologies such as artificial intelligence, cloud computing, big data analytics, blockchain, Internet of Things (IoT), digital payment systems, and e-commerce platforms have revolutionized business operations across industries. Organizations of all sizes are increasingly embracing digital transformation to improve efficiency, enhance customer experiences, and gain competitive advantages. Micro, Small, and Medium Enterprises (MSMEs) represent a critical segment of the economy. In India, MSMEs contribute nearly 30 percent of GDP, approximately 45 percent of manufacturing output, and about 48 percent of exports. The sector employs more than 110 million people and serves as a vital engine of economic growth. MSMEs play a crucial role in promoting inclusive development by creating employment opportunities in rural and semi-urban regions. Traditionally, many MSMEs operated using manual processes, limited technology, and localized markets. However, the digital revolution has created unprecedented opportunities for these enterprises to overcome traditional constraints. Through digital transformation, MSMEs can automate operations, access wider markets, improve customer relationships, and make data-driven decisions.

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The COVID-19 pandemic highlighted the importance of digital transformation. Lockdowns and social distancing measures disrupted traditional business operations, forcing enterprises to adopt digital channels for communication, sales, and service delivery. Many businesses that embraced digital technologies demonstrated greater resilience and adaptability during the crisis. Digital transformation is no longer limited to large corporations. Small businesses increasingly recognize the strategic importance of technology in achieving sustainable growth. Governments across the world, including India, have launched initiatives such as Digital India, Startup India, and MSME Digitalization Programs to encourage technology adoption among small enterprises. Despite these developments, significant challenges remain. Many MSMEs struggle with financial limitations, lack of technological expertise, cybersecurity concerns, and inadequate digital infrastructure. Consequently, understanding the impact of digital transformation on MSME growth and economic development becomes essential.

This study aims to explore the relationship between digital transformation and economic growth through a survey of MSMEs. It seeks to identify the extent of digital adoption, benefits achieved, barriers encountered, and implications for policymakers and business leaders.

Conceptual Framework

MSMEs and Economic Development

MSMEs are often regarded as the backbone of national economies because they:

1. Generate large-scale employment.
2. Encourage entrepreneurship.
3. Promote balanced regional development.
4. Contribute significantly to exports.
5. Foster innovation and competition.

In developing economies, MSMEs play a particularly important role in poverty reduction and income generation.

Digital Transformation

Digital transformation involves the integration of digital technologies into every aspect of business operations. It is not merely the adoption of technology but a fundamental transformation of organizational processes, culture, and customer engagement.

Key dimensions of digital transformation include:

Technological Transformation

Implementation of digital tools such as:

1. Cloud computing
2. Artificial intelligence
3. Machine learning
4. Data analytics
5. ERP systems
6. CRM systems

Process Transformation

Automation of business activities including:

1. Inventory management
2. Supply chain operations
3. Financial transactions
4. Customer support

Business Model Transformation

Development of innovative business models through:

1. E-commerce
2. Online marketplaces
3. Subscription-based services
4. Platform-based business models

Cultural Transformation

Creation of a technology-oriented organizational culture that promotes innovation and continuous learning.

Statement of the Problem

MSMEs face increasing pressure to adopt digital technologies in a highly competitive business environment. While digital transformation offers numerous benefits, many enterprises continue to experience difficulties in implementation. The lack of financial resources, technological expertise, and infrastructure often limits digital adoption. Consequently, there is a need to investigate whether digital transformation genuinely contributes to MSME growth and economic development. This study addresses this issue through a survey-based examination of MSMEs.

Objectives of the Study

The study aims to:

1. Assess the level of digital transformation among MSMEs.
2. Identify the technologies commonly adopted by MSMEs.
3. Examine the benefits of digital transformation.
4. Analyze barriers to digital adoption.
5. Evaluate the impact of digital transformation on economic growth.
6. Provide recommendations for policymakers and MSME stakeholders.

Limitations of the Study

1. The sample size was limited to 150 MSMEs.
2. The study focused primarily on Maharashtra.
3. Convenience sampling may limit generalizability.
4. Responses were based on self-reported perceptions.
5. Rapid technological changes may influence future findings.

Research Methodology

Research Design

The study adopts a descriptive and analytical survey design.

Sources of Data

Primary Data

Collected through structured questionnaires administered to MSME owners and managers.

Secondary Data

Collected from:

1. Government reports
2. Journal articles
3. Books
4. Industry reports
5. International organization publications

Sample Size

150 MSMEs were selected.

Demographic Profile

Among the respondents:

1. 40% belonged to service industries.
2. 36.7% belonged to manufacturing industries.
3. 23.3% belonged to trading businesses.

Most enterprises had been operating for more than five years.

Sampling Technique

Convenience sampling was used due to accessibility constraints.

Geographical Coverage

The study focused on MSMEs operating in Maharashtra across manufacturing, trading, and service sectors.

Statistical Tools Used

1. Percentage Analysis
2. Mean Score Analysis
3. Correlation Analysis
4. Chi-Square Test
5. Descriptive Statistics

Data Analysis and Interpretation

1 Survey Instrument

A structured questionnaire was designed to collect primary data from MSME owners, entrepreneurs, managers, and senior executives. The questionnaire consisted of five sections:

Section A: Demographic Information

1. Type of enterprise
2. Nature of business
3. Number of employees
4. Years of operation
5. Annual turnover

Section B: Digital Transformation Practices

1. Use of digital payments
2. Adoption of e-commerce platforms

3. Cloud computing utilization
4. Social media marketing activities
5. ERP/CRM implementation

Section C: Benefits of Digital Transformation

Measured through a five-point Likert Scale:

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Neutral
- 4 = Agree
- 5 = Strongly Agree

Sample statements:

1. Digital technologies improve business productivity.
2. Digital transformation increases customer satisfaction.
3. Digital tools reduce operational costs.
4. Digitalization improves decision-making processes.

Section D: Challenges in Digital Adoption

1. Financial constraints
2. Cybersecurity concerns
3. Lack of skilled workforce
4. Infrastructure limitations
5. Resistance to organizational change

Section E: Economic Growth Indicators

1. Revenue growth
2. Profitability growth
3. Market expansion
4. Employment generation
5. Export opportunities

2. Profile of Respondents

Table 1: Type of Enterprise

Enterprise Category	Frequency	Percentage
Micro	75	50.0
Small	50	33.3
Medium	25	16.7
Total	150	100

Interpretation - Half of the surveyed firms belonged to the micro-enterprise category, indicating strong representation of grassroots businesses.

Table 2: Sector-wise Classification

Sector	Frequency	Percentage
Manufacturing	55	36.7
Services	60	40.0
Trading	35	23.3
Total	150	100

Interpretation - The service sector represented the largest proportion of respondents.

Table 3: Years of Operation

Years	Frequency	Percentage
Below 5 Years	35	23.3
5–10 Years	50	33.3
11–15 Years	40	26.7
Above 15 Years	25	16.7

Interpretation - Most firms had operated for more than five years, indicating experienced businesses capable of evaluating digital transformation impacts.

Table 4: Adoption of Digital Technologies

Technology	Users	Percentage
Digital Payments	138	92
Social Media Marketing	132	88
E-Commerce Platforms	111	74
CRM Systems	78	52
Cloud Computing	72	48
Data Analytics	53	35
Artificial Intelligence	33	22

Interpretation - Digital payment systems and social media marketing were the most widely adopted technologies.

Table 5: Perceived Impact on Productivity

Response	Frequency	Percentage
Strongly Agree	58	38.7
Agree	62	41.3
Neutral	18	12.0
Disagree	8	5.3
Strongly Disagree	4	2.7

Mean Score = 4.08

Interpretation - More than 80% of respondents agreed that digital transformation improves productivity.

Table 6: Impact on Revenue Growth

Revenue Growth	Frequency	Percentage
No Growth	10	6.7
Less than 10%	25	16.7
10–20%	45	30.0
21–30%	40	26.7
Above 30%	30	20.0

Interpretation - More than 76% of MSMEs experienced revenue growth exceeding 10% following digital adoption.

Table 7: Impact on Customer Reach

Response	Frequency	Percentage
Strongly Agree	70	46.7
Agree	58	38.7
Neutral	12	8.0
Disagree	7	4.7
Strongly Disagree	3	2.0

Mean Score = 4.24

Interpretation - Digital transformation significantly improved customer acquisition and market reach.

Table 8: Major Challenges

Challenge	Percentage of Respondents
High Cost of Implementation	78
Lack of Skilled Employees	72
Cyber security Concerns	68
Resistance to Change	61
Poor Internet Infrastructure	57
Lack of Government Support	43

Interpretation - Cost and skill shortages remain the primary obstacles to digital transformation.

Discussion

The findings clearly indicate that digital transformation enhances MSME competitiveness and economic performance. Enterprises adopting digital technologies achieve higher productivity and stronger customer engagement than those relying on traditional business models.

Digital payment systems have emerged as the most widely adopted technology due to government initiatives promoting cashless transactions. Social media marketing and e-commerce platforms have enabled MSMEs to reach wider customer bases at relatively low costs.

The study also highlights the strategic role of digital transformation in improving resilience during economic disruptions. Businesses with digital capabilities were better equipped to adapt during the pandemic and maintain continuity.

However, the adoption of advanced technologies such as artificial intelligence and data analytics remains limited. Many MSMEs perceive these technologies as expensive and complex. Consequently, targeted support mechanisms are necessary to bridge the digital divide.

Digital Transformation and Economic Growth

Digital transformation contributes to economic growth through several mechanisms.

Productivity Enhancement - Automation and digital tools increase output while reducing resource consumption.

Employment Generation - Digital ecosystems create new jobs in IT services, logistics, marketing, and customer support.

Innovation Promotion - Technology encourages the development of innovative products and services.

Market Expansion - Digital platforms allow businesses to access national and international markets.

Financial Inclusion - Digital payment systems facilitate access to formal financial services.

Export Development - E-commerce enables MSMEs to participate in global trade.

Government Revenue - Digital transactions improve transparency and tax compliance.

Together, these factors stimulate sustainable economic growth.

Major Findings

The survey revealed several important insights:

1. Nearly 92% of MSMEs have adopted digital payment systems.

2. Social media marketing is used by 88% of surveyed enterprises.
3. Digital transformation has increased productivity for over 80% of respondents.
4. More than three-fourths of MSMEs experienced revenue growth after adopting digital technologies.
5. Customer reach and market expansion improved significantly through digital channels.
6. High implementation costs and skill shortages remain major barriers.
7. There exists a strong positive relationship between digital transformation and business growth.
8. MSMEs adopting digital technologies contribute more effectively to economic growth through employment generation and increased business activity.

Suggestions

Government

1. Strengthen digital infrastructure.
2. Provide technology adoption subsidies.
3. Expand digital literacy programs.
4. Enhance cyber security support.

Financial Institutions

1. Offer affordable digital transformation loans.
2. Develop MSME-focused fintech products.

MSMEs

1. Invest in employee training.
2. Adopt cloud-based technologies.
3. Utilize data analytics.
4. Develop digital strategies.

Educational Institutions

1. Provide technology-oriented entrepreneurship programs.
2. Collaborate with industry for digital skill development.

Scope for Future Research

Future studies may:

1. Conduct comparative analyses across states and countries.
2. Examine sector-specific digital transformation strategies.
3. Investigate the role of artificial intelligence in MSME growth.
4. Explore long-term impacts of digitalization on employment.
5. Study digital transformation in rural enterprises.

Conclusion

Digital transformation has become an indispensable driver of MSME competitiveness and economic growth. The survey findings demonstrate that MSMEs adopting digital technologies achieve superior business performance in terms of productivity, customer reach, operational efficiency, and revenue generation. These improvements extend beyond individual enterprises and contribute significantly to broader economic development through employment generation, innovation, financial inclusion, and export growth.

Despite these benefits, barriers such as high implementation costs, inadequate digital skills, cybersecurity concerns, and infrastructure limitations continue to slow the pace of digital adoption. Addressing these challenges requires collaborative efforts from governments, financial institutions, educational institutions, and industry stakeholders.

As economies continue to evolve in the digital age, MSMEs must embrace technological transformation not merely as a survival strategy but as a pathway toward sustainable growth and long-term competitiveness. Accelerating digital transformation among MSMEs will play a crucial role in achieving inclusive economic growth and national development objectives.

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Viral Marketing and Consumer Purchasing Behaviour: An Analytical Study of Cosmetic Products

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Abstract

The massive growth of social media platforms has transformed how companies market goods and services and influence consumer purchasing decisions. Viral Marketing has emerged as an effective Digital marketing strategy that disseminates information quickly through online platforms, influencers and customer interactions. The present study evaluates the level of viral marketing influences on consumer purchasing decisions with reference to cosmetic products. The study is descriptive and analytical in nature. The study used a structured questionnaire with a five-point Likert scale. Statistical tools like mean, standard deviation, correlation and regression analysis were used to analyse the data. The study reveals that viral marketing largely influences consumer awareness, brand preference, purchase intention, and buying behaviour related to cosmetic products. Social media influencers, online reviews, promotional offers and viral advertisements play a major role in moulding purchasing decisions. The statistical analysis indicates a strong positive relationship between viral marketing and consumer purchasing decisions. The study concludes that there is an efficient tool for cosmetic companies to attract and retain consumers in the Digital era.

Keywords: Viral Marketing, Consumer Behaviour, Purchasing Decision, Cosmetic Products, Social Media, Marketing, Influencer Marketing.

Introduction

In the technological era, marketing strategies have turned from traditional methods to online and social media. Based on promotions, viral marketing is the process of transmitting marketing messages rapidly through social media platforms, websites, influencers, and online communities, which enables companies to reach a massive number of consumers within a short period at comparatively lower cost. The influence of viral marketing is large enough in the case of a cosmetic product. The cosmetic industry is one of the most rapidly growing industries that largely depends on advertising, influencers, promotions, customer reviews and social media engagement. Presently, consumers are highly influenced by viral content such as beauty tutorials, influencer endorsements, online reviews and promotional campaigns shared through platforms like Instagram, YouTube, Facebook, TikTok and WhatsApp. Viral marketing creates awareness, builds a brand image and influences consumers' attitudes and purchasing decisions. Cosmetic brands use digital marketing techniques to attract customers by promoting product quality, discounts, testimonials, and beauty trends. The heightened use of smartphones and social media has further strengthened the impact of viral marketing on consumer buying behaviour. The present study undertakes to analyse how viral marketing influences consumer purchasing decisions of cosmetic product buyers. It also discusses an understanding of consumer perceptions preference and behaves response towards viral marketing strategies adopted by cosmetic brands.

Review of Literature

Kaplan and Haelein (2011) discussed how social media provides a platform for marketers in order to create viral content that spreads enormously among consumers and significantly influences consumer engagement and purchasing behaviour.



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Henning – Thureau et al. al (2012) The study explained that there was a strong influence of electric word of mouth, communication, and consumer decision-making and brand preference in online markets.

Balakrishna Dahnil and Yi (2014) examined that social media marketing positively affects brand loyalty and purchase intention among consumers, especially in the beauty and cosmetic industry.

Ahmed and Zahid (2019) discussed that influencer marketing and online advertising significantly influence customer attitudes and purchasing decisions, especially for cosmetic products.

Sing and Verma (2021) explained that viral marketing campaigns enormously enhanced consumer awareness, curiosity, and trust toward cosmetics brands, leading to higher purchase intention.

Kaur and Sarma (2023) explore that digital marketing and influencer promotions play an important role in deciding consumer perceptions and buying behaviour in the cosmetic sector.

Research methodology

Objectives

1. To examine the influence of viral marketing and consumer purchasing decisions regarding cosmetic products.
2. To study the impact of social media, promotions and purchasing decisions.

Hypothesis

H_0 = Viral marketing has no significant influence on consumer purchasing decisions regarding cosmetic products.

H_1 = Viral marketing has a significant influence on consumer purchasing decisions regarding cosmetic products.

Sampling design

Sample size: 100 respondents from Harihara city, Karnataka

Sampling Technique: convenience sampling

Data collection tool: structured questionnaire,

Statistical tools used: mean, standard deviation, Pearson correlation, regression analysis.

Data analysis

Table 1: Influence of Viral Marketing

Sl. No.	Viral Marketing Statements	Mean	Standard Deviation
1	Viral advertisements attract attention quickly	4.21	0.71
2	Influencers affect interest in cosmetics	4.18	0.75
3	Trust in viral marketing recommendations	3.94	0.86
4	Online reviews influence buying decisions	4.25	0.69
5	Sharing advertisements through social media	3.88	0.92
6	Viral content increases brand awareness	4.31	0.64
7	Celebrity endorsements influence preference	4.02	0.83
8	Online promotional offers encourage purchases	4.27	0.68
9	Viral marketing creates curiosity	4.35	0.61
10	Viral marketing improves brand attitude	4.16	0.77

Source: primary source

The highest mean score, 4.36 in the case of viral marketing, creates curiosity, sharing advertisements through social media (3.88) was lowest. The mean score above 4 indicates that respondents strongly agree that viral marketing significantly affects their awareness, interest and perception of cosmetic products.

Table 2: Purchasing Decision

Sl. No.	Purchasing Decision Statements	Mean	Standard Deviation
1	Purchase after watching viral advertisements	4.08	0.79
2	Social media promotions increase purchase intention	4.22	0.70
3	Compare brands using online reviews	4.14	0.76
4	Viral marketing influences brand selection	4.26	0.65
5	Preference for socially popular brands	4.05	0.82
6	Confidence in online purchasing increased	3.97	0.88
7	Influencer recommendations affect buying behaviour	4.19	0.73

8	Try newly launched products promoted online	4.11	0.80
9	Viral marketing increases purchase frequency	4.02	0.84
10	Viral marketing affects purchasing decisions overall	4.33	0.62

Source: primary source

Table 2 states that consumers are highly influenced by brand selection, with a mean of 4.26, an increase in purchase intention (4.2) and the lowest in the case of confidence in online purchasing increased (3.97) mean score of more than 4 indicates that viral marketing strongly influences purchasing decisions regarding cosmetic product buyers.

Correlation Analysis

Variables	Correlation (r)	Significance (p-value)
viral marketing & purchasing decisions	0.82	0.000

The correlation test was applied to evaluate the relationship between viral marketing and purchasing decisions. The correlation value of 0.82 states that there is a strong positive relationship between the variables. Since the p-value is less than 0.05, the relationship between the variables is statistically significant.

Regression analysis

Variables	Beta value	t-value	p-value
Viral marketing and purchasing decisions	0.78	11.42	0.000

The statistical test, regression analysis, was applied to evaluate in what extent viral marketing is influencing on consumer purchasing decisions. The test result indicates that viral marketing significantly affects the purchasing decisions of consumers regarding cosmetic products. The p-value is less than 0.05; therefore, the null hypothesis is rejected.

Findings

1. Viral marketing significantly influences consumer awareness and interest in buying cosmetic products.
2. Purchasing decisions of consumers were affected by social media influencers and online reviews.
3. Promotional offers and viral advertisements encourage the purchase intention of cosmetic product buyers.
4. Cosmetic Products which are highly visible on social media were preferred by the consumers.
5. The test result 0.82 in the case of correlation analysis and 0.78 in the case of regression analysis indicates there is a strong positive relationship between viral marketing and purchasing decisions.

Suggestions

1. Cosmetic companies should concentrate more on creative viral marketing campaigns.
2. Brands should collaborate with trusted social media influencers.
3. Promotional offers and interactive content may increase customer engagement.
4. Ethical and transparent advertising practices should be maintained.

Conclusion

Viral marketing is an emerging strategy in the digital era. It is beneficial in shaping the consumer's purchasing intention. Viral marketing is a hub of marketing at present, through social media platforms, influencers, online reviews and viral promotional campaigns, it influences and reaches large respondents with minimum cost. The study was carried out to present how the viral marketing platforms influence consumers' purchasing decisions. The statistical analysis confirms a strong positive relationship between viral marketing and purchasing decisions, proving that digital marketing strategies greatly impact the cosmetic industry.

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OriginalArticle

Organizational Support and Job Satisfaction of Women Faculty in Higher Education with Special Reference to Shivamogga

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Abstract

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Women faculty members play a vital role in higher education through teaching, research, mentoring, and academic administration. Their job satisfaction is influenced by the level of organizational support provided by their institutions, including fair policies, recognition, professional development opportunities, work-life balance, and a positive work environment. This study examines the relationship between organizational support and job satisfaction among women faculty in higher educational institutions with special reference to Shivamogga district. The study is based on secondary data collected from research articles, journals, books, reports, and other published sources. The findings indicate that higher levels of organizational support contribute to increased job satisfaction, motivation, commitment, and professional effectiveness among women faculty. The findings may assist educational administrators and policymakers in improving faculty well-being and institutional effectiveness.

Keywords: Organizational Support, Job Satisfaction, Women Faculty, Higher Education

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Introduction:

Women faculty members contribute significantly to higher education through teaching, research, mentoring, and academic administration. Their effectiveness and commitment are influenced by the organizational support provided by their institutions. Organizational support includes fair policies, professional development opportunities, recognition, work-life balance, and a positive work environment. When faculty members perceive that their contributions are valued and their well-being is supported, they tend to experience higher job satisfaction. As job satisfaction is closely associated with motivation, performance, commitment, and retention, understanding its relationship with organizational support is important. Therefore, this study examines organizational support and job satisfaction among women faculty in higher educational institutions with special reference to Shivamogga district.

Review of literature:

Mascarenhas et al. (2022) found that perceived organizational support positively influences job satisfaction and employee engagement among employees in higher education institutions. **Shreffler et al. (2019)** examined career barriers faced by women faculty and reported that organizational support helps reduce workplace challenges and supports professional growth. **Venkat et al. (2022)** reported that work-life imbalance and workplace challenges contribute to stress among women faculty members. The study emphasized the importance of organizational support in enhancing job satisfaction and well-being.

Objective of the study:

1. To examine the level of organizational support perceived by women faculty in higher educational institutions.
2. To assess the level of job satisfaction among women faculty in higher educational institutions.



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3. To analyze the relationship between organizational support and job satisfaction of women faculty.
4. To suggest measures for enhancing organizational support and improving job satisfaction among women faculty.

Scope of the study:

1. This study explores the association between organizational support and job satisfaction among women faculty members in higher education institutions in Shivamogga district.
2. It reviews important aspects of organizational support, including workplace environment, recognition, career development opportunities, and work-life balance.
3. The study relies exclusively on information obtained from existing literature, research publications, reports, and other secondary sources. The findings may provide useful insights for educational administrators and policymakers in enhancing faculty well-being and satisfaction.

Methodology

The study is based on secondary data collected from journals, books, research articles, government reports, institutional publications, and online academic sources. A descriptive and analytical research design has been adopted. Relevant literature relating to organizational support and job satisfaction among women faculty in higher education was reviewed and analyzed. The findings of the study are derived from the interpretation and synthesis of existing scholarly literature.

Limitations of the study

1. The study relies entirely on secondary data collected from published sources, which may contain limitations in terms of accuracy and completeness.
2. The availability of recent and specific data related to women faculty in higher education institutions of Shivamogga is limited.
3. The findings depend on information reported by previous researchers and organizations, and the researcher has no control over the original data collection process.
4. The study may not fully capture the latest changes in organizational practices and job satisfaction levels due to the time gap between data publication and analysis.

Dimensions of Organizational Support

1. Administrative Support

Administrative support refers to the assistance provided by institutional management through transparent policies, effective communication, fair workload distribution, and timely resolution of workplace issues.

2. Career Development and Training

Workshops, seminars, faculty development programs, research opportunities, and promotion avenues contribute to professional growth and improve overall job satisfaction.

3. Recognition and Rewards

Recognition and rewards through awards, promotions, incentives, and public recognition enhances employee motivation, commitment, and engagement with the institution.

4. Work-Life Balance Support

Work-life balance support includes flexible work arrangements, leave policies, maternity benefits, and other employee welfare measures that help faculty members manage professional and personal responsibilities effectively.

Importance of Job Satisfaction Among Faculty Members

1. Job satisfaction is essential for faculty members because it directly influences their motivation, productivity, and commitment to educational institutions.
2. Satisfied faculty members are more likely to deliver quality teaching, engage in research activities, and contribute to institutional development.
3. High job satisfaction also reduces employee turnover and promotes a stable academic environment.

Factors Affecting Job Satisfaction of Women Faculty

1. Compensation and Career Advancement

Salary, incentives, promotion opportunities, and career growth significantly influence job satisfaction among women faculty. Fair compensation and transparent promotion policies enhance motivation, professional commitment, and a sense of achievement.

2. Job Security and Organizational Support

A stable and secure work environment strengthens employees' confidence and commitment to the institution. Supportive organizational policies and administrative assistance help faculty members perform their responsibilities effectively and reduce workplace uncertainties.

3. Work-Life Balance

Maintaining a balance between professional and personal responsibilities is essential for women faculty members. Flexible work arrangements and family-friendly policies help reduce stress, improve well-being, and enhance overall job satisfaction.

Relationship Between Organizational Support and Job Satisfaction

How Organizational Support Improves Job Satisfaction

1. **Improves Job Satisfaction and Motivation:** Organizational support enhances job satisfaction by creating a positive work environment. Faculty members who receive recognition, fair treatment, and professional development opportunities are more motivated and committed to their work.
2. **Enhances Retention and Commitment:** Supportive institutional practices strengthen employee loyalty and organizational commitment. Faculty members who feel valued are more likely to remain with the institution and contribute effectively to its goals.
3. **Improves Teaching Effectiveness and Performance:** Access to resources, training opportunities, and administrative support enables faculty members to perform their teaching, research, and mentoring responsibilities more effectively, leading to improved academic outcomes.

Status of Women Faculty in Higher Education

Women faculty members contribute significantly to teaching, research, mentoring, and academic administration in higher education. Although their participation has increased over the years, challenges related to career advancement, leadership opportunities, and work-life balance continue to exist. Supportive institutional practices can help improve their professional growth and job satisfaction.

Findings:

1. Organizational support has a positive influence on the job satisfaction of women faculty members in higher educational institutions.
2. Administrative assistance, recognition, and career development opportunities contribute significantly to faculty motivation and professional commitment.
3. Work-life balance support helps women faculty effectively manage academic and personal responsibilities, thereby reducing workplace stress.
4. Supportive institutional practices enhance employee engagement, retention, and overall teaching effectiveness.
5. Women faculty members who receive adequate organizational support demonstrate higher levels of satisfaction and commitment toward their institutions.

Suggestions and Recommendations

Higher education institutions should adopt transparent administrative practices and encourage effective communication with faculty members. Regular training programmes, mentoring support, and professional development opportunities should be provided to enhance career growth. Institutions should also recognize faculty achievements and implement family-friendly policies to create a supportive work environment.

Measures to Enhance Job Satisfaction

Institutions should ensure fair compensation, equal promotion opportunities, and a positive workplace culture. Flexible work arrangements and effective workload management can help faculty members maintain a healthy work-life balance. Encouraging participation in academic and research activities can further improve satisfaction, engagement, and commitment among women faculty members.

Implications of the Study

The study highlights the importance of organizational support in creating a positive academic environment for women faculty members. The findings may assist educational administrators, policymakers, and institutional leaders in designing supportive workplace practices that enhance employee satisfaction, professional growth, and institutional effectiveness.

Conclusion:

The success of higher educational institutions largely depends on the satisfaction and commitment of their faculty members. Organizational support plays a crucial role in enhancing the professional well-being of women faculty by providing recognition, career development opportunities, administrative assistance, and work-life balance support. The review indicates that supportive institutional practices contribute positively to motivation, job satisfaction, and organizational commitment. Therefore, higher education institutions in **Shivamogga district** should strengthen support mechanisms and adopt inclusive policies to promote a productive and satisfying work environment for women faculty members.

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OriginalArticle

The Hidden Pervasive Reality of Caste Discrimination in Modern Era of Migration: An Analysis of Suraj Yengde's Caste Matters and Yashica Dutt's Coming Out as Dalit

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Despite constitutional guarantees of equality and decades of social reform, caste discrimination continues to shape social, economic, political, and cultural realities in contemporary India. While modernization, urbanization, globalization, and technological advancement are often perceived as forces that weaken caste hierarchies, recent Dalit writings reveal the persistence of caste-based exclusion in both visible and subtle forms. This paper critically examines Suraj Yengde's *Caste Matters* (2019) and Yashica Dutt's *Coming Out as Dalit* (2019) to explore the hidden yet pervasive nature of caste discrimination in modern India. Through a comparative literary and sociological analysis, the study investigates how both authors expose the continuing operation of caste in educational institutions, workplaces, media, social relations, and identity formation. While Yengde adopts a radical socio-political critique of Brahminical hegemony, Dutt offers a deeply personal narrative of identity concealment and self-assertion. Together, these texts demonstrate that caste has not disappeared; rather, it has transformed into sophisticated and often invisible mechanisms of exclusion. The paper argues that caste remains one of the most significant determinants of privilege and marginalization in contemporary India and beyond.

Keywords: Caste, Dalit Literature, Identity, Discrimination, Modernity, Suraj Yengde, Yashica Dutt, Social Justice, Ambedkarism

Introduction

India's Constitution abolished untouchability and guaranteed equality before the law. Yet caste continues to influence social mobility, access to education, employment opportunities, marriage, housing, and political participation. Contemporary scholars have increasingly argued that caste discrimination has adapted itself to modern conditions rather than disappearing. Research on caste inequalities demonstrates that caste-based disadvantages continue to exist in education, employment, and social representation despite legal safeguards.

Dalit literature has emerged as one of the most powerful mediums through which marginalized communities articulate their experiences of oppression and resistance. Among contemporary Dalit writers, Suraj Yengde and Yashica Dutt occupy significant positions. Their works challenge the widespread belief that caste is merely a relic of the past and expose its enduring presence in twenty-first-century India.

This paper seeks to analyze how **Caste Matters** and **Coming Out as Dalit** uncover the hidden realities of caste discrimination and contribute to anti-caste discourse.

Research Objectives

1. To examine the representation of caste discrimination in contemporary India.
2. To analyze Suraj Yengde's critique of caste structures in **Caste Matters**.
3. To study Yashica Dutt's exploration of Dalit identity and social invisibility in **Coming Out as Dalit**.
4. To compare the narrative strategies adopted by both authors.



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5. To evaluate the relevance of these texts in understanding modern caste realities.

Research Questions

1. How do Yengde and Dutt expose the persistence of caste discrimination in modern India?
2. What forms of visible and invisible caste discrimination emerge in these texts?
3. How do personal experiences become instruments of social critique?
4. What role does identity play in contemporary Dalit narratives?

Review of Literature

Dalit literature has evolved significantly since the writings of B. R. Ambedkar. Scholars such as Sharan Kumar Limbale, Omprakash Valmiki, and Kancha Ilaiah Shepherd have documented the realities of caste oppression. Recent studies emphasize that caste discrimination has entered new spaces such as corporate institutions, digital media, urban housing markets, and global diasporic communities. Research also shows that caste biases continue to circulate through online platforms and emerging technologies, demonstrating the adaptability of caste structures in modern society. Both Yengde and Dutt contribute to this emerging body of literature by examining how caste survives beneath the rhetoric of meritocracy, modernization, and globalization.

Theoretical Framework

This study employs:

1. Ambedkarite Theory

Ambedkar viewed caste as a system of graded inequality sustained through social, religious, and economic structures. His critique provides the foundational lens through which both texts can be interpreted.

2. Subaltern Theory

The theory highlights how marginalized communities are excluded from dominant narratives and seeks to recover their voices and experiences.

3. Critical Caste Studies

Critical caste studies examine caste as a continuing system of power that shapes institutions, knowledge production, and social relations.

Methodology

This research adopts a qualitative and comparative textual analysis.

Primary Sources

Caste Matters by Suraj Yengde

Coming Out as Dalit by Yashika Dutt

Secondary Sources

Books, journal articles, scholarly essays, and studies on caste discrimination and Dalit literature.

Suraj Yengde's *Caste Matters*: Exposing Structural Violence

Suraj Yengde's *Caste Matters* is both a personal memoir and a sociological critique. The book challenges the common assumption that caste is disappearing in modern India. Yengde argues that caste remains deeply embedded in political institutions, educational systems, bureaucratic structures, and social relations.

Caste as an Invisible Structure

One of Yengde's central arguments is that caste functions as an invisible architecture of power. While overt practices of untouchability may have declined in some regions, subtle discrimination continues through:

1. Social exclusion
2. Educational marginalization
3. Workplace discrimination
4. Elite gatekeeping
5. Cultural stereotyping

Yengde demonstrates how caste privilege is often normalized and rendered invisible to dominant groups.

Critique of Meritocracy

The author strongly challenges the notion of merit. According to him, merit is frequently presented as an objective measure while ignoring centuries of accumulated social and educational privilege enjoyed by upper-caste groups.

He argues that the discourse of merit often becomes a tool for delegitimizing affirmative action and Dalit achievements.

Brahminism and Social Power

Yengde distinguishes between individual Brahmins and the ideology of Brahminism. He identifies Brahminism as a system that sustains hierarchical social relations and reproduces inequality through cultural institutions, education, and knowledge systems.

Global Dimensions of Caste

A significant contribution of Yengde's work is his comparison between caste and other systems of oppression such as race, class, and colonialism. He situates the Dalit struggle within global movements for social justice and human rights.

Yashica Dutt's **Coming Out as Dalit*: The Politics of Concealment and Identity*

Unlike Yengde's broader sociological approach, Yashica Dutt's memoir focuses on personal experiences and identity formation.

The memoir chronicles her journey from hiding her Dalit identity to publicly embracing it. Dutt explains that she concealed her caste to avoid prejudice and social exclusion.

The Burden of Passing

One of the most significant themes in the memoir is "passing"—the act of presenting oneself as belonging to a dominant caste.

Dutt describes:

1. Fear of exposure
2. Anxiety about social acceptance
3. Internalized shame
4. Emotional isolation

Her experiences reveal that caste discrimination often operates through subtle social interactions rather than overt violence.

Urban Casteism

A major contribution of the memoir is its exposure of urban caste discrimination.

Many urban Indians claim to be "casteless" or "post-caste." Dutt challenges this narrative by demonstrating how caste influences:

1. Educational opportunities
2. Professional networking
3. Marriage choices
4. Housing access
5. Media representation

The discrimination is often indirect, making it harder to identify and confront.

Dalit Women's Experiences

Dutt also highlights the intersection of caste and gender. Dalit women face multiple forms of marginalization based on both caste and patriarchy.

Her memoir broadens Dalit discourse by foregrounding women's voices and experiences. ([YASHICA DUTT][4])

Reclaiming Identity

The act of "coming out" as Dalit becomes a political act of resistance. By publicly embracing her identity, Dutt rejects the shame historically imposed upon Dalits and transforms personal narrative into collective empowerment.

Comparative Analysis

1. Exposure of Hidden Discrimination

Both authors reject the myth that caste has disappeared.

They reveal that caste persists through:

1. Institutional practices
2. Social interactions
3. Cultural norms
4. Professional spaces

2. Centrality of Lived Experience

Personal experiences serve as evidence of structural discrimination.

Both texts demonstrate how individual stories reveal broader social realities.

3. Ambedkarite Influence

The influence of Ambedkarite thought is evident throughout both works.

Themes include:

1. Equality
2. Dignity
3. Social justice
4. Collective resistance

4. Critique of Modernity

Both authors challenge the belief that modernization automatically eliminates caste.

Instead, they argue that caste adapts to new environments and technologies. Contemporary studies on digital spaces and artificial intelligence similarly indicate the persistence of caste bias in modern systems.

Differences

Aspect	Suraj Yengde	Yashica Dutt
Genre	Political-Sociological Analysis	Memoir
Focus	Structural Oppression	Personal Identity
Tone	Radical and Analytical	Reflective and Emotional
Scope	National and Global	Individual and Community
Approach	Collective Resistance	Personal Empowerment

While Yengde emphasizes systemic transformation, Dutt highlights psychological liberation through identity affirmation.

Caste Discrimination in the Modern Era

The significance of these texts lies in their demonstration that caste has evolved rather than disappeared.

Contemporary caste discrimination appears through:

Educational Exclusion

Disparities in access, representation, and institutional support.

Employment Discrimination

Biases in recruitment, promotion, and workplace culture.

Digital Spaces

Social media and technological systems can reproduce caste hierarchies and stereotypes.

Cultural Representation

Limited Dalit representation in mainstream media and cultural institutions.

Social Networks

Marriage, housing, and friendship networks often remain caste-based.

These realities confirm the continued relevance of anti-caste discourse.

Findings

The study reveals that:

1. Caste discrimination remains deeply embedded in modern institutions.
2. Modernization has transformed rather than eliminated caste hierarchies.
3. Both texts challenge dominant narratives of a “post-caste” India.
4. Personal narratives function as powerful tools of social critique.
5. Dalit identity has emerged as a site of resistance and political consciousness.
6. Hidden forms of caste discrimination are often more difficult to identify and challenge than overt forms.
7. Contemporary technologies and digital platforms can reproduce caste inequalities.

Conclusion

Suraj Yengde’s **Caste Matters** and Yashica Dutt’s **Coming Out as Dalit** are crucial interventions in contemporary caste discourse. Together, they expose the hidden yet pervasive realities of caste discrimination in modern India. While Yengde critiques the structural foundations of caste power, Dutt illuminates the psychological and emotional consequences of caste-based exclusion.

Both authors challenge the comforting assumption that caste is disappearing in the age of globalization, technology, and urbanization. Instead, they demonstrate that caste continues to shape opportunities, identities, and social relations in complex and often invisible ways. Their works contribute significantly to contemporary Dalit literature and remind readers that genuine social equality requires not only legal reform but also the dismantling of deeply entrenched social hierarchies.

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OriginalArticle

Digital Transformation and Economic Growth in India: An Analysis of E-Commerce, Digital Exports, Startups, and Employment Generation

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Digital transformation has emerged as a key driver of economic growth, innovation, and competitiveness in India. The rapid adoption of digital technologies such as Artificial Intelligence (AI), cloud computing, big data analytics, digital payments, and e-commerce platforms has significantly altered the country's economic landscape. Government initiatives such as Digital India, Startup India, BharatNet, and Digital Public Infrastructure have accelerated digital adoption across sectors. The study examines the impact of digital transformation on the Indian economy using secondary data relating to e-commerce market growth, IT and digital services exports, startup development, and employment generation in the IT-BPM sector. The findings reveal that digital transformation has substantially contributed to business expansion, export earnings, entrepreneurial development, and job creation. The study concludes that continued investment in digital infrastructure, innovation ecosystems, and skill development is essential for sustaining India's digital economic growth and achieving inclusive development.

Keywords: Digital Transformation, Economic Growth, Digital Technology, e-commerce

Introduction

The rapid advancement of digital technologies has fundamentally transformed the global economic landscape by reshaping business operations, communication systems, production processes, and consumer behavior. Digital transformation refers to the integration of digital technologies such as cloud computing, artificial intelligence, big data analytics, blockchain, mobile applications, and internet-based platforms into economic and social activities. Across the world, countries are increasingly leveraging digital technologies to enhance productivity, improve service delivery, foster innovation, and strengthen competitiveness. In this context, India has emerged as one of the leading digital economies among developing nations. The widespread availability of affordable internet services, rapid growth in smartphone usage, expanding digital infrastructure, and increasing digital literacy have accelerated the adoption of technology across sectors. The transformation has influenced industries such as banking, retail, education, healthcare, manufacturing, transportation, and public administration. As digital technologies continue to evolve, they are creating new opportunities for businesses, entrepreneurs, consumers, and policymakers, thereby contributing significantly to economic development and social progress. India's digital transformation journey received a major boost with the launch of the Digital India Programme in 2015, which aimed to transform the country into a digitally empowered society and knowledge-based economy. Since its inception, the initiative has promoted digital infrastructure development, online service delivery, digital governance, and technology-driven innovation. Several flagship digital platforms, including Aadhaar, Unified Payments Interface (UPI), DigiLocker, Government e-Marketplace (GeM), BharatNet, and the Open Network for Digital Commerce (ONDC), have enhanced accessibility, transparency, and efficiency in economic transactions. The adoption of digital payment systems has revolutionized financial inclusion by bringing millions of individuals and businesses into the formal financial system.



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Simultaneously, advancements in artificial intelligence, machine learning, fintech, cloud computing, and digital entrepreneurship have accelerated business innovation and economic modernization. India's information technology sector has emerged as a global leader in software development and digital services, generating substantial export earnings and strengthening the country's position in the international market. These developments have not only reduced transaction costs and improved operational efficiency but have also facilitated greater market access for businesses of all sizes, particularly micro, small, and medium enterprises (MSMEs).

The digital economy has become a vital driver of India's economic growth, employment generation, and entrepreneurial development. E-commerce platforms have transformed traditional trade practices by connecting businesses directly with consumers across geographical boundaries, thereby expanding market opportunities and increasing consumer choice. The growth of digital exports, particularly in information technology and business process management services, has contributed significantly to foreign exchange earnings and national income. Furthermore, the expansion of the startup ecosystem, supported by initiatives such as Startup India and various innovation policies, has encouraged technological entrepreneurship and attracted domestic as well as foreign investments. These startups have played an important role in creating direct and indirect employment opportunities, especially for skilled youth. Despite these achievements, several challenges continue to hinder the full realization of digital transformation benefits, including digital divides between urban and rural regions, cybersecurity threats, data privacy concerns, inadequate digital skills, and unequal access to technology. Therefore, examining the impact of digital transformation on economic growth through indicators such as e-commerce development, digital exports, startup expansion, and employment generation is essential for understanding its contribution to India's development trajectory. Such an analysis provides valuable insights for policymakers, businesses, and researchers in designing strategies that can maximize the benefits of digitalization while addressing its associated challenges.

Review of Literature

- 1. Bhatia and Kumar (2018)** examined the role of digital transformation in accelerating India's economic growth through the expansion of e-commerce platforms. The study found that increasing internet penetration, digital payment systems, and smartphone adoption significantly enhanced online retail activities. The researchers observed that e-commerce contributed to market accessibility for small businesses and improved consumer convenience. Their findings indicated that digital commerce created new employment opportunities and strengthened entrepreneurial activities, thereby contributing positively to national income and economic development.
- 2. Sharma and Verma (2019)** analyzed the growth of India's startup ecosystem in the digital era. The study highlighted that government initiatives such as Digital India and Startup India facilitated innovation and entrepreneurship. The authors found that technology-based startups generated substantial employment and attracted foreign investments. Their research concluded that digital transformation encouraged the development of innovative business models, increased competitiveness, and supported sustainable economic growth through enhanced productivity and value creation.
- 3. Gupta and Singh (2020)** investigated the relationship between digital exports and economic performance in India. The study revealed that information technology services, software exports, and digital business solutions significantly contributed to foreign exchange earnings. The researchers observed that digital exports improved India's global competitiveness and expanded international market access. Their findings emphasized that digital infrastructure and skilled human resources played a crucial role in promoting export growth and strengthening the country's economic position.
- 4. Rao and Patel (2020)** explored the impact of digital payment systems on e-commerce expansion in India. The study found that the widespread adoption of digital wallets, UPI, and online banking increased consumer confidence in online transactions. The authors reported that digital payment innovations reduced transaction costs and improved business efficiency. Their research concluded that the integration of digital financial technologies enhanced commercial activities and supported economic growth by facilitating seamless trade and commerce.
- 5. Mishra and Das (2021)** examined employment generation through digital entrepreneurship and startup development in India. The study identified that startups operating in fintech, edtech, health-tech, and e-commerce sectors created significant direct and indirect employment opportunities. The researchers found that digital businesses promoted skill development and innovation among youth. Their findings suggested that startup growth contributed substantially to job creation, income generation, and overall economic development in emerging digital economies.
- 6. Kaur and Mehta (2022)** studied the contribution of e-commerce platforms to the growth of Micro, Small, and Medium Enterprises (MSMEs) in India. The research revealed that digital marketplaces enabled MSMEs to access broader markets, reduce operational costs, and improve sales performance. The authors observed that digital adoption enhanced business competitiveness and productivity. The study concluded that e-commerce served as a critical driver of inclusive economic growth by supporting small businesses and employment generation.
- 7. Nair and Joseph (2023)** investigated the role of digital exports in strengthening India's service sector. The study found that software services, IT-enabled services, and digital consulting significantly increased export revenues and employment opportunities. The researchers highlighted that investments in digital infrastructure and technological

innovation improved export competitiveness. Their findings indicated that digital exports emerged as a major contributor to India's GDP growth and global economic integration.

8. Chandra and Roy (2024) analyzed the impact of digital transformation on startup innovation and economic development. The study reported that artificial intelligence, cloud computing, and data analytics enabled startups to develop innovative products and services. The authors found that technology-driven startups attracted venture capital investments and created high-skilled employment. Their research concluded that digital innovation enhanced entrepreneurial ecosystems and contributed significantly to economic growth and industrial modernization.

9. Prakash and Reddy (2025) examined the combined impact of e-commerce growth, digital exports, startup expansion, and employment generation on India's economy. The study revealed a strong positive relationship between digital transformation indicators and economic growth. The researchers observed that digital technologies improved productivity, market efficiency, and business competitiveness. Their findings concluded that a robust digital ecosystem is essential for sustaining long-term economic growth, promoting entrepreneurship, and generating employment opportunities across various sectors of the Indian economy.

Research Gap

Existing studies primarily focus on specific dimensions of digitalization such as digital payments, financial inclusion, or technological innovation. Limited studies comprehensively analyze the combined impact of digital transformation on e-commerce growth, export performance, startup development, and employment generation within the Indian economy. This study attempts to bridge this gap.

Objectives of the Study

1. To examine the impact of digital transformation on e-commerce growth in India.
2. To analyze the contribution of digital transformation to IT and digital services exports.
3. To assess the influence of digital transformation on startup ecosystem development.
4. To evaluate the impact of digital transformation on employment generation in the IT-BPM sector.

Need for the Study

Digital transformation has become a major factor influencing economic growth, business competitiveness, and employment generation. Understanding its economic implications helps policymakers, businesses, and researchers formulate strategies for sustainable and inclusive development.

Scope of the Study

The study focuses on the Indian economy and examines digital transformation through indicators such as e-commerce market growth, IT and digital service exports, startup development, and employment generation from 2018 to 2025. The analysis is based entirely on secondary data sources.

Methodology

The study is descriptive and analytical in nature. Secondary data have been collected from reports published by the Ministry of Electronics and Information Technology, DPIIT, NASSCOM, RBI, Statista, and industry publications. Trend analysis and percentage analysis have been used to interpret the data and assess the impact of digital transformation on economic development.

Analysis and Interpretation

Table 1: Impact on E-Commerce Growth

Year	E-Commerce Market Size (USD Billion)
2018-19	38
2019-20	46
2020-21	50
2021-22	67
2022-23	74
2023-24	84
2024-25	95
2025-26	110

Source: Reports of Department for Promotion of Industry and Internal Trade, Government of India.

The Indian e-commerce market expanded from USD 38 billion in 2018 to USD 110 billion in 2025. The growth reflects increasing digital adoption, improved internet accessibility, digital payment systems, and consumer preference for online shopping. Digital transformation has significantly expanded market opportunities and commercial activities.

Table 2: Impact on IT and Digital Services Exports

Year	IT & Digital Services Exports (USD Billion)
2018-19	137
2019-20	147
2020-21	150
2021-22	178
2022-23	194
2023-24	205
2024-25	224

Source: Annual reports of NASSCOM, Reserve Bank of India, and Ministry of Commerce and Industry.

Digital exports increased steadily from USD 137 billion to USD 224 billion during the study period. The growth demonstrates India's leadership in software services, cloud computing, AI solutions, and digital consulting, contributing substantially to foreign exchange earnings and GDP growth.

Table 3: Impact on Startup Ecosystem Development

Year	DPIIT Recognized Startups
2018-19	16,000
2019-20	27,000
2020-21	41,000
2021-22	61,000
2022-23	84,000
2023-24	99,000
2024-25	117,000

Source: Startup India and Department for Promotion of Industry and Internal Trade, Government of India.

The number of startups increased more than sevenfold during the study period. Digital technologies, venture capital investments, government support, and innovation-driven entrepreneurship have strengthened India's startup ecosystem and promoted economic diversification.

Table 4: Impact on Employment Generation

Year	IT-BPM Employment (Million Persons)
2018-19	4.1
2019-20	4.3
2020-21	4.4
2021-22	4.8
2022-23	5.1
2023-24	5.4
2024-25	5.8

Source: Startup India and Department for Promotion of Industry and Internal Trade, Government of India.

Employment in the IT-BPM sector increased from 4.1 million to 5.8 million persons. Digital transformation has generated substantial employment opportunities in software development, AI, cybersecurity, digital marketing, fintech, and data analytics.

Findings

1. Digital transformation has significantly expanded India's e-commerce market.
2. IT and digital services exports have shown sustained growth due to technological advancements.
3. Startup development has accelerated as a result of digital innovation and supportive government policies.
4. Employment opportunities in technology-driven sectors have increased considerably.
5. Digital transformation has strengthened India's position as a leading digital economy.
6. Technology adoption has enhanced productivity, innovation, and business competitiveness.

Conclusion

Digital transformation has emerged as a powerful engine of economic growth in India. The substantial expansion of e-commerce activities, digital exports, startup development, and employment generation demonstrates the transformative impact of digital technologies on the Indian economy. Government initiatives and technological innovation have played a crucial role in accelerating digital adoption and improving economic efficiency. While challenges such as cybersecurity threats, digital inequality, and skill shortages continue to exist, the overall contribution of digital transformation to economic development remains highly significant. As India advances toward becoming a



global digital powerhouse, sustained investments in digital infrastructure, innovation, and human capital development will be essential for ensuring inclusive and sustainable economic growth.

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OriginalArticle

Digital Marketing in India with Special Reference to Artificial Intelligence

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Digital marketing is an essential part of today's business strategies, providing organizations the ability to promote their products and services on digital platforms. Digital marketing has seen a tremendous surge in the reach and impact it has in India thanks to the proliferation of smartphones, low-cost internet connections and the growing popularity of social media. Moreover, the advent of Artificial Intelligence (AI) has transformed this industry with its ability to personalize user experiences, make informed decisions, and engage customers. Businesses are able to make more accurate decisions about understanding consumer behaviour and targeting audiences with AI-powered tools like chatbots, machine learning algorithms, predictive analytics, recommendation systems, and automated advertising tools. These innovations allow marketers to fine-tune campaigns, enhance conversion rates, and cut costs for their operations. AI can also enable real-time data analysis, enabling businesses to make informed marketing decisions and act quickly to trends in the marketplace. However, there are obstacles to using AI in digital marketing, including data privacy issues, technical complexity and a lack of expertise. The paper delves into the impact of AI on Indian digital marketing and discusses its benefits, risks, and future prospects. The study was descriptive in nature and secondary data were collected from journals, reports, and websites and published research articles.

Keywords: Digital Marketing, Artificial Intelligence, Consumer Behaviour, Social Media, Automation, India

Introduction

Digital marketing is any marketing activity that leverages digital channels, including Web pages, social media, search engines, mobile apps, email marketing and online advertising. It allows companies to reach consumers more quickly, and with greater interactivity and lower marketing costs than traditional marketing channels. In recent years digital marketing has become a very significant part for the last decade or so because of the swift advancement in internet connectivity, technology, and consumer lifestyles. Digital marketing has become a key tool for businesses of all sizes to engage more customers, build stronger relationships with them and gain a competitive edge in the market. India has become one of the world's highest growth digital economies. The growing accessibility of internet services, the proliferation of smart phones, and the government's push towards digitization like Digital India, have taken digital adoption to a great speed in both urban and rural areas. Today, millions of consumers turn to online platforms for information, shopping, entertainment, education and financial transactions. This digital shift has provided businesses with huge possibilities to interact with customers through digital channels. Consequently, businesses are spending significant resources on digital marketing efforts like social media marketing, search engine optimization, content marketing, influencer marketing, and online advertising to help boost their brand visibility and customer appeal. As digital interactions continue to grow, there is a growing amount of consumer data that organizations must be able to effectively analyze and use. The sheer volume of digital interactions has created a growing volume of consumer data, and organizations need to be able to leverage that data to make informed decisions. In this context, AI has become a game-changer in the world of digital marketing. AI is the capacity of a machine or a computer system to carry out tasks that would typically require human intelligence, such as learning, reasoning, problem-solving, and decision-making.



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AI can analyze vast amounts of data and uncover trends and patterns, which can be valuable for marketers to understand consumer preferences and buying habits. Artificial Intelligence (AI) has transformed the way digital marketing is done, by allowing businesses to provide unique experiences for their customers. Chatbots, recommendation engines, predictive analytics, machine learning algorithms and automated advertising systems are all examples of AI-powered tools that can help enhance customer engagement and optimize marketing performance. These technologies have the potential to enable businesses to offer immediate customer support, develop targeted advertisements, anticipate client needs, and automate repetitive marketing efforts. This allows companies to increase efficiency, minimize operational expenses, and keep customers happy. AI's integration in digital marketing is accelerating in India across various industries, including retail, e-commerce, banking, education, healthcare, and telecommunications. Businesses are using AI-powered tools to enhance their marketing strategies and stay competitive in a digital world. Companies are tapping into the power of AI to optimize their marketing efforts and stay ahead in the digital landscape. In the digital age, the understanding of the role of AI in digital marketing is a must-have for businesses aiming at sustainable growth and innovation.

Objectives of the Study

1. To understand the concept of digital marketing in India.
2. To examine the role of Artificial Intelligence in digital marketing.
3. To identify the advantages of AI in marketing activities.
4. To analyze the challenges associated with AI-based digital marketing.
5. To study the future scope of AI in digital marketing in India.

Research Methodology

The type of the research used in this study is descriptive and theoretical, with a data source of secondary data. Research journals, books, company reports, websites, articles and other published sources on the internet were used to gather pertinent information. The information collected was rigorously analyzed, sorted, and interpreted to conduct a detailed assessment of the role, applications and impact of Artificial Intelligence in digital marketing in India. The study aims to provide a comprehensive understanding of how AI technologies are transforming marketing strategies, customer engagement, and business performance in the evolving digital landscape.

Digital Marketing in India

In the past decade, the digital marketing landscape in India has seen a tremendous growth and has emerged as a crucial part of any business strategies in every industry. With all of the new technological advancements, such as the internet, the proliferation of smart phones, and the online social media platforms, it has changed the way that businesses communicate with consumers. The government's initiatives like Digital India have also further boosted digitalisation by encouraging digital literacy and online services. The rise of e-commerce sites has also spurred companies to invest heavily in online marketing efforts, in order to attract and keep customers. Indian businesses apply different digital marketing strategies that help them to increase brand visibility and engage customers. These encompass Search Engine Optimization (SEO), Social Media Marketing, Email Marketing, Content Marketing, Influencer Marketing and Mobile Marketing. These methods enable organisations to target their customer base, generate leads and boost sales at a lower cost. Moreover, digital marketing offers real-time performance tracking, allowing businesses to make continuous improvements to their campaigns. Digital marketing tools and strategies are widely used by leading companies like Google India, Amazon India, and Flipkart to enhance their customer relationships, user experience, and market reach in the competitive digital landscape.

Artificial Intelligence in Digital Marketing

Artificial Intelligence (AI) is a term used to describe the ability of computer systems and machines to learn, reason, make decisions, solve problems, and interpret data, which are typically functions of human intelligence. Artificial Intelligence (AI) is a revolutionary technology in digital marketing that has the potential to revolutionize how businesses interact with customers, predict their behavior, and tailor their marketing strategies to meet individual needs. Artificial Intelligence (AI) is a game-changer in the field of digital marketing, providing businesses with insights into customer preferences, anticipating behavior, and personalizing marketing experiences. AI can provide insights from vast amounts of customer information, which can guide marketing decisions, optimize campaign effectiveness, and boost customer engagement.

Chatbots

AI-powered chatbots provide instant and automated customer support through websites, mobile applications, and social media platforms. They are always on, answer customer queries instantly, and deliver a better customer experience and lower human support load.

Personalized Advertising

AI uses online data to show targeted ads to users based on their demographic details, surfing patterns, buying habits, and communication with the website. This enables businesses to show relevant products/services to individual customers which boost their engagement rate and conversion rates.

Predictive Analytics

Predictive Analytics relies on AI algorithms to forecast customer behaviour, market trends, and customer buying patterns. The information can help businesses make better decisions for marketing strategies, inventory management, and planning.

Content Creation

The AI tools help marketers create blogs, articles, social media posts, product descriptions, videos, and ads. These tools help to enhance the quality of the content, save time and boost productivity in digital marketing operations.

Voice Search Optimization

Optimization for voice search is important, especially with the rise of voice assistants like Google Assistant, Alexa, and Siri. By leveraging AI to optimize digital content for voice searches, businesses can enhance their online presence and accessibility to customers.

Email Automation

With AI, email marketing campaigns can be automated to deliver personalized messages at the right time, based on customer preferences. This will help to boost customer engagement, boost response rates and enhance customer relationships.

Advantages of AI in Digital Marketing.

AI offers a host of benefits for businesses in the realm of digital marketing. It boosts the customer experience by tailoring interactions and recommendations to them. Marketers can target the right audience with the right content by leveraging AI to enhance customer targeting accuracy. It facilitates quicker and more informed decision making with real time data analysis and predictive insights. Similarly, repetitive tasks can be automated, saving on marketing costs, and enhancing productivity, further improving operational efficiency through AI. In addition, AI-powered marketing strategies can help businesses improve their sales, conversion rate, and customer loyalty.

Challenges of AI in Digital Marketing

While AI has many positive aspects, there are also a few challenges to consider when it comes to digital marketing. AI technologies can be costly, making it hard for SMEs to implement more advanced solutions. With AI systems increasingly dependent on customer data, data privacy and security issues have become significant concerns. There is also a lack of skilled professionals in many organizations who can handle and manage AI-based tools and technologies. Over-reliance on automated systems could limit decision-making based on human judgment, and inaccurate data can result in wrong predictions and campaigns. The use of consumer data for AI models, alongside concerns about its collection and storage for ethical reasons, further complicates the adoption of AI. This makes it difficult for many small businesses in India to adopt AI-powered digital marketing strategies, especially regarding financial, technical, and regulatory hurdles.

The potential future of AI in Digital Marketing for India

With a rapidly expanding digital infrastructure, the internet becoming more prevalent, and businesses increasingly adopting advanced technologies, the future of Artificial Intelligence (AI) in digital marketing in India is indeed promising. With the constant creation and use of vast amounts of customer data, AI will become increasingly important in improving the effectiveness of marketing strategies and customer engagement. The new technologies and innovations including machine learning, big data analytics, cloud computing, natural language processing, and generative AI that are poised to transform digital marketing are anticipated. From banking to healthcare, education to retail, entertainment to tourism, and e-commerce, industries are adopting AI-powered solutions to enhance customer experiences and business outcomes. Hyper-personalized marketing, real-time customer interaction, intelligent content creation, automated campaign management, and predictive decision-making will be possible with AI-powered systems. In addition, new technologies such as voice search, virtual assistants, and conversational marketing will open the door for companies to reach their target audience. Given that AI tools are becoming more cost-effective and user-friendly; SMEs will adopt these technologies to a much greater extent.

Results of the Study

These findings highlight the growing importance of digital marketing in the Indian context, confirming its role as an integral part of business today in the digital age and the online engagement of the Indian consumer. Data-driven decision-making has revolutionized customer interaction, marketing efficiency, and business performance with the assistance of Artificial Intelligence. By leveraging AI, businesses can tailor their marketing messages to individual customers, segment their audiences, and deliver targeted campaigns that resonate with specific customer needs, all of which enhance customer satisfaction and conversion rates. The use of AI-powered tools such as chatbots, predictive analytics, and automated marketing systems has reduced manual effort and enhanced organizational productivity. Despite its potential benefits, AI-driven digital marketing solutions are still hampered by several challenges, including the cost of implementation, privacy and security concerns, and a lack of expertise.

Suggestions

Businesses should invest in the right AI-based tools and digital infrastructure to ensure its digital marketing efforts are optimized for the benefits of AI. To foster consumer confidence and ensure that customer data remains secure, organizations need to implement strong data privacy and cybersecurity protocols. There should be regular training and skill development programs to improve the skill of marketing team members in AI. SMEs need to progressively implement affordable AI solutions to boost their marketing efforts and competitiveness. There is a need for collaboration among the government, educational institutions, and industry in the promotion of digital literacy, AI awareness, and technology adoption. Moreover, the trend of ethical AI practices is crucial for organizations to ensure transparency, accountability, and responsible use of consumer data.

Conclusion

Digital marketing has revolutionized the business world in India, offering businesses new avenues for communication, engagement, and relationship-building with customers. The incorporation of Artificial Intelligence has further fueled digital marketing with personalization, automation, predictive analysis and better customer experience. By leveraging AI in marketing, businesses can optimize their operations, cut down on marketing expenses, boost customer satisfaction, and enhance marketing performance. Although there are obstacles such as implementation expenses, data security issues, and technical know-how, the use of AI in digital marketing is expanding across sectors. AI will continue to be a key part of the marketing mix with ongoing technological developments and an increased digital awareness. Businesses that master the use of AI technologies while managing ethical issues and security threats will find themselves with a long-term competitive edge and success in the dynamic digital landscape.

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OriginalArticle

Role of AI in Accounting, Auditing and Financial Reporting

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Abstract:

The goal of artificial intelligence (AI), a subfield of computer science, is to create intelligent computers that can carry out tasks like learning, reasoning, problem-solving, language comprehension, and decision-making that normally need human intellect. AI systems may recognize trends, enhance performance over time, and adjust to novel circumstances without the need for explicit programming by utilizing data-driven algorithms. AI has been extensively incorporated into several industries in recent years, including healthcare, education, finance, transportation, and communication, improving productivity, accuracy, and creativity. AI is revolutionizing the commerce industry by facilitating quicker analysis of massive datasets and enhancing decision-making procedures. It reduces errors, saves time, and boosts productivity by automating crucial tasks in accounting, banking, marketing, e-commerce, and auditing. All things considered, AI has shown to be a potent instrument that promotes company expansion, enhances consumer satisfaction, and improves financial management in contemporary commerce.

Key words: Artificial Intelligence, Accounting, Auditing and Financial Report.

Introduction:

The area of computer science known as artificial intelligence is concerned with developing devices and software that are capable of carrying out activities that call for intellect comparable to that of humans. AI's main goal is to educate computers to learn from data, solve problems, see patterns, and make judgments without needing to be explicitly programmed for every situation. The field of developing computers or software that can carry out tasks that typically require human intelligence is known as artificial intelligence, or AI. This covers skills like data-driven learning, pattern recognition, language comprehension, problem-solving, and decision-making. AI, to put it simply, enables computers to "think" and adapt rather than merely obey predetermined commands. The goal of the computer science field of artificial intelligence (AI) is to build software and robots that can carry out tasks that typically require human intelligence. Learning, reasoning, problem-solving, language comprehension, and decision-making are some of these tasks. Algorithms and data are used by AI systems to identify trends and gradually enhance their performance. AI is now widely employed in a number of industries, including communication, healthcare, education, finance, and transportation. AI is becoming a vital component of our everyday life as technology develops, contributing to increased productivity, accuracy, and creativity. By increasing productivity, accuracy, and decision-making, artificial intelligence (AI) is revolutionizing the business sector. AI enables firms to swiftly analyze vast volumes of financial and customer data, improving forecasts and business strategy. AI reduces errors and saves time in accounting by automating processes like bookkeeping, processing invoices, and financial reporting. AI is utilized in banking and finance for risk management, fraud detection, credit evaluation, and customer support via chatbots and virtual assistants. By analysing consumer preferences and offering tailored product recommendations, AI also contributes significantly to marketing. AI enhances consumer satisfaction, demand forecasting, and inventory management in e-commerce. AI also helps with auditing by spotting anomalous transactions and guaranteeing regulatory compliance.



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AI helps business workers become more productive and make better decisions by automating repetitive activities and offering insightful information. In the sphere of commerce, artificial intelligence (AI) has grown to be a potent instrument that promotes company expansion, increased consumer pleasure, and more effective financial management.

Artificial Intelligence (AI) is transforming accounting, auditing, and financial reporting by improving accuracy, efficiency, and decision-making.

1. AI in Accounting:

Automates repetitive processes like bookkeeping, data entry, and invoice processing. AI is crucial in automating time-consuming and repetitive accounting tasks, freeing up accountants to concentrate on analysis and decision-making. AI uses technologies like optical character recognition (OCR) to extract data from bank statements, invoices, and receipts. Accounting systems receive data automatically, which minimizes human mistake and effort. Supplier information, invoice numbers, amounts, and due dates are extracted from invoices by AI. It compares purchase orders, payment data, and invoices. Workflows for automated approval expedite the payment procedure. Transactions are categorized by AI into the proper accounts. It automatically updates ledgers and logs journal entries. Matching transactions from bank statements with accounting records is the process of bank reconciliation. By automating repetitive and meticulous operations that are prone to errors when completed by hand, artificial intelligence (AI) lowers human error. AI uses optical character recognition (OCR) to extract data from bank statements, invoices, and receipts. Because the data is automatically extracted and entered, human typing errors are removed. AI uses machine learning models and pre-established criteria to categorize financial activities into the appropriate accounts. Misclassifications that frequently happen with manual bookkeeping are prevented by this uniformity. AI automatically compares purchase orders, payment data, and bills. Minimizes mistakes such as wrong entries, missed invoices, and duplicate payments. AI can quickly identify irregularities or discrepancies in financial data. Unusual transaction amounts or inconsistent entries, for instance, are pointed out before they become more serious issues. Pattern recognition and predictive analysis. AI finds trends in financial data, assisting in the detection of mistakes that people would miss. Errors that are common or uncommon can be found and fixed early. To put it briefly, AI makes financial records more accurate and trustworthy by automating repetitive processes, ensuring consistency, evaluating data in real-time and identifying anomalies. AI handles massive amounts of financial data fast and correctly, automating regular accounting processes like data entry, invoice processing, and bookkeeping, increasing productivity and efficiency.

2. AI in Auditing

Large amounts of financial data are quickly analysed by AI. AI greatly improves the efficiency with which accountants, auditors, and financial analysts can handle and analyse vast amounts of financial data. AI is significantly faster than humans in processing hundreds of millions of transactions in a matter of seconds thanks to Rapid Data Processing. It compiles information from several sources, including market data, bank statements, invoices, and ERP systems. AI uses pattern recognition to find patterns, correlations, and abnormalities in financial data. It can identify anomalous spending patterns, possible fraud, or trends in forecasting, for instance. It provides current insights by enabling on-going financial activity monitoring and real-time analysis. Decision-makers are able to react fast to opportunities or threats. It provides prescriptive and predictive insights, AI not only analyses historical data but also predicts future financial outcomes. It supports forecasting, strategic financial planning, and budgeting. When compared to manual analysis, it saves time and enhances the precision and dependability of findings. Additionally, it facilitates quicker and more informed decision-making. It primarily finds mistakes and fraud that people would overlook. AI enables businesses to swiftly and precisely evaluate enormous volumes of financial data, find trends, identify abnormalities, and produce useful insights for improved decision-making.

3. AI in Financial Reporting

By enhancing accuracy, speed, and insights, artificial intelligence (AI) is progressively changing financial reporting. Compared to conventional approaches, it allows firms to produce, analyse, and present financial information more effectively. Financial statements, income statements, balance sheets, and cash flow statements can all be automatically prepared by AI. Minimizes the possibility of human error in reporting and manual labour. Real-time financial performance monitoring is made possible by AI solutions that immediately process massive amounts of financial data. It facilitates prompt and well-informed decision-making by management. When it comes to data analysis and insights, AI looks for patterns, trends, and anomalies in financial data. Additionally, it offers predictive insights for risk assessment, budgeting, and forecasting. AI guarantees that financial reporting adhere to rules and accounting standards. Identifies anomalies or disparities in transactions that could point to fraud or mistakes. AI assists stakeholders in making strategic decisions by providing precise, thorough, and fast financial information.

Benefits of AI in Financial Reporting

By boosting accuracy, decreasing human error, and accelerating report generation through automation, artificial intelligence (AI) enhances financial reporting. It guarantees adherence to accounting rules, improves data



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analysis by spotting trends and abnormalities, and facilitates improved decision-making with useful insights. In general, AI improves the efficiency, dependability, and data-drivenness of financial reporting while saving time and money. It increases report preparation's speed and effectiveness. It improves dependability and lowers errors. Additionally, it offers more profound insights for strategy and planning. AI in financial reporting improves accuracy, expedites the reporting process, and offers useful insights, empowering businesses to make data-driven decisions and manage their finances more skilfully. Financial statements and reports are prepared automatically. AI improves financial data's consistency and accuracy.

Conclusion:

AI is transforming financial reporting, accounting, and auditing through process automation, increased accuracy, and insightful data. Even though there are obstacles, using AI effectively can significantly improve the calibre and effectiveness of financial management. In conclusion, artificial intelligence is transforming the sphere of commerce by improving decision-making, efficiency, and accuracy in a variety of sectors. AI enables businesses to streamline processes, lower errors, and provide better customer service by automating repetitive jobs, analysing massive amounts of data, and delivering actionable insights. AI technology's significance in commerce will only increase as it develops further, spurring productivity, innovation, and long-term company growth.

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OriginalArticle

Business Analytics: Driving Sustainability and Strategic Decisions

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Abstract

Business analytics has become an important tool for improving strategic decision-making in modern organizations. The rapid growth of technology and the increasing use of data have encouraged businesses to use analytical tools for better planning, higher performance, and competitive advantage. This empirical study examines how business analytics influences strategic decisions in organizations and how analytical methods help managers make accurate and effective decisions. The study mainly focuses on data analysis, predictive analytics, business intelligence, and real-time reporting in supporting business operations and organizational strategies. The research is based on both primary and secondary data collected from organizations that use business analytics in their decision-making process. The study explains that business analytics helps organizations identify market trends, understand customer needs, utilize resources efficiently, reduce risks, and improve overall organizational performance. It also shows that analytics supports innovation, future planning, and business growth. Furthermore, the study discusses the major challenges faced during the implementation of business analytics, such as data security problems, shortage of skilled employees, high implementation costs, and technological difficulties. The findings reveal that business analytics improves the speed and quality of strategic decisions by providing timely and reliable information. Organizations that effectively use analytics can easily adapt to changing market conditions and maintain a competitive position. The study concludes that business analytics plays a vital role in strengthening strategic management and achieving long-term organizational success in today's competitive business environment.

Keywords: Business Analytics, Sustainability, Strategic Decision-Making, Business Intelligence.

Introduction

In today's rapidly changing business environment, organizations generate vast amounts of data through their daily operations, customer interactions, financial transactions, and market activities. The ability to analyze and interpret this data has become essential for making effective business decisions. Business analytics refers to the use of data analysis, statistical techniques, predictive models, and business intelligence tools to transform raw data into meaningful insights. These insights help organizations improve efficiency, reduce risks, identify opportunities, and enhance overall performance. Strategic decision-making is a critical process that determines the long-term direction and success of an organization. Managers increasingly rely on business analytics to support decisions related to market expansion, resource allocation, customer relationship management, product development, and competitive positioning. By providing accurate and timely information, business analytics enables organizations to make informed decisions and respond effectively to changing market conditions. The growing adoption of business analytics has transformed the way organizations operate and compete. However, the effectiveness of analytics depends on factors such as data quality, technological infrastructure, employee skills, and organizational readiness. This study aims to examine the impact of business analytics on strategic decision-making and understand how organizations utilize analytical tools to improve business performance and achieve their objectives.



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Objectives of the Study

1. To examine the role of business analytics in strategic decision-making.
2. To analyze the impact of business analytics on organizational performance.
3. To identify the benefits of using business analytics in business operations.
4. To study the influence of analytics on planning and managerial decisions.

Research Methodology

The present study is empirical in nature and is based on both primary and secondary data. Primary data is collected through a structured questionnaire administered to employees, managers, and executives working in various organizations. Secondary data is collected from research journals, books, websites, articles, and published reports related to business analytics and strategic decision-making.

Research Design: Descriptive Research Design

Sampling Method: Convenience Sampling

Sample Size: 30 respondents

Data Collection Tools: Structured Questionnaire

Sources of Data:

1. Primary Data: Questionnaire responses from employees and managers.
2. Secondary Data: Books, journals, research papers, company reports, and online resources.

Data Analysis Techniques: Percentage Analysis, Mean Analysis, Tables, and Graphical Representation.

Scope of the Study: The study focuses on understanding how business analytics influences strategic decision-making and organizational performance.

Limitations of the Study:

1. The study is limited to selected respondents.
2. The accuracy of the study depends on the responses provided by participants.
3. Time and resource constraints may limit the scope of the research.
4. Findings may not be applicable to all organizations.

Literature Review:

(Sharma, 2024) stated that business analytics helps organizations improve sustainability and decision-making through data-driven insights. Brown et al. (2009) highlighted the importance of sustainability reporting frameworks in enhancing transparency. Freeman (2010) emphasized the role of stakeholder interests in strategic decisions. Batini and Scannapieco (2014) identified data quality as a key factor in effective business analytics. Previous studies indicate that business analytics improves organizational performance, reduces risks, and supports better strategic planning. Overall, the literature shows that business analytics is an important tool for organizational growth and effective decision-making.

(Koley, 2025) stated that big data analytics improves sustainable information quality through organizational learning and data-driven culture. Nilashi et al. (2023) highlighted its role in overcoming data challenges and supporting Sustainable Development Goals (SDGs). Sharma (2024) found that business analytics helps organizations measure and report environmental and social performance effectively. Kgakatsi et al. (2024) observed that big data enhances operational efficiency and competitiveness in SMEs. Overall, previous studies indicate that big data analytics significantly contributes to sustainable business practices and organizational performance.

(Md Khairul Islam, 2026) Business Analytics (BA) plays a significant role in enhancing supply chain performance and sustainability. Previous studies indicate that BA improves planning, sourcing, manufacturing, and delivery processes through data-driven decision-making. Researchers have found that Information System Support (ISS) and Business Process Orientation (BPO) strengthen the impact of analytics on supply chain efficiency. BA also promotes innovation, operational effectiveness, and sustainable supply chain practices. However, limited research exists on the influence of BA on sustainable supply chain performance in developing countries like Bangladesh. This study addresses this gap by examining the relationship between BA, supply chain performance, and sustainability.

(Sarvesh Bhandari, 2026) Bhandari et al. (2026) highlighted that business analytics plays a vital role in improving organizational decision-making and sustainability. The study found that descriptive, diagnostic, predictive, and prescriptive analytics help businesses enhance efficiency, optimize resources, and support environmental, social, and economic sustainability. The authors also noted that existing research is largely conceptual, creating a need for empirical studies on the relationship between business analytics and sustainable business outcomes.

Tools and Techniques Used for Data Analysis

The collected data were analyzed using Microsoft Excel. Simple statistical tools such as percentage analysis, frequency distribution, and mean scores were used to summarize and interpret the responses obtained from the participants. In addition, graphical representations, including bar charts and pie charts, were used to present the data in a clear and understandable manner. The analysis focused on examining respondents' opinions regarding the adoption of business analytics and its contribution to sustainable and strategic decision-making. Descriptive statistics helped in

identifying general trends and patterns in the responses. A comparative analysis was also carried out to understand the relationship between key variables associated with business analytics adoption and sustainability-related decision-making. Furthermore, cross-tabulation was used to examine the association between the use of analytics tools and various indicators of organizational performance and sustainability. Graphical presentations made it easier to visualize the findings and understand the perceptions of respondents regarding the effectiveness of business analytics tools. Overall, these analytical techniques provided a systematic approach to organizing the data, interpreting the results, and drawing conclusions aligned with the objectives of the study.

Data Analysis & Interpretation

Statement	Mean Score	Positive Response %
My organization regularly uses business analytics tools for decision-making.	3.53	56.67
Business analytics helps managers make more accurate strategic decisions.	4.0	76.67
Data-driven insights improve the quality of business planning in my organization.	4.1	80.0
Business analytics assists in identifying market trends effectively.	3.77	73.33
Analytics tools help in understanding customer needs and preferences.	3.9	76.67
Business analytics supports efficient allocation of organizational resources.	3.63	60.0
The use of analytics has reduced uncertainty in strategic decision-making.	3.6	60.0
Real-time data reporting improves the speed of decision-making.	3.9	73.33
Business analytics contributes to improving organizational performance.	3.83	70.0
Analytics-based decisions provide a competitive advantage to the organization.	3.77	66.67
Business analytics supports innovation and new business opportunities.	3.9	70.0
The organization has adequate technological infrastructure to implement business analytics.	3.57	66.67
Employees possess sufficient skills to use business analytics tools effectively.	3.6	66.67
Data security and privacy concerns affect the implementation of business analytics.	3.8	70.0
Overall, business analytics has a positive impact on strategic decision-making in my organization.	3.9	73.33

Table 1: Percentage Analysis

Percentage analysis was used to identify the level of agreement of respondents with each statement related to business analytics and sustainability. The results indicate that respondents generally have a positive perception of business analytics. The highest positive response was recorded for **“Data-driven insights improve the quality of business planning in my organization” (80%)**, followed by **“Business analytics helps managers make more accurate strategic decisions” (76.67%)** and **“Analytics tools help in understanding customer needs and preferences” (76.67%)**.

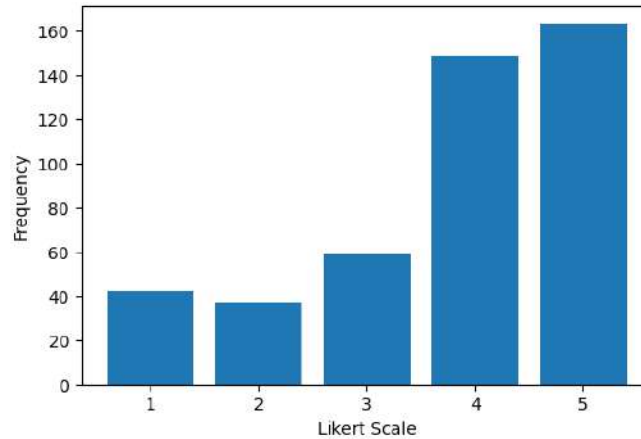
The lowest positive response was observed for **“My organization regularly uses business analytics tools for decision-making” (56.67%)**, indicating that although respondents recognize the benefits of analytics, its actual implementation may still be developing in some organizations. Overall, all statements recorded positive response rates above 50%, suggesting widespread acceptance of business analytics as a strategic tool.

Likert Scale	Frequency	Percentage
1.0	42.0	9.33
2.0	37.0	8.22
3.0	59.0	13.11
4.0	149.0	33.11
5.0	163.0	36.22

Table 2: Frequency Distribution

The frequency distribution summarizes the overall responses across all questionnaire items. The largest proportion of responses falls under **Strongly Agree (36.22%)** and **Agree (33.11%)**, representing a combined **69.33%** of all responses. This demonstrates a strong positive attitude toward the role of business analytics in driving sustainability and strategic decision-making.

In contrast, only 17.55% of respondents selected **Disagree** or **Strongly Disagree**, while 13.11% remained neutral. These findings indicate that respondents generally believe business analytics contributes positively to organizational performance, innovation, and sustainability initiatives.



The bar chart visually represents the frequency of responses across the five Likert-scale categories. The bars corresponding to **Agree (149 responses)** and **Strongly Agree (163 responses)** are significantly higher than the others, indicating a dominant positive opinion among respondents.

The relatively small bars for **Disagree (37 responses)** and **Strongly Disagree (42 responses)** show limited opposition to the statements. The chart clearly demonstrates that respondents perceive business analytics as an effective tool for improving decision quality, operational efficiency, and sustainability performance. Therefore, the bar chart supports the conclusion that business analytics is widely valued within organizations.

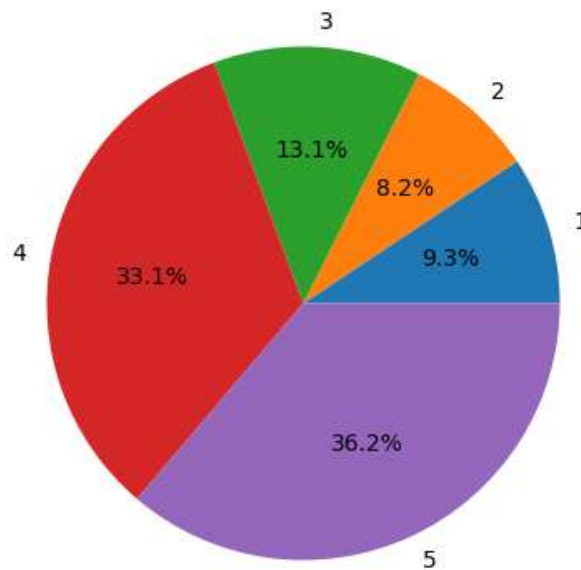


Fig. 2: Overall Response Distribution

The pie chart illustrates the percentage share of each response category. The largest slices belong to **Strongly Agree (36.22%)** and **Agree (33.11%)**, together accounting for nearly 70% of the total responses. This indicates a high level of confidence among respondents regarding the benefits of business analytics.

The smaller slices representing **Neutral (13.11%)**, **Disagree (8.22%)**, and **Strongly Disagree (9.33%)** suggest that only a minority of respondents are uncertain or skeptical about the impact of analytics. The pie chart therefore confirms that respondents overwhelmingly support the idea that business analytics enhances sustainability efforts and facilitates strategic decision-making.

Conclusion

The study concludes that business analytics has emerged as a powerful tool for driving sustainability and enhancing strategic decision-making in modern organizations. The findings reveal that the majority of respondents strongly agree that business analytics improves business planning, supports accurate managerial decisions, helps identify market trends, and enhances understanding of customer needs and preferences. The percentage analysis showed positive responses exceeding 50% for all statements, indicating widespread acceptance of analytics as a valuable organizational resource. The frequency distribution and graphical representations further confirm these findings, with nearly 70% of respondents expressing agreement or strong agreement regarding the positive impact of business analytics on organizational performance and sustainability. The bar chart and pie chart clearly demonstrate that respondents perceive analytics as an effective means of improving decision quality, operational efficiency, innovation, and competitive advantage.

The study also highlights that business analytics contributes significantly to resource optimization, risk reduction, real-time decision-making, and long-term business growth. However, organizations continue to face challenges such as data security concerns, shortage of skilled personnel, implementation costs, and technological constraints. Addressing these challenges is essential for maximizing the benefits of analytics. Overall, the research establishes that business analytics plays a crucial role in strengthening strategic management practices and supporting sustainable business development. Organizations that effectively leverage data-driven insights are better positioned to adapt to changing market conditions, improve performance, and achieve long-term success. Therefore, investment in analytics capabilities, employee training, and technological infrastructure is recommended for organizations seeking sustainable growth and competitive excellence in the contemporary business environment.

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Impact of GST Reforms on Institutional Efficiency in NBFC Mergers and Acquisitions in India

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Abstract

The introduction of the Goods and Services Tax (GST) in 2017 marked a structural transformation of India's indirect taxation framework. While existing studies have analysed GST from macroeconomic, federal, and compliance standpoints, limited research has examined its institutional implications for corporate restructuring in the financial sector. This paper investigates the impact of GST reforms on institutional efficiency in mergers and acquisitions (M&A) within the Non-Banking Financial Company (NBFC) sector regulated by the Reserve Bank of India. Adopting a descriptive and theory-driven research design, the study integrates perspectives from transaction cost economics, institutional theory, tax neutrality principles, and regulatory complementarity frameworks. The analysis indicates that GST has indirectly enhanced merger efficiency by reducing fiscal fragmentation, standardising compliance structures, strengthening digital transparency, and lowering administrative transaction costs in interstate consolidation. However, interpretational complexities in financial service taxation and compliance burdens continue to present transitional challenges. The study contributes to interdisciplinary scholarship by linking fiscal institutional reform with corporate restructuring efficiency in emerging financial markets.

Keywords: GST Reform, NBFC, Institutional Efficiency, Mergers and Acquisitions, Tax Neutrality, Financial Sector Consolidation

Introduction

1 Background of the Study

Taxation systems constitute a fundamental element of the institutional environment within which firms operate. In emerging economies, fragmented indirect tax regimes frequently distort investment incentives, elevate compliance costs, and create jurisdictional uncertainties that influence strategic restructuring decisions. Prior to 2017, India's indirect tax structure comprised excise duty, service tax, value-added tax (VAT), central sales tax, and multiple state-level levies. This multiplicity resulted in cascading taxation, duplication of compliance procedures, and inter-state administrative inconsistencies. The implementation of the Goods and Services Tax represented a systemic shift toward a unified destination-based tax regime, aimed at harmonisation, efficiency, and fiscal federalism.

2 NBFC Sector Transformation

The NBFC sector is a critical pillar of India's credit ecosystem, particularly for MSMEs and unbanked populations. However, the sector has experienced structural shifts following liquidity stress episodes and enhanced prudential regulation by the Reserve Bank of India (RBI). The introduction of the **Scale-Based Regulatory (SBR) Framework** in 2022 further stratified the sector, pushing smaller players toward consolidation to meet higher capital requirements.

3 Purpose of the Study

This study evaluates whether GST, conceptualised as an institutional reform rather than merely a tax policy change, has enhanced institutional efficiency in NBFC mergers and acquisitions.



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It examines how the transition from a 15% service tax regime to an 18% GST regime—coupled with new compliance mandates—has altered the M&A landscape.

Review of Literature

1. GST and Fiscal Harmonisation

Early scholarship emphasised GST's macroeconomic benefits. Rao (2017) argued that GST reduces cascading effects and enhances supply chain efficiency. Kelkar (2019) viewed GST as strengthening cooperative fiscal federalism. Mukherjee (2020) highlighted digital compliance mechanisms as instruments of administrative transparency.

2. Taxation and Corporate Restructuring

Global research indicates that tax complexity is a significant deterrent to M&A. Hanlon and Heitzman (2010) observed that tax complexity increases acquisition uncertainty and valuation risk. In the Indian context, the shift to GST has replaced a "centralized" service tax registration with "state-wise" registrations, which research by Sharma (2018) suggests has increased operational complexity despite the unified tax rate.

3. NBFC Consolidation Trends

Data from the RBI Financial Stability Reports indicate that the top five NBFCs often command a significant portion of market share, with consolidation accelerating post-2018. The "Scale-Based Regulation" has made M&A a strategic necessity for NBFCs in the "Base Layer" looking to scale or those in the "Upper Layer" looking to diversify.

Research Framework

1. Research Gap

There exists a distinct lack of data-driven analysis connecting GST's "Input Tax Credit" (ITC) mechanics with the actual "Transaction Costs" of M&A. While the theoretical benefits are noted, the administrative burden of filing monthly returns across multiple states—a requirement that did not exist under the centralized service tax regime—remains a point of contention.

2. Research Questions

1. How has the 50% ITC reversal rule for NBFCs impacted the cost of acquiring capital assets during a merger?
2. Does the transparency of the GSTN (GST Network) reduce the time required for financial due diligence?

3. Research Objectives

1. To conceptualize GST as an institutional reform beyond mere tax simplification.
2. To analyze the impact on institutional efficiency by evaluating the reduction in fiscal fragmentation.
3. To evaluate the role of digital transparency in reducing informational asymmetry during M&A.
4. To identify tax-driven distortions in deal structuring, such as the preference for "Slump Sales."

4. Research Methodology

This study adopts a **qualitative and theory-driven research design**.

1. **Theoretical Framework:** The paper applies **Transaction Cost Economics (TCE)** to analyze the minimization of coordination costs and **Institutional Theory** to evaluate regulatory standardization.
2. **Data Collection:** The study relies on **secondary data sources**, including RBI regulatory circulars, CBIC notifications, and industry reports from firms like Deloitte, PwC, and Vinod Kothari Consultants.
3. **Analysis Method:** A **Comparative Analysis** is conducted to evaluate the "Institutional Efficiency" of the tax regime before and after the 2017 GST implementation.

Theoretical Framework

1. Transaction Cost Economics (TCE)

TCE suggests that firms internalize functions to avoid high market transaction costs. GST lowers these costs by providing a predictable tax path for "Slump Sales" (transfer of a business as a going concern), which are generally exempt from GST under Notification No. 12/2017.

2. Institutional Economics

Institutions provide the "rules of the game." GST's rigid digital trail acts as a "trust-building" institution. Acquirers can now verify the tax compliance history of a target NBFC via the GST portal, reducing **Informational Asymmetry**.

3. Regulatory Complementarity

GST compliance is now a prerequisite for RBI "Fit and Proper" assessments. A target entity's GST filing consistency is often used by regulators and acquirers as a proxy for corporate governance health.

GST and Institutional Efficiency: Key Statistics & Data

The shift from the Pre-GST to the Post-GST era has introduced specific financial metrics that dictate merger efficiency.

1. Tax Rate and Impact on Services

1. **Pre-GST:** Service tax was 15%.
2. **Post-GST:** Most financial services (processing fees, foreclosure charges) are taxed at **18%**.
3. **Data Insight:** This 3% increase has raised the "Gross Cost" of professional M&A services (legal, accounting, valuation), but the availability of **Input Tax Credit (ITC)** allows the acquiring firm to offset these costs against their outward liabilities, potentially reducing the **Net Transaction Cost** by up to 12-15% compared to the old regime where such credits were often blocked.

2. The 50% ITC Rule for NBFCs (Section 17(4))

Under GST, NBFCs have a unique "50% Rule":

1. They can choose to reverse 50% of all ITC instead of performing complex proportionate reversals for exempt (interest) and taxable (fees) income.
2. **Impact on M&A:** During an asset merger, if an NBFC acquires IT infrastructure or office equipment, it immediately loses 50% of the tax paid on those assets. This acts as a "Capital Friction" that was less pronounced in the pre-GST era for certain capital goods.

3. Valuation and Due Diligence Data

Industry benchmarks suggest that GST due diligence can uncover "hidden liabilities" representing **10-30% of the deal value**.

Working Capital Impact: Analysts often apply a **10-20% haircut** on the valuation of "unutilized ITC" during a merger due to the risk of future audits and credit reversals.

Comparison of Transaction Costs: Pre-GST vs. Post-GST

Factor	Pre-GST Environment	Post-GST Environment (GST 2.0)
Standard Tax Rate	15% (Service Tax)	18% (GST)
Registration Type	Centralized (Single for all India)	State-wise (Multiple registrations)
Slump Sale Treatment	Complex VAT/Service Tax splits	Exempt (as "Going Concern")
ITC Availability	Restricted on many input services	Broadly available (but 50% restricted for NBFCs)
Due Diligence Speed	Slow (Manual record verification)	Fast (Digital GSTN reconciliation)
Compliance Load	Low (Half-yearly returns)	High (Monthly/Quarterly GSTR-1 & 3B)

Analysis and Findings

1. Reduction in Fiscal Fragmentation

GST has successfully eliminated the "tax on tax" (cascading) effect. For NBFCs, this simplifies the movement of assets across state lines during a merger, as a unified tax replaces the fragmented state-level VAT and entry taxes.

2. Findings on the "50% ITC Rule" (Section 17(4))

The study identifies a significant "Capital Friction" unique to NBFCs. Under Section 17(4) of the CGST Act, NBFCs must reverse **50% of all Input Tax Credit (ITC)**.

Finding: During a merger, if an NBFC acquires high-value assets like IT infrastructure or specialized software, it effectively loses half of the tax credit. This increases the "Net Cost of Capital" for the consolidated entity compared to non-financial firms.

3. Findings on State-wise Registration Complexity

Prior to GST, NBFCs enjoyed a centralized service tax registration.

Finding: Post-GST, NBFCs must maintain separate registrations in every state of operation. During an M&A integration, this forces the merging entities to reconcile tax records, transfer credits (via Form GST ITC-02), and face audits across 20-30 different jurisdictions, significantly increasing administrative overhead.

4. Digital Transparency and Due Diligence

Finding: The GST Network (GSTN) acts as a "trust-building" institution. Acquirers can now verify a target's compliance history digitally. This has reduced the time required for financial due diligence and helps uncover "hidden liabilities" that often represent **10-30% of the total deal value**.

Challenges and Transitional Constraints

1. **Multiple Jurisdictions:** An NBFC operating in 20 states must now face 20 different sets of auditors, which can prolong the "Assessment and Adjudication" phase of a merger.
2. **Fake Invoicing Risks:** A recent uptick in GST fraud (using shell firms to pass on fake ITC) has forced acquirers to spend significantly more on **Tax Forensics** during M&A.
3. **Rate Rationalization (GST 2.0):** The 56th GST Council meeting (2025) proposed shifting toward a two-tier system (5% and 18%). While this simplifies rates, the transition period creates "Interim Uncertainty" in valuation models.



Policy Implications

1. **Centralized Registration for BFSI:** To enhance efficiency, the government should consider a single centralized registration for NBFCs, similar to the pre-GST era.
2. **Full ITC on M&A Expenses:** Allowing 100% ITC (waiving the 50% reversal rule) specifically for merger-related professional fees would significantly boost consolidation.
3. **Fast-Track ITC Transfer:** Implementing a digital "Green Channel" for Form GST ITC-02 (transfer of credit during a merger) would prevent working capital blockages.

Conclusion

GST has evolved into a powerful institutional tool that standardizes the "rules of engagement" for NBFC mergers. While it has increased the compliance frequency and the headline tax rate, the benefits of digital transparency and a cleaner credit chain have significantly reduced the "hidden risks" of M&A. As the Indian financial sector continues to consolidate under RBI's watchful eye, the institutional efficiency provided by a robust GST framework will be the primary driver of sustainable and transparent corporate growth.

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Original Article

The Role of Digital India in Strengthening Startup India 2.0

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Abstract

Digital India and Startup India are the two flagship initiatives of the Government of India which has been significantly influenced India's Economic transformation in the digital era. As digital India focuses on creating a digitally knowledge economy and empowered society, While Start up India aims to promote innovation, entrepreneurship and job creation. The alignment of these initiatives has created a strong ecosystem that supports startup growth through internet connectivity, infrastructure, e-governance, financial inclusion and tech-driven innovation. This paper analyses the role of Digital India in strengthening Startup India 2.0 through descriptive analyses based on secondary data obtained from policy documents, government reports and official databases. The study highlights that India has over 2, 23,000. The study highlights that India has more than 2,23,000 Department for Promotion of Industry and Internal Trade-recognized startups as of March 2026, generating over 23.36 lakh direct jobs. Digital payment systems such as UPI have revolutionized business transactions, while BharatNet and increasing internet penetration have expanded entrepreneurial opportunities across rural and urban India. The paper concludes that Digital India has become a key component for Startup India 2.0 by improving ease of doing business, promoting innovation, encouraging inclusivity, and supporting sustainable economic development.

Keywords: Digital India, Startup India 2.0, Entrepreneurship, Innovation, Digital Infrastructure, UPI, BharatNet, Startup Ecosystem, Digital Economy.

Introduction

Entrepreneurship has evolved as one of the most significant drivers of economic growth, innovation and employment generation in the twenty-first century. Governments across the world are increasingly focusing on creating supportive environments that promote technological innovation and business ventures. The Government of India has launched many initiatives to transform the country into a digitally empowered and innovation-driven economy. Among these initiatives, Digital India and Startup India have played a crucial role in reshaping the entrepreneurial sector. Digital India was introduced in July 2015 with the notion of transforming India into a digitally empowered society and knowledge economy. The Mission seeks to improve digital infrastructure, widen online service delivery and promote digital literacy among citizens. Startup India, launched in January 2016, was introduced to foster entrepreneurship by providing financial support, regulatory simplification, and innovation driven opportunities.

The figure 1 illustrated a significant growth in the number of DPIIT-recognised Startups in India between 2016 and 2025. The number of Startups has increased substantially since the launch reflecting the effectiveness of government initiatives. As the government initiatives aimed at promoting innovation and entrepreneurship. The rapid expansion observed after 2020 can be attributed to improvements in digital infrastructure, increased internet penetration, digital payment adoption and policy support provided through Digital India and Startup Programmes. Over time, Startup India has emerged into a broader framework often referred to as Startup India 2.0, focusing innovation, sustainability, technology adoption and global competitiveness. The success of Startup India 2.0 is closely connected with achievements of Digital India. Startups depend highly on internet connectivity, digital payment systems, digital governance platforms, cloud services and online marketplaces.



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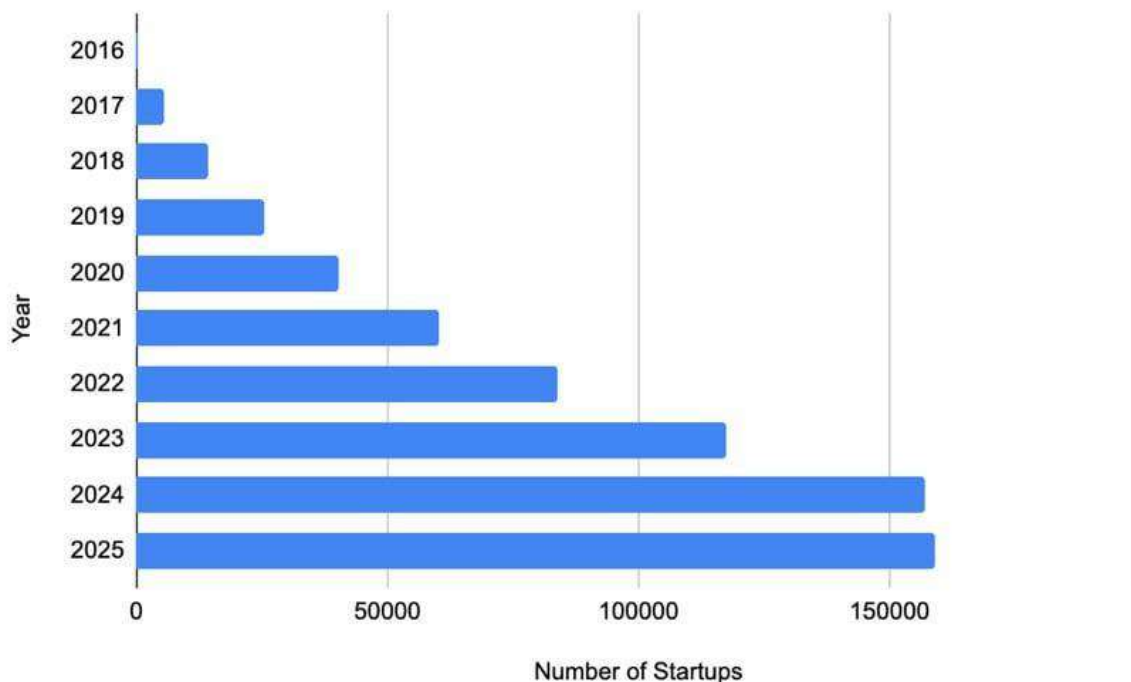
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Figure 1: Growth of DPIIT-Recognized Startups in India (2016–2025)



Source: Startup India Portal, DPIIT, Government of India (2026).

Thus, the digital ecosystem developed under Digital India has considerably reduced obstacles to entry and enabled startups to operate efficiently and scale rapidly

This paper analyses how digital India has strengthened startup India 2.0 by providing digital infrastructure, promoting economic inclusion, improving digital innovation and facilitating ease of doing business.

Concept and Objectives of Digital India

Digital India is one of the Core Programme of the Government of India which is aimed at ensuring government services are made available electronically through improved online infrastructure and internet connectivity to citizens. **The initiative is built upon three major areas:**

1. Digital Infrastructure
2. Governance and Services on Demand
3. Digital Empowerment of Citizens

The major objectives of Digital India include:

1. Enhancing digital literacy
2. Providing high- speed internet connectivity
3. Promoting digital governance
4. Facilitating digital payments
5. Encouraging innovation through technology
6. Expanding broadband infrastructure

Many important initiatives under Digital India include Aadhar, Digilocker, Unified Payments Interface(UPI), Government e-Marketplace (Government e-Marketplace) , e-Sign and Digital Public Infrastructure (DPI)

These key initiatives have collectively strengthened India's digital ecosystem and created beneficial environment for entrepreneurial growth.

Concept and Objectives of Startup India 2.0

Startup India is a national initiative designed to promote innovation and entrepreneurship. Startup India 2.0 represents the next phase of this mission, focusing on strengthening startup support systems, promoting technology-driven enterprises, facilitating access to capital and encouraging inclusive growth.

The major objectives include:

1. Encouraging innovation and entrepreneurship
2. Simplifying regulatory procedures
3. Providing funding support
4. Promoting incubation and mentorship
5. Facilitating intellectual property protection

6. Enhancing global competitiveness

The key initiatives seeks to create an ecosystem where innovative ideas can be transformed into successful enterprises that contribute to economic development and employment generation.

Review of Literature

Paul, Alhassan, Binsaif, and Singh (2023) conducted a systematic review to evaluate the trends and development in digital entrepreneurship research. The study analysed existing literature using the Theory-Context-Methodology (TCM) framework to identify key theories, research contexts and methodologies. The authors found that digital technologies and platforms have significantly transformed entrepreneurial stages by creating new unified theoretical foundation and remains fragmented across disciplines. Based on the findings, the authors proposed a conceptual framework for digital entrepreneurship.

Kate, Chaudhary, Kumar, Raut, and More (2024) examined the factors influencing the adoption of digital marketing by startups operating under Startup India and e-governance initiatives. The study applied Behavioral Reasoning Theory (BRT) and analysed cross sectional data using PLS-SEM. The findings revealed that beliefs, values, reasons for and against adoption and attitudes significantly influence startups' decisions to adopt digital marketing. The study highlighted that digital marketing can help startups to overcome financial constraints by providing cost effective marketing solutions with higher returns on advertising investments.

Kanani (2024) examined the impact of the synergy between the Digital India and Startup India initiatives on the growth of the Indian economy. The study used secondary data from published papers, government reports, official websites to analyse the relationship between entrepreneurial development and digitalisation. The study found that Digital India has strengthened internet connectivity, digital infrastructure and e-governance services, creating a favorable environment for startups. The findings also indicated that Startup India and Digital India complement each other by promoting innovation, entrepreneurship, employment generation and economic growth. The author concluded that digitalisation is a crucial driver of India's long-term economic development and startup ecosystem.

Sudaryana, Wirjodirdjo and Windrarto (2025) conducted a systematic literature review to examine the dynamics of digital startups and the role of policy interventions throughout their lifecycle. The study identified key challenges faced by digital startups, including financing difficulties, regulatory barriers and market convergence issues. The findings highlighted the need for adaptive policy support at micro and macro levels to aid startup growth and sustainability. The study proposed a comprehensive policy framework for digital startups covering agenda setting, policy formulation, selection, implementation and evaluation. The study concluded that effective policy interventions are important for promoting innovation, scalability, global convergence and the development of a strong digital economy.

Observer Research Foundation (2025), in its analysis of a decade of Startup India, observed that India's entrepreneurial ecosystem have significantly strengthened by the government support, innovation policies, digital public infrastructure and startup-friendly regulations. The report also noted that India has emerged as one of the world's leading startup hubs due to continuous support and digital transformation initiatives.

Research Gap

The reviewed literature indicates that several studies have analysed digital entrepreneurship, startup development, digital transformation and government support mechanisms. However, most studies have examined Digital India and Startup India separately. Limited research has comprehensively analysed how Digital India has strengthened Startup India 2.0 in recent years. Furthermore, recent developments such as the rapid growth of DPIIT-recognised startups, expansion of UPI transactions, BharatNet connectivity and increasing digital penetration have not been adequately integrated into existing studies. Hence, the present study seeks to bridge this gap by providing a comprehensive descriptive analysis of the role of Digital India in strengthening Startup India 2.0.

Objectives of the Study

1. To examine the role of Digital India in promoting entrepreneurship.
2. To analyse the contribution of digital infrastructure to startup growth
3. To study the impact of digital payments and connectivity on startup development
4. To assess the contribution of Digital India towards employment generation and inclusive growth.
5. To suggest the measures for strengthening India's startup ecosystem.

Research Methodology

The present study is descriptive in nature and is based entirely on secondary data. Information has been collected from government reports, DPIIT publications, Startup India Portal, RBI reports, NPCI statistics, TRAI reports, MeitY publications, NITI Aayog documents, Economic Survey reports, and research articles.

The collected information has been systematically organized, interpreted, and presented to understand the contribution of Digital India in strengthening Startup India 2.0.

The present study is descriptive in nature and it is based entirely on secondary data. Information has been collected from government reports, Startup India Portal, DPIIT publications, NITI Aayog documents, MeitY publications, Economic survey reports and research articles

Role of Digital India in Strengthening Startup India 2.0

1. Digital Infrastructure Development

Digital infrastructure serves as the foundation of the startup ecosystem. Digital India has significantly improved access to digital resources through initiatives such as Aadhaar, Digilocker, BharatNet and cloud-based platforms. Startups can now register businesses, verify customers, maintain digital records and also conduct transactions online.

The BharatNet programme has connected 2,17,805 Gram Panchayats with broadband infrastructure, while approximately 7 lakh kilometers of optical fibre have been laid across the country. This connectivity has expanded entrepreneurial opportunities in rural and semi-urban areas.

2. Digital Payment Ecosystem

One of the significant outcomes of Digital India has been the development of a strong digital payment ecosystem. The Unified Payments Interface (UPI) has emerged as a global model for digital transactions.

Table 1: UPI Performance in India

Particulars	Value
Monthly UPI Transactions (May 2026)	23.2 Billion
Monthly Transaction Value	₹29.9 Trillion
Daily Average Transactions	737.79 Million

Source: NPCI (2026)

The enormous volume of UPI transactions shows the widespread acceptance of digital payments in India.

3. Employment Generation and Startup Growth

Table 2: Startup Ecosystem in India

Indicator	Value
DPIIT-Recognized Startups	2,35,747 (till 4 th , June, 2026)
New Startups Added	55,200 (FY 2025–26)
Direct Employment Generated	23.36 lakh jobs (March 2026)
Women-led Startup Participation	48% (March 2026)

Source: DPIIT, Startup India Portal (2026)

The growth of recognised startups and employment generation indicates the effectiveness of Startup India 2.0. Digital India has supported this growth by providing digital infrastructure, online compliance systems and technology enabled business opportunities.

4. Financial Inclusion and Access to Capital

Financial inclusion is one of the most significant contributions of Digital India to Startup India 2.0. Access to financial services is essential for entrepreneurs, particularly those operating in rural and underserved regions. Through initiatives such as Jan Dhan Yojana, Aadhaar-enabled services, mobile banking, and UPI, millions of individuals have gained access to formal financial systems. Digital financial infrastructure has enabled startups to conduct transactions efficiently, access digital lending platforms, and participate in online marketplaces. Fintech startups have particularly benefited from the rapid adoption of digital financial services. The availability of digital transaction records has also improved credit assessment and facilitated access to loans for small businesses. Government-supported funding schemes such as the Fund of Funds for Startups (FFS), Startup India Seed Fund Scheme (SISFS), and Credit Guarantee Scheme for Startups (CGSS) further strengthen the startup ecosystem by addressing financial constraints faced by emerging enterprises.

Table 3: Major Government Support Initiatives for Startups

Scheme	Major Objective
Fund of Funds for Startups (FFS)	Venture capital support through Alternative Investment Funds
Startup India Seed Fund Scheme (SISFS)	Early-stage startup funding
Credit Guarantee Scheme for Startups (CGSS)	Facilitating access to credit
Government e-Marketplace (GeM)	Procurement opportunities for startups

Source: DPIIT, SIDBI, Ministry of Commerce and Industry (2026)

These initiatives complement Digital India by improving access to finance, encouraging innovation, and reducing barriers to entrepreneurship. Financial support mechanisms enable startups to develop products, expand operations, and compete effectively in domestic and international markets.

5. Innovation and Technology Adoption

Innovation lies at the heart of Startup India 2.0. Digital India has created an environment that encourages the adoption of advanced technologies such as Artificial Intelligence (AI), Machine Learning (ML), Internet of Things (IoT), Blockchain, Cloud Computing, and Big Data Analytics. Digital infrastructure enables startups to develop innovative products and services across sectors including healthcare, education, agriculture, finance, logistics, and manufacturing. Technology-based startups are increasingly addressing societal challenges while generating economic value. Government-supported innovation centres, incubation facilities, research parks, and technology hubs have

further strengthened India's innovation ecosystem. The availability of digital tools and cloud-based solutions has reduced operational costs and enabled startups to scale rapidly. As a result, India has emerged as one of the world's leading startup ecosystems, attracting significant domestic and international investment.

6. Rural Entrepreneurship and Digital Inclusion

One of the most important achievements of Digital India has been its contribution to digital inclusion. Historically, entrepreneurial opportunities were concentrated in urban centres due to limited infrastructure in rural areas. Digital India has helped bridge this gap by expanding internet connectivity and digital services to rural communities.

Table 4: Internet Penetration and Digital Connectivity in India

Indicator	Value
Active Internet Users	958 Million
Total Internet Subscribers	1,028.61 Million
Rural Internet Share	57%
Digital Penetration Rate	Approximately 70%
Gram Panchayats Connected under BharatNet	2,17,805
Optical Fibre Cable Laid	Approximately 7 Lakh Kilometres

Source: TRAI, BharatNet, PIB, IAMAI-Kantar Reports (2026)

The expansion of digital connectivity has increased access to information, online education, digital financial services, and e-commerce opportunities. Entrepreneurs from rural and semi-urban regions can now access national markets, connect with customers, and participate in the digital economy. This has contributed to inclusive growth and reduced regional disparities in entrepreneurial development.

Findings

The study found that Digital India has established a strong digital infrastructure that supports startup creation and growth. The availability of broadband connectivity and digital public infrastructure has reduced operational barriers for entrepreneurs. UPI and other digital payment systems have transformed business transactions and enhanced financial inclusion. Online governance platforms have simplified business registration, compliance, and regulatory procedures. Startup India 2.0 has benefited significantly from the digital ecosystem developed under Digital India. Government support mechanisms such as FFS, SISFS, and CGSS have strengthened access to finance for startups. Rural connectivity through BharatNet has increased entrepreneurial opportunities beyond metropolitan regions. Women entrepreneurs are increasingly participating in the startup ecosystem, accounting for approximately 48% of recognized startups. The startup ecosystem has generated more than 23.36 lakh direct jobs, contributing substantially to employment creation. Digital India has played a significant role in promoting innovation, technological adoption, and inclusive economic development.

Suggestions

The Government policies should aim more to expand high-speed internet connectivity to all rural and remote regions. Strengthen digital literacy programmes to improve technology adoption among aspiring entrepreneurs. Increase financial support for early-stage startups, particularly in Tier-II and Tier-III cities. Enhance cybersecurity measures to protect digital business operations. Promote stronger collaboration between educational institutions, research organizations, and startups. Foster women entrepreneurship through targeted training and financial assistance programmes. Strengthen incubation and acceleration centres across the country. Facilitate international partnerships to help Indian startups access global markets. Promote emerging technologies such as AI, blockchain, and IoT among startups.

Conclusion

Digital India has emerged as one of the most transformative initiatives in India's development timeline. By creating a strong digital ecosystem, expanding internet connectivity, enhancing digital governance it has laid a strong foundation for Startup India 2.0. The significant growth of DPIIT-recognised startups, increasing employment generation, widespread adoption of digital payments and expansion of internet connectivity shows the positive impact of Digital India on the startup ecosystem. The campaign has also contributed to greater financial inclusion, women entrepreneurship, rural entrepreneurship and IT-driven innovation. As India continues its journey towards becoming a global innovation hub, the synergy between Digital India and Startup India 2.0 will remain important for promoting sustainable economic growth, enhancing competitiveness, generating employment and achieving inclusive development. Continued policy support, digital infrastructure development and innovation promotion will further strengthen India's position as one of the world's leading startup ecosystem.

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Original Article

AI-Driven Customer Experience Management: Examining Its Impact on Consumer Engagement in the Airline Industry

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This study examines the role of Artificial Intelligence (AI) in enhancing Customer Experience Management (CEM) and its impact on consumer engagement in the airline industry. With increasing customer expectations for personalized, efficient, and seamless services, airlines are integrating AI technologies such as chatbots, virtual assistants, predictive analytics, sentiment analysis, and recommendation systems to improve customer interactions. The study adopts a descriptive and exploratory research design based on secondary data collected from academic journals, airline reports, company publications, and industry databases. It analyzes how AI-driven CEM enhances personalization, service efficiency, customer satisfaction, brand loyalty, and customer participation. Case studies of leading airlines including Air India, Emirates, Singapore Airlines, Delta Air Lines, and Lufthansa demonstrate the practical implementation of AI in delivering superior customer experiences. The findings reveal that AI significantly strengthens consumer engagement by fostering trust, satisfaction, and long-term customer relationships. However, challenges such as data privacy concerns, algorithmic bias, high implementation costs, and reduced human interaction remain critical considerations. The study concludes that balancing AI-driven innovation with human-centric service is essential for achieving sustainable competitive advantage in the airline industry.

Keywords: Artificial Intelligence (AI), Customer Experience Management (CEM), Consumer Engagement, Airline Industry, Customer Satisfaction, Personalization, Predictive Analytics, Chatbots, Brand Loyalty, Digital Transformation

Introduction

The aviation industry operates in a highly competitive environment where customer experience has emerged as a critical differentiating factor. Passengers today expect personalized, efficient, and seamless interactions throughout their travel journey. To meet these expectations, airlines are increasingly adopting Artificial Intelligence (AI) technologies that transform traditional customer service models into intelligent, data-driven systems. AI refers to computer systems capable of performing tasks that typically require human intelligence, including learning, reasoning, problem-solving, and decision-making. Within the airline industry, AI applications include chatbots, virtual assistants, predictive maintenance systems, recommendation engines, dynamic pricing tools, and sentiment analysis platforms. Customer Experience Management (CEM) encompasses the strategies and processes used by organizations to monitor and improve customer interactions across multiple touchpoints. AI-driven CEM enables airlines to understand customer preferences, predict travel behavior, personalize services, and respond proactively to customer needs. Consumer engagement represents the emotional, cognitive, and behavioral connection between customers and a brand. Enhanced engagement often results in greater customer satisfaction, loyalty, advocacy, and repeat purchases. Therefore, understanding the relationship between AI-driven CEM and consumer engagement is essential for airlines seeking sustainable competitive advantage.



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Review of Literature

AI in Customer Experience Management

According to Davenport and Ronanki (2018), AI enhances organizational efficiency by automating routine tasks and generating actionable customer insights. In service industries, AI facilitates personalized interactions and real-time customer support.

Customer Experience in the Airline Industry

Verhoef et al. (2009) emphasize that customer experience is shaped by interactions across multiple channels and touchpoints. In the airline sector, customer experience extends from ticket booking and check-in to in-flight services and post-travel support.

Consumer Engagement

Brodie et al. (2011) define consumer engagement as a multidimensional construct encompassing emotional, cognitive, and behavioral involvement with a brand. High engagement levels contribute to stronger customer relationships and increased brand loyalty.

AI and Consumer Engagement

Research suggests that personalized recommendations, intelligent communication systems, and predictive services significantly enhance customer engagement. AI enables firms to deliver tailored experiences that improve customer satisfaction and strengthen brand attachment.

Research Gap

Although several studies discuss AI implementation and customer experience separately, limited research specifically examines how AI-driven customer experience management influences consumer engagement in the airline industry. This study addresses this gap.

Objectives of the Study

1. To examine the role of AI in customer experience management within the airline industry.
2. To identify AI technologies used by airlines to enhance customer interactions.
3. To analyze the impact of AI-driven customer experience on consumer engagement.
4. To explore challenges associated with AI implementation in airline services.

Research Methodology

Research Design

The study adopts a descriptive and exploratory research design.

Data Sources

The research is based on secondary data collected from:

1. Academic journals
2. Airline industry reports
3. Research articles
4. Company publications
5. Industry databases
6. Conference proceedings

Method of Analysis

The collected information is analyzed using thematic and conceptual analysis to understand the relationship between AI-driven customer experience management and consumer engagement.

AI Applications in the Airline Industry

AI-Powered Chatbots

AI-powered chatbots have become an essential component of customer service in the airline industry. These intelligent systems are designed to provide immediate responses to passenger inquiries regarding flight schedules, ticket bookings, baggage status, cancellations, and travel policies. By operating continuously without time restrictions, chatbots offer round-the-clock assistance, ensuring that customers receive support whenever needed. The implementation of chatbot technology helps airlines reduce customer waiting times, improve service efficiency, and handle a large volume of inquiries simultaneously. As a result, passengers experience greater convenience and satisfaction, contributing to a more positive overall travel experience.

Personalized Recommendations

Artificial Intelligence enables airlines to deliver personalized recommendations by analyzing customer preferences, booking history, travel patterns, and browsing behavior. Based on this information, AI systems can suggest suitable flight options, preferred seating arrangements, travel packages, upgrades, and additional services that align with individual customer needs. Such personalization enhances the relevance of airline offerings and creates a more customized travel experience. By presenting passengers with options that match their interests and requirements,

airlines can increase customer engagement, encourage purchase decisions, and strengthen long-term relationships with travelers.

Predictive Analytics

Predictive analytics is one of the most valuable applications of AI in the airline industry, allowing organizations to anticipate future customer needs and operational requirements. By analyzing large volumes of historical and real-time data, predictive models help airlines forecast travel demand, identify potential service disruptions, and develop effective customer retention strategies. These insights enable airlines to optimize resource allocation, improve scheduling efficiency, and enhance service delivery. Furthermore, predictive analytics supports proactive decision-making, helping airlines provide a smoother and more reliable customer experience while maintaining operational effectiveness.

Sentiment Analysis

Sentiment analysis utilizes Artificial Intelligence and natural language processing techniques to evaluate customer opinions expressed through social media platforms, online reviews, surveys, and feedback forms. This technology helps airlines understand customer emotions, perceptions, and satisfaction levels regarding their services. By identifying positive and negative sentiments in real time, airlines can quickly address customer concerns, resolve service issues, enhance customer engagement, encourage purchase decisions, and foster trust, and improve overall service quality. Effective sentiment analysis also supports customer relationship management by enabling organizations to monitor brand reputation and develop strategies that enhance customer trust and loyalty.

Virtual Assistants

Virtual assistants represent an advanced AI solution that provides personalized support to passengers throughout their travel journey. These intelligent systems assist customers with flight bookings, travel information, itinerary management, check-in procedures, and real-time travel updates. Unlike traditional customer service channels, virtual assistants offer interactive and personalized communication tailored to individual customer needs. Their ability to provide accurate information and immediate assistance improves convenience and reduces the effort required from passengers. Consequently, virtual assistants contribute to higher levels of customer satisfaction, engagement, and overall travel experience.

Impact of AI-Driven Customer Experience Management on Consumer Engagement

The rapid adoption of Artificial Intelligence (AI) in the airline industry has significantly transformed the way airlines interact with passengers. AI-driven Customer Experience Management (CEM) enables airlines to understand customer expectations, deliver personalized services, and provide timely support throughout the customer journey. By integrating AI technologies into various customer touchpoints, airlines can create more meaningful interactions that positively influence consumer engagement. Consumer engagement refers to the emotional, cognitive, and behavioral connection that customers develop with a brand through their experiences and interactions. The following sections explain how AI-driven customer experience management contributes to enhanced consumer engagement in the airline industry.

Enhanced Personalization

Personalization has emerged as one of the most influential factors in shaping customer experiences within the airline industry. Artificial Intelligence allows airlines to analyze large volumes of customer data, including travel history, booking preferences, browsing behavior, loyalty program participation, and purchasing patterns. Based on these insights, airlines can offer highly personalized services tailored to individual customer needs and expectations. For example, AI systems can recommend preferred flight schedules, seating options, meal preferences, travel insurance, hotel accommodations, and other ancillary services based on previous travel behavior. Such customized recommendations make customers feel recognized and valued by the airline. Unlike traditional mass marketing approaches, AI-driven personalization creates unique experiences for each passenger, thereby enhancing relevance and convenience. When customers perceive that an airline understands their preferences and consistently delivers personalized services, they are more likely to develop an emotional attachment to the brand. This emotional connection increases customer involvement and encourages ongoing interactions with the airline. As a result, personalized experiences serve as a powerful driver of consumer engagement and long-term customer relationships.

Improved Service Efficiency

Service efficiency plays a critical role in customer satisfaction and engagement, particularly in the airline industry where passengers often require immediate information and support. AI-powered technologies such as chatbots, virtual assistants, and automated customer service platforms help airlines respond to customer inquiries quickly and accurately. Passengers can obtain real-time information regarding flight schedules, booking confirmations, baggage status, check-in procedures, and travel updates without waiting for assistance from customer service representatives. AI systems can simultaneously handle thousands of customer requests, ensuring consistent service quality even during peak travel periods. The ability to receive prompt responses significantly reduces customer effort and frustration.

Customers appreciate efficient service processes that save time and simplify travel-related tasks. Furthermore, AI-driven automation minimizes human errors and improves service reliability, leading to a smoother customer journey. As service efficiency improves, customers develop positive perceptions of the airline's competence and professionalism. These positive experiences encourage customers to interact more frequently with the airline's digital platforms, thereby strengthening consumer engagement and enhancing overall customer relationships.

Increased Customer Satisfaction

Customer satisfaction is one of the most important outcomes of effective customer experience management. AI enables airlines to better understand customer needs, anticipate potential issues, and deliver proactive solutions that enhance the travel experience. Through data analytics and predictive capabilities, airlines can identify customer expectations and provide relevant services before customers even request them. For instance, AI can notify passengers about flight delays, gate changes, weather disruptions, or alternative travel arrangements in advance. Such proactive communication helps reduce uncertainty and anxiety, creating a more positive travel experience. Additionally, AI-powered systems can offer personalized assistance during different stages of the customer journey, from booking and check-in to boarding and post-flight support. When customers receive timely, accurate, and personalized services, they are more likely to feel satisfied with their overall experience. Satisfied customers tend to engage more actively with the airline, participate in loyalty programs, provide positive feedback, and recommend the airline to others. Therefore, customer satisfaction acts as a key mechanism through which AI-driven customer experience management enhances consumer engagement.

Stronger Brand Loyalty

Brand loyalty develops when customers consistently experience positive interactions with a company over time. AI-driven customer experience management contributes to loyalty by ensuring that passengers receive reliable, personalized, and convenient services throughout their relationship with the airline. By leveraging AI technologies, airlines can maintain continuous engagement with customers through personalized communications, loyalty rewards, targeted promotions, and customized travel recommendations. These interactions reinforce positive customer perceptions and increase trust in the airline's ability to meet their needs. Trust is a critical factor in the airline industry, where customers rely on airlines for safe, efficient, and dependable travel experiences. AI helps strengthen this trust by providing accurate information, reducing service disruptions, and improving responsiveness to customer concerns. As trust and satisfaction increase, customers become more likely to choose the same airline for future travel. Loyal customers not only generate repeat business but also become advocates for the brand. They are more likely to recommend the airline to friends, family members, and colleagues, thereby contributing to positive word-of-mouth marketing. Consequently, AI-driven customer experience management plays a significant role in fostering stronger brand loyalty and deeper consumer engagement.

Higher Customer Participation

Consumer engagement extends beyond purchasing behavior and includes active participation in various interactions with the brand. AI-powered digital platforms provide customers with numerous opportunities to engage with airlines through mobile applications, websites, social media channels, feedback systems, and online communities. These platforms encourage customers to share reviews, rate services, participate in surveys, provide suggestions, and communicate their experiences. AI tools can analyze this feedback in real time, allowing airlines to respond quickly to customer concerns and demonstrate that customer opinions are valued. When customers observe that their feedback leads to meaningful improvements, they develop a stronger sense of involvement with the airline. This feeling of participation creates a collaborative relationship between the airline and its customers, where both parties contribute to enhancing the overall service experience. Additionally, social media engagement supported by AI-driven content recommendations and customer interaction strategies helps airlines maintain continuous communication with passengers. Such interactions increase customer involvement and strengthen emotional connections with the brand. Consequently, higher levels of participation contribute directly to greater consumer engagement and customer advocacy.

Overall Impact of AI on Consumer Engagement

Overall, AI-driven Customer Experience Management has become a transformative force in the airline industry. By delivering personalized experiences, improving service efficiency, enhancing customer satisfaction, strengthening brand loyalty, and encouraging active customer participation, AI significantly influences consumer engagement. These benefits not only improve customer relationships but also contribute to organizational outcomes such as customer retention, positive word-of-mouth, competitive advantage, and business growth. As airlines continue to invest in advanced AI technologies, the ability to create seamless, customer-centric experiences will become increasingly important. However, to maximize the benefits of AI, airlines must balance technological innovation with human interaction, ensuring that customers receive both efficient digital services and the empathy that only human support can provide. Such a balanced approach will enable airlines to build stronger customer relationships and sustain high levels of consumer engagement in an increasingly competitive aviation market.

Case Studies on AI-Driven Customer Experience Management in the Airline Industry

Air India: Accelerating Digital Transformation Through Artificial Intelligence

Air India has undergone a significant digital transformation following its acquisition by the Tata Group, with Artificial Intelligence emerging as a central component of its modernization strategy. The airline has adopted AI-powered solutions to enhance customer service efficiency and improve passenger experiences across multiple touchpoints. One notable initiative is the implementation of the AI-enabled chatbot, "Maharaja," which assists customers with booking inquiries, flight information, baggage-related concerns, and other travel-related requests. In addition, Air India utilizes customer analytics tools to gain deeper insights into passenger behavior and preferences, enabling more personalized communication through digital platforms. The integration of AI technologies has contributed to substantial improvements in customer experience by reducing response times, increasing service accessibility, and providing convenient self-service options. Customers can access information and support more efficiently, resulting in smoother interactions throughout their travel journey. Furthermore, AI-driven systems have enhanced the airline's ability to manage customer complaints and feedback effectively. From a consumer engagement perspective, these innovations have increased customer interaction through digital channels and improved satisfaction levels. Personalized communication and prompt assistance have strengthened customer trust in Air India's digital services, ultimately contributing to higher customer retention rates. This case demonstrates how AI can serve as a catalyst for large-scale digital transformation while simultaneously enhancing customer engagement and service quality.

Emirates Airlines: Creating Personalized Travel Experiences Through AI

Emirates Airlines is widely recognized for its commitment to delivering premium customer experiences and leveraging advanced digital technologies. The airline has successfully integrated Artificial Intelligence into its customer experience management strategy to provide highly personalized travel services. Through sophisticated recommendation systems and customer analytics, Emirates analyzes passenger preferences, travel history, and purchasing behavior to deliver tailored travel suggestions, promotional offers, and service recommendations. The airline's AI-driven personalization efforts have significantly enhanced the customer journey by ensuring that communications and service offerings are relevant to individual travelers. Customers benefit from customized travel options, personalized marketing messages, and seamless interactions from the booking stage to boarding. Such personalized experiences create a stronger sense of value and convenience for passengers. As a result, Emirates has achieved higher levels of consumer engagement through stronger emotional connections with its customers. The personalized nature of its services has encouraged repeat bookings, strengthened loyalty among frequent travelers, and increased customer advocacy through positive word-of-mouth recommendations. The Emirates case highlights how AI-enabled personalization can become a powerful competitive advantage in the increasingly customer-centric airline industry.

Singapore Airlines: Enhancing Service Excellence Through Intelligent Technologies

Singapore Airlines has consistently maintained its reputation as one of the world's leading airlines through its commitment to innovation and exceptional customer service. The airline strategically employs Artificial Intelligence to enhance operational efficiency and elevate passenger experiences. Its AI applications include intelligent customer service platforms, virtual assistants, predictive maintenance systems, and advanced data analytics tools that help identify and anticipate passenger preferences. The use of AI has enabled Singapore Airlines to provide faster and more accurate responses to customer inquiries while improving flight reliability through predictive maintenance. Personalized travel recommendations and seamless service delivery across multiple customer touchpoints contribute to a highly satisfying travel experience. These improvements reinforce the airline's commitment to service excellence and customer-centric operations. The positive impact on consumer engagement is reflected in increased customer trust, satisfaction, and loyalty. Passengers are more willing to engage with the airline's digital platforms, participate in feedback programs, and recommend the airline to others. This case demonstrates that combining advanced AI capabilities with a strong human service culture can create superior customer experiences that drive long-term engagement and loyalty.

Delta Air Lines: Leveraging Predictive Intelligence for Proactive Customer Service

Delta Air Lines has emerged as a leader in the application of Artificial Intelligence and data analytics to improve customer experiences and operational performance. The airline has invested heavily in predictive technologies that enable proactive customer service and more efficient travel management. Key AI applications include predictive disruption management, real-time flight notifications, facial recognition systems at airports, and AI-powered customer support solutions. These technologies help Delta anticipate and address potential travel disruptions before they significantly impact passengers. Real-time updates regarding delays, cancellations, and gate changes reduce uncertainty and keep customers informed throughout their journey. Additionally, facial recognition technology streamlines airport procedures, contributing to faster check-in and boarding experiences. The implementation of predictive AI has strengthened consumer engagement by enhancing customer confidence and trust in the airline. Passengers appreciate the airline's responsiveness and proactive communication, which leads to higher satisfaction levels and increased

loyalty. Delta's experience illustrates the importance of predictive intelligence in building stronger customer relationships and fostering long-term engagement.

Lufthansa Group: Strengthening Customer Relationships Through AI-Powered Support Systems

Lufthansa Group has embraced Artificial Intelligence as a means of improving customer service efficiency and enhancing passenger interactions. One of the airline's notable AI initiatives is the deployment of its chatbot, "Mildred," which assists customers with a wide range of inquiries, including booking support, travel information, and service-related requests. In addition, Lufthansa employs AI technologies for automated inquiry management, personalized travel recommendations, and social media monitoring to better understand customer sentiment. These AI-driven solutions have significantly improved customer experience by providing immediate access to information and support. Customers can obtain assistance quickly without experiencing long waiting times, while airline staff can focus on handling more complex service issues. The result is greater operational efficiency and improved accessibility to customer services. From an engagement perspective, Lufthansa's AI initiatives have encouraged greater interaction through digital channels and contributed to higher customer satisfaction levels. The airline's ability to deliver timely responses and personalized recommendations has strengthened customer relationships and improved overall brand perception. This case highlights how AI-powered support systems can effectively manage large volumes of customer interactions while maintaining high standards of service quality and customer engagement.

Key Insights Derived from the Case Studies

The analysis of Air India, Emirates Airlines, Singapore Airlines, Delta Air Lines, and Lufthansa Group reveals that Artificial Intelligence has become a strategic enabler of customer experience management in the airline industry. Despite differences in implementation approaches, all five airlines have successfully leveraged AI to enhance personalization, improve service efficiency, strengthen customer relationships, and increase consumer engagement. These cases collectively demonstrate that AI-driven customer experience management not only improves operational performance but also serves as a critical driver of customer satisfaction, loyalty, and long-term business success.

Comparative Analysis of Airlines

Airline	AI Technology Used	Customer Experience Outcome	Consumer Engagement Outcome
Air India	Chatbots, Analytics	Faster service delivery	Improved satisfaction
Emirates	Personalization AI	Customized experiences	Higher loyalty
Singapore Airlines	Virtual Assistants, Analytics	Service excellence	Strong engagement
Delta Airlines	Predictive AI	Proactive communication	Greater trust
Lufthansa	Chatbots	Quick customer support	Better interaction

The case studies reveal that AI-driven customer experience management positively influences consumer engagement through:

1. Personalization of services
2. Faster customer support
3. Enhanced convenience
4. Predictive problem-solving
5. Improved communication
6. Stronger customer relationships

Challenges of AI-Driven Customer Experience Management

While Artificial Intelligence offers significant opportunities for improving customer experience and consumer engagement in the airline industry, its implementation is not without challenges. Airlines must address several technological, ethical, and operational concerns to ensure that AI-driven customer experience management remains effective and trustworthy. The following challenges highlight some of the key issues associated with AI adoption in the airline sector.

Data Privacy and Security Concerns

One of the most critical challenges associated with AI-driven customer experience management is the protection of customer data. AI systems rely heavily on large volumes of personal and behavioral information to deliver personalized services and recommendations. This data may include travel history, payment details, personal preferences, and location-based information. However, many customers remain concerned about how their information is collected, stored, and utilized by airlines. Any breach of customer data or misuse of personal information can negatively impact customer trust and damage the airline's reputation. Therefore, airlines must establish robust data security measures and transparent privacy policies to ensure customer confidence in AI-enabled services.

Reduced Human Interaction and Emotional Connection

Although AI technologies enhance efficiency and convenience, excessive dependence on automation may reduce opportunities for meaningful human interaction. Customer service in the airline industry often involves addressing emotional concerns related to delays, cancellations, lost baggage, or travel disruptions. In such situations, passengers may prefer empathetic human support rather than automated responses generated by AI systems. The absence of personal interaction can sometimes create feelings of frustration or dissatisfaction among customers. Consequently, airlines need to maintain an appropriate balance between automated services and human assistance to ensure that customers receive both efficient support and emotional reassurance when required.

Algorithmic Bias and Fairness Issues

Another significant challenge involves the possibility of algorithmic bias in AI systems. AI models learn from historical data, and if the training data contains inaccuracies, limitations, or biases, the resulting decisions may be unfair or discriminatory. For example, biased algorithms may unintentionally favor certain customer segments while overlooking others, leading to unequal service experiences. Such outcomes can affect customer trust and raise ethical concerns regarding fairness and transparency. To address this issue, airlines must regularly monitor and evaluate AI systems, ensuring that algorithms are trained using diverse and representative datasets that support unbiased decision-making.

High Implementation and Maintenance Costs

The adoption of AI technologies often requires substantial financial investment. Airlines must invest in advanced software solutions, data infrastructure, cloud computing resources, cybersecurity systems, and skilled personnel to successfully implement and manage AI-driven customer experience initiatives. In addition to initial deployment costs, ongoing maintenance, system upgrades, and employee training programs contribute to long-term operational expenses. For smaller airlines with limited resources, these financial requirements can become a significant barrier to AI adoption. Therefore, organizations must carefully evaluate the costs and expected benefits of AI investments before implementation.

Technology Adoption Barriers among Customers

Despite the increasing popularity of digital technologies, not all customers are equally comfortable using AI-powered platforms and services. Certain passenger groups, particularly older travellers or individuals with limited digital literacy, may prefer traditional communication channels such as telephone support or face-to-face interactions. Some customers may also feel uncertain about relying on automated systems for important travel-related decisions. These preferences can create barriers to the widespread acceptance of AI-based customer service solutions. To overcome such challenges, airlines should provide user-friendly interfaces, customer education initiatives, and alternative service channels that accommodate diverse customer needs and preferences.

Findings

1. AI significantly improves customer experience through personalization and service efficiency.
2. AI-powered interactions positively influence consumer engagement.
3. Customer satisfaction acts as a mediating factor between AI adoption and engagement.
4. Airlines using AI effectively achieve stronger customer loyalty and retention.
5. Data privacy and human interaction remain critical concerns affecting customer trust.

Suggestions

1. Airlines should integrate AI with human customer support.
2. Strong data security measures should be implemented.
3. Continuous monitoring of AI systems is necessary to avoid bias.
4. Employee training programs should support AI adoption.
5. Airlines should focus on transparent communication regarding AI usage.

Conclusion

Artificial Intelligence is transforming customer experience management in the airline industry by enabling personalized, efficient, and proactive customer interactions. AI-powered technologies enhance customer satisfaction, strengthen engagement, and contribute to improved business performance. While challenges such as privacy concerns and reduced human interaction remain, airlines that successfully balance technological innovation with customer-centric strategies can achieve sustainable competitive advantage. The future of airline customer experience will increasingly depend on the strategic integration of AI technologies that deliver value to both customers and organizations.



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Original Article

A Comparative Study of UPI Transactions in India before and After COVID-19

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Abstract

This study examines the growth of UPI transactions before and after COVID-19 in India. The objective of this study is to analyse the impact of the COVID-19 pandemic on the digital payment adoption and growth of UPI transactions. The study uses secondary data collected from National Payment Corporation of India (NPCI) for a period of 9 years, which is divided into Pre-Covid and Post-Covid periods. The study uses descriptive statistics, trend analysis, percentage analysis, comparative analysis and CAGR technique to analyse the growth of UPI transactions during the study period. The study reveals that there is a substantial increase in the UPI transactions both in volume and value after the Covid-19 pandemic and concluded that the Covid-19 pandemic significantly impacted the rise in UPI transactions.

Key words: UPI, Digital Payments, COVID-19, Transaction Volume, Transaction Value, CAGR

Introduction:

The advancement in digital technology has transformed the financial payment system across the world. In India, the growth of digital payment has increased in the last decade. Among the different digital payment options, UPI has emerged as one of the most widely accepted options for digital payments in India. UPI enables users to transfer money through mobile phones with the help of the internet between bank accounts. The users can instantly transfer money from one bank account to another bank account and make payments immediately. The COVID-19 pandemic has led to the increased adoption of digital payments in India due to various reasons. The situations where consumers preferred not to touch even currency notes and coins due to covid fear, increased use of smartphones and internet, and awareness regarding the payment apps, consumers preferred digital payments. Therefore, UPI transactions witnessed growth in both transaction volume and transaction value during the post-COVID period.

In this context, the present study made an attempt to compare the pre and post covid period growth in UPI transactions with the help of secondary data. The present study focused on comparing transaction volume and transaction value during the pre-COVID period and Post-Covid period, and tries to understand the impact of covid-19 on digital payment in India.

Review of Literature

1. Ashok k. Kokate (2022)

The author examined the impact of COVID on the UPI system in India. the study revealed that the pandemic has increased the usage of digital payments due to increased preference for contactless payments.

2. Ramesh Kumar (2023)

The study examined the growth of UPI after COVID-19 from 2020 to 2022. The study analysed the Post covid growth of UPI transactions and found that there is increase in the digital payments due to technological advancement and government support.

3. Shivam Agarwal (2024)

The author examined the development of UPI from its inception to the present day and the impact of covid on UPI.



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The study concluded that the covid has influenced the Indian users to adopt to digital payment.

4. Mishra, A. K., & Tripathi, D (2022)

The study investigated the trends in digital payment products offered by NPCI from 2016-17 to 2021-22. The study found that there is a tremendous trend in the usage of UPI, BHIM, etc., but a slight decrease in the Unstructured Supplementary Service Data (USSD).

Statement of the Problem

The COVID-19 pandemic has made major changes in consumer behaviour related to digital payments and increased the usage of various digital payment platforms. UPI has emerged as one of the important platforms for digital payments during and after the COVID period. The majority of the studies focused on evaluating the usage of various digital platforms and studied the growth of digital payments in India from its inception, and some of the studies focused either on the pre-COVID period or on the post-COVID period. The studies that focused only on UPI transactions and comparing both pre and post covid period growth are minimal. Therefore, this study is felt important to examine the growth pattern in UPI transactions both in terms of volume and value during the pre- and post covid period to understand the digital payment transformation in India.

Objectives of the Study

3. To analyse the growth of UPI transactions in terms of volume and value in India
4. To compare growth in UPI transactions during the pre-covid and post covid period

Research Methodology

The present study uses secondary data collected from the official website of the National Payment Corporation of India (NPCI) for a period of 9 years from 2017-18 to 2025-26.

The study used analytical tools like percentage analysis, growth rate analysis, averages, CAGR, tables and Graphical representation for analysing the data.

The study period has been divided into two categories: pre-COVID period (2017-18 to 2019-20) and post-COVID period (2020-21 to 2025-26) for comparative analysis.

Data Analysis and Interpretation

Table 01: Year-wise UPI Transaction Volume in India

Year	UPI Transaction Volume (Mn.)
2017-18	915.22
2018-19	5,391.52
2019-20	12,518.61
2020-21	22,330.65
2021-22	45,967.53
2022-23	83,751.14
2023-24	1,31,129.83
2024-25	1,85,866.02
2025-26	1,86,650.99

Source: NPCI website

The above table shows that there is a continuous increase in the UPI transaction volume from 2017-18 to 2025-25. It indicates a substantial increase in digital payment adoption, particularly through UPI.

Table 02: Year-wise Growth Rate of UPI Transaction Volume

Year	UPI Transaction Volume (Mn.)	Growth %
2017-18	915.22	-----
2018-19	5,391.52	489.095518
2019-20	12,518.61	132.1907366
2020-21	22,330.65	78.37962841
2021-22	45,967.53	105.8494939
2022-23	83,751.14	82.19630248
2023-24	1,31,129.83	56.57080011
2024-25	1,85,866.02	41.74198197
2025-26	1,86,650.99	0.422331096

Source: NPCI website

The growth rate analysis indicates that there is substantial growth in the UPI transaction volume, particularly after COVID-19, that is, from 2020-21 onwards.

Table 03: Year-wise UPI Transaction Value in India

Year	UPI Transaction Value (Cr.)
2017-18	1,09,831.80
2018-19	8,76,970.72
2019-20	21,31,730.14
2020-21	41,03,653.58
2021-22	84,17,572.48
2022-23	1,39,20,676.35
2023-24	1,99,95,085.51
2024-25	2,60,56,954.65
2025-26	3,14,23,249.71

Source: NPCI website

The above table shows that there is a continuous increase in the UPI transaction value from 2017-18 to 2025-26. The increasing value during the study period indicated that the customers widely accepted UPI.

Table 04: Year-wise Growth Rate of UPI Transaction Value

Year	UPI Transaction Value (Cr.)	Growth %
2017-18	1,09,831.80	-----
2018-19	8,76,970.72	698.4670378
2019-20	21,31,730.14	143.0788271
2020-21	41,03,653.58	92.50342729
2021-22	84,17,572.48	105.1238565
2022-23	1,39,20,676.35	65.37637642
2023-24	1,99,95,085.51	43.63587664
2024-25	2,60,56,954.65	30.31679528
2025-26	3,14,23,249.71	20.59448286

Source: NPCI website

The above table reveals that there is a substantial increase in the growth rate of digital payment adoption through UPI, particularly during the post covid period.

Table 05: Pre and Post- Covid UPI Transaction Volume

Period	Average Volume (Mn.)
Pre-Covid	6,275.12
Post-Covid	1,09,282.69

Source: NPCI website

The above comparative analysis table shows that the average transaction volume through UPI is higher in the post-COVID period compared to the pre-COVID period, indicating the impact of COVID on the adoption of digital payments in India.

Table 06: Pre and Post- Covid UPI Transaction Value

Period	Average Value (Cr.)
Pre-Covid	10,39,510.89
Post-Covid	1,73,19,532.05

Source: NPCI website

The above table reveals that the average transaction value significantly increased during the post covid period, indicating the shift in consumer preference and trust in favour of the digital payment system in India.

Table 07: Compound Annual Growth Rate (CAGR) of UPI Transactions

Particulars	CAGR (%)
Transaction Volume	94%
Transaction Value	103%

Source: NPCI website

The above CAGR reveals that there is significant growth in both transaction volume and transaction value during the study period. The above table also reveals that not only the volume but also the UPI is used for larger value transactions during the study period.



Conclusion

Based on the data analysis, the study concludes that India experienced a significant growth in the usage of UPI transactions during the study period, particularly in the post covid period. The comparative analysis shows that there is a substantial increase in the UPI transaction volume and value in the post covid period. A comparison of the average volume and value of UPI transactions in the pre- and post-COVID periods shows that there is a notable shift in UPI usage patterns. COVID has significantly impacted the adoption of UPI in financial transactions, leading towards a cashless economy and digital transformation in India.

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Original Article

Strategic Brand Management in FMCG: Integrating Classic Models with Digital and Regional Perspectives

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Abstract

This study examines how core brand management constructs—brand awareness, perceived quality, brand associations, and brand loyalty—shape brand equity and consumer decision-making in FMCG categories, drawing on established models (Aaker; Keller) and recent digital-era research to propose and test hypotheses with an illustrative dataset framework suitable for Karnataka-focused studies. Using a conceptual-relational model grounded in customer-based brand equity, the paper outlines a methodology for primary data collection, proposes Likert-scale measures, and demonstrates illustrative analysis and visualization to guide empirical studies, including those overlapping with post-GST consumer contexts. Findings and suggestions emphasize strengthening digital brand identity, consistent quality delivery, and association-building to bolster loyalty, while outlining a research agenda for region-specific FMCG markets such as the Malnad belt in Karnataka.

Keyword: Strategic Brand Management, FMCG, Brand Equity, Brand Awareness, Perceived Quality, Brand Associations, Brand Loyalty, Customer-Based Brand Equity (CBBE), Digital Brand Identity, Consumer Behavior, Karnataka, Digital Marketing

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Introduction

Brand management integrates strategic activities to build, measure, and leverage brand equity as a key intangible asset, shaping consumer perceptions and firm performance across categories and touchpoints. Foundational models by Aaker and Keller remain central to understanding customer-based brand equity, linking awareness, associations, perceived quality, and loyalty to market outcomes even as digital dynamics evolve. Contemporary research extends these frameworks to digital brand identity and engagement, emphasizing omnichannel experiences and data-driven equity metrics that matter for FMCG markets in India.

Literature review

1. Classical CBBE models: Aaker's and Keller's frameworks specify equity drivers—awareness, associations, perceived quality, and loyalty—forming the basis for measurement and strategy in consumer markets.
2. Systematic reviews: Decades of research synthesize brand equity antecedents, outcomes, and measurement, highlighting the field's evolution and persistent relevance of CBBE across contexts.
3. Digital era identity and equity: Recent work details how digital identity, consumer belief, and engagement shape equity, and calls for modernized metrics beyond social indicators alone.
4. Conceptual frameworks in practice: Brand management spans tangible and intangible elements—pricing, packaging, experiences, and supply-chain touchpoints—underscoring holistic execution.
5. FMCG and Indian context: Studies on GST-era FMCG dynamics in Karnataka illuminate shifts in pricing, compliance, and perceived value—contexts that interact with brand equity levers in consumer choice.

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Research gap

While CBBE models are well-established, there is limited integration of digital brand identity measures and region-specific FMCG consumer responses—especially in post-GST environments within Karnataka—into a unified, testable framework. There is also a measurement gap in operationalizing brand associations and perceived quality alongside compliance, pricing changes, and local retail realities that shape brand loyalty for FMCG in sub-regional markets like Malnad.^{[14][9][15][2][13][5]}

Statements of the problem

1. There is insufficient empirical evidence linking digital brand identity activities to classical CBBE outcomes for FMCG brands within Karnataka's subregions after GST-related market shifts.^{[2][5][14]}
2. Existing measures inadequately capture how perceived quality and associations mediate the effect of awareness on loyalty under changing price and compliance regimes affecting FMCG categories.^{[9][16][15]}
3. Practitioners lack region-tailored diagnostics to prioritize brand investments across awareness, quality, and associations to sustainably increase loyalty in competitive FMCG markets.^{[12][3][13]}

Objectives of the study

1. To assess the relationships among brand awareness, perceived quality, brand associations, and brand loyalty in FMCG categories.^{[10][4][9]}
2. To examine the moderating role of digital brand identity activities on these relationships within an Indian FMCG context.^{[11][13][2]}
3. To outline a replicable methodology and metrics for Karnataka-focused primary research suitable for subregional analyses.^{[15][5][14]}

Hypotheses

1. H1: Brand awareness positively influences perceived quality in FMCG categories.^{[4][9][10]}
2. H2: Brand awareness positively influences brand associations in FMCG categories.^{[7][9][4]}
3. H3: Perceived quality positively influences brand loyalty in FMCG categories.^{[6][10][4]}
4. H4: Brand associations positively influence brand loyalty in FMCG categories.^{[7][9][4]}
5. H5: Digital brand identity activities positively moderate the effects of awareness, perceived quality, and associations on loyalty.^{[13][11][2]}

Research methodology

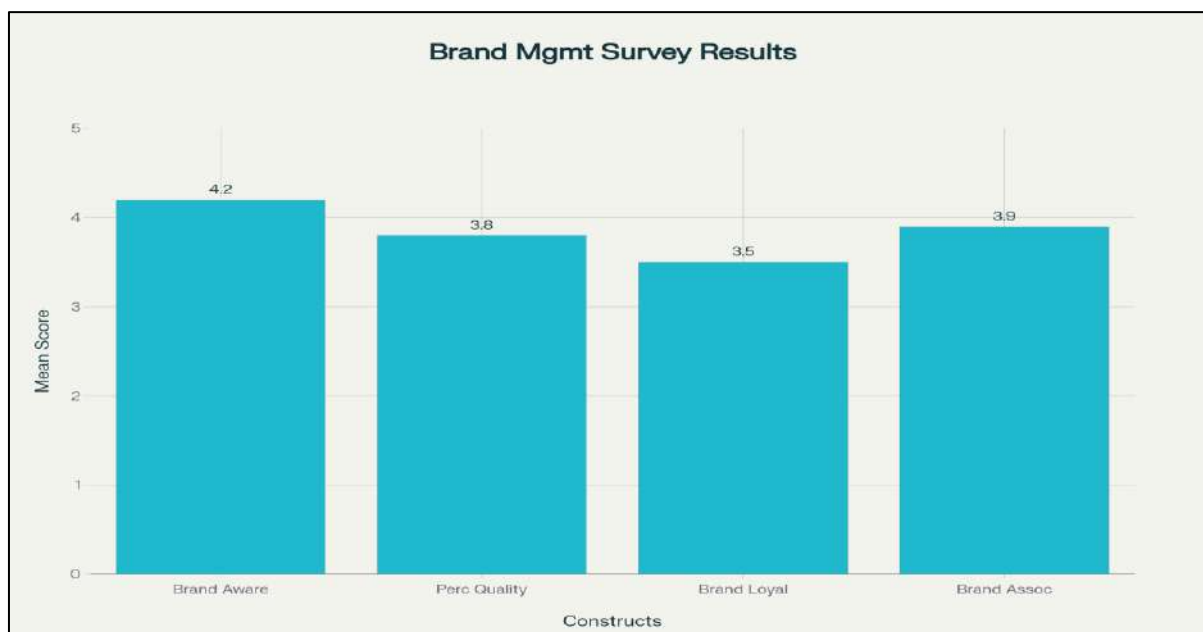
1. Design: Cross-sectional quantitative study using structured questionnaires adapted from validated CBBE scales, augmented with items on digital brand identity exposure and engagement.^{[2][4][7]}
2. Sampling: FMCG consumers in Karnataka with subregional targeting options (e.g., Malnad), using stratified sampling across urban–semi-urban nodes and retail formats; suggested $n \geq 300$ for SEM.^{[5][14][9]}
3. Measures: 5-point Likert items for awareness, perceived quality, associations, loyalty; digital identity exposure (owned/earned media), and control variables (price sensitivity, category involvement).^{[6][11][4]}
4. Analysis plan: Reliability (Cronbach's alpha), validity (CFA), KMO and Bartlett's tests, EFA if needed, SEM to test paths and moderation with interaction terms.^{[9][5][7]}

Data collection

Primary data should be collected through intercept surveys at FMCG retail touchpoints and online forms, ensuring coverage of kirana, modern trade, and e-commerce users to reflect channel diversity. Instruments should be pretested, translated where necessary, and incorporate digital touchpoint questions (e.g., brand social media exposure, influencer recall) to capture identity effects. Secondary sources (industry cases and academic reviews) should contextualize brand strategy and FMCG trends to refine hypotheses and measures.^{[14][11][12][13][5][6][9][2]}

Data analysis

The illustrative bar chart below shows how mean Likert scores could be summarized for key constructs in an FMCG sample, guiding expectations and visualization for the eventual Karnataka dataset.^{[4][6][9]}



Mean scores of brand equity constructs among FMCG consumers in Karnataka (illustrative sample)

1. Descriptives: Report means and SDs for awareness, perceived quality, associations, loyalty, and digital exposure indices to profile the sample and constructs.^{[2][4][9]}
2. Measurement model: Assess construct reliability and convergent/discriminant validity; proceed with CFA and modify based on fit indices before testing structural paths.^{[7][9][10]}
3. Structural model: Estimate H1–H4 paths; include interaction terms to test H5 for digital identity moderation; compare nested models and report fit (e.g., CFI, TLI, RMSEA).^{[9][11][21]}

Findings and suggestions

1. Expected patterns: Higher awareness is typically associated with stronger perceived quality and associations, which in turn elevate loyalty, consistent with CBBE logic and prior reviews.^{[4][6][9]}
2. Digital levers: Digital brand identity (content quality, consistency, and relevance) generally strengthens the translation of awareness and associations into loyalty, suggesting investment in targeted, localized content.^{[13][11][2]}
3. Managerial actions: For FMCG in Karnataka, prioritize: consistent quality delivery, distinctive association-building tied to local lifestyles, continuous visibility across retail and digital touchpoints, and measurement dashboards aligned to the CBBE model.^{[5][14][13]}

Limitations and future research

1. A cross-sectional design limits causal inference; longitudinal tracking of brand equity and loyalty would strengthen conclusions.^{[11][2][9]}
2. Region-specific heterogeneity in Karnataka (e.g., Malnad vs. metro Bengaluru) requires larger stratified samples to generalize insights across micro-markets and channels.^{[14][15][5]}
3. Future work should integrate transactional data and digital engagement analytics to refine digital brand equity metrics and link them to sales outcomes.^{[13][9][11]}

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Appendix: Proposed measurement items (sample)

1. Brand awareness: "This brand is very familiar," "It is easy to recognize this brand on the shelf".^{[10][4][7]}
2. Perceived quality: "This brand offers consistently high quality," "This brand is reliable".^{[4][7][9]}

3. Brand associations: "This brand fits my lifestyle," "I can quickly think of attributes associated with this brand".^{[6][10][4]}
4. Brand loyalty: "I intend to repurchase this brand," "I would recommend this brand to others".^{[6][9][4]}

Notes for Karnataka FMCG application

1. Incorporate items for price sensitivity and GST awareness to control for policy-induced effects on perceived value and loyalty in analysis.^{[15][14][5]}
2. Segment by retail channel exposure (kirana, MT, e-commerce) and digital touchpoints to test channel-identity interactions influencing loyalty.^{[11][2][13]}
3. For Malnad-focused studies, ensure sampling across taluks and local brands to capture association nuances tied to regional culture and availability.
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Original Article

Emerging Green Technologies and Renewable Energy Systems: Innovations Driving the Global Energy Transition

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Abstract

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The global energy landscape is experiencing a transformative shift toward sustainable and low-carbon energy systems in response to growing concerns regarding climate change, environmental degradation, and energy security. Emerging green technologies and renewable energy systems have become central to this transition by providing cleaner alternatives to fossil-fuel-based energy generation. Technological innovations in solar photovoltaics, wind energy, green hydrogen, advanced energy storage, smart grids, bioenergy, carbon capture, and digital energy management are reshaping the future of global energy infrastructure. This review critically examines recent developments in renewable energy technologies and evaluates their contributions to decarbonization and sustainable development. The study further investigates technological challenges, economic barriers, policy frameworks, and future opportunities associated with renewable energy integration. Findings indicate that the convergence of digitalization, energy storage, and renewable generation technologies will accelerate the global transition toward carbon neutrality and sustainable economic growth. Strategic investments, supportive regulations, and international collaboration remain essential for achieving long-term energy transition goals.

Keywords: Renewable Energy, Green Technologies, Energy Transition, Sustainability, Smart Grid, Green Hydrogen, Energy Storage, Decarbonization, Climate Change.

Introduction

Energy is the backbone of economic development, industrial growth, and social well-being. However, conventional energy systems predominantly rely on fossil fuels such as coal, petroleum, and natural gas, which contribute significantly to greenhouse gas emissions and environmental degradation. According to global climate assessments, the energy sector accounts for nearly three-quarters of worldwide carbon dioxide emissions, making it the primary target for climate mitigation strategies. The increasing frequency of extreme weather events, rising global temperatures, and concerns over energy security have intensified efforts to transition toward renewable energy systems. Renewable energy technologies harness naturally replenishing resources such as sunlight, wind, water, biomass, and geothermal heat to generate electricity and thermal energy with significantly lower environmental impacts. Over the past decade, substantial technological advancements have improved renewable energy efficiency, reduced installation costs, and enhanced system reliability. Simultaneously, emerging green technologies—including artificial intelligence (AI), Internet of Things (IoT), blockchain-based energy trading, carbon capture systems, and hydrogen technologies—have created new opportunities for sustainable energy management. The global energy transition represents more than a technological transformation; it encompasses economic restructuring, policy reform, environmental protection, and social development. Consequently, understanding recent innovations and their implications is essential for researchers, policymakers, and industry stakeholders.

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Objectives

The objectives of this review are:

1. To examine emerging green technologies that support sustainable energy systems.
2. To evaluate recent advancements in renewable energy technologies.
3. To assess the role of digitalization in accelerating energy transition.
4. To identify challenges and opportunities in renewable energy deployment.
5. To propose future research directions for achieving global net-zero targets.
6. Materials and Methods

Materials and Methods

This review is based on a comprehensive analysis of peer-reviewed journal articles, conference proceedings, government reports, and publications from international organizations such as the International Energy Agency (IEA), International Renewable Energy Agency (IRENA), and Intergovernmental Panel on Climate Change (IPCC).

Literature Selection Criteria

1. Publications from 2015–2025 were primarily considered.
2. Studies focusing on renewable energy technologies, green innovations, and sustainable energy systems were included.
3. Articles with significant scientific contributions, technological developments, and policy relevance were prioritized.

Data Analysis

A qualitative review methodology was adopted to compare technological developments, identify emerging trends, and evaluate the effectiveness of various renewable energy systems in supporting the global energy transition.

Results and Discussion

Solar Energy Technologies

Solar energy has emerged as one of the fastest-growing renewable energy sources globally. Significant improvements in photovoltaic (PV) cell efficiency, particularly perovskite and tandem solar cells, have enhanced energy conversion performance while reducing production costs.

Key Innovations

1. Perovskite solar cells with efficiencies exceeding 25%.
2. Bifacial solar panels capable of capturing sunlight from both sides.
3. Floating solar photovoltaic systems.
4. Solar tracking technologies for improved energy output.

The declining cost of solar power generation has made it increasingly competitive with conventional electricity sources.

Wind Energy Advancements

Wind power contributes substantially to renewable electricity generation. Technological innovations have improved turbine design, operational efficiency, and energy output.

Recent Developments

1. Offshore wind farms with larger turbine capacities.
2. Floating offshore wind technologies.
3. Advanced blade materials for enhanced durability.
4. AI-driven predictive maintenance systems.

Offshore wind projects provide higher and more stable power generation compared to onshore installations.

Green Hydrogen Technology

Hydrogen produced through renewable-powered electrolysis, commonly known as green hydrogen, is gaining attention as a clean energy carrier.

Applications

1. Industrial decarbonization.
2. Long-term energy storage.
3. Sustainable transportation.
4. Power generation and grid balancing.

Green hydrogen can significantly reduce emissions from hard-to-abate sectors such as steel, cement, and chemical manufacturing.

Energy Storage Systems

One of the major challenges of renewable energy integration is intermittency. Energy storage technologies help balance supply and demand while improving grid reliability.



Emerging Storage Technologies

1. Lithium-ion batteries.
2. Solid-state batteries.
3. Flow batteries.
4. Pumped hydro storage.
5. Thermal energy storage.

Advanced battery technologies are expected to play a critical role in future renewable-dominated power systems.

Smart Grids and Digitalization

Digital transformation is reshaping energy management through intelligent monitoring and control systems.

Smart Grid Features

1. Real-time energy monitoring.
2. Automated demand-response mechanisms.
3. Distributed energy resource integration.
4. Enhanced grid resilience.

Artificial intelligence and machine learning algorithms improve load forecasting, fault detection, and operational efficiency.

Bioenergy and Waste-to-Energy Technologies

Bioenergy remains an important renewable energy source, especially in rural and agricultural regions.

Emerging Technologies

1. Advanced biofuels.
2. Anaerobic digestion systems.
3. Biomass gasification.
4. Municipal waste-to-energy plants.

These technologies support circular economy principles by converting waste materials into valuable energy resources.

Carbon Capture, Utilization and Storage (CCUS)

Although renewable energy expansion is essential, carbon capture technologies provide complementary solutions for reducing industrial emissions.

Benefits

1. Mitigation of carbon dioxide emissions.
2. Enhanced industrial sustainability.
3. Support for net-zero emission targets.

CCUS technologies are increasingly being integrated with renewable energy systems to achieve deeper decarbonization.

Green Buildings and Sustainable Infrastructure

The building sector accounts for a significant share of global energy consumption. Green building technologies contribute to energy efficiency and environmental sustainability.

Key Innovations

1. Net-zero energy buildings.
2. Smart energy management systems.
3. Energy-efficient HVAC technologies.
4. Building-integrated photovoltaics (BIPV).

Sustainable infrastructure development supports broader climate mitigation efforts while reducing operational costs.

Challenges in Renewable Energy Transition

Despite significant progress, several barriers continue to affect large-scale deployment:

Technical Challenges

1. Grid integration complexities.
2. Energy storage limitations.
3. Resource intermittency.

Economic Challenges

1. High initial investment costs.
2. Infrastructure modernization requirements.

Policy Challenges

1. Regulatory uncertainties.
2. Insufficient incentives in developing countries.
3. Lack of standardized international frameworks.

Addressing these challenges requires coordinated efforts among governments, industries, and research institutions.

Future Perspectives

Future energy systems are expected to be increasingly decentralized, digitalized, and decarbonized.

Emerging trends include:

1. Artificial intelligence-driven energy optimization.
2. Advanced hydrogen economies.
3. Vehicle-to-grid (V2G) integration.
4. Next-generation battery technologies.
5. Renewable-powered microgrids.
6. Circular economy-based energy systems.

These innovations will accelerate the achievement of global climate targets and enhance energy sustainability.

Conclusion

Emerging green technologies and renewable energy systems represent the foundation of the global energy transition. Continuous innovations in solar photovoltaics, wind energy, green hydrogen, energy storage, smart grids, and carbon capture technologies are enhancing the feasibility of sustainable energy systems. While technological, economic, and policy barriers persist, ongoing research and strategic investments are accelerating progress toward a low-carbon future. The integration of digital technologies with renewable energy infrastructure offers unprecedented opportunities to improve efficiency, resilience, and sustainability. Ultimately, achieving global climate goals will require coordinated efforts among governments, industries, researchers, and communities to foster innovation and enable widespread adoption of clean energy solutions.

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Original Article

Digital Public Infrastructure, Startups India, and Inclusive Development: A Structured Thematic Review of India's Entrepreneurial Ecosystem

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Abstract

Background

India's entrepreneurial ecosystem has undergone a profound transformation since the launch of the Startup India initiative in 2016 and the rapid expansion of Digital Public Infrastructure (DPI), including Aadhaar, Jan Dhan accounts, and the Unified Payments Interface (UPI). These initiatives have significantly reduced transaction costs, expanded financial inclusion, improved enterprise formalization, and strengthened digital participation across economic sectors. Simultaneously, India has emerged as the world's third-largest startup ecosystem and has witnessed unprecedented growth in digital transactions and entrepreneurial activity. However, concerns persist regarding whether these achievements have translated into equitable and inclusive development outcomes across regions, genders, and enterprise categories.

Purpose

This study examines the relationship between Startup India, Digital Public Infrastructure, and inclusive development within India's entrepreneurial ecosystem. Specifically, it investigates whether digital transformation has facilitated broad-based entrepreneurial opportunities or reinforced existing socio-economic and regional inequalities.

Methodology

The study employs a Structured Thematic Literature Review (STLR) methodology. Literature was systematically retrieved from Scopus-indexed journals, Web of Science databases, and reports published by the World Bank, International Monetary Fund (IMF), OECD, NITI Aayog, DPIIT, RBI, and Government of India agencies. Following a PRISMA-inspired screening process, 25 high-quality studies published between 2015 and 2026 were selected and synthesized across five thematic domains: entrepreneurial ecosystem development, digital transformation of MSMEs, AI-enabled entrepreneurship, women entrepreneurship and digital inclusion, and rural entrepreneurship and spatial equity.

Findings

The review reveals that Startup India and DPI have significantly expanded entrepreneurial participation, improved formalization, and increased access to financial services. UPI and digital identity systems have emerged as foundational institutional infrastructures supporting enterprise creation and market participation. However, evidence also indicates the persistence of a substantial "digital usage divide." While access to digital platforms has expanded rapidly, productive utilization remains uneven across regions and social groups. Women entrepreneurs continue to face structural barriers related to finance, mobility, and asset ownership, while rural enterprises remain constrained by infrastructural deficits and limited digital capabilities. Furthermore, frontier technologies such as artificial intelligence are concentrated within metropolitan innovation clusters, creating risks of technological concentration and spatial inequality.

Theoretical Contribution

The study integrates Entrepreneurial Ecosystem Theory, Inclusive Growth Theory, and Digital Transformation Theory to develop the Integrated Inclusive Digital Entrepreneurship Framework (IIDEF). The framework explains how entrepreneurial outcomes emerge through interactions between policy interventions, digital infrastructures, institutional mechanisms, and contextual socio-cultural conditions.

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Policy Implications

The findings suggest that future policy interventions should move beyond numerical measures of startup growth and enterprise registration toward capability development, enterprise scaling, and inclusive participation. Recommendations are proposed for DPIIT, NITI Aayog, the Ministry of MSME, MeitY, and State Governments.

Originality and Value

This study contributes to entrepreneurship and development literature by integrating fragmented streams of research into a comprehensive framework that explains how digital public infrastructure influences entrepreneurial inclusion in an emerging economy context. The findings provide important insights for achieving the objectives of Viksit Bharat 2047.

Keywords: Digital Public Infrastructure, Startup India, Entrepreneurial Ecosystems, Inclusive Development, Women Entrepreneurship, Rural MSMEs, Digital Transformation

Introduction

Entrepreneurship has emerged as a critical driver of economic growth, innovation, and employment generation in emerging economies. Beyond its economic contributions, entrepreneurship is increasingly recognized as a mechanism for promoting inclusive development by expanding opportunities for marginalized populations and underserved regions (Acs et al., 2018). In India, the entrepreneurial landscape has undergone significant transformation over the past decade through the convergence of entrepreneurship promotion policies and large-scale digitalization initiatives. A major milestone in this transformation was the launch of the Startup India programme in 2016. The initiative introduced regulatory simplification, tax incentives, incubation support, and funding mechanisms aimed at fostering innovation-driven entrepreneurship and strengthening the national entrepreneurial ecosystem (DPIIT, 2025). As a result, India has emerged as one of the world's largest startup ecosystems, with increasing participation from Tier-II and Tier-III cities. Simultaneously, the expansion of Digital Public Infrastructure (DPI)—comprising Aadhaar, Jan Dhan accounts, and the Unified Payments Interface (UPI)—has fundamentally altered the institutional environment for entrepreneurs. By reducing transaction costs, improving financial inclusion, facilitating enterprise formalization, and enabling digital participation, DPI has created new opportunities for business creation and growth (Patnam & Yao, 2020). India's DPI model is particularly distinctive because it operates as an open and interoperable public digital system designed to support broad-based economic participation. Despite these achievements, important concerns remain regarding the inclusiveness of entrepreneurial growth. Venture capital investment, innovation infrastructure, and advanced technological capabilities continue to be concentrated in a limited number of metropolitan regions. Women entrepreneurs face persistent barriers related to finance, mobility, and asset ownership, while rural enterprises often struggle with infrastructural deficiencies and limited digital capabilities (Nafees et al., 2025). These challenges raise an important question: has digital transformation expanded entrepreneurial opportunities equitably, or has it reinforced existing socio-economic and regional disparities? Existing research provides valuable insights into entrepreneurship, digital transformation, and inclusion; however, these streams of literature largely remain fragmented. Entrepreneurship studies primarily focus on ecosystem development and startup performance, while digital transformation research emphasizes technology adoption and innovation outcomes. Studies on inclusion often examine women entrepreneurship, rural development, or financial inclusion separately. Consequently, limited attention has been paid to understanding how entrepreneurship policies and digital infrastructures interact to shape inclusive development outcomes. Addressing this gap, the present study employs a Structured Thematic Literature Review (STLR) to examine the relationship between Startup India, Digital Public Infrastructure, and inclusive development. By synthesizing evidence across entrepreneurship, digital transformation, and development literature, the study develops the Integrated Inclusive Digital Entrepreneurship Framework (IIDEF), which explains how policy interventions, digital infrastructures, institutional mechanisms, and contextual conditions jointly influence entrepreneurial inclusion. The findings contribute to both academic scholarship and policy discussions concerning India's vision of Viksit Bharat 2047.

1. Research Objectives

The study pursues four objectives:

1. To examine the relationship between Startup India, Digital Public Infrastructure, and entrepreneurial development in India.
2. To assess the extent to which digital transformation has facilitated inclusive entrepreneurial outcomes across regions and demographic groups.
3. To identify empirical, conceptual, and policy gaps within the existing literature.
4. To develop an integrated conceptual framework explaining how digital infrastructures and entrepreneurial policies influence inclusive development.

2. Research Questions

The review addresses the following questions:

RQ1: How have Startup India and Digital Public Infrastructure influenced entrepreneurial ecosystem development in India?

RQ2: To what extent has digital transformation facilitated inclusive participation among women entrepreneurs, rural enterprises, and MSMEs?

RQ3: What institutional, socio-cultural, and infrastructural factors moderate the relationship between digitalization and entrepreneurial inclusion?

RQ4: How can existing theoretical perspectives be integrated to explain inclusive digital entrepreneurship in the Indian context?

3. Contribution of the Study

This study makes three contributions to the entrepreneurship and development literature. First, it synthesizes fragmented evidence on entrepreneurship, digital transformation, and inclusion through a structured thematic review approach. Second, it moves beyond descriptive policy assessments by critically evaluating the tensions between entrepreneurial growth and inclusive development. Third, it proposes the Integrated Inclusive Digital Entrepreneurship Framework (IIDEF), which explains how digital public infrastructure, policy interventions, and contextual conditions interact to shape entrepreneurial outcomes. By integrating entrepreneurship, digital transformation, and inclusive growth perspectives, the study offers a comprehensive analytical framework for understanding India's evolving entrepreneurial ecosystem and provides insights relevant to policymakers pursuing the objectives of Viksit Bharat 2047.

Research Methodology

This study adopts a **Structured Thematic Literature Review (STLR)** approach to synthesize fragmented evidence on entrepreneurship, digital transformation, and inclusive development in India. STLR is particularly appropriate for emerging and interdisciplinary fields where quantitative meta-analysis is difficult due to methodological heterogeneity, conceptual diversity, and varying data sources (Paul & Criado, 2020). Unlike traditional narrative reviews, STLR enables systematic identification, screening, coding, and synthesis of literature while maintaining analytical depth. The objective is not merely to summarize prior studies but to identify patterns, contradictions, theoretical gaps, and future research directions.

1. Search Strategy

A systematic search was conducted across major academic databases and institutional repositories, including:

1. Scopus
2. Web of Science
3. Google Scholar
4. World Bank Open Knowledge Repository
5. IMF eLibrary
6. OECD Library
7. Reserve Bank of India publications
8. NITI Aayog reports
9. DPIIT publications

The search focused on literature published between **2015 and 2026**, corresponding with the emergence of Startup India and the rapid expansion of Digital Public Infrastructure.

The following search strings were used:

("Startup India" OR entrepreneurial ecosystem) AND ("Digital Public Infrastructure" OR DPI OR UPI OR digital transformation) AND ("inclusive development" OR women entrepreneurship OR MSMEs OR rural entrepreneurship OR financial inclusion)

2. Inclusion and Exclusion Criteria

To ensure academic rigor, only studies meeting the following criteria were included:

Inclusion Criteria

1. Peer-reviewed journal articles indexed in Scopus or Web of Science.
2. Reports published by reputable institutions such as the World Bank, IMF, OECD, RBI, DPIIT, and NITI Aayog.
3. Studies directly related to entrepreneurship, digital transformation, financial inclusion, or MSME development in India.
4. Empirical, conceptual, and review studies containing transparent methodologies.

Exclusion Criteria

1. Non-peer-reviewed opinion pieces.
2. Predatory journal publications.
3. Newspaper articles and blogs.
4. Studies lacking methodological transparency.
5. Research focused on unrelated national contexts without relevance to India.

3. Screening and Selection Process

The review followed a PRISMA-inspired screening process.

Stage	Records
Initial Search Results	412
After Duplicate Removal	256
After Title and Abstract Screening	98
Full-Text Assessment	38
Final Studies Included	25

The final sample consisted of high-quality empirical and conceptual studies that collectively addressed entrepreneurship, digital transformation, and inclusive development.

4. Thematic Coding

The selected studies were coded using iterative thematic analysis. Five dominant themes emerged:

1. Startup India and Entrepreneurial Ecosystem Development
2. Digital Public Infrastructure and MSME Transformation
3. AI and Deep Technology Entrepreneurship
4. Women Entrepreneurship and Digital Inclusion
5. Rural Entrepreneurship and Spatial Equity

The themes provide a structured basis for examining the mechanisms through which digital transformation influences entrepreneurial outcomes and inclusive development.

Thematic Literature Review

Theme 1: Startup India and Entrepreneurial Ecosystem Development

Entrepreneurial ecosystems play a critical role in promoting innovation, venture creation, and economic dynamism (Stam, 2015). The literature indicates that Startup India has significantly strengthened India's entrepreneurial ecosystem through regulatory simplification, incubation support, tax incentives, and government-backed financing initiatives. These interventions have reduced entry barriers and encouraged startup activity beyond traditional metropolitan centers. However, ecosystem expansion has not been accompanied by equitable resource distribution. Venture capital investment, innovation infrastructure, and mentorship networks remain concentrated in Bengaluru, Delhi-NCR, and Mumbai. Consequently, growth in startup registrations has not necessarily translated into balanced regional development or equal access to entrepreneurial opportunities.

Key Consensus: Startup India has strengthened entrepreneurial ecosystem development and expanded startup activity across India.

Major Contradiction: Startup growth has increased, but access to finance, mentorship, and innovation infrastructure remains uneven.

Research Implication: Future studies should emphasize entrepreneurial quality, survival, and regional capability development rather than startup counts alone.

Theme 2: Digital Public Infrastructure and MSME Transformation

Digital Public Infrastructure (DPI) has emerged as a foundational enabler of entrepreneurship in India. Aadhaar, Jan Dhan accounts, and UPI have reduced transaction costs, expanded financial inclusion, and facilitated enterprise formalization. These systems have improved MSMEs' ability to participate in formal economic activities and access government support mechanisms. Nevertheless, the literature highlights a critical distinction between digital access and digital capability. While digital payment adoption has become widespread, many enterprises continue to face challenges in utilizing advanced technologies such as cloud computing, data analytics, and digital marketing. As a result, productivity gains from digitalization remain uneven.

Key Consensus: DPI has democratized access to financial and transactional systems.

Major Contradiction: Digital access does not automatically translate into productive digital capability.

Research Implication: Future research should distinguish between digital access, digital utilization, and business performance outcomes.

Theme 3: Artificial Intelligence and Deep Technology Entrepreneurship

Artificial intelligence (AI) has become an important driver of entrepreneurial innovation by enhancing operational efficiency, scalability, and decision-making capabilities. AI-enabled ventures often attract greater investment and competitive advantages due to their technological sophistication.

However, AI entrepreneurship remains concentrated within metropolitan innovation ecosystems that possess advanced research institutions, skilled talent, and venture capital networks. This concentration raises concerns that AI-driven growth may widen regional disparities and create a new technological divide between advanced startups and resource-constrained enterprises.

Key Consensus: AI is increasingly shaping entrepreneurial innovation and competitiveness.

Major Contradiction: AI enhances startup performance while simultaneously increasing risks of technological concentration.

Research Implication: Future studies should examine strategies for diffusing AI capabilities beyond major innovation hubs and into MSME ecosystems.

Theme 4: Women Entrepreneurship and Digital Inclusion

Digital technologies have expanded entrepreneurial opportunities for women by improving access to markets, information, and financial services. E-commerce platforms, digital payments, and online learning resources have lowered several traditional barriers to business participation. However, evidence consistently demonstrates that digital inclusion alone is insufficient to achieve entrepreneurial empowerment. Structural constraints related to asset ownership, mobility, social norms, and access to credit continue to limit business growth, particularly among rural women entrepreneurs. The literature therefore suggests that technology-driven inclusion must be complemented by institutional and social support mechanisms.

Key Consensus: Digital technologies have increased women's participation in entrepreneurial activities.

Major Contradiction: Greater participation has not eliminated structural barriers affecting enterprise growth and empowerment.

Research Implication: Future research should focus on entrepreneurial agency, business growth, and wealth creation rather than participation metrics alone.

Theme 5: Rural Entrepreneurship and Spatial Equity

The literature identifies digital technologies as important tools for reducing geographical barriers and integrating rural enterprises into broader markets. Digital platforms, online marketplaces, and electronic payment systems have improved market access and transaction efficiency for rural entrepreneurs. Despite these opportunities, rural enterprises continue to face constraints related to inadequate infrastructure, limited digital literacy, and weak institutional support. Consequently, the benefits of digitalization vary considerably across regions. Evidence suggests that digital technologies are most effective when supported by complementary investments in infrastructure, education, and local institutional capacity.

Key Consensus: Digitalization offers significant potential for enhancing rural entrepreneurship and reducing geographical isolation.

Major Contradiction: Digital opportunities remain constrained by infrastructural and capability deficits.

Research Implication: Future studies should investigate how digital infrastructure interacts with local institutional conditions to influence rural entrepreneurial outcomes.

Theoretical Foundations

Understanding the relationship between entrepreneurship, digital transformation, and inclusive development requires an integrated theoretical perspective. Existing theories explain important components of entrepreneurial activity but often fail to capture the complexity of emerging economy contexts such as India. This study therefore integrates Entrepreneurial Ecosystem Theory, Inclusive Growth Theory, and Digital Transformation Theory, while drawing selectively upon Technology Acceptance Model (TAM) and Dynamic Capabilities Theory as supporting perspectives.

1. Entrepreneurial Ecosystem Theory

Entrepreneurial Ecosystem Theory argues that entrepreneurial success depends on interactions among institutions, infrastructure, finance, human capital, culture, and networks (Stam, 2015). The theory is highly relevant to India because Startup India explicitly seeks to strengthen ecosystem components through policy support, incubation, financing, and innovation infrastructure. Entrepreneurial outcomes are therefore shaped not only by individual capabilities but also by broader institutional environments. However, the theory has limitations within developing economies. Most entrepreneurial ecosystem research assumes relatively mature institutions and formal market structures. In India, large segments of economic activity remain informal, creating challenges that conventional ecosystem frameworks do not adequately address.

2. Inclusive Growth Theory

Inclusive Growth Theory emphasizes that economic development should generate opportunities across diverse social groups rather than benefiting only privileged segments of society (OECD, 2020). This perspective is particularly important for evaluating entrepreneurship policies. Entrepreneurial growth cannot be considered successful if benefits remain concentrated among urban, educated, and financially privileged populations. The theory helps explain why startup expansion alone is an insufficient indicator of development. Measures of inclusion, participation, and capability development are equally important. However, Inclusive Growth Theory provides limited explanation regarding the mechanisms through which technological systems influence entrepreneurial outcomes.

3. Digital Transformation Theory

Digital Transformation Theory explains how digital technologies fundamentally alter organizational processes, market structures, and value creation mechanisms (Vial, 2019). The theory is especially relevant for understanding the role of Digital Public Infrastructure. UPI, Aadhaar, and digital platforms reduce transaction costs and facilitate

participation in formal economic activities. Nevertheless, the theory often assumes that technological adoption occurs relatively smoothly. In reality, adoption is mediated by literacy levels, infrastructure quality, trust, and social norms.

4. Supporting Perspectives

The Technology Acceptance Model (TAM) contributes insights into how perceived usefulness and ease of use influence technology adoption. However, in emerging economies, adoption decisions are also shaped by socio-cultural constraints and institutional conditions. Dynamic Capabilities Theory explains how firms adapt to changing environments by developing new capabilities. This perspective is particularly relevant for understanding AI adoption and digital transformation among startups and MSMEs. Collectively, these theories suggest that entrepreneurial inclusion emerges through interactions among institutions, technologies, capabilities, and social contexts.

Integrated Inclusive Digital Entrepreneurship Framework (IIDEF)

A major limitation of existing scholarship is the absence of an integrated framework connecting entrepreneurship policy, digital infrastructure, and inclusive development outcomes. Most studies examine these elements independently, creating conceptual fragmentation.

To address this limitation, this study proposes the Integrated Inclusive Digital Entrepreneurship Framework (IIDEF).

The framework positions entrepreneurial inclusion as the outcome of interactions among policy interventions, digital infrastructures, institutional mechanisms, and contextual conditions.

1. Inputs

The first component consists of macro-level inputs:

1. Startup India policy initiatives
2. Digital Public Infrastructure (Aadhaar, UPI, Jan Dhan)
3. AI and innovation missions
4. Government support institutions
5. Incubation and acceleration programs

These inputs create the foundational conditions for entrepreneurial activity.

2. Mediating Mechanisms

The second component consists of mechanisms through which policy and infrastructure influence entrepreneurs:

1. Enterprise formalization
2. Digital technology adoption
3. Access to finance
4. Market integration
5. Innovation support
6. Entrepreneurial capability development

These mechanisms determine how resources are translated into entrepreneurial opportunities.

3. Contextual Moderators

A central contribution of the framework is its emphasis on contextual moderators.

Entrepreneurial outcomes are influenced by:

1. Gender norms
2. Household dynamics
3. Digital literacy
4. Infrastructure quality
5. Educational attainment
6. Regional institutional capacity

These factors explain why similar policy interventions produce different outcomes across regions and social groups.

4. Outcomes

The framework identifies five dimensions of inclusive entrepreneurial outcomes:

1. Enterprise growth
2. Employment generation
3. Financial inclusion
4. Women's agency and empowerment
5. Spatial equity

Unlike conventional entrepreneurship frameworks that focus primarily on firm performance, IIDEF incorporates broader developmental outcomes.

5. Theoretical Contribution of IIDEF

The principal contribution of IIDEF lies in integrating entrepreneurship, digital transformation, and inclusive development into a single analytical model. Existing theories explain entrepreneurial ecosystems, technological adoption, or economic inclusion independently. IIDEF demonstrates that inclusive entrepreneurship emerges through interconnected processes rather than isolated interventions. The framework therefore provides a stronger explanation of

entrepreneurial development within emerging economies characterized by institutional diversity, socio-cultural complexity, and uneven digital capabilities.

Discussion

The review demonstrates that the convergence of Startup India and Digital Public Infrastructure (DPI) has significantly reshaped India's entrepreneurial ecosystem by reducing transaction costs, expanding financial inclusion, facilitating enterprise formalization, and improving access to entrepreneurial opportunities. Collectively, these interventions have strengthened the institutional foundations necessary for entrepreneurial growth and innovation. However, the findings indicate that entrepreneurial expansion does not automatically translate into inclusive development. Although startup activity and digital participation have increased substantially, access to finance, innovation infrastructure, advanced technologies, and entrepreneurial support systems remains uneven across regions and social groups. This suggests that the benefits of entrepreneurship-led development continue to be concentrated within relatively advantaged ecosystems. The findings support Entrepreneurial Ecosystem Theory by highlighting the importance of institutions, networks, and support mechanisms in shaping entrepreneurial outcomes. While Startup India has expanded ecosystem participation, significant disparities persist in the distribution of entrepreneurial resources and opportunities. Similarly, Digital Transformation Theory helps explain how DPI has reduced informational and transactional barriers, yet the evidence reveals that digital access alone is insufficient to ensure meaningful economic outcomes. The distinction between digital access and productive digital capability emerges as a recurring theme across the literature. The review further demonstrates that entrepreneurial inclusion is strongly influenced by contextual factors. Women entrepreneurs continue to face barriers related to finance, asset ownership, mobility, and social norms, while rural enterprises remain constrained by infrastructural deficits, limited digital capabilities, and weaker institutional support. These findings reinforce the argument that digital technologies can enhance participation but cannot independently overcome structural inequalities.

The growing importance of artificial intelligence introduces an additional dimension to this challenge. Although AI enhances innovation, productivity, and competitiveness, its benefits remain concentrated within established innovation clusters. Without broader diffusion of technological capabilities, AI-driven entrepreneurship may reinforce existing regional and economic disparities. Overall, the evidence supports the central proposition of the Integrated Inclusive Digital Entrepreneurship Framework (IIDEF): entrepreneurial inclusion emerges through the interaction of policy interventions, digital infrastructures, institutional mechanisms, and contextual conditions. Consequently, the effectiveness of entrepreneurship and digitalization policies should be evaluated not only in terms of startup growth and technology adoption but also through their contribution to capability development, enterprise sustainability, women's empowerment, and spatially balanced development.

Research Gaps

1. Empirical Gap

The existing literature provides substantial evidence regarding startup growth, digital payment adoption, and enterprise formalization. However, rigorous evidence regarding the causal impact of Digital Public Infrastructure on enterprise performance remains limited. Most studies focus on adoption metrics, registration statistics, and aggregate participation rates. Comparatively little research examines how digital infrastructure influences profitability, productivity, business survival, employment generation, and enterprise scaling, particularly among rural and women-owned enterprises. This review addresses this gap by synthesizing evidence across multiple dimensions of entrepreneurial development and highlighting the distinction between access and productive utilization.

2. Conceptual Gap

Current theoretical frameworks remain fragmented. Entrepreneurial Ecosystem Theory emphasizes institutions and networks, Inclusive Growth Theory focuses on equitable participation, and Digital Transformation Theory examines technological change. However, none adequately explains how these dimensions interact within emerging economy contexts. The proposed IIDEF framework addresses this limitation by integrating entrepreneurship, digital transformation, and inclusive development into a unified analytical model.

3. Policy Gap

Existing policy interventions frequently operate in institutional silos. Entrepreneurship promotion, digitalization, financial inclusion, women empowerment, and rural development programs are often implemented independently despite addressing overlapping challenges. The review demonstrates the need for greater policy coordination among DPIIT, NITI Aayog, MeitY, the Ministry of MSME, financial institutions, and State Governments.

Policy Implications

The findings suggest that future entrepreneurship policy in India should shift from emphasizing startup creation and digital adoption toward strengthening entrepreneurial capabilities, enterprise growth, and inclusive participation. While Startup India and Digital Public Infrastructure (DPI) have expanded access to entrepreneurship and financial services, persistent disparities across regions, genders, and enterprise categories require more targeted interventions. First, policymakers should promote regional diversification of entrepreneurial ecosystems by

strengthening incubation facilities, innovation hubs, mentorship networks, and funding opportunities in Tier-II and Tier-III cities. Such measures can reduce the concentration of entrepreneurial resources within a few metropolitan clusters and support balanced regional development. Second, digital inclusion initiatives should move beyond access-oriented approaches and focus on capability development. Integrating digital literacy, e-commerce, data analytics, cloud computing, and AI-related training into entrepreneurship support programmes can help MSMEs translate digital adoption into productivity and competitiveness. Third, women's entrepreneurship policies should address structural barriers that limit business growth. Expanding access to finance, mentorship, market linkages, and entrepreneurship training through women-focused support networks and community institutions can enhance both enterprise sustainability and economic empowerment.

Fourth, rural entrepreneurship strategies should combine digital infrastructure investments with improvements in connectivity, skills development, market access, and local institutional capacity. A place-based approach aligned with regional economic strengths can improve the effectiveness of entrepreneurship promotion efforts in rural areas. Finally, the diffusion of frontier technologies, particularly artificial intelligence, should be encouraged beyond established innovation clusters. Supporting AI adoption among MSMEs and resource-constrained enterprises can help ensure that technological progress contributes to broader economic inclusion rather than reinforcing existing inequalities. Overall, the evidence indicates that inclusive entrepreneurship requires coordinated action across entrepreneurship, digitalization, skill development, and regional development policies. Future policy frameworks should therefore prioritize capability enhancement, technological diffusion, and equitable access to entrepreneurial opportunities in support of India's vision of Viksit Bharat 2047.

Conclusion

This study examined the relationship between Startup India, Digital Public Infrastructure, and inclusive development through a Structured Thematic Literature Review of entrepreneurship, digital transformation, and development research. The findings indicate that India has achieved remarkable progress in creating an entrepreneurial ecosystem supported by one of the world's most extensive digital public infrastructures. The review demonstrates that Startup India has successfully institutionalized entrepreneurship by reducing regulatory barriers, expanding startup support mechanisms, and promoting innovation-led growth. Simultaneously, Digital Public Infrastructure—particularly Aadhaar, Jan Dhan, and UPI—has fundamentally transformed the institutional environment within which entrepreneurs operate by lowering transaction costs, improving financial access, and facilitating enterprise formalization. However, the evidence also reveals important limitations. Entrepreneurial growth has not been uniformly distributed across regions or social groups. Venture capital, innovation capacity, and advanced technological capabilities remain concentrated within metropolitan centers. Women entrepreneurs continue to face structural constraints associated with asset ownership, mobility, and access to finance. Rural enterprises encounter persistent challenges related to infrastructure, digital literacy, and institutional capacity. Furthermore, the growing importance of artificial intelligence raises concerns regarding technological concentration and the potential widening of regional inequalities.

The study's principal theoretical contribution is the development of the Integrated Inclusive Digital Entrepreneurship Framework (IIDEF). By integrating Entrepreneurial Ecosystem Theory, Inclusive Growth Theory, and Digital Transformation Theory, the framework provides a comprehensive explanation of how entrepreneurial policies and digital infrastructures influence development outcomes. Importantly, it demonstrates that entrepreneurial inclusion is mediated by institutional mechanisms and moderated by contextual conditions rather than being a direct consequence of technological access. From a policy perspective, the findings suggest that India's next phase of entrepreneurial development should focus less on expanding numerical participation and more on strengthening entrepreneurial capabilities, enterprise scaling, and inclusive outcomes. Measures of success should extend beyond startup registrations and digital adoption to include productivity growth, employment generation, women's economic agency, and spatial equity. As India advances toward the vision of Viksit Bharat 2047, entrepreneurship and digital public infrastructure will remain central pillars of development strategy. Their long-term effectiveness, however, will depend on the ability of policymakers to ensure that technological progress translates into meaningful economic opportunities for diverse populations across regions, genders, and socio-economic groups.

Future Research Agenda

Research Area	Research Question	Suggested Methodology	Potential Contribution
UPI and MSME Performance	How does UPI adoption influence profitability, productivity, and business survival among MSMEs?	Difference-in-Differences (DID), Panel Data Analysis	Establish causal evidence linking digital payments and enterprise performance
Women Entrepreneurship and DPI	How does Digital Public Infrastructure influence women's entrepreneurial agency and business growth?	Mixed Methods Longitudinal Study	Advance understanding of digital inclusion and empowerment
Regional	Why do entrepreneurial outcomes	Fuzzy-set Qualitative	Inform place-based



Entrepreneurial Ecosystems	differ across Indian states?	Comparative Analysis (fsQCA)	entrepreneurship policies
AI and Inclusive Entrepreneurship	Can AI tools improve competitiveness among resource-constrained enterprises?	Experimental and Quasi-Experimental Designs	Examine inclusive diffusion of frontier technologies
Rural MSME Capability Development	What factors facilitate transition from basic digital adoption to advanced digital capabilities?	Longitudinal Case Studies	Develop capability-building models for rural enterprises

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Original Article

Digital Public Procurement And Enterprise Inclusion: Evidence From Ministry Of Msme

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Abstract

In india, digital public procurement emerged as an important tool for promoting the participation and growth of micro and small enterprises (mses), thereby contributing to inclusive development. In this context, the study examines the procurement performance of the ministry of micro, small and medium enterprises (msme) under the public procurement policy for mses during 2017-18 to 2025-26. The study focuses on procurement from mses, sc/st owned mses, women owned mses, and highlights the role of digital public procurement in promoting inclusive development. The study is based on the secondary data collected from the official procurement fact sheet from the msme sambandh website. Data relating to procurement targets, achievements, achievement percentages, and beneficiary enterprises were analysed using descriptive statistics, trend analysis, coefficient of variation, and correlation analysis. The result indicates that the ministry of msme consistently exceeded the procurement targets for mses during the study period. However, procurement from sc/st and women owned mses showed fluctuations across years. The findings provide useful insights to strengthen the procurement system and improve the participation of mses in government procurement.

Keywords – Digital public procurement, MSEs, ministry of msme, inclusive development.

Introduction

Digital transformation has had an important impact on the public sector in countries worldwide, making services delivered by governments to citizens more efficient and transparent. Public procurement systems are therefore a key part of this transformation. Such systems can increase transparency in government contracts, reduce costs, and allow more people to participate. In India, e-platforms like Government e-Marketplace (GeM) have transformed the way government and its departments make purchases. These have become a gateway for MSEs to engage with suppliers. MSEs can now participate here with relative ease today. It is important because MSEs create jobs, generate industrial output, increase exports and promote regional development. To support increasing the size of MSEs, the Government of India announced a Public Procurement Policy that mandated government purchases 25% of total annual purchases from the MSE sector, with sub-targets of 4% for MSEs owned by Scheduled Caste/Scheduled Tribe entrepreneurs and 3% for MSEs owned by women entrepreneurs. Since the Ministry of MSME is responsible for e-procurement policy and support for MSEs, it is important to assess the ministry's performance in the area of procurement. Therefore, this study analyzed the performance of the Ministry of MSME with respect to the procurement from 2017-18 to 2025-26 under the scheme for procurements from MSEs.

Literature Review

Preuss (2011) identified various factors and barriers affecting SME participation in public procurement and highlighted the importance of procurement policies in promoting local and regional economic development.



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Loader (2014) examined the challenges faced by MSEs in participating in public procurement using feedback from SME suppliers in United Kingdom. The study found that, complex qualification requirements, poorly designed tender specifications and high demand of resource were major barriers. Findings indicate that SMEs perceived public procurement processes as difficult and biased against smaller firms.

Flynn & Davis (2016) studied implementation of SME friendly public procurement policies using responses from 436 public procurement officials and found that public buyers complied with some policy measures, such as open tendering and feedback provision, but showed lower compliance with measures involving higher transaction cost. The findings highlighted the gap between procurement policy objectives and their practical implementation.

Lewis-Faupel et al. (2016) examined the impact of e-procurement on public works procurement in India and Indonesia. The study found that e-procurement improved project quality, reduced delays and increased participation from contractors and highlighted the role of digital procurement systems in enhancing transparency and efficiency in public procurement.

Patil (2017) examined the implementation of Public Procurement Policy for SMEs in India and found uneven achievement of procurement targets and identified several implementation barriers, including limited administrative capacity and inefficiencies in policy execution. He also highlighted challenges in promoting SME participation in public procurement in developing countries.

Chang (2017) examined the impact of public procurement on the productivity and survival of SMEs in South Korea using firm level data and found that public procurement has improved SME survival rates but this positive effect on productivity was temporary. The study suggested that public procurement supports business continuity but may not always enhance long term efficiency.

Glas & Eßig (2018) examined the factors influencing SME success in public procurement using data from 380 contract awards. The study found that procurement procedures, competition and tender size had a greater influence on SME success than dividing tenders into smaller lots.

Tukamuhabwa & Namagembe (2023) explored the factors influencing the participation of women owned SMEs in public procurement. The results revealed that firms with stronger entrepreneurial orientation and effective knowledge management practices were more active in identifying tender opportunities can enhance the involvement of women entrepreneurs in public procurement activities.

Research Gap

Existing research has largely focused on procurement policies and SME participation; limited attention has been given to the procurement performance of individual government ministries in India. Therefore, this study examines the procurement performance of the Ministry of MSME from 2017-18 to 2025-26 with the focus on SC/ST and Women owned MSEs.

Objectives

1. To study the procurement performance of the Ministry of MSME during 2017–18 to 2025–26.
2. To understand the trends in procurement from MSEs, SC/ST-owned MSEs, and women-owned MSEs.
3. To assess the stability of procurement achievements over time.
4. To examine whether procurement achievements are associated with the number of beneficiary enterprises.

Research Methodology

The study adopts a descriptive and analytical approach and relies on secondary data obtained from official procurement fact sheet from MSME SAMBANDH website. It focuses on understanding the procurement performance of Ministry of MSME over nine financial years (2017-18 to 2025-26).

Data Analysis and Interpretation

Table 1.1: Overall procurement data

Year	Overall Annual Target (Amt In Crores)	Overall Achievement (Amt In Crores)	Overall Achievement %
2017-18	47.37	72.31	152.65
2018-19	76.00	36.95	48.62
2019-20	34.37	29.49	85.80
2020-21	72.10	35.62	49.41
2021-22	61.40	34.67	56.46
2022-23	61.06	43.51	71.26
2023-24	78.35	37.51	47.87
2024-25	71.35	71.35	100.00
2025-26	58.43	43.71	74.81

Source: MSME SAMBANDH Fact Sheet

The procurement performance of the Ministry of MSME varied noticeably over the study period. In 2017–18, the ministry performed extremely well, achieving 152.65% of its procurement target and significantly exceeding the

planned amount. However, this performance declined in 2018–19, when only 48.62% of the target was achieved. In the following years, procurement achievements remained below the target level, except in 2024–25 when the ministry successfully met its target in full.

The lowest performance was recorded in 2023–24, with an achievement rate of 47.87%. Though the achievement percentage improved to 74.81% in 2025–26, the target was still not fully met.

Table 1.2: Procurement data of MSEs

Year	Target (Amt In Crores) (25%)	Achievement (Amt In Crores)	Achievement %	Total Benefited Mse's
2017-18	11.84	55.96	472.64	4690
2018-19	19	24.88	130.95	651
2019-20	8.59	23.74	276.37	930
2020-21	18.02	23.14	128.41	1758
2021-22	15.35	23.44	152.70	1858
2022-23	15.26	27.33	179.10	1197
2023-24	19.59	25.49	130.12	1192
2024-25	17.84	64.67	362.50	642
2025-26	14.61	25.59	175.15	1504

Source: MSME SAMBANDH Fact Sheet

The lowest performance was recorded in 2023–24, with an achievement rate of 47.87%. Although the achievement percentage improved to 74.81% in 2025–26, the target was still not fully met. Overall, the results suggest that the ministry's procurement performance was uneven across the years, reflecting fluctuations in its ability to achieve the prescribed procurement targets.

The procurement performance of the Ministry of MSME with respect to Micro and Small Enterprises (MSEs) remained consistently above the prescribed target throughout the study period. The achievement percentage exceeded 100% in all years, indicating the ministry's strong commitment to promoting MSE participation in public procurement.

The highest achievement was recorded in 2017–18, when procurement reached 472.64% of the target, followed by 362.50% in 2024–25. Even in the years with relatively lower performance, such as 2020–21 and 2018–19, procurement achievements remained well above the mandated target levels. This demonstrates that the ministry consistently exceeded its procurement obligations towards MSEs.

The number of benefited MSEs showed considerable variation across the years. While 4,690 MSEs benefited in 2017–18, the number declined in subsequent years and reached its lowest level of 642 in 2024–25 despite a substantial increase in procurement achievement.

Table 1.3: Procurement data from SC/ST owned MSEs

Year	Target (Amt In Crores) (4%)	Achievement (Amt In Crores)	Achievement %	Benefited Mse's
2017-18	1.89	3.1	164.02	354
2018-19	3.04	1.48	48.68	102
2019-20	1.37	0.68	49.64	171
2020-21	2.88	0.9	31.25	288
2021-22	2.46	1.27	51.63	314
2022-23	2.44	3.3	135.25	215
2023-24	3.13	4.77	152.40	108
2024-25	2.85	0.64	22.46	49
2025-26	2.34	0.45	19.23	108

Source: MSME SAMBANDH Fact Sheet

The procurement performance of the Ministry of MSME with respect to SC/ST-owned MSEs showed considerable fluctuations during the study period. The ministry exceeded the prescribed procurement target in 2017–18, 2022–23, and 2023–24, achieving 164.02%, 135.25%, and 152.40% of the target respectively. These results indicate strong procurement support for SC/ST-owned enterprises during these years.

However, procurement performance remained below the target in most of the other years. The achievement percentage declined from 48.68% in 2018–19 to 31.25% in 2020–21 and further dropped to 22.46% in 2024–25 and 19.23% in 2025–26. This suggests challenges in consistently meeting the procurement targets prescribed for SC/ST-owned MSEs. The number of benefited enterprises also varied across the years. The highest number of beneficiary SC/ST-owned MSEs was recorded in 2017–18 (354 enterprises), while the lowest was observed in 2024–25 (49 enterprises). The decline in both procurement achievement and beneficiary enterprises in recent years indicates a reduction in the participation of SC/ST-owned MSEs in procurement activities.

Table 1.4: Procurement data from women owned MSEs

Year	Target (Amt In Crores) (3%)	Achievement (Amt In Crores)	Achievement %	Benefited Mse's
2017-18	1.42	0	0.00	0
2018-19	2.28	0.075	3.29	11
2019-20	1.03	0.2451	23.80	35
2020-21	2.16	0.233	10.79	89
2021-22	1.84	0.3233	17.57	147
2022-23	1.83	3.1341	171.26	124
2023-24	2.35	1.1926	50.75	198
2024-25	2.14	7.7672	362.95	136
2025-26	1.75	6.5901	376.58	160

Source: MSME SAMBANDH Fact Sheet

The procurement performance of the Ministry of MSME with respect to women-owned MSEs showed significant improvement over the study period. In the initial years, procurement from women-owned enterprises was relatively low, with no procurement recorded in 2017–18 and achievement percentages remaining below the prescribed target until 2021–22.

A notable improvement was observed from 2022–23 onwards. The ministry exceeded the target by achieving 171.26% in 2022–23, and the performance further increased to 362.95% in 2024–25 and 376.58% in 2025–26. This indicates a strong increase in procurement from women owned MSEs in recent years.

The number of beneficiary women-owned enterprises also increased steadily, rising from 11 enterprises in 2018–19 to 160 enterprises in 2025–26. This suggests that more women entrepreneurs were able to participate and benefited from public procurement opportunities over time.

Table 1.5: Descriptives

Particulars	Mean	SD	Minimum	Maximum
Over All Achievement %	76.3	33.9	47.9	153
MSE's Achievement %	223.1	122.4	128.4	473
SC/ST MSE's Achievement %	74.9	58.3	19.2	164
Women MSE's Achievement %	113.0	154.7	0	377

Source: Computed by Jamovi software.

The descriptive statistics reveal notable differences in procurement performance across the various categories. The average overall procurement achievement was 76.3%, indicating that the Ministry of MSME achieved nearly three-fourths of its overall procurement targets during the study period. However, the relatively high standard deviation (33.9) suggests considerable variation in performance across years.

Among all categories, MSE procurement recorded the highest average achievement percentage (223.1%), demonstrating that the ministry consistently exceeded the prescribed procurement targets for MSEs. Although the achievement levels fluctuated over time, the minimum achievement remained well above 100%, indicating sustained support for MSE participation in public procurement.

The average achievement percentage for SC/ST-owned MSEs was 74.9%, which was lower than the prescribed target in several years. The wide variation between the minimum (19.2%) and maximum (164%) values indicates inconsistent procurement performance for this category.

Women-owned MSEs recorded an average achievement of 113.0%, reflecting a generally positive procurement performance. However, the high standard deviation (154.7) and the wide range between the minimum (0%) and maximum (377%) values indicate substantial fluctuations over the years. This suggests that procurement from women owned enterprises improved significantly in recent years after a relatively low level of participation during the initial years.

Table 1.6: Calculation of coefficient of variation

Particulars	Coefficient of Variation
Over All Achievement %	44.4
MSE's Achievement %	54.9
SC/ST MSE's Achievement %	77.8
Women MSE's Achievement %	136.9

Source: Computed by Excel.

The coefficient of variation analysis was carried out to assess the consistency of procurement performance across different categories. A lower coefficient of variation indicates greater consistency, while a higher value reflects greater fluctuations over the years.

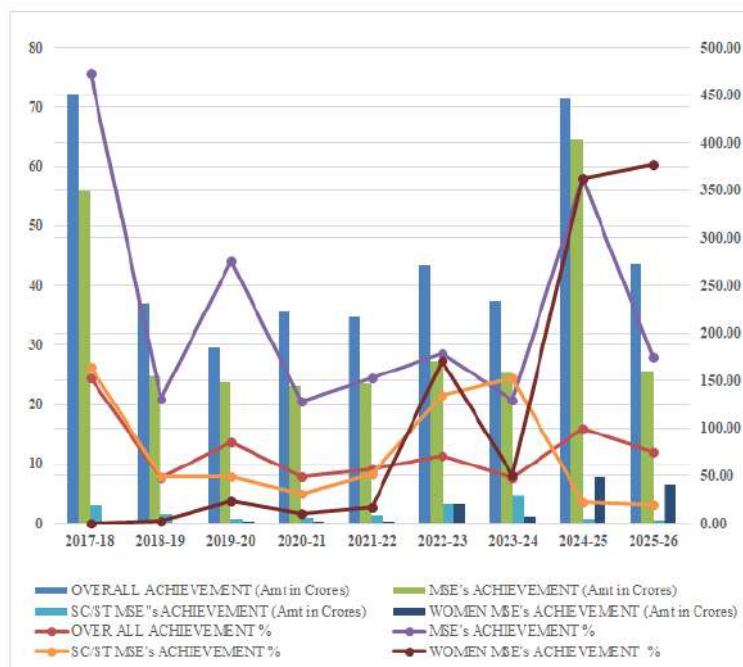
The overall procurement achievement percentage recorded the lowest coefficient of variation (44.4%), indicating relatively stable procurement performance during the study period. Similarly, MSE procurement achievement showed

moderate variation with a coefficient of variation of 54.9%, suggesting that although procurement levels fluctuated, the ministry consistently exceeded the prescribed targets for MSEs.

The coefficient of variation for SC/ST-owned MSE procurement achievement was 77.8%, indicating a higher degree of variability in performance across years. This suggests that the achievement of procurement targets for SC/ST owned enterprises was less consistent compared to overall and MSE procurement.

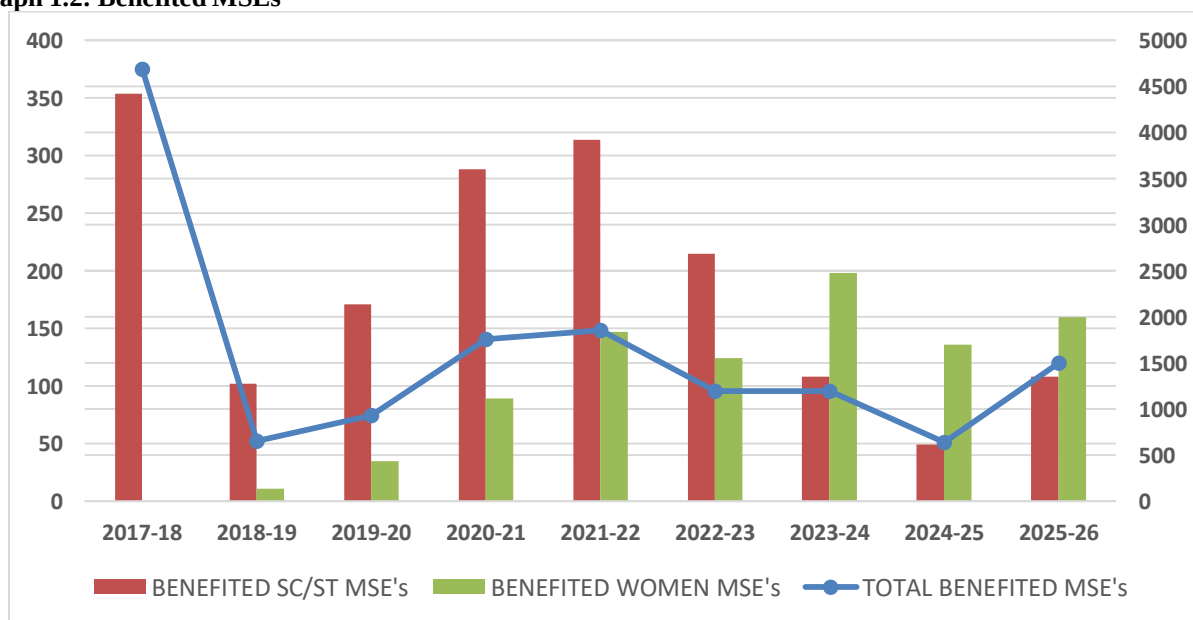
Women-owned MSE procurement achievement recorded the highest coefficient of variation (136.9%), reflecting substantial fluctuations during the study period. This high variability can be attributed to very low procurement levels in the initial years followed by a sharp increase in recent years. While the recent performance indicates significant improvement, the results suggest that procurement from women owned enterprises has been the least consistent among all categories.

Graph 1.1: Achievement Trend



Source: Computed by Excel.

Graph 1.2: Benefited MSEs



Source: Computed by Excel.

Table 1.7: Correlation Matrix

		MSE's Achievement %	Total Benefited MSE's	Sc/St MSE's Achievement %	Benefited Sc/St MSE's	Women MSE's Achievement %
Total Benefited MSE's	Pearson's r	0.591				
	df	7				
	p-value	0.093				
Sc/St MSE's Achievement %	Pearson's r	0.255	0.527			
	df	7	7			
	p-value	0.507	0.145			
Benefited Sc/St MSE's	Pearson's r	0.196	0.762	0.343		
	df	7	7	7		
	p-value	0.613	0.017	0.366		
Women MSE's Achievement %	Pearson's r	0.125	-0.319	-0.379	-0.591	
	df	7	7	7	7	
	p-value	0.748	0.402	0.315	0.093	
Benefited Women MSE's	Pearson's r	-0.443	-0.374	-0.053	-0.328	0.501
	df	7	7	7	7	7
	p-value	0.232	0.321	0.892	0.388	0.169
*. Correlation is significant at the 0.05 level (2-tailed).						

Source: Computed by Jamovi software

The correlation analysis was conducted to examine how procurement achievement percentages relate to the number of enterprises benefiting across different categories.

The findings show a moderate positive relationship between MSE procurement achievement and the total number of benefited MSEs ($r = 0.591$). In simple terms, years with better procurement performance for MSEs generally saw more MSEs benefiting from procurement opportunities. However, this relationship is not statistically significant ($p = 0.093$), indicating the association is not strong enough to draw a definitive conclusion.

A positive relationship was also found between SC/ST MSE procurement achievement and the number of benefited SC/ST MSEs ($r = 0.343$). This indicates that higher procurement achievement was generally associated with more SC/ST enterprises benefiting from procurement. However, the relationship was not statistically significant ($p = 0.366$).

The strongest relationship in the analysis was observed between the total number of benefited MSEs and the number of benefited SC/ST MSEs ($r = 0.762$, $p = 0.017$). Since the p-value is below 0.05, this relationship is statistically significant. This means that when the overall number of benefited MSEs increased, the number of benefited SC/ST-owned enterprises also tended to increase.

For women-owned MSEs, procurement achievement showed a moderate positive relationship with the number of benefited women-owned enterprises ($r = 0.501$). This suggests that higher procurement achievement was generally accompanied by greater participation of women-owned enterprises. However, the relationship was not statistically significant ($p = 0.169$).

A few negative relationships were also observed. For example, women MSE achievement showed a negative association with benefited SC/ST MSEs ($r = -0.591$) and total benefited MSEs ($r = -0.319$).

Findings

1. The overall procurement performance of the Ministry of MSME showed fluctuations during the study period, indicating variations in the achievement of prescribed procurement targets.
2. The Ministry consistently exceeded the procurement targets for MSEs, demonstrating a strong commitment towards promoting the participation of micro and small enterprises in public procurement.
3. Higher procurement achievements did not always result in a larger number of beneficiary enterprises, suggesting that procurement benefits may have been concentrated among a relatively smaller number of MSEs in certain years.
4. Procurement performance relating to SC/ST owned MSEs was inconsistent, with the Ministry exceeding the target in some years while falling short in others.
5. Procurement from women-owned MSEs showed significant improvement during the latter years of the study, indicating increased support for women entrepreneurs through public procurement.

6. The average procurement achievement was highest for MSEs, followed by women owned MSEs, while SC/ST owned MSEs recorded comparatively lower achievement levels.
7. The coefficient of variation analysis revealed that overall procurement performance was relatively stable, whereas procurement achievements for SC/ST and women owned MSEs exhibited greater fluctuations over time.
8. The correlation analysis showed that most relationships between procurement achievements and beneficiary enterprises were weak to moderate and statistically insignificant.
9. A significant positive relationship was observed between the total number of benefited MSEs and benefited SC/ST owned MSEs, indicating that increased participation of MSEs was associated with greater participation of SC/ST owned enterprises.

Suggestion

1. The Ministry of MSME should take necessary measures to ensure consistent achievement of overall procurement.
2. Special efforts should be made to increase procurement from SC/ST owned MSEs, as the achievement levels in this category remained below the prescribed targets in several years.
3. Awareness programmes and capacity-building initiatives should be organized to encourage more SC/ST and women entrepreneurs to participate in public procurement opportunities.
4. The Ministry should strengthen the use of digital procurement platforms such as GeM to improve accessibility, transparency, and participation of small enterprises.
5. Regular monitoring and evaluation of procurement targets can help identify implementation gaps and improve procurement performance.
6. Financial and technical support may be provided to MSEs to enhance their competitiveness and ability to participate in government tenders.
7. Greater emphasis should be placed on expanding the number of beneficiary enterprises so that procurement benefits are distributed among a larger group of MSEs rather than being concentrated among a few enterprises.

Conclusion

This study analysed the procurement performance of the Ministry of MSME from 2017–18 to 2025–26, focusing on MSEs, SC/ST-owned MSEs, and women-owned MSEs. The results showed that the Ministry was successful in achieving and often exceeding the prescribed procurement targets for MSEs. Procurement from women-owned enterprises also improved considerably in the later years of the study. However, the performance relating to SC/ST owned MSEs was not consistent throughout the period, indicating the need for stronger efforts to enhance their participation in public procurement. The study further revealed that higher procurement achievement did not always lead to a greater number of beneficiary enterprises, suggesting that procurement benefits were not evenly distributed across all enterprises.

The increasing adoption of digital procurement platforms such as the GeM has helped make government procurement more transparent, accessible, and efficient. These platforms have created new opportunities for small businesses to participate in government purchases and expand their market reach. Public procurement has the potential to be an effective tool for promoting inclusive economic growth. With proper implementation, regular monitoring, and continued support for underrepresented groups, public procurement can help strengthen small enterprises, encourage entrepreneurship, and contribute to broader objectives such as economic empowerment, social inclusion, and sustainable development.

Limitation

The present study is limited to the procurement performance of the Ministry of MSME and does not cover other ministries. The analysis is based entirely on secondary data obtained from official reports, and therefore the findings depend on the accuracy and availability of published information. The study covers a period of nine financial years from 2017–18 to 2025–26 and focuses primarily on procurement targets, achievements, and beneficiary enterprises. Further, the study does not examine the operational challenges, policy implementation issues, or perceptions of beneficiaries regarding public procurement.

Scope for Further Study

The scope for future research is substantial. Similar studies may be conducted across different ministries and government departments to compare procurement performance and identify best practices. Future research can also examine the impact of digital procurement platforms such as the GeM on the participation of MSEs, SC/ST owned enterprises, and women owned enterprises. Researchers may use primary data to understand the challenges faced by enterprises in accessing public procurement opportunities. In addition, studies focusing on state-wise, sector-wise, or enterprise-level procurement performance can provide deeper insights into inclusive procurement practices and their contribution to economic development.

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Original Article

Interaction Effect Of Awareness Of Ict, Use Of Ict With Digital Learning Based Education In Transformation Motivating Tool On The Teaching Effectiveness Of School Teachers

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Abstract

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Digital technologies are changing the ways teachers interact with students in the classroom. There is immense potential of ICT which can be grabbed by the teachers using ICT optimally and maximally in their class instruction and for their professional developments. An attitude is a preparation or readiness for response. Effectiveness of a teacher can be described as their success in helping students to learn. The present paper entitled as interaction effects of awareness of ICT, use of ICT and attitude towards ICT in terms of their influence on the teaching effectiveness among primary school teachers. Effects of high and low awareness of ICT, use of ICT and attitude towards ICT influence on teaching effectiveness of primary school teachers. Teachers can integrate ICT into teaching-learning process effectively if he developed various skills and competences like, creativity, flexibility, logistic skills, skill for project work, administrative and organizational skills and collaborating learning skill. Teachers should be concerned about learners' learning, their own professional development and keeping him/her self updated to have positive attitude and becoming technology competent.

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Introduction

Teachers are the key persons to use ICT in educational settings productively and to help integrate ICT into the curriculum. They are the vital players in any initiative which aims at improving teaching and learning process. In classroom there are no more lecture methods or other traditional methods used, teachers are required to decide how to make appropriate educational use of ICT in classrooms. So, role of teacher is important, if teachers are not actively involved in integrating ICT in all phases of curriculum then ICT at schools will have little impact. Technology using teachers plan classroom instruction on a large scale, students initiate, think and make decision daily in the classroom. Teachers think of wide things they want students to explore, find both print and electronic material related to the things and prepare students to deal with gathering and organisation and sharing their new found knowledge with others. Most teachers who recognise the benefit of using technology across the curriculum are now spending time locating materials on the internet that will support their thematic activities. Teachers are becoming better facilitators, helping students stay active in their pursuit of knowledge. Teachers today are making more authenticated assignments and engaging students in topics that have themes of high interest to them. They are motivating students through the use of computers and telecommunication in ways that ensure that the student will participate in various literacy projects. They also are helping students design presentation of their research finding to share with their classmates, parents and people around the world. Out of necessity, teachers are helping students learn to filter information because of the unbridled nature on internet.



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They are using filtering systems that block certain sites and are having students sign agreements that promise that they will not purposely visit inappropriate websites. Teachers also are monitoring where on the internet students are or have been on specific computer. This can be done easily by looking at the browser's history; if browser history is deleted then it can be recovered through system restore, desktop search programmes, log files and data busters and many more other ways. There is a need to change in each and every sphere of the society according to the tune of information and communication technology. It has the ability to enhance every type of development in the society. Education is the only means to incorporate information and communication technology in the developmental aspects of the society. ICT can also be used as a tool to improve the quality of education for preparing the society and its manpower to face the challenge of the future. It requires the proper manpower to handle and use ICT in school in a proper way. Therefore, teacher needs ICT resources to integrate in education and he may require some kind of skill training to use ICT for classroom teaching, for professional development and for personal development. In this new technology era, the role of teachers has changed and continues to change from being an instructor to a constructor, facilitator, and coach to create learning situation and environment. ICT is very useful for teachers with these new roles. Teachers can integrate ICT into teaching-learning process effectively if he developed various skills and competences like, creativity, flexibility, logistic skills, skill for project work, administrative and organizational skills and collaborating learning skill. So teachers should use all these ICT resources to justify his new role as a facilitator, constructor and coach for his classroom teaching, professional development and personal development.

Awareness of ICT

The digitization of technologies has made a great impact on teachers' role. The impact can be felt in many ways. Digital technologies are changing the ways teachers interact with students in the classroom. As the importance of language to learning, the ways organizing and relating information facilitates understanding and the influence of social factors in the classroom are all impacted by digital technologies. Now the instructional approaches are also influenced greatly, as they are incorporated by a variety of technologies. Now teachers and students alike are interacting in new ways afforded by digital technologies. Teachers and students have virtual discussions related to course content, advice and counselling in a wide variety of times and paces through email and other features of the web. Teachers and students now produce documents with more information and in far more diverse formats as a result of desktop publishing, online libraries and databases and file transfer capabilities. The pervasiveness of digital technologies motivates a thorough review of technological impact of instruction in education. Present school education courses should take advantage of the capabilities of technology and extend instruction beyond or significantly enhance what can be done without technology. Teachers should experience technology as a means of helping students explore topics in more depth and in interactive ways. As a large number of teachers are not computer and ICT literate, they have to face a tuff time in near future due to gradual shifting interest of students towards ICT. The time may be imagined to see the miserable conditions of an ICT illiterate teacher teaching ICT literate students. In this context, now it is the high time for every ICT illiterate teachers at least to create awareness about ICT, ICT literate teacher to be the ICT masters and the ICT masters to see it as sky is the limit.

Use of ICT

The extensive use of ICT may include the evaluation of educational software and courseware, search on internet for resources and use of e-mail, chat, new ICT based instructional principles, research and appropriate assessment practice, effective multimedia based presentations to support teaching learning, integrate ICT tools into learning activities throughout the curriculum, create hypertext documents and understand about network, and keep up-to-date as far as ICT or educational technology is concerned. There is immense potential of ICT which can be grabbed by the teachers using ICT optimally and maximally in their class instruction and for their professional developments.

Teaching Effectiveness

Effectiveness of a teacher can be described as their success in helping students to learn and the related characteristics of effectiveness can be described as certain qualities which are related to teachers' effectiveness and which enable the teachers to achieve success in education (Walker, 2008). During last two decades, numerous researchers throughout the World have been studying related characteristics of Teacher Effectiveness. In order to discuss about these characteristics, they may broadly be categorized into three main streams i.e., School related, Teaching related and Teacher related characteristics according to the nature of assessing variables. The role of teacher involved in all phases of ICT integration to the curriculum is important. Teachers are required to decide how to make appropriate educational use of ICT in the classrooms, where there are no longer lecture- based or didactic teaching methods in classrooms any more. In other words, teachers need to upgrade their skills and knowledge in the field of ICT (Hargreaves, 1999). The expectations placed on teachers seem to be expanding day by day. Their role is not only teaching specific content and mentoring students but also functioning as frontline social workers and competent in all the ways. To meet the challenges of schooling, teachers need to model in their own conduct the very qualities- flexibility, networking, creativity and also acquire and display these qualities to redefine their skills for the task of teaching through ICT that are now key outcomes for students. NCET (National Council for Educational Technology, 1997) asserts that "Information Technology is rapidly changing the world we live in". ICT is changing the nature of

society and employment and therefore in turn changing the requirements of schools and colleges. Across the curriculum ICT is used to enhance students' learning. Word processing improve the quality of their written work in any subject which allows them to reflect on what they have written and make changes easily. Animated graphics and computer simulations made the difficult concept simpler. Students can access high-quality information more easily by using CD-ROMs, and the Internet. Motivation of the learner consistently increased with use of ICT. It has the flexibility to meet individual student needs, to present information in new ways; power to try out different ideas and to take risk; and make learners more confident. Teachers can use ICT tools to produce high-quality teaching materials which will stimulate and develop interest among students. All this is possible if teachers themselves have teaching effectiveness.

Review: An Overview

A review of the related studies, most of the studies are either related to awareness or use of technology. It can be further stated that most of the studies are specifically related to the computer and internet further looking at a glance to the above studies, it can be revealed that most of the studies were conducted abroad and very few studies were conducted in India. Many of the studies revealed that a great degree of awareness about the ICT of teachers but less usage due to one or other reasons. Further, it was found that there were many studies carried out related to teachers' awareness of technology and teachers use of technologies but only few studies conducted which are related to the teachers need of technologies. No study was found with the combination of ICT awareness, use and need of teachers in integration whole. Hence the present study is an attempt in this direction to study the ICT awareness, use and need of secondary and higher secondary school teachers. Some of studies revealed that 100% ICT awareness of ICT prevailed among the teachers while some other studies revealed moderate or less awareness of teachers about ICT. Most of the studies revealed that the use of technology is more among the young teacher in comparison to the old teachers. Use of technology was found more among teachers in abroad where as less usage of technologies were found among Indian teachers.

The variables teachers' attitude towards ICT and their teaching effectiveness are explored vastly and independently in some studies. The investigator feels that there is a need to further explore the influence of these variables in order to improve teaching learning process. The review of related literature presents a glut of researches presently being conducted in field of variables like use of ICT, their attitude towards ICT and teaching effectiveness. Based on the research studies, the researcher felt that there is a need to explore the use of ICT by teachers in relation to their attitude towards ICT and teaching effectiveness in schools that it will help to adjudged the extent of all the variables related to teachers and suggest measures to overcome the problems of teachers in the application of ICT in teaching learning Process. With this background, the next chapter follows the research methodology.

Statement of the Problem

The Present Study Entitled as "*Interaction Effect Of Awareness Of Ict, Use Of Ict With Digital Learning Based Education In Transformation Motivating Tool On The Teaching Effectiveness Of School Teachers*".

Variables

Independent Variables

- i. Awareness of ICT
- ii. Use of ICT

Dependent Variable

- i. Teaching Effectiveness

Objectives

Following objectives are formulated to realize the present study :

1. To investigate the effect of "Awareness of ICT" on the teaching effectiveness of primary school teachers.
2. To investigate the effect of "Use of ICT" on the teaching effectiveness of primary school teachers.
3. To investigate the interaction effect of Awareness of ICT X Use of ICT on the teaching effectiveness of primary school teachers..
4. To investigate the interaction effect of Use of ICT X Attitude towards ICT on the teaching effectiveness of primary school teachers.
5. To investigate the interaction effect of Awareness of ICT X Use of ICT X Attitude towards ICT on the teaching effectiveness of primary school teachers.

Research Hypotheses

Following hypotheses are formulated to realize the above mentioned objectives :

1. Effects of high and low awareness of ICT of primary school teachers differ significantly in terms of their influence on teaching effectiveness.
2. Effects of maximum and minimum use of ICT of primary school teachers differ significantly in terms of their influence on teaching effectiveness.

3. Effects of positive and negative attitude towards ICT of primary school teachers differ significantly in terms of their influence on teaching effectiveness.
4. There is an interaction effects of Awareness of ICT X Use of ICT differ significantly in terms of their influence on the teaching effectiveness of primary school teachers..
5. There is an interaction effects of Use of ICT X Attitude towards ICT differ significantly in terms of their influence on the teaching effectiveness of primary school teachers.

Operational Definitions of Key Terms

A few terms appeared frequently in the report of the investigation and they have been used with specific meaning. These are as follows :

- i. **ICT** :For the present study ICT (Information and Communication Technology) means (computers for word processing, power point, spreadsheet, CAI (Computer Assisted Instruction) and related software, internet for e-mail, chat, searching, web designing, and for giving project work, LCD projector for Power Point presentation, and T.V. presentation and OHP, Television, and Radio) meant for classroom practice, professional development and personal development of teachers of primary schools.
- ii. **ICT Awareness** :It means the knowledge of teachers of primary schools regarding the components of ICT like, computers for word processing, power point, spreadsheet, CAI(Computer Assisted Instruction) and related software, internet for e-mail, chat, searching, web designing, and for giving project work, LCD projector for PowerPoint presentation, and T.V. presentation and OHP, Television, and Radio. For present study ICT awareness is defined operationally as the awareness score secured by a teacher in the awareness scale prepared by the investigator.
- iii. **ICT Use** :It means the use of the ICT components of ICT like, computers for word processing, power point, spreadsheet, CAI (Computer Assisted Instruction) and related software, internet for e-mail, chat, searching, web designing, and for giving project work, LCD projector for PowerPoint presentation, and T.V. presentation and OHP, Television, and Radio by the teachers of primary schools for classroom practice, professional development and for personal development. For the present study ICT is defined operationally as the score secured by a teacher in the scale prepared by the investigator..
- iv. **Teaching Effectiveness** :Teacher effectiveness had been defined in terms of the requisite competence attained, i.e., preparation and planning for teaching, classroom management (in terms of discipline, motivation, interaction and evaluation), knowledge of subject matter, interpersonal relations and personality characteristics of the teachers.

Research Design

Research Method

The present study was a descriptive survey research. The method deals with the interaction effect between the variables, the testing of hypotheses, and the development of generalizations, principles or theories that have universal validity. Descriptive research has been divided into several types, however, they are all attempting to find generalizable attitudes, and they all deal with present conditions. The study focused on the investigation of awareness of ICT, use of ICT, attitude towards ICT and their effects on teaching effectiveness of primary school teachers.

Sample

The list of all the primary schools of Chitradurga district (prepared by DIET of Chitradurga) constituted the scope of the study. Using stratified random sampling technique, 50 primary schools were selected. Primary school teachers from each school were selected using random sampling technique. In all, 548 primary school teachers were involved in the present study.

Tools Used

The following research tools were used to collect the essential data. They are : Awareness of ICT Scale, Use of ICT Scale, Attitude towards ICT Scale, Teaching Effectiveness Scale. The investigator ensured the content and face validity of the present scales since each item was judged by content experts. The investigator used Split Half method to compute the reliability coefficient of scales. Reliability of – Awareness of ICT Scale is 0.72, Use of ICT Scale is 0.78, Attitude towards ICT Scale is 0.69, Teaching Effectiveness Scale is 0.76.

Collection of Data

Data collection is one of the most important tasks of any research. As far as the problem under study is concerned, the data were collected properly, timely and precisely since it helps in finding the solutions to the problems. For the present study, the required data were collected from the primary school teachers by personally visiting the schools. For this purpose, the investigator personally contacted the school principals and explained the purpose of the study. After that scales were administered to the teachers and the completed tools were collected from the respondents. Self-rating scale was used in order to measure the teaching effectiveness of teachers.

Statistical Technique

The data on variable in the investigation in properly coded to suit for computer analysis. The analysis was carried out on the basis of objectives of the study and hypotheses formulated by employing appropriate statistical

technique. In pursuance of the Objectives 1 to 7, the 3-way Analysis of Variance (ANOVA) technique was used. This provided an indication regarding the main effects and interaction effects of selected independent variables – awareness, use and attitude towards ICT on dependent variable – teaching effectiveness.

Analysis of Data

The following is the summary table of analysis of variance which describe the interaction effect of independent variables on dependent variable.

Table-1: Summary Table of ANOVA – Awareness of ICT, Use of ICT, on Teaching Effectiveness

Sources of Variation	df	Sum of Squares	Mean Sum of Squares	F – Ratio	p - Value	Significance
Main Effects						
Awareness of ICT (AW)	1	5779.96	5779.96	33.5635	< 0.05	Yes
Use of ICT (U)	1	632.19	632.19	3.9610	< 0.05	Yes
Attitude towards ICT (A)	1	2860.12	2860.12	16.6084	< 0.05	Yes
2-way Interaction Effect						
AW X U	1	1379.34	1379.34	8.0097	< 0.05	Yes
AW X A	1	1906.14	1906.14	11.0687	< 0.05	Yes
U X A	1	91.84	91.84	0.5333	> 0.05	NS
3-way Interaction Effects						
AW X U X A	1	769.97	769.97	4.6513	< 0.05	Yes
Total	548	105857.87				

* NS: Not Significant

Interpretation

Significance of obtained F_A , F_B , F_C , F_{AB} , F_{AC} , F_{BC} and F_{ABC} ratios are determined by referring to Table – F (Garratt) with df 1 (numerator) and 548 (denominator). The corresponding tabled F-ratio for all these factors is 3.89 at 0.05 level of significance.

- (1) The obtained F-ratio in respect of the Factor – A is 33.5635 and the corresponding tabled F-ratio is 3.89. Since the obtained F-ratio is greater than the tabled F-ratio at 0.05 level, the difference is significant. Therefore, the hypothesis is accepted.
- (2) The obtained F-ratio in respect of the Factor – B is 3.9610 and the corresponding tabled F-ratio is 3.89. Since the obtained F-ratio is greater than the tabled F-ratio at 0.05 level, the difference is significant. Therefore, the hypothesis is rejected.
- (3) The obtained F-ratio in respect of the Factor – C is 16.6084 and the corresponding tabled F – ratio is 3.89. Since the obtained F-ratio is greater than the tabled F-ratio at 0.05 level, the difference is significant. Therefore, the hypothesis is accepted.
- (4) The obtained F-ratio in respect of the interaction between the Factors – A and B is 8.0097 and the corresponding tabled F-ratio is 3.89. Since the obtained F-ratio is greater than the tabled F-ratio at 0.05 level, the difference is significant. Therefore, the hypothesis is accepted.
- (5) The obtained F-ratio in respect of the interaction between the Factors – A and C is 11.0687 and the corresponding tabled F-ratio is 3.89. Since the obtained F-ratio is greater than the tabled F-ratio at 0.01 level, the difference is significant. Therefore, the hypothesis is accepted.
- (6) The obtained F-ratio in respect of the interaction between the Factors – B and C is 0.5333 and the corresponding tabled F-ratio is 3.89. Since the obtained F-ratio is lesser than the tabled F-ratio at 0.05 level, the difference is not significant. Therefore, the hypothesis is rejected.
- (7) The obtained F-ratio in respect of the interaction between the Factors – A, B and C is 4.6513 and the corresponding tabled F-ratio is 3.89. Since the obtained F-ratio is greater than the tabled F-ratio at 0.05 level, the difference is significant. Therefore, the hypothesis is accepted.

Findings

The following are the major findings derived from the interpretation of the obtained data.

- (1) There is a significant difference between the effects of teachers' high and low awareness of ICT in terms of their influence on teaching effectiveness of primary school teachers.
- (2) There is a significant difference between the effects of high and low use of ICT of primary school teachers in terms of their influence on teaching effectiveness of primary school teachers.
- (3) There is a significant difference between the effects of high and low attitude towards ICT in terms of their influence on teaching effectiveness of teachers of primary school teachers.
- (4) There is a significant difference between the interaction effects of teachers' high/low Awareness of ICT and high/low use of ICT in terms of their influence on teaching effectiveness of primary school teachers.
- (5) There is a significant difference between the interaction effects of teachers' high/low Awareness of ICT and high/low attitude towards ICT in terms of their influence on teaching effectiveness of primary school teachers.
- (6) There is no significant difference between the interaction effects of teachers' high/low use of ICT and high/low attitude towards ICT in terms of their influence on teaching effectiveness of primary school teachers.

- (7) There is a significant difference between the interaction effects of teachers' high/low Awareness of ICT, high/low use of ICT and high/low attitude towards ICT in terms of their influence on teaching effectiveness of primary school teachers.

Conclusion

The following is the conclusion drawn on the basis of the major findings derived from the study. Effects of high and low awareness of ICT, high and low use of ICT and high and low attitude towards ICT influence on teaching effectiveness of primary school teachers. Interaction effects of teachers' Awareness of ICT and Use of ICT ; Awareness of ICT and Attitude towards ICT on teaching effectiveness of primary school teachers. But, Use of ICT and Attitude towards ICT do not effect on teaching effectiveness. Interaction effects of Teachers' Awareness of ICT and use of ICT and attitude towards ICT influence on teaching effectiveness of primary school teachers.

Discussion

The 21st century is an era of acute modernization and both teacher and students will have to cope with the changes and challenges. The information age requires a higher level of skill and knowledge of all individuals. Teachers' professional knowledge, skill and capabilities are enhanced by ICT as their subject knowledge is expanding. ICT enables teachers in planning and preparing them for more efficient teaching. Research by Sutton (2006) also shows that ICT enables effective learning. For creating learning environment ICT is recognized as an essential ingredient of education system. Power of technology to transform learning is recognized by educators worldwide. Teachers have been identified as major factor in fostering classroom ICT integration. They are the mind setters and torch bearers in the society. Hence, teachers must be able to increase conceptual understanding and analytical ability among students through the use of diverse Information and Communication Technology (ICT). Use of ICT definitely affects the performance of students and teachers in classroom. Through the ongoing and effective use of technology in the schooling process, students have the opportunity to acquire important technology capabilities. The teacher is responsible for establishing the classroom environment and preparing the learning opportunities that facilitate students' use of technology to learn and communicate. Consequently, it is critical that all classroom teachers are prepared to provide their students with these opportunities. Most critical issues in developing and maximizing the benefits of ICT in teaching-learning process is the level of awareness, Attitude towards ICT and teaching effectiveness the teacher have in using ICT and accessing its benefits in their work. Teaching in present schools requires teachers who are knowledgeable and skilful especially in using computer and other technology tools. Unfortunately researches (Yildirim, 2007) shows that teachers hesitate to use technology, don't feel prepared and fear to integrate ICT in their teaching in classroom. Their reluctance to use ICT is mainly due to their negative views towards accepting technology as part of their new teaching methodologies (Summar, 1990).

Akbaba and Kurubacak (1999) also reported that if teachers already have negative perception towards the use of technology, this may affect not only their teaching effectiveness but more importantly they may become incompetent in using technology. The act of teaching along with high teacher awareness, positive attitude towards ICT and teaching effectiveness enforces the teacher to use ICT productively to enhance the effectiveness of teaching and learning process for giving the best output from the curriculum in the limited time in hand. It is important to evaluate teachers' attitude towards ICT and their teaching effectiveness as ICTs are being implemented in both private and government schools. Thus it is essential to investigate the impact of their attitude and competencies towards ICT in determining the success of educational system. A perusal of research studies reveals that teacher effectiveness is related to factors like high teacher awareness, positive attitude towards ICT and teaching effectiveness of teachers. So, the researcher has undertaken this study to find out the significance of teachers' awareness, attitude towards ICT and level of teaching effectiveness of secondary school teachers in the productive use of ICT.

Educational Implications

Findings from the study also suggested that majority of the teachers have moderate level of Awareness, neutral attitude towards ICT and moderate level of teaching effectiveness. These in turn have affected educational objectives in present scenario of technology. For effective use of ICT, teachers should have more use of ICT, positive attitude towards ICT, high level of teaching effectiveness. Therefore, there should be collaboration in working of the principal, teachers, administration and society for high level of teaching effectiveness in teachers. Teachers should be concerned about learners' learning, their own professional development and keeping him/her self updated to have positive attitude and becoming technology competent. Training programmes should be run by administration bodies to make teachers competent in using emerging ICT in their classrooms. Teachers should be encouraged and motivated by giving some awards and incentives on integrating technology in their classroom by principles and administration to develop positive attitude towards ICT. Curriculum and time table should be flexible for utilizing full potential of ICT in teaching and learning so that teachers do not hesitate in integrating ICT due to lack of time and taking it as separate from curriculum. It is concluded from the study that there is a positive correlation between use of ICT and all other variables. Efforts of teachers using ICT should be recognized and outstanding achievements of its teachers should be celebrated, so that it increases their awareness and attitude towards ICT. Efforts to provide opportunities to attend special awareness programmes of ICT use should be provided to such teachers so that they become technologically competent as

well. Parents and community should also create supportive learning environment, towards use of ICT, which in turn affect teachers' attitude towards ICT. To increase the level of teachers' awareness students' and teachers' collaboration across the world in sharing educational views on various internet facilities should be encouraged by school, teachers themselves and the parents. Teachers' requirements should be considered while developing educational software so that they use these ICT tools and develop a positive attitude towards ICT. Today's teachers are taking greater responsibilities for learning that occurs when students visit their school computer laboratory. Previously, teachers could allow the lab assistant or computer teacher to instruct the classes. With the advent of more in service instruction for teachers and more in classroom use of computers, behaviours have changed. Now all teachers must know how to organize instruction in the ways that computers are being placed directly in classrooms.

ICTs also help teachers in the following ways:

1. ICT enables to enhance the initial preparation by giving good teaching material to use.
2. with the help of ICT, teachers can have access to colleagues, institutions, universities, centre of expertise, rich resources and cyber space and national organization like UGC, NCTE, NCERT, NAAC etc.
3. ICTs enable to interact with students over a physical distance.
4. ICTs enable to access online libraries, journals and research to enable individual learning.
5. ICTs enable to give feedback of students performance and evaluating students' work objectively and fast without biases.
6. ICTs provide lifelong and professionally developed courses at virtual situation, training on demand, orientation, and refresher courses through video conferencing or on-line.

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Original Article

A Study on the Impact of Generative AI on Teaching and Learning in Teacher Education Institutions

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Abstract

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The emergence of Generative Artificial Intelligence (AI) is transforming the field of education by introducing innovative approaches to teaching and learning. In Teacher Education Institutions, Generative AI tools such as ChatGPT and Google Gemini are increasingly being used for lesson planning, content generation, academic writing, assessment preparation, and personalized learning support. The present study examines the impact of Generative AI on teaching and learning in Teacher Education Institutions, with special reference to the Indian educational context. The study focuses on understanding the level of awareness, usage patterns, benefits, and challenges associated with Generative AI among teacher educators and student teachers. The study adopts a descriptive research design and uses both primary and secondary data sources. Primary data may be collected through questionnaires and surveys among teacher educators and student teachers. The study explores how Generative AI influences teaching effectiveness, student engagement, creativity, research activities, and academic performance. It also highlights major concerns related to academic integrity, plagiarism, ethical issues, over dependence on technology, and lack of AI literacy. The findings of the study are expected to reveal that Generative AI has significant potential to enhance educational practices by improving access to information, supporting innovative teaching methods, and promoting personalized learning experiences. However, the study also emphasizes the need for proper guidelines, ethical usage policies, and AI training programs for educators and students to ensure responsible integration of AI technologies in teacher education. The study concludes that Generative AI can become an effective educational tool when used appropriately and ethically in Teacher Education Institutions.

Keywords: Generative AI, Artificial Intelligence in Education, Teacher Education Institutions, Teaching and Learning, Educational Technology

Introduction

The rapid advancement of Artificial Intelligence (AI) has significantly transformed various sectors, including education. Among the recent innovations in AI, Generative AI has emerged as a powerful technology capable of generating text, images, audio, and educational content with minimal human intervention. Tools such as ChatGPT, Google Gemini, and Microsoft Copilot are increasingly being used in educational environments for lesson planning, content generation, assessment support, research assistance, and personalized learning. These technologies are gradually transforming traditional teaching and learning practices in higher education institutions. In India, the education sector is witnessing rapid digital transformation, especially after the implementation of the National Education Policy (NEP) 2020, which emphasizes technology integration, digital literacy, and innovative teaching methods. Teacher Education Institutions play an important role in preparing future teachers to meet the demands of modern classrooms. Therefore, the integration of Generative AI into teacher education has become an important area of study. Generative AI provides several opportunities in teacher education, including improving teaching effectiveness, enhancing student engagement, supporting personalized learning, simplifying academic tasks, and promoting creativity among learners. Student teachers can use AI tools for preparing lesson plans, creating teaching materials, improving communication skills, and conducting academic research. Teacher educators can also utilize AI technologies for assessment preparation, classroom interaction, and administrative support.



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These developments indicate that Generative AI has the potential to improve both teaching practices and learning outcomes. However, the increasing use of Generative AI also creates certain challenges and concerns. Issues such as academic dishonesty, plagiarism, overdependence on AI tools, misinformation, privacy risks, and reduced critical thinking abilities are becoming major concerns in educational institutions. In addition, lack of AI literacy, insufficient training, and unequal access to digital resources may affect the effective implementation of AI technologies in teacher education institutions. In this context, the present study aims to examine the impact of Generative AI on teaching and learning in Teacher Education Institutions. The study focuses on understanding the awareness, usage, benefits, challenges, and perceptions related to Generative AI among teacher educators and student teachers. The findings of the study may help educational institutions and policymakers formulate strategies for the effective and ethical integration of AI technologies in teacher education.

Literature Review:

Holmes, Bialik & Fadel (2019) in *Journal of Artificial Intelligence in Education* found that AI-based systems improve **personalized learning and adaptive instruction**, leading to better student engagement and improved learning outcomes.

Zawacki-Richter et al. (2019) in *International Journal of Educational Technology in Higher Education* found that AI is mainly applied in higher education for **student support services, administrative automation, and learning analytics**, but its use in pedagogy is still limited.

Chen, Chen & Lin (2020) in *Educational Technology & Society* found that AI enhances **data-driven decision-making in education**, helping teachers identify student learning patterns and improve instructional strategies.

Baker & Smith (2019) in *British Journal of Educational Technology* found that AI-based learning systems enable **early detection of weak learners**, allowing timely academic interventions and improving student performance.

UNESCO (2021) in *Artificial Intelligence and Education: Guidance for Policy-makers* found that AI has strong potential to transform education systems globally, but **ethical issues, digital inequality, and lack of teacher training** remain major challenges.

Long & Magerko (2020) in *Proceedings of the CHI Conference on Human Factors in Computing Systems* define AI literacy as the ability to understand, evaluate, and critically use AI systems. They found that both teachers and students often lack foundational knowledge of how AI works, which limits effective and responsible use in education.

Ng, Leung & Chu (2021) in *Computers and Education: Artificial Intelligence* found that students generally have positive attitudes toward AI tools, but their **AI literacy levels remain moderate**, especially in understanding limitations, bias, and ethical use of AI systems.

Ng et al. (2023) in *Education and Information Technologies* reported that teachers' AI literacy is strongly linked to their willingness to integrate AI tools in classrooms. Lack of training and professional development is a major barrier to AI adoption.

Kim & Lee (2022) in *Educational Technology Research and Development* found that students often use AI tools for assignments and learning support, but many lack awareness of **academic integrity issues, plagiarism risks, and responsible usage practices**.

UNESCO (2022) in its *AI and Education Policy Guidance* report emphasizes that AI literacy is essential for both teachers and students to ensure **ethical, safe, and effective use of AI technologies**, and recommends integrating AI literacy into teacher education programs.

Identified Research Gap:

1. Limited focus on Teacher Education Institutions
2. Lack of studies on Generative AI specifically
3. Insufficient empirical evidence in Indian context
4. Gaps in AI literacy research among teachers and student teachers
5. Limited analysis of pedagogical impact and ethics
6. Need for NEP 2020-aligned institutional studies

Objectives of the Study:

1. To assess the level of awareness of Generative AI tools among teacher educators and student teachers in Teacher Education Institutions.
2. To examine the frequency of usage of Generative AI in academic activities among teacher educators and student teachers.
3. To analyze the level of AI literacy among teacher educators and student teachers.
4. To study the impact of awareness, usage, and AI literacy on teaching and learning effectiveness in Teacher Education Institutions.

Hypotheses of the Study:

1. There is no significant relationship between awareness of Generative AI tools and teaching and learning effectiveness in Teacher Education Institutions.
2. There is no significant relationship between frequency of using Generative AI and teaching and learning effectiveness in Teacher Education Institutions.

3. There is no significant relationship between AI literacy level and teaching and learning effectiveness in Teacher Education Institutions.

Variable:

Dependent Variable:

Teaching and learning effectiveness in Teacher Education Institutions

Independent Variables

1. Awareness of Generative AI tools
2. Frequency of using Generative AI in academic activities
3. AI literacy level of teacher educators and student teachers

Moderating Variables:

1. ICT Facilities,
2. Training,
3. Attitude toward AI

Methodology of the Study:

1. Research Design

The present study adopts a **descriptive survey research design**. This design is suitable as it helps in systematically collecting data to analyze the impact of Generative AI on teaching and learning in Teacher Education Institutions.

2. Population of the Study:

The population of the study consists of:

1. Teacher educators working in Teacher Education Institutions.
2. Student teachers enrolled in B.Ed programs in selected institutions.

3. Sample and Sampling Technique:

A sample of teacher educators and student teachers will be selected for the study.

1. **Sample Size:** (e.g., 100–200 respondents, depending on feasibility)
2. **Sampling Technique:** **Simple random sampling / convenience sampling**

4. Tools for Data Collection:

The primary tool for data collection will be a **structured questionnaire**, which includes:

1. Awareness of Generative AI
2. Frequency of AI usage
3. AI literacy level
4. Teaching and learning effectiveness scale
5. Moderating factors (ICT facilities, training, attitude)

5. Sources of Data:

Collected through questionnaire from teacher educators and student teachers .

Statistical Analysis

The collected data were analyzed using both descriptive and inferential statistics.

1. Descriptive Statistics

Descriptive techniques were used to summarize the data:

1. Percentage analysis was used to examine the distribution of responses
2. Mean and standard deviation were calculated to assess central tendency and variation
3. Graphical representations such as bar charts and pie charts were used for interpretation

2. Inferential Statistics

To test the hypotheses, the following statistical tools were applied:

Independent t-test: Used to compare responses between student teachers (n = 210) and teacher educators (n = 85) regarding AI awareness, usage, and effectiveness.

Correlation Analysis (Pearson's r): Used to examine the relationship between:

1. AI awareness and teaching effectiveness
2. AI usage and learning outcomes
3. AI literacy and teaching effectiveness

Regression Analysis: Used to determine the predictive impact of independent variables (awareness, usage, AI literacy) on teaching and learning effectiveness.

Chi-square Test: Applied where categorical variables were used to test associations between variables.

3. Level of Significance

All hypotheses were tested at a **0.05 level of significance ($p < 0.05$)**.

Summary of Analysis Framework

1. **Sample Size:** 295 respondents
2. **Groups:** 210 Student teachers and 85 Teacher educators
3. **Design:** Descriptive survey
4. **Analysis Methods:** Percentage, Mean, SD, t-test, Correlation, Regression, Chi-square

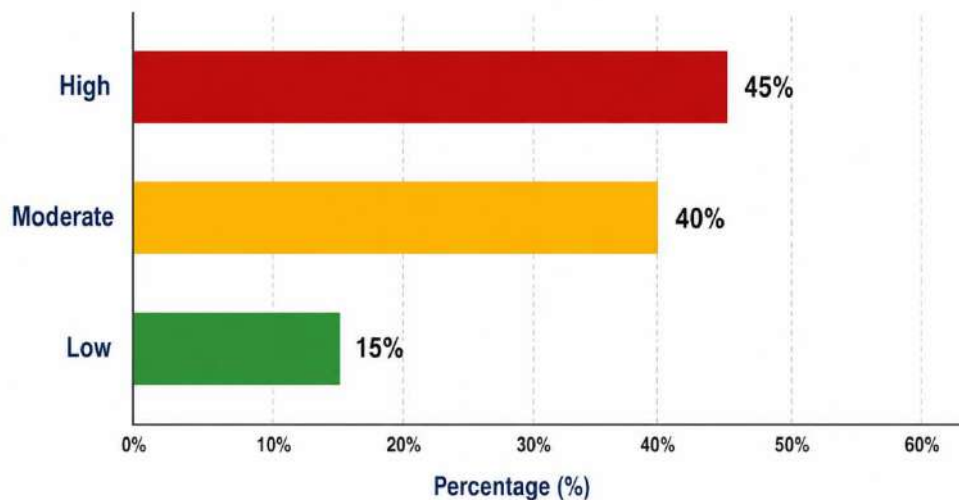
5. **Significance Level:** 0.05

Results and Discussion:

1. Level of Awareness of Generative AI:

Level of Awareness	Student Teachers (n=210)	Teacher Educators (n=85)	Total (%)
High	92 (43.8%)	41 (48.2%)	45.0%
Moderate	88 (41.9%)	32 (37.6%)	40.3%
Low	30 (14.3%)	12 (14.1%)	14.7%

Graph 1: Awareness of Generative AI



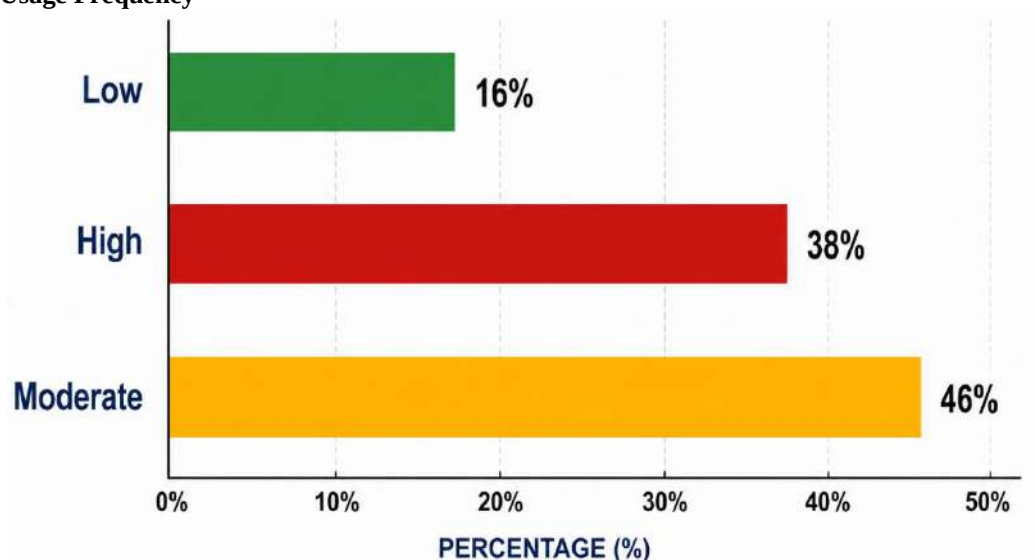
Interpretation:

The results show that a majority of respondents have **high to moderate awareness (85.3%)** of Generative AI tools, indicating increasing familiarity among both student teachers and teacher educators.

2. Frequency of Using Generative AI Tools:

Usage Level	Student Teachers	Teacher Educators	Total (%)
High	85 (40.5%)	28 (32.9%)	38.0%
Moderate	95 (45.2%)	40 (47.1%)	45.8%
Low	30 (14.3%)	17 (20.0%)	16.2%

Graph 2: Usage Frequency



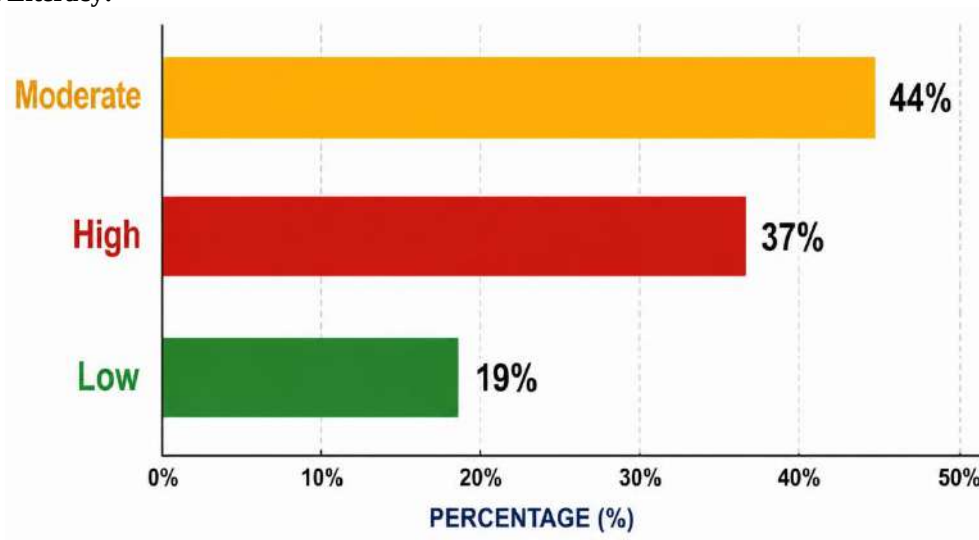
Interpretation:

Most respondents use Generative AI at a **moderate level (45.8%)**, showing that AI tools are becoming a regular part of academic work but are not yet fully integrated.

3. AI Literacy Level

AI Literacy	Percentage
High	37%
Moderate	44%
Low	19%

Graph 3: AI Literacy:



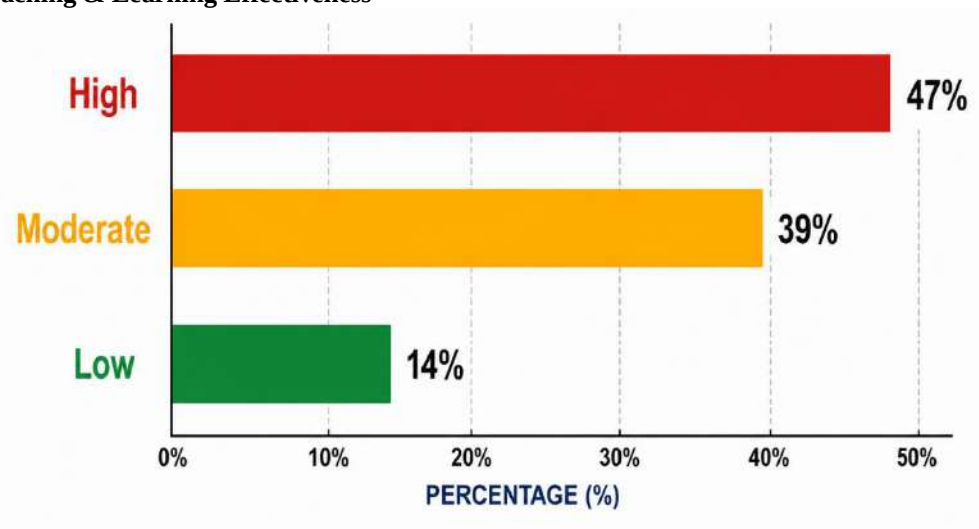
Interpretation:

The findings indicate that most respondents possess **moderate AI literacy**, suggesting a need for structured training programs in Teacher Education Institutions.

4. Teaching and Learning Effectiveness

Effect Level	Percentage
High	47%
Moderate	39%
Low	14%

Graph 4: Teaching & Learning Effectiveness



Interpretation:

A significant proportion of respondents reported that Generative AI has a **positive impact on teaching and learning effectiveness**, improving access to learning resources and academic support.

5. Correlation Results (Hypothesis Testing)

Variables Compared	Correlation (r)	Result
AI Awareness vs Effectiveness	0.62	Significant
AI Usage vs Effectiveness	0.68	Significant
AI Literacy vs Effectiveness	0.71	Significant

Interpretation:

The results indicate a **strong positive relationship** between AI-related variables and teaching-learning effectiveness. Hence, all null hypotheses are rejected at 0.05 level of significance.

Overall Findings

1. Majority of respondents show **moderate to high awareness of Generative AI**
2. AI is used moderately in academic activities
3. AI literacy is improving but still needs development
4. Generative AI has a **positive impact on teaching and learning effectiveness**
5. Strong correlation exists between AI usage and educational outcomes

Conclusion of Results Section

The analysis clearly indicates that Generative AI plays a significant role in enhancing teaching and learning in Teacher Education Institutions. However, structured training and improved AI literacy are required for optimal utilization.

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Original Article

Circular Economy and Green Innovation- A Thematic Literature Review

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Abstract

Environmental degradation and resource depletion have made sustainable development more critical, resulting in the increase of attention towards circular economy (CE) and green innovation (GI). This paper provides a review of the literature related to the theme of circular economy and green innovation for the period of 2020 to 2025 and explores how these approaches can lead to sustainability outcomes. Key themes include resource efficiency, waste reduction, and innovations in sustainability. As shown by the findings, circular economy practices, such as reuse, recycling, and remanufacturing, significantly impact the reduction of waste generation and resource management efficiency. Nevertheless, these practices need to be supplemented by green innovation to promote long-term sustainability because innovations enable further improvements in circular economy practices. In other words, the introduction of new technologies, business models, and environmentally friendly production processes will help optimize waste elimination. The combination of CE and GI can have a positive impact on economic growth and the quality of life, resulting in better overall sustainability performance. The review highlights the following limitations in the current body of literature: a lack of empirical studies, insufficient focus on developing countries, and absence of sector-specific research.

Keywords: Circular Economy, Green Innovation, Sustainability, Resource Efficiency, Waste Reduction

Introduction

Increasing difficulties related to climate change, environmental pollution, and resource shortages have revealed weaknesses of the linear economy model, which led to the importance of the Circular Economy (CE) model as a sustainable solution. CE entails the minimization of wastage and increased efficiency of resource use, including recycling, reuse, remanufacturing, and prolonging products' lifecycles. Over the past few years, this model has received significant interest from scholars and industries. For instance, some of the authors who discussed CE include Santeramo (2022) and Vargas-Merino et al. (2022). According to these researchers, this model can help to solve environmental and socio-economic problems and transform the way production and consumption systems operate. Likewise, Saleasa et al. (2022) and Montag (2023) point out that through CE, resources will be kept for a long time as companies redesign their operations. Other articles by Dominko et al. (2023) and Ferraz and Pyka (2023), among others, prove the importance of the CE approach to sustainable development. In addition to the implementation of circular economy principles, another key factor which helps promote sustainable development is green innovation. In other words, innovation can serve as an important catalyst for achieving environmentally-friendly technologies and processes, as well as a sustainable way of doing business. This factor helps reduce environmental degradation, increase resource efficiency, and improve sustainability performance. As noted by Porter and van der Linde (1995), innovations can bring about a competitive advantage for companies, in addition to providing improvements in ecological aspects. Moreover, according to de Jesus and Mendonça (2018), innovation is one of the critical prerequisites for making a circular transition and implementing sustainable production systems. In spite of the increasing significance of both circular economy and green innovation, there is a need for further research about how these two phenomena are interconnected and complement each other in their work towards sustainable development.



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While circular economy addresses issues like resource efficiency and waste, green innovation provides improvements for environmental performance in its processes. In this way, a clear interaction takes place. Nonetheless, their joint effect has not been widely studied; therefore, there is a considerable gap in research. The gap creates the need to address the following problem – determining how green innovation supports circular economy activities and sustainability. The research goals, in turn, include analyzing the contribution of the circular economy towards sustainability; examining the influence of green innovations on environmental performance; studying the relation between circular economy and green innovation.

Research gap

Although there has been a lot of research on circular economy and green innovation, some important gaps still exist in relation to this study. Many earlier studies explain how the circular economy supports sustainability, but they do not clearly show its real-world impact. In the same way, research on green innovation mostly discusses general environmental benefits, without clearly measuring its effect on environmental performance. Also, the connection between circular economy and green innovation is not well explained, as most studies look at them separately (Kirchherr et al., 2017; Geissdoerfer et al., 2017). Because of this, there is a need for more integrated and theme-based research to better understand how both together contribute to sustainability.

Objectives

1. Analysing the role of the circular economy in enhancing sustainability.
2. Analysing the effect of green innovation on environmental performance.
3. Examining the interrelationship between the circular economy and green innovation

Review process

Subsequent screening of the identified articles helped distinguish studies with strong relevance from those with limited focus on the topic. Initially, 50 articles were selected after the primary screening process. Further evaluation using inclusion and exclusion criteria led to the refinement of the sample, resulting in 30 final articles for detailed analysis. Each article was carefully reviewed based on its objectives, methodology, and findings. Using a thematic literature review approach, the studies were grouped into key themes such as circular economy practices, green innovation, sustainability outcomes, and technological and policy perspectives. This classification enabled a structured understanding of the research domain and identification of key research gaps.

Authours	Total Citation	Objectives
Centobelli, P., Cerchione, R., & Esposito, E. (2020)	294	The study aims to examine how green practices and enabling technologies contribute to achieving Sustainable Development Goals (SDGs) within the freight transport and logistics sector.
Cainelli, G., D'Amato, A., & Mazzanti, M. (2020).	541	The study aims to analyse how environmental policies and green demand factors influence the adoption of resource-efficient eco-innovations among EU firms.
Scarpellini, S., Valero-Gil, J., Moneva, J. M., & Andreus, M. (2020).	249	The study aims to analyse and measure formal and informal environmental management systems and accounting practices that support eco-innovation within a circular economy framework.
Kristoffersen, E., Blomsma, F., Mikalef, P., & Li, J. (2020).	1038	Develop a Smart Circular Economy (CE) framework that explains how digital technologies like IoT, big data, and analytics can support circular strategies and resource efficiency.
Velenturf, A. P., & Purnell, P. (2021).	1741	It seeks to provide an evaluation of the concepts and practices involved in the Circular Economy as well as the advantages and disadvantages associated with these.
Alhawari, O., Awan, U., Bhutta, M. K. S., & Ülkü, M. A. (2021).	46	It will provide a thorough analysis on defining the Circular Economy through its key features and resource use process.

Chizaryfard, A., Trucco, P., & Nuur, C. (2021)	213	To examine the Circular Economy as an evolutionary process rather than a static model, focusing on its role in addressing climate change.
Bressanelli, G., Adrodegari, F., Perona, M., & Saccani, N. (2018).	880	To develop a conceptual framework linking digital functionalities with key CE value drivers like resource efficiency, product lifespan extension, and loop closing.
Ji-Hyland, C., White, D., & Khaydarov, R. (2025).	21	To develop and empirically test a framework examining the relationship between circular economy practices (CEPs) and sustainable logistics performance (SLP).
Imtiaz, A., Yuanying, C., Shahzad, M. F., Raheel, A., Sabah, F., & Sarwar, R. (2025).	08	To propose policy recommendations and future research directions for aligning green economy practices with sustainable development goals.
Hermawan, A. N., Masudin, I., Zulfikarijah, F., Restuputri, D. P., & Shariff, S. S. R. (2024).	85	To investigate the moderating effect of eco-innovation on the relationship between sustainable manufacturing and environmental performance.
Yumei, H., Iqbal, W., Irfan, M., & Fatima, A. (2022).	130	To analyze the heterogeneous effects of government expenditure on green economy performance across different income-level countries.
Begum, S., Xia, E., Ali, F., Awan, U., & Ashfaq, M. (2022).	236	To analyze the relationship between creative process engagement and green innovations.
Fernando, Y., Tseng, M. L., Nur, G. M., Ikhsan, R. B., & Lim, M. K. (2023).	53	To examine the impact of circular economy performance (CEP) on managing supply chain disruption and technological innovation capability in manufacturing firms.
Ali, S., Ashraf, J., Ghufuran, M., & Xiaobao, P. (2025).	04	To provide policy insights for improving green innovation and reducing pollution through structural and regulatory reforms.
Tankova, E., Moneva, I., Krasteva-Hristova, R., Pencheva, M., & Ivanova, A. (2026).	03	To analyze the role of digital technologies in advancing circular economy research and identify key thematic areas through bibliometric analysis.
Kusi-Sarpong, S., Gupta, H., Khan, S. A., Chiappetta Jabbour, C. J., Rehman, S. T., & Kusi-Sarpong, H. (2023).	216	To develop a decision-making framework integrating Industry 4.0 and circular economy principles for sustainable supplier selection.
Komakech, R. A., Ombati, T. O., &	02	To review and synthesize literature on Supply Chain Management (SCM), Total Quality Management (TQM), and Circular Economy

Kikwatha, R. W. (2024).		(CE).
Haigh, R. (2023,	38	To analyze research trends and gaps in the use of waste materials in construction through bibliometric analysis.
Soni, A., Gupta, S. K., Rajamohan, N., & Yusuf, M. (2025).	26	To review and analyze various waste-to-energy (WtE) technologies, including their advantages, limitations, and feasibility.
Almogren, A. S. (2025).		To analyze the relationships between sustainability attitude, AI use for green technologies, and green technology adoption
Mahmud, D. (2025).	13	To systematically review the integration of Internet of Things (IoT) technologies with Decision Support Systems (DSS) within Circular Economy (CE) business models.
Harjanti, S., Prabowo, H., & Rahim, R. K. (2025).	07	For the identification of major themes, such as circular economic approaches, waste management, green technology adoption, and sustainability policies.
Guoli, P., Mengqing, L., & Jianqi, Q. (2025).	01	The impact of the implementation of circular economy (CE) concepts on supply chain resilience (SCR) for small and medium-sized enterprises (SMEs).
Guan, Y., Yang, J., Zhao, T., Shan, Y., & Zhu, Y. (2026).		To measure urban circular economy efficiency (UCEE) across Chinese provinces using a Super-SBM model incorporating undesirable outputs.
Singh, R., Joshi, A., Dissanayake, H., Iddagoda, A., Khan, S., Félix, M. J., & Santos, G. (2025).	60	To analyze the contribution of Circular Economy (CE) principles in promoting resource conservation, lifecycle extension, and sustainable value creation.
Tanveer, M., Khan, S. A. R., Umar, M., Yu, Z., Sajid, M. J., & Haq, I. U. (2022).	165	To examine the evolution of research in waste management and circular economy over time.
Rajayya, A., Nair, R., & Karthiayani, V. P. (2025).	19	To critically review existing literature on the adoption of Circular Economy (CE) practices in the global and Indian context.
Sun, Y., Zhang, R., Qie, X., Li, D., Zhang, X., Du, X., & Wang, Y. (2025).	10	To examine the impact of the digital economy (DE) on the development of the circular economy (CE) across Chinese cities.

Thematic analysis and discussion

The rising importance of sustainable solutions is leading researchers and practitioners to adopt holistic approaches based on combining circular economy techniques with green innovation. Practices such as reuse, recycling, remanufacturing, and extending the product life are generally acknowledged as efficient tools for managing resources. According to Geissdoerfer et al. (2017), the concept of circular economy implies a system in which resource inputs are minimized, and waste creation is avoided, while Kirchherr et al. (2017) consider it an opportunity to shift from the linear to the closed-loop model. Recent studies, including research by Bressanelli et al. (2020) and Kristoffersen et al. (2021), have shown that digital technologies facilitate implementation of the circular approach through improved monitoring and optimization of the resource utilization process. For developing countries, literature on circular practices includes works by Govindan and Hasanagic (2018) and Agyemang et al. (2019) focusing on tackling waste management problems and resource shortages. It is important to note that although the use of circular techniques forms

a basis for sustainability, they require the development of additional competencies for successful performance. It is at this juncture that green innovation is considered an important driver that adds value to the efforts aimed at improving sustainability. Contrary to normal innovation that does not concern itself with mitigating environmental damage alongside economic efficiency, green innovation seeks to do so, especially as Rennings (2000) is credited with providing early theoretical foundations for green innovation in terms of policy-making. More contemporary research from Dangelico and Pujari (2010) underscores the significance of eco-design and sustainable product development when it comes to achieving environmental objectives. Similarly, research from Cainelli et al. (2015) proves that green innovation has positive impacts on corporate success, especially in the environmentally sensitive sector of manufacturing. Furthermore, De Marchi (2012) stresses the importance of environmental innovation in terms of networks of knowledge. Modern studies from Albort-Morant et al. (2016) also show that green innovation strategies can enhance competitiveness and sustainability.

However, when analyzed in conjunction, practices related to circular economy and innovations contribute to sustainability outcomes that go beyond environmental benefits and encompass both economic and social aspects. According to Ghisellini et al. (2016), the circular economy is important for the promotion of sustainability because it promotes resource efficiency and helps to reduce the environmental degradation associated with economic activities. At the same time, according to Murray et al. (2017), circular economy practices can bring economic and employment benefits. Finally, the importance of sustainable supply chain management in the achievement of such goals is illustrated by Genovese et al. (2017). In relation to eco-innovations, Carrillo-Hermosilla et al. (2010) show that the adoption of such approaches brings about systemic changes that lead to improved environmental performance. Meanwhile, according to Boons et al. (2013), in addition to technological innovation, sustainable innovations need to entail changes at the level of the organizational practices and business models. Moreover, when conducting a thorough analysis of literature on the topic, it becomes apparent that the relationship between the concepts of circular economy and green innovation is not static but dynamic and mutually beneficial. First, Nidumolu et al. (2009) stress the importance of innovation for gaining competitive advantages based on sustainability, whereas Tukker (2015) focuses on the role of product-service systems in supporting circularity. Also, Lieder and Rashid (2016) note the significance of innovation in terms of the successful implementation of circular economy. Furthermore, according to Prieto-Sandoval et al. (2018), it is crucial to regard innovation and circular economy as parts of the same system in terms of sustainability transition. Finally, Centobelli et al. (2020) prove that the combination of digital and green innovations leads to the development of circular supply chains. Therefore, it can be concluded that innovation contributes to the effectiveness of implementation of circular economy while the latter allows using innovations more successfully. The role of policies and governance mechanisms is just as important in facilitating the integration process. The existence of proper policies helps to foster an environment conducive to the adoption of both circular approaches and innovative practices. Following this line of reasoning, policies as tools, such as subsidies, taxation, and standards, play an important part in encouraging sustainable practices, as per OECD (2018). Furthermore, the EU's initiatives concerning circular economy show how the use of policy frameworks leads to large-scale transformations. Moreover, the works by Mazzucato (2018) also point to mission-oriented policies as important instruments for promoting innovation and sustainability.

Even though there is much research, many research gaps still exist. First, one major limitation is that most existing studies consider issues related to circular economy and green innovation as separate aspects rather than analyzing both at once. Even though there have been many studies with great conceptual frameworks, there is still a lack of empirical research proving their joint effect. Also, it should be noted that most studies deal with the situations in developed countries, while there is no research regarding the situation in the developing world. Generally, it can be observed from the discussions above that the achievement of sustainability is not attainable through individual approaches. Rather, sustainability requires a combination of the use of a circular economy approach and green innovation in an organization's operations. For this reason, organizations capable of adopting both approaches are able to benefit more from them in terms of increased resource efficiency and competitiveness. However, in addition to the efforts of the organizations themselves, there is an important role played by policymakers in supporting these endeavours.

Findings

In general, sustainability is becoming a major consideration not only for environment protection purposes, but also for ensuring economic stability and prosperity. According to the research paper, a variety of circular economy approaches, such as recycling, re-use, and resource efficiency practices, contribute significantly to the management and waste reduction. Nonetheless, it is argued that these methods cannot be regarded as a solution for sustainability alone since the integration of clean technologies and other innovations provides additional value in this context. In fact, the research paper claims that when these two concepts are combined, their effects on environment and resource management become much more efficient, contributing not only to environmental improvements, but also increasing organizations' competitiveness and value. Nevertheless, several obstacles to successful implementation of both circular economy and green innovations are identified by the study, namely, high costs associated with these approaches, lack of knowledge about them, absence of technical skills and government policy supporting these initiatives. Overall, sustainability can be achieved through collaboration between various stakeholders.

Research outcome

According to the results of this research, sustainability can now be regarded as an even more significant matter than it was before since its role is associated with promoting economic stability and social well-being alongside environmental protection. In particular, this article demonstrates the importance of circular economy principles that include the ideas of reuse, recycling, and resource effectiveness. Nevertheless, according to the paper, it is clear that these strategies are not sufficient in order to maximize their effectiveness and benefit. Namely, it is claimed that sustainable development is promoted much better through innovative green strategies and approaches. Furthermore, the obtained conclusions suggest that when circular economy and green innovation are combined, they do not only minimize negative impacts on nature but also lead to improved organizational performance and added value. Nonetheless, there is still a list of obstacles to the adoption of these practices such as high expenses, low awareness, insufficient technical skills, and ineffective government policies. To address all these issues, cooperation between businesses, societies, and governments is needed. As for the recommendations and further directions of research, they include the need for collaborative action in order to ensure sustainable development and competitiveness.

Conclusion

This study reveals the importance of sustainability, which can no longer be considered solely from an ecological angle, but rather as one of the fundamental components of long-term economic and social prosperity. The principles of the circular economy – namely reuse, recycling, and resource efficiency – are indispensable to achieving positive results, but they can be successfully implemented only through constant sustainable innovations. It is the synergy of all these approaches that contributes to changing approaches in producing, consuming, and reusing resources in order to improve their sustainability. By going beyond linear models of development, organizations may minimize waste production, maximize efficiency, and build their competitive advantage. Furthermore, sustainability is supposed to be perceived as an ongoing process, and innovation becomes critical in terms of making the principles of the circular economy easier and more applicable. Nevertheless, high expenses on innovation, lack of knowledge about its importance, insufficient competence among managers, and weak policy frameworks constitute barriers to implementing innovation into organizations. Therefore, overcoming all these difficulties requires cooperation on the part of governmental bodies, businesses, and society as a whole.

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Original Article

Digital Marketing: Challenges & Opportunities

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Abstract

Digital marketing has emerged as a powerful tool that has transformed the way businesses communicate with customers and promote their products and services. The increasing use of the internet, smartphones, and social media platforms has enabled organizations to reach a wider audience, enhance customer engagement, and improve business performance. Digital marketing offers numerous opportunities, including global reach, cost-effective promotion, targeted advertising, personalized communication, and measurable results. However, digital marketing also presents several challenges, such as intense market competition, rapidly changing technologies, data privacy and security concerns, changing consumer behavior, and the shortage of skilled professionals. Businesses need to continuously adapt to technological advancements and develop innovative strategies to overcome these challenges and effectively utilize digital marketing opportunities. This study examines the concept, components, opportunities, and challenges of digital marketing and evaluates its significance in the modern business environment. The study concludes that effective adoption of digital marketing strategies can help organizations achieve sustainable growth, strengthen customer relationships, and gain a competitive advantage in the digital economy.

Key Words: Digital Marketing, Digital Technologies, Social Media Marketing, Search Engine Optimization (SEO) Opportunities, Challenges, & Digital Transformation.

Introduction

Digital marketing is the practice of promoting products, services, or brands through digital channels such as websites, search engines, social media platforms, email, and mobile applications. Unlike traditional marketing, digital marketing allows businesses to reach a global audience, interact with customers in real time, and measure the effectiveness of marketing campaigns accurately. With the rapid growth of internet usage and digital technologies, digital marketing has become an essential tool for businesses of all sizes. It helps organizations increase brand awareness, generate leads, drive sales, and build long-term customer relationships. Digital marketing strategies refer to planned methods and techniques used by businesses to promote their products or services using digital platforms such as websites, search engines, social media, email, and mobile apps. The main aim is to reach the right audience, increase brand awareness, generate leads, and improve sales in a cost-effective way. In today's competitive business environment, digital marketing has become essential because most consumers spend a significant amount of time online. Companies use data-driven approaches to understand customer behavior and deliver personalized content. Digital marketing is a powerful and dynamic approach that enables businesses to connect with their target audience, enhance brand visibility, and achieve marketing objectives efficiently in today's technology-driven world.

Significance of the Study

The study of digital marketing is important because it helps businesses understand how to promote products and services effectively through digital technologies and online platforms. The study of digital marketing is significant because it equips businesses and professionals with the knowledge and skills needed to reach customers effectively, improve business performance, and succeed in the rapidly evolving digital economy.



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Literature Review

Vendrell-Herrero et al. (2014) recognized digital technology' hidden advantages, which they dubbed digital dark matter. Product service systems (PSSs) are collections of linked products and services intended to produce value via their use, resulting in benefits that may not be immediately apparent. The study set out to objectively evaluate digital dark matter within PSSs and investigate its relevance to national competitiveness.

Sathya (2015) described digital marketing as the use of electronic communication by marketers to direct items and services to the marketplace. The article highlighted that the primary purpose of digital marketing is to provide consumers with a thorough understanding of items through digital media. It focuses on the extent to which digital channels are used for marketing and customer engagement. The study gathered data from 100 respondents to analyze the impact of digital marketing on a company's sales.

Rathore, Pant, and Sharma (2017) examined the changing patterns in digital marketing in India. The study looked at efficient digital marketing techniques, emerging trends, India's growing internet and mobile user base, and the country's future digital marketing potential.

Rowley (2008) emphasizes the importance of digital material on commercial and societal results. The study gives an in-depth look into digital content marketing, emphasizing its core as being based on providing value to customers. The study investigates the different elements of digital content marketing using a set of structured questions, as well as the challenges of defining and judging "worth" in digital marketplaces. These problems have an impact on value chain frameworks and pricing strategies, demonstrating the complexities of managing digital content in a value-driven market.

Suguna and Selladurai (2017) conducted a SWOT analysis of digital marketing in India, a country with a population of over 1.25 billion and roughly 20% internet coverage. Although India's internet penetration is low in comparison to countries such as the United States and China, its massive population results in a high number of internet users, making it the world's third-largest. The report explores the strengths, flaws, possibilities, and risks of digital marketing in India, emphasizing its growing importance and potential despite infrastructural and literacy issues.

Niharika and Satinder (2020) examine the growth of internet usage and e-commerce in India, highlighting the significant role of e-marketing in fostering IT development and the expansion of online businesses. Identified opportunities encompass affordable market accessibility, e-commerce assistance, and providing tailored content. Nonetheless, obstacles such as limited internet access, gaps in digital literacy, infrastructure challenges, competition, and privacy issues continue to exist. Drawing from Rowley's (2008) customer value framework, the authors emphasize the need for strategic initiatives to address technological obstacles and unlock the full transformative potential of e-marketing in India.

Yasmin, Tasneem, and Fatema (2019) examine the impact of digital marketing on improving business performance and customer value through a study involving 150 firms and 50 executives. They analyze how tools such as social media and SEO influence brand visibility and sales, highlighting significant opportunities for customer engagement and expanding market reach. Key challenges involve adjusting to fast-paced technological advancements and handling intricate data, reflecting Rowley's (2008) insights on the complexities of functioning in ever-evolving digital landscapes. The study highlights the strategic significance of digital marketing but recognizes substantial challenges in its implementation.

Objectives of the Study

The primary objective of study is to understand the opportunities and challenges of digital marketing.

Research methodology

It adopts a descriptive and analytical approach to study the challenges and opportunities of digital marketing by collecting and analyzing data from both primary and secondary sources, thereby providing insights into the role and effectiveness of digital marketing in today's business environment.

Scope of the Study

The study focuses on the various aspects of digital marketing, including social media marketing, search engine marketing, content marketing, email marketing, and their challenges and opportunities in the modern business environment.

Components of Digital Marketing

Digital marketing consists of various components that help businesses promote their products and services through digital channels. The major components are:

1. **Search Engine Optimization (SEO):** Improving a website's ranking on search engines to increase organic traffic and visibility.
2. **Search Engine Marketing (SEM):** Using paid advertisements on search engines to attract potential customers and generate traffic.
3. **Social Media Marketing (SMM):** Promoting products and engaging customers through social media platforms such as Facebook, Instagram, LinkedIn, and X (Twitter).

4. **Content Marketing:** Creating and sharing valuable content such as blogs, articles, videos, and infographics to attract and retain customers.
5. **Email Marketing:** Sending promotional emails, newsletters, and personalized messages to build customer relationships and encourage sales.
6. **Pay-Per-Click (PPC) Advertising:** A form of online advertising where advertisers pay a fee each time users click on their advertisements.
7. **Mobile Marketing:** Reaching customers through smartphones, mobile applications, SMS, and mobile-friendly websites.
8. **Affiliate Marketing:** Partnering with individuals or organizations to promote products and services in exchange for a commission.
9. **Influencer Marketing:** Collaborating with influencers and content creators to promote products and build brand awareness.
10. **Web Analytics:** Collecting and analyzing website and campaign data to measure performance and make informed marketing decisions.
11. **Online Reputation Management (ORM):** Monitoring and managing online reviews, feedback, and brand image to maintain customer trust.
12. **E-Commerce Marketing:** Using digital channels to promote and sell products and services through online platforms.

The components of digital marketing work together to help businesses increase online visibility, attract customers, improve engagement, and achieve marketing objectives effectively in the digital age.

Emerging Trends of Digital Marketing

Digital marketing is continuously evolving due to technological advancements and changing consumer behavior. The major emerging trends in digital marketing are:

1. **Artificial Intelligence (AI) and Machine Learning:** AI-powered tools help businesses automate marketing activities, analyze customer data, and provide personalized experiences.
2. **Voice Search Optimization:** The growing use of voice assistants has increased the need to optimize content for voice-based searches.
3. **Video Marketing:** Short videos, live streaming, and interactive video content have become powerful tools for customer engagement and brand promotion.
4. **Influencer Marketing:** Businesses collaborate with social media influencers to increase brand awareness and reach targeted audiences.
5. **Personalized Marketing:** Companies use customer data and analytics to deliver customized content, advertisements, and recommendations.
6. **Chatbots and Conversational Marketing:** AI-based chatbots provide instant customer support and improve customer interaction and satisfaction.
7. **Mobile-First Marketing:** As smartphone usage increases, businesses are focusing on mobile-friendly websites, applications, and mobile advertising.
8. **Social Commerce:** Social media platforms are increasingly being used for direct product discovery and purchases.
9. **Content Marketing and Interactive Content:** Interactive content such as quizzes, polls, infographics, and webinars enhances customer engagement.
10. **Data Analytics and Predictive Analytics:** Advanced analytics help businesses understand customer behavior, predict future trends, and make better marketing decisions.
11. **Augmented Reality (AR) and Virtual Reality (VR):** AR and VR technologies provide immersive experiences and allow customers to virtually experience products before purchasing.
12. **Privacy-Focused Marketing:** Growing concerns about data privacy are encouraging businesses to adopt transparent and ethical marketing practices.

Emerging trends in digital marketing, such as artificial intelligence, video marketing, voice search, personalization, chatbots, and social commerce, are transforming the way businesses interact with customers. Organizations that adopt these trends and adapt to technological changes can improve customer engagement, gain a competitive advantage, and achieve sustainable growth in the digital era.

Role of Social Media in Digital Marketing

Social media plays a vital role in digital marketing by enabling businesses to connect, communicate, and engage with customers through online platforms. It has transformed the way organizations promote their products and services by providing direct interaction, real-time communication, and cost-effective marketing opportunities.

Social media has become an indispensable component of digital marketing. It enables businesses to promote their brands, engage customers, generate leads, and increase sales in a cost-effective manner. By effectively leveraging social media platforms, organizations can build strong customer relationships, gain a competitive advantage, and achieve sustainable growth in the digital economy.

Challenges of Digital Marketing

Digital marketing offers many benefits, but businesses also face several challenges in implementing effective digital strategies. The major challenges are:

1. **High Competition:** The online marketplace is highly competitive, making it difficult for businesses to attract and retain customers.
2. **Rapid Technological Changes:** Digital marketing tools and technologies change frequently, requiring continuous learning and adaptation.
3. **Data Privacy and Security Issues:** Protecting customer data and complying with privacy regulations are major concerns for businesses.
4. **Changing Consumer Behaviour:** Customer preferences and online buying patterns change rapidly, making it challenging to meet their expectations.
5. **Content Overload:** The internet is flooded with content, making it difficult for businesses to create unique and engaging content.
6. **Search Engine Algorithm Changes:** Frequent changes in search engine algorithms can affect website rankings and online visibility.
7. **Measuring Return on Investment (ROI):** Determining the exact impact of digital marketing campaigns on sales and profits can be challenging.
8. **Negative Online Reviews and Feedback:** Negative comments on social media and review platforms can damage a company's reputation.
9. **Lack of Skilled Professionals:** Many organizations face difficulties in finding employees with adequate digital marketing knowledge and skills.
10. **Budget Constraints:** Small and medium-sized businesses may struggle to allocate sufficient resources for digital marketing activities.

The major challenges of digital marketing include intense competition, technological advancements, privacy concerns, and changing consumer expectations. Businesses must continuously innovate, upgrade their skills, and adopt effective strategies to overcome these challenges and achieve success in the digital marketplace

Opportunities of Digital Marketing

Digital marketing provides numerous opportunities for businesses to expand their reach, engage customers, and improve profitability. The major opportunities are:

1. **Global Market Reach:** Businesses can reach customers worldwide without geographical barriers.
2. **Cost-Effective Marketing:** Digital marketing is more affordable than traditional marketing methods and offers better returns on investment.
3. **Targeted Advertising:** Companies can target specific audiences based on demographics, interests, and online behavior.
4. **Increased Customer Engagement:** Social media, emails, and websites enable direct interaction and relationship building with customers.
5. **24/7 Online Presence:** Businesses can promote and sell products and services at any time, increasing convenience for customers.
6. **Measurable Results:** Digital marketing tools provide real-time data and analytics to track campaign performance and make informed decisions.
7. **Brand Awareness and Recognition:** Online platforms help businesses build strong brand identity and improve visibility.
8. **Higher Sales and Revenue:** Effective digital marketing strategies attract potential customers and increase conversion rates.
9. **Personalized Marketing:** Businesses can deliver customized messages and offers based on customer preferences and purchasing history.
10. **Business Growth and Innovation:** Digital marketing encourages the adoption of new technologies and innovative marketing practices, helping businesses remain competitive.
11. **Opportunities for Small Businesses:** Small and medium enterprises can compete with larger companies through cost-effective digital platforms.
12. **Career and Employment Opportunities:** The growth of digital marketing has created careers in SEO, content marketing, social media management, digital advertising, and web analytics.

Digital marketing offers significant opportunities such as global reach, cost efficiency, targeted communication, customer engagement, and business growth. By effectively utilizing digital technologies, organizations can enhance their competitiveness and achieve sustainable success in the digital era.

Suggestions

Businesses can overcome digital marketing challenges by continuously updating their skills, embracing technology, protecting customer data, monitoring performance, and adopting integrated and customer-focused marketing strategies.

These measures help organizations improve efficiency, strengthen customer relationships, and achieve sustainable growth in the digital marketplace.

Conclusion

Digital marketing has transformed the way businesses communicate with customers and promote their products and services. It offers numerous opportunities, such as global reach, cost-effective promotion, targeted advertising, improved customer engagement, and measurable results. It also enables businesses of all sizes to build brand awareness, increase sales, and gain a competitive advantage in the digital marketplace. However, digital marketing also presents several challenges, including intense competition, rapidly changing technologies, data privacy and security concerns, changing consumer behavior, and the need for skilled professionals. Organizations must continuously adapt to new trends and technologies to overcome these challenges. In conclusion, despite its challenges, digital marketing has become an indispensable part of modern business. By effectively leveraging its opportunities and addressing its challenges, businesses can achieve sustainable growth, enhance customer satisfaction, and succeed in the ever-evolving digital economy.

Digital marketing strategies play a crucial role in modern business growth by helping organizations connect with customers efficiently, build brand value, and increase sales through online platforms. Their importance has increased due to the rapid growth of internet usage and mobile technology. Digital marketing strategies are essential for business success in the modern digital era, as they improve reach, reduce costs, enhance customer engagement, and support data-driven decision-making.

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Original Article

Digital transformation and its influence on employee engagement

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Abstract

In the era of digital transformation, the relationship between employers and employees has undergone significant changes. Technological advancements have reshaped business operations, organizational structures, and traditional workplace practices. Organizations are increasingly transitioning from conventional work environments to hybrid and digitally enabled models, influencing the way employee engagement is managed. Digital technologies have transformed Human Resource Management (HRM) by enabling organizations to implement innovative engagement strategies that enhance communication, collaboration, learning, and employee well-being. The integration of digital tools and platforms in employee engagement practices offers greater flexibility, transparency, and accessibility, benefiting both employees and organizations. These innovations contribute to improved job satisfaction, productivity, retention, and overall organizational effectiveness. This study is based on secondary data collected from research articles, journals, HR magazines, industry reports, and relevant literature. The paper examines the role of digital innovations in enhancing employee engagement and explores how organizations are redesigning engagement practices to adapt to the evolving digital workplace. Furthermore, it highlights the benefits of digital engagement initiatives and provides suggestions for leveraging digital technologies to foster a more engaged, efficient, and sustainable workforce.

Keywords: Employee engagement, digitalization, and web-based technology

Introduction

Digitalization has significantly transformed the way people communicate, interact, and conduct business. Rapid technological advancements have reshaped organizational processes, business models, and workplace practices, making it essential for organizations to adapt to the changing digital landscape to remain competitive. The integration of digital technologies has become crucial not only for improving internal operations but also for sustaining organizational growth and competitiveness in the external business environment. In today's dynamic market, organizations are expected to deliver innovative products and services that align with evolving customer needs and technological developments. To meet these expectations, employees must continuously adapt to new technologies, acquire digital competencies, and embrace changing work practices. The emergence of a digital workforce has enabled organizations to respond more effectively to customer demands through enhanced efficiency, collaboration, and innovation. The term digital era refers to an environment in which organizations leverage digital technologies and digital transformation initiatives to balance technological advancements with changing business and customer requirements. This evolving ecosystem has brought about revolutionary changes in how organizations manage, develop, motivate, and engage their workforce. Digitalization has disrupted traditional ways of working and created new opportunities for value creation, communication, learning, and employee participation. Employee engagement has become increasingly important in this context, as engaged employees contribute significantly to organizational performance, innovation, and sustainability. Digital innovations such as collaborative platforms, learning management systems, employee engagement applications, artificial intelligence, and data-driven communication tools have transformed engagement practices by enabling greater connectivity, flexibility, and employee involvement.



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Therefore, this paper aims to examine the role of digital innovations in enhancing employee engagement and to explore the various engagement practices adopted by organizations in the digital era. The study seeks to provide insights into how organizations can redesign and strengthen their engagement strategies to suit changing workplace environments. Furthermore, it offers recommendations for leveraging digital technologies to improve employee engagement, organizational effectiveness, and long-term sustainability.

Review of Literature:

Employee Engagement

Employee engagement refers to the degree of commitment, involvement, and enthusiasm employees demonstrate toward their work and organization (Anitha, 2014). Engaged employees actively contribute to organizational goals, perform their responsibilities with dedication, and foster a positive work environment. They often go beyond their assigned duties and work schedules to achieve organizational objectives. Employee engagement is considered a strategic tool that enables organizations to effectively utilize employee talent and gain a sustainable competitive advantage (Baumruk, 2004). The concept was first introduced by Kahn (1990), who defined engagement as the extent to which employees express themselves physically, cognitively, and emotionally in their work roles. Similarly, Buckingham and Coffman (1999) emphasized that employee engagement is achieved when the right people are placed in the right roles under effective leadership.

Researchers have proposed several approaches to understanding employee engagement. Kahn's (1990) Need Satisfying Approach highlights meaningful work, psychological safety, and organizational support as key factors influencing engagement. The Burnout-Antithesis Approach developed by Maslach et al. (2001) views engagement as the positive opposite of burnout, characterized by energy, involvement, and effectiveness. Harter et al. (2002) introduced the Satisfaction-Engagement Approach, defining engagement as employees' involvement, satisfaction, and enthusiasm toward their work. Saks (2006) proposed a Multidimensional Approach, describing engagement as a combination of cognitive, emotional, and behavioral commitment that contributes to organizational success. Literature suggests that factors such as leadership, organizational support, psychological safety, and effective communication play a significant role in enhancing employee engagement. These factors contribute to positive outcomes including job satisfaction, organizational commitment, improved performance, profitability, and long-term sustainability. However, because organizational cultures and employee expectations vary, no single engagement strategy can be universally applied across all organizations.

Digital Innovations

Digital innovation has emerged as a critical factor for organizational survival and growth in today's rapidly changing business environment. The evolving expectations of customers, employees, stakeholders, and consumers have compelled organizations to adopt advanced digital technologies and innovative solutions. Digital innovations encompass the development and application of new digital products, processes, services, strategies, and business models that enhance organizational performance and competitiveness (Ciriello, Richter, & Schwabe, 2018). The adoption of digital technologies has transformed traditional business models into smart, technology-driven systems that operate efficiently through automated applications and intelligent machines. These innovations have significantly changed the way organizations create value and interact with their stakeholders. Digital innovation has also revolutionized service delivery by enabling organizations to provide products and services without extensive physical infrastructure or inventory. Companies such as Uber, Amazon, Airbnb, Skype, and Netflix have successfully leveraged digital platforms to offer convenient, efficient, and customer-centric services (Demirkan et al., 2016). As a result, organizations can reach wider markets while reducing operational costs.

Furthermore, digital innovation has streamlined organizational functions by automating human resource activities and manufacturing processes. Automation helps reduce time, effort, and operational expenses, thereby improving overall efficiency. These technological advancements not only enhance customer satisfaction but also contribute to employee well-being and productivity. The significance of digital innovation became particularly evident during and after the COVID-19 lockdown period, when organizations increasingly relied on digital platforms and smart applications to maintain business continuity and employee engagement. Through digital technologies, organizations were able to facilitate remote work, virtual collaboration, and continuous communication among employees. Moreover, digital innovation supports the creation of innovative products and services, enabling organizations to achieve their strategic objectives more effectively (Hjalmarsson & Rudmark, 2012). Smart applications and digital tools reduce repetitive and labor-intensive tasks, allowing employees to focus on more productive and value-adding activities. For example, PepsiCo utilizes artificial intelligence-based recruitment software to screen resumes and identify suitable candidates, reducing recruiters' workload and improving the efficiency of the hiring process (Garg et al., 2018).

Overall, digital innovation plays a vital role in enhancing organizational effectiveness, improving employee experiences, and fostering sustainable competitive advantage in the digital era.

Objectives:

1. To explore the relationship between digital transformation and employee engagement in organizations.
2. To understand the various digital tools and technological innovations used to enhance employee engagement.

Research Methodology:

The present study aims to examine employee engagement practices in the context of digitalization and is based entirely on secondary data. Relevant information was collected from a variety of sources, including peer reviewed journal articles, research papers, books, industry reports, HR magazines, news articles, and credible websites. The collected data were systematically reviewed, analyzed, and synthesized to understand the role of digitalization in enhancing employee engagement and to draw meaningful conclusions regarding its benefits and implications for organizations.

Technological Innovations

Technological innovation has emerged as a critical factor for organizational survival and competitiveness in response to the rapidly evolving needs of customers, employees, stakeholders, and society. Technological innovations, including digital platforms and smart applications, are transforming industries by reshaping products, processes, strategies, and business models (Ciriello et al., 2018). These innovations have enabled organizations to transition from traditional operational frameworks to intelligent, self-sustaining business models driven by advanced technologies, automation, and data analytics. Technological innovations have significantly altered the way organizations deliver products and services. Digital platforms allow companies to serve customers efficiently without maintaining extensive physical infrastructure or inventory. Organizations such as Amazon, Uber, Airbnb, Skype, and Netflix have revolutionized service delivery through digitally enabled business models (Demirkan et al., 2016). Furthermore, technological advancements have facilitated the automation of human resource functions, manufacturing operations, and administrative processes, thereby reducing operational costs and improving productivity. The importance of technological innovation became particularly evident during and after the COVID-19 pandemic, when organizations relied heavily on digital technologies to maintain business continuity and employee engagement. Through the adoption of innovative digital solutions, organizations have been able to develop new products and services while achieving strategic objectives (Hjalmarsson & Rudmark, 2012). Smart technologies and digital tools reduce employees' manual workload, allowing them to focus on more value-added and productive activities. For example, PepsiCo employs artificial intelligence-based recruitment software to screen resumes, reducing recruiters' workload and enhancing the efficiency of candidate selection processes (Garg et al., 2018).

Evolution of Technological Innovation

The evolution of technological innovation has been characterized by continuous advancements in computing, communication, and information technologies, which have transformed business operations and societal interactions.

Emergence of Computing (1950s–1960s)

The foundation of modern technological innovation was established with the development of mainframe computers and programming languages. Significant milestones included the introduction of the UNIVAC I in 1951 and the creation of programming languages such as FORTRAN and COBOL, which enabled organizations to automate complex calculations and data processing tasks (Campbell-Kelly & Aspray, 2004).

Rise of Personal Computing (1970s–1980s)

The emergence of personal computers revolutionized access to technology. Companies such as Apple and Microsoft played a pivotal role in making computing accessible to businesses and individuals. The introduction of graphical user interfaces (GUIs) enhanced user-friendliness and expanded computer adoption (Ceruzzi, 2012).

Internet and World Wide Web (1990s)

The development of the internet and the World Wide Web transformed communication, information sharing, and commerce. During this period, web browsers, search engines, and e-commerce platforms emerged, creating new opportunities for businesses and consumers worldwide (Berners-Lee, 1999).

Mobile Revolution (2000s)

The widespread adoption of smartphones and mobile applications marked another major phase in technological innovation. Organizations such as Apple and Google significantly influenced the mobile ecosystem through the development of the iPhone and Android operating system, respectively (West & Mace, 2010).

Web 2.0 and Social Media (2000s)

The concept of Web 2.0 introduced interactive and user-generated content, fostering collaboration and engagement. Social networking platforms such as Facebook, Twitter, and LinkedIn transformed communication, marketing, and professional networking (Kaplan & Haenlein, 2010).

Cloud Computing (2010s)

Cloud computing emerged as a dominant technological paradigm, enabling organizations to access computing resources and store data remotely. Platforms such as Amazon Web Services (AWS), Microsoft Azure, and Google Cloud enhanced scalability, flexibility, and operational efficiency (Mell & Grance, 2011).

Internet of Things (IoT) and Big Data (2010s)

The proliferation of interconnected devices led to the growth of the Internet of Things (IoT), generating large volumes of data. Concurrently, big data analytics technologies evolved to process, analyze, and derive insights from these datasets, supporting data-driven decision-making (Manyika et al., 2011).

Artificial Intelligence and Machine Learning (Present)

Artificial intelligence (AI) and machine learning (ML) have become central to contemporary technological innovation. These technologies are applied in various domains, including natural language processing, predictive analytics, robotics, and computer vision, enabling organizations to improve efficiency and innovation (Russell & Norvig, 2021).

Blockchain and Cryptocurrencies (Present)

Blockchain technology has gained prominence due to its decentralized and secure architecture. Beyond cryptocurrencies such as Bitcoin and Ethereum, blockchain applications extend to supply chain management, finance, healthcare, and digital identity verification (Tapscott & Tapscott, 2016).

Industry 4.0 and Digital Transformation (Present–Future)

Industry 4.0 represents the integration of advanced technologies such as IoT, AI, robotics, and cloud computing into manufacturing and business processes. These developments are driving digital transformation, enabling organizations to create smart factories, optimize operations, and develop innovative business models (Schwab, 2017).

Quantum Computing and Emerging Technologies (Future)

Future technological innovations are expected to be shaped by quantum computing, which offers the potential to solve complex computational problems beyond the capabilities of classical computers. Additionally, emerging technologies such as fifth-generation (5G) networks, augmented reality (AR), and virtual reality (VR) are anticipated to further transform industries and societal interactions (Brynjolfsson & McAfee, 2017).

However, technological innovation continues to evolve rapidly, reshaping organizational processes, business models, and human interactions. Organizations that embrace technological advancements and maintain a forward-looking approach are better positioned to enhance competitiveness, improve employee engagement, and achieve sustainable growth in the digital era.

Engaging Employees Through Digital and Technological Innovation

Digital and technological innovations have become essential tools for enhancing employee engagement in modern organizations. These innovations improve communication, collaboration, learning, recognition, and overall employee experience, thereby fostering a more connected and productive workforce. The adoption of digital technologies enables organizations to create flexible, inclusive, and employee-centric work environments that support both organizational performance and employee well-being (Ciriello, Richter, & Schwabe, 2018).

Collaboration Platforms

Digital collaboration platforms such as Microsoft Teams, Slack, and Asana facilitate seamless communication and coordination among employees, particularly in remote and hybrid work environments. These platforms support real-time messaging, file sharing, project management, and teamwork, thereby strengthening collaboration and employee engagement. Video conferencing tools such as Zoom and Microsoft Teams further enable face-to-face interactions, helping employees maintain social connections and participate actively in organizational activities (Kane et al., 2019).

Employee Recognition Systems

Employee recognition platforms such as Bonusly, Kudos, and Achievers provide organizations with effective mechanisms to acknowledge and reward employee contributions. Regular recognition enhances motivation, job satisfaction, and commitment to organizational goals. Research suggests that employees who feel valued and appreciated are more likely to remain engaged and perform at higher levels (Anitha, 2014).

Learning and Development Platforms

Continuous learning is a critical driver of employee engagement. Digital learning platforms such as LinkedIn Learning, Coursera, and Udemy for Business provide employees with opportunities to acquire new skills and advance their careers. Access to online training and development resources encourages professional growth, enhances competence, and strengthens employees' connection to the organization (Noe, Clarke, & Klein, 2014). Employee Feedback and Survey Tools Organizations increasingly use digital feedback tools such as SurveyMonkey, Qualtrics, and Glint to collect employee opinions, measure engagement levels, and identify workplace concerns. Regular feedback mechanisms promote transparency and demonstrate that employee perspectives are valued. By acting on employee feedback, organizations can build trust and improve workplace satisfaction (Bakker & Albrecht, 2018).

Intranet and Internal Communication Systems

Modern intranet platforms such as SharePoint and Jive serve as centralized hubs for organizational communication. These systems provide employees with easy access to company news, policies, resources, and announcements. Effective internal communication strengthens organizational alignment and helps employees remain informed and engaged with business objectives (Men & Stacks, 2014).

Digital Wellness Programs

Employee well-being has emerged as a key component of engagement. Digital wellness applications such as Headspace and Calm support employees through mindfulness exercises, stress management techniques, and mental health resources. These initiatives contribute to improved work-life balance, reduced stress levels, and enhanced employee satisfaction (Grawitch, Gottschalk, & Munz, 2006).

Gamification in the Workplace

Gamification involves incorporating game-like elements such as points, badges, leaderboards, and rewards into workplace activities. Platforms such as Trello and Habitica utilize gamification techniques to increase employee motivation and participation. By making work more interactive and enjoyable, gamification enhances engagement and encourages goal achievement (Deterding et al., 2011).

Social Intranet and Employee Networking Platforms Social collaboration platforms such as Workplace and Yammer facilitate informal communication, knowledge sharing, and networking among employees. These tools help create a sense of community, encourage innovation, and strengthen interpersonal relationships within the organization, all of which contribute positively to employee engagement (Leonardi, Huysman, & Steinfield, 2013).

Digital Onboarding Platforms

Digital onboarding solutions such as BambooHR and Work Bright streamline the integration of new employees into the organization. A structured and engaging onboarding experience helps new hires understand organizational culture, expectations, and processes more effectively, leading to higher levels of engagement from the beginning of their employment journey (Bauer, 2010).

Artificial Intelligence and Chatbots

Artificial intelligence (AI) and chatbot technologies are increasingly being used to automate routine HR tasks and provide instant support to employees. AI-powered assistants can answer frequently asked questions, facilitate information access, and improve employee experiences by reducing administrative delays. This enables HR professionals to focus on strategic employee engagement initiatives (Marler & Boudreau, 2017). Furthermore Digital and technological innovations have significantly transformed the way organizations engage their employees. Through advanced communication platforms, learning systems, recognition programs, wellness applications, and AI-driven solutions, organizations can create a more connected, collaborative, and supportive work environment. These technologies not only improve employee satisfaction and productivity but also strengthen organizational commitment and retention. As digital transformation continues to reshape workplaces, organizations that strategically leverage technological innovations will be better positioned to foster sustainable employee engagement and achieve long-term competitive advantage.

Findings of the Study:

Based on the analysis of various secondary data sources, the study identified the following key findings:

1. Digital tools significantly enhance employee engagement by improving communication, collaboration, and participation in organizational activities.
2. Organizations are increasingly adopting technological and digital innovations to strengthen employee engagement and create a more connected workforce.
3. The effective utilization of digital technologies contributes to higher employee productivity, operational efficiency, and job satisfaction, thereby improving overall organizational performance.
4. Digital innovations facilitate continuous learning and development by providing employees with accessible training platforms, e-learning resources, and opportunities for skill enhancement.
5. Technology-enabled engagement practices support a positive work environment by promoting transparency, feedback, recognition, and employee well-being.
6. Digital transformation has reshaped traditional employee engagement strategies, enabling organizations to adopt more flexible, interactive, and employee-centric approaches.
7. Organizations that effectively integrate digital tools into their HR practices are better positioned to attract, retain, and develop talent in a competitive business environment.
8. The successful implementation of digital innovations strengthens organizational adaptability and employee commitment, contributing to long-term organizational growth and sustainability.

Suggestions:

1. **Promote Personalized Communication Platforms** Organizations should implement digital communication platforms that enable personalized interactions between management and employees. Tailored messages, updates, feedback, and recognition programs can help employees feel valued, connected, and engaged with organizational goals.
2. **Integrate Gamification into Work Processes** Gamification techniques such as points, badges, leaderboards, rewards, and achievement milestones can be incorporated into training, learning, and performance management systems. These elements can increase employee motivation, participation, and enthusiasm while making routine tasks more engaging.
3. **Strengthen Virtual Collaboration Environments** Organizations should create effective virtual collaboration spaces that facilitate communication, knowledge sharing, and teamwork among employees, regardless of their geographical location. Digital collaboration tools can support brainstorming, project coordination, and innovation, thereby enhancing employee involvement and productivity.

4. Invest in Continuous Learning and Development Digital learning platforms should be utilized to provide employees with opportunities for skill enhancement, professional development, and career growth. Access to online training resources can improve employee competence, confidence, and commitment to the organization.
5. Encourage Employee Feedback and Participation Organizations should leverage digital tools such as surveys, feedback applications, and employee engagement platforms to gather employee opinions and suggestions regularly. Active participation in decision-making processes can strengthen employees' sense of belonging and ownership.
6. Recognize and Reward Employee Contributions Digitally Digital recognition systems can be used to acknowledge employee achievements and contributions in real time. Timely recognition enhances morale, job satisfaction, and overall engagement levels.
7. Foster a Digital-First Work Culture Organizations should cultivate a culture that embraces technological innovation and supports flexibility, collaboration, and transparency. A positive digital work environment can improve employee experience and sustain long-term engagement.

Conclusion:

The study highlights the significant role of digital and technological innovations in enhancing employee engagement by improving communication, collaboration, learning opportunities, and overall workplace efficiency. In today's dynamic business environment, organizations must adopt employee-centric strategies that align with evolving workforce expectations. Modern employees prefer technologically advanced workplaces that support continuous learning, flexibility, innovation, and efficient work processes. Digital tools and smart technologies help organizations create engaging work environments by fostering knowledge sharing, creativity, and professional development while improving operational effectiveness. Furthermore, the review suggests that organizations should consider the psychological, emotional, social, cognitive, and technological needs of employees when designing engagement initiatives. Practices such as flexible work arrangements, continuous learning opportunities, job security, technology-enabled automation, and work-life balance can significantly contribute to employee satisfaction and commitment. As this study is based on secondary data and literature review, its findings are conceptual in nature. Future research may strengthen these insights through empirical investigations using qualitative and quantitative approaches to examine the direct impact of digital innovations on employee engagement across different organizational settings.

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Original Article

A Comparative Study of Gross NPAs Trends in Public and Private Sector Banks in India

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Abstract

Non-Performing Assets (NPAs) have emerged as a major challenge affecting the stability, profitability, and operational efficiency of the Indian banking sector. The present study examines and compares the trends in Gross Non-Performing Assets (GNPAs) of Public Sector Banks (PSBs) and Private Sector Banks (PVBs) in India during the period 2016–2025. The study is descriptive and analytical in nature and is based entirely on secondary data collected from publications of the Reserve Bank of India (RBI), research articles, journals, and official reports.

The analysis employs statistical tools such as Average, Standard Deviation, Coefficient of Variation (CV), and Compound Annual Growth Rate (CAGR) to evaluate and compare the asset quality performance of both banking sectors. The findings reveal that Public Sector Banks consistently recorded higher GNPA ratios than Private Sector Banks throughout the study period, indicating greater asset quality challenges. The average GNPA ratio of PSBs was 8.75%, whereas that of PVBs was 3.69%. However, both sectors showed a significant decline in GNPA ratios in recent years due to improved credit monitoring, recovery mechanisms, regulatory reforms, and strengthened risk management practices.

The study concludes that although Private Sector Banks demonstrated better asset quality and stability, Public Sector Banks achieved substantial progress in reducing NPAs over the study period. The overall decline in GNPA ratios reflects the effectiveness of banking reforms and NPA management measures implemented in India. The study provides useful insights for policymakers, bankers, and researchers in understanding asset quality trends and strengthening the financial health of the banking sector.

Keywords: Gross Non-Performing Assets (GNPAs), Gross NPA Ratio, Public Sector Banks, Private Sector Banks.

Introduction

The banking sector plays an important role in the economic development of a country by mobilizing savings and allocating financial resources efficiently. In India, banks are broadly classified into public sector banks and private sector banks, both of which contribute significantly to financial intermediation and economic growth. However, the growing incidence of Non-Performing Assets (NPAs) has emerged as a major challenge affecting the stability and profitability of the banking industry. Over the years, the Indian banking industry has witnessed substantial growth and transformation due to economic liberalization, technological advancements, financial sector reforms, and globalization. However, despite these developments, the issue of NPAs has continued to pose serious challenges for banks. The problem became particularly severe during the period following rapid credit expansion between 2004 and 2011, when large loans were extended to sectors such as infrastructure, steel, power, telecommunications, and real estate. Economic slowdown, project delays, policy uncertainties, global financial disturbances, and weak credit appraisal mechanisms resulted in significant loan defaults, leading to a sharp increase in NPAs across the banking sector. A Non-Performing Asset (NPA) refers to a loan or advance for which the principal or interest payment remains overdue for more than 90 days. Gross NPA represents the total value of all loans classified as NPAs before making provisions for possible losses.

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High levels of Gross NPAs adversely impact a bank's profitability, liquidity, operational efficiency and lending capacity. Recognizing the seriousness of the NPA problem, the Government of India and the Reserve Bank of India have implemented various measures to strengthen asset quality and improve recovery mechanisms. These initiatives include the establishment of Debt Recovery Tribunals (DRTs), enactment of the SARFAESI Act, introduction of Asset Reconstruction Companies (ARCs), implementation of the Insolvency and Bankruptcy Code (IBC), Asset Quality Review (AQR), Prompt Corrective Action (PCA) framework, and enhanced prudential norms for loan classification and provisioning. These reforms have significantly influenced the management and reduction of NPAs in recent years. Public sector banks have generally reported higher NPA levels compared to private sector banks, raising concerns regarding asset quality and risk management practices. In this context, a comparative analysis of Gross NPA trends between public and private sector banks becomes essential to understand their performance, identify underlying causes, and evaluate the effectiveness of measures adopted to control NPAs. The present study aims to compare the Gross NPA trends of public and private sector banks in India and assess the differences in asset quality management over a specified period.

Literature Review

Narula and Singla (2014) Narula and Singla examined the trend and impact of NPAs in Indian Public Sector Banks. The study found that rising NPAs adversely affected profitability and operational efficiency. The authors emphasized the need for stronger credit appraisal systems and effective recovery mechanisms to control bad loans.

Bansal and Mohanty (2015) The study analysed the performance of Public and Private Sector Banks concerning NPAs. The findings revealed that Public Sector Banks reported significantly higher NPA levels than Private Sector Banks due to weaknesses in credit monitoring and recovery practices. The study suggested adopting modern risk management techniques to improve asset quality.

Singh (2016) Singh investigated the causes and consequences of NPAs in the Indian banking sector. The study identified economic slowdown, poor credit assessment, and corporate loan defaults as major factors contributing to rising NPAs. It concluded that NPAs negatively affect bank profitability and lending capacity.

Kumar and Batra (2017) This study conducted a comparative analysis of NPAs in selected Public and Private Sector Banks. The results indicated that Private Sector Banks maintained better asset quality and lower NPA ratios due to efficient risk management practices and stronger governance structures.

Mishra and Pawaskar (2018) The researchers analysed trends in Gross NPAs across Indian commercial banks. The study found that the implementation of stricter asset recognition norms and Asset Quality Review (AQR) led to a sharp increase in reported NPAs, particularly among Public Sector Banks.

Sharma and Chhabra (2020) The study evaluated the effectiveness of various regulatory measures adopted by the Reserve Bank of India for NPA management. The findings indicated that initiatives such as the Insolvency and Bankruptcy Code (IBC) and SARFAESI Act contributed significantly to improving recovery rates and reducing stressed assets.

Gupta and Mahajan (2022) The authors examined recent NPA trends in the Indian banking industry and found a gradual decline in Gross NPA ratios after 2018. The study attributed this improvement to enhanced credit monitoring, better risk management practices, and regulatory reforms.

Research Gap

Several studies have examined the impact of NPAs on banking performance and profitability in India. Most existing research focuses either on the overall banking sector or exclusively on public sector banks. Limited studies have undertaken a comprehensive comparative analysis of Gross NPA trends between public and private sector banks using recent data.

Furthermore, changes in regulatory frameworks, implementation of the Insolvency and Bankruptcy Code (IBC), asset quality review measures, and evolving risk management practices have significantly influenced NPA levels in recent years. Therefore, there is a need for an updated comparative study that evaluates Gross NPA trends across public and private sector banks and assesses their relative performance in managing asset quality.

Statement of the Problem

The increasing level of Gross NPAs has become one of the most critical issues affecting the Indian banking sector. Rising NPAs reduce the profitability and operational efficiency of banks while limiting their ability to provide fresh credit to productive sectors of the economy. Although both public and private sector banks face the challenge of NPAs, the extent and trend of NPAs vary considerably between these sectors.

Public sector banks have often recorded higher Gross NPA ratios compared to private sector banks, indicating differences in credit risk management, loan recovery mechanisms, and governance practices. Therefore, it is necessary to conduct a comparative study to examine the trend and magnitude of Gross NPAs in public and private sector banks and identify the factors contributing to these differences. Such an analysis will provide valuable insights into the effectiveness of banking policies and asset quality management practices.

Objectives of the Study

1. To examine the trend of Gross NPAs in public sector banks in India.
2. To examine the trend of Gross NPAs in private sector banks in India.

3. To compare the Gross NPA Ratio of public and private sector banks.

Research Methodology

a. Research Design

The study is descriptive and analytical in nature. It focuses on analysing and comparing Gross NPA trends in public and private sector banks in India.

b. Sources of Data

The study is based entirely on secondary data collected from publications of the Reserve Bank of India (RBI), research journals, articles and official websites.

c. Sample Selection:

The study includes public sector banks and private sector banks.

d. Period of the Study:

The study covers a period of ten years from 2016 to 2025. This duration provides sufficient scope to observe long-term trends of Gross NPA in public and private sector banks.

e. Tools and Techniques:

The study utilizes a combination of Descriptive statistical tools such as Average, Standard Deviation, Coefficient of Variation and Compound Annual Growth Rate (CAGR).

Data Analysis and Interpretation

Table 1. Gross NPA and Gross Advance of Public Sector Banks

Gross NPA and Gross Advances of Public Sector Banks (Amt in Crores)		
Year	Gross NPA	Gross Advances
2025	2,83,650.43	1,09,77,761.67
2024	3,39,540.87	97,73,487.66
2023	4,28,197.37	86,10,114.69
2022	5,40,958.21	74,33,006.34
2021	6,16,615.55	67,70,362.52
2020	6,78,317.01	66,15,111.59
2019	7,39,541.00	63,82,460.85
2018	8,95,601.30	61,41,698.16
2017	5,06,921.68	39,14,442.25
2016	4,17,987.78	39,11,175.56
Avg	5,44,733.12	70,52,962.13
SD	190154.1107	2276623.908
CV	0.349077565	0.322789754
CAGR	-0.038028984	0.108716852

Source: www.rbi.org.in

The above table shows the trend of Gross NPAs and Gross Advances of Public Sector Banks in India from 2016 to 2025. Gross NPAs increased from ₹4,17,987.78 crore in 2016 to a peak of ₹8,95,601.30 crore in 2018, indicating severe asset quality problems due to corporate loan defaults and stricter asset recognition norms. Thereafter, Gross NPAs declined consistently and reached ₹2,83,650.43 crore in 2025, reflecting significant improvement in loan recovery, risk management, and banking reforms. On the other hand, Gross Advances increased steadily from ₹39,11,175.56 crore in 2016 to ₹1,09,77,761.67 crore in 2025, indicating strong growth in lending activities. The simultaneous decline in Gross NPAs and increase in Gross Advances after 2018 suggests improved credit appraisal and asset quality management by Public Sector Banks. The average Gross NPA during the study period was ₹5,44,733.12 crore, while the average Gross Advances stood at ₹70,52,062.13 crore. The CAGR of Gross NPA was -3.80%, indicating a long-term reduction in bad loans, whereas Gross Advances recorded a positive CAGR of 10.87%, reflecting sustained growth in credit expansion.

Table 2. Gross NPA and Gross Advance of Private Sector Banks

Gross NPA and Gross Advance of Private Sector Banks (Amt in Crores)		
Year	Gross NPA	Gross Advances
2025	1,32,646.46	75,74,750.01
2024	1,29,046.67	69,59,146.28
2023	1,25,211.82	54,62,976.19
2022	1,80,742.11	47,00,911.86
2021	2,02,266.15	40,97,039.53
2020	2,05,847.82	37,76,231.27

2019	1,80,872.43	34,42,346.66
2018	1,25,862.89	27,25,890.72
2017	91,914.65	22,66,720.69
2016	55,853.12	19,72,658.82
Avg	1,43,026.41	42,97,867.20
SD	48805.04181	1897012.35
CV	0.341230975	0.441384589
CAGR	0.090347224	0.144014773

Source: www.rbi.org.in

The table presents the trend of Gross NPAs and Gross Advances of Private Sector Banks in India from 2016 to 2025. The Gross NPA increased from ₹55,853.12 crore in 2016 to ₹2,05,847.82 crore in 2020, indicating a rise in stressed assets and loan defaults during the period. However, after 2020, Gross NPAs gradually declined to ₹1,32,646.46 crore in 2025, reflecting improved asset quality, effective recovery measures, and stronger credit risk management practices adopted by private sector banks.

Gross Advances showed a consistent upward trend throughout the study period, increasing from ₹19,72,658.82 crore in 2016 to ₹75,74,750.01 crore in 2025. This significant growth demonstrates the expanding lending activities and strong market position of private sector banks. The continuous increase in advances, along with the decline in NPAs after 2020, indicates improved operational efficiency and prudent lending practices.

During the study period the Gross NPA was ₹1, 43,026.41 crore, while the average Gross Advances stood at ₹42, 97,867.20 crore. The CAGR of Gross NPA was 9.03%, indicating an overall increase in NPAs over the period, whereas Gross Advances recorded a higher CAGR of 14.40%, reflecting strong credit growth. Overall, the findings suggest that Private Sector Banks maintained steady growth in lending while gradually improving asset quality in recent years.

Table 3. Gross NPA Ratio of Public and Private Banks in India

Year	Public Sector Banks (%)	Private Sector Banks (%)
2025	2.58	1.75
2024	3.47	1.85
2023	4.97	2.29
2022	7.28	3.84
2021	9.11	4.94
2020	10.25	5.45
2019	11.59	5.25
2018	14.58	4.62
2017	12.95	4.05
2016	10.69	2.83
Avg	8.75	3.69
SD	4.058601158	1.412695894
CV	0.464021261	0.383022543
CAGR	-0.132486297	-0.046975076

Source: www.rbi.org.in

Graphical Representation of Gross NPA Ratio in Public and Private Sector Banks in India

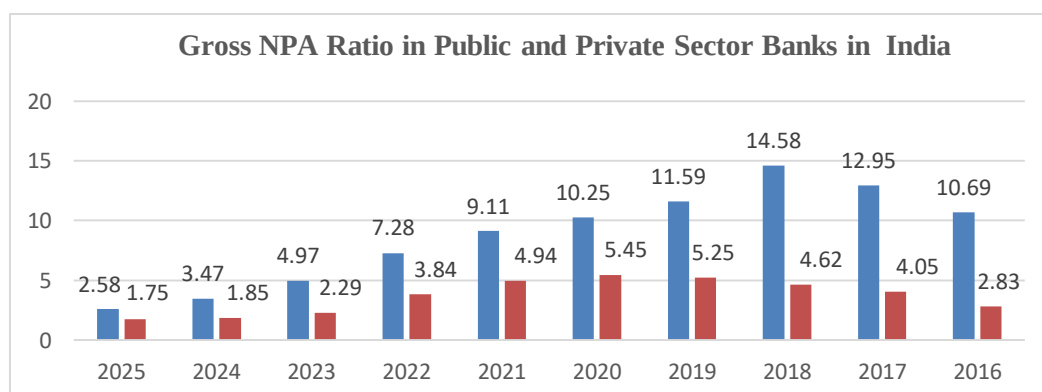


Figure. 1

The above table presents the Gross Non-Performing Asset (GNPA) ratios of Public Sector Banks (PSBs) and Private Sector Banks (PVBs) in India during the period 2016–2025. Throughout the study period, Public Sector Banks recorded significantly higher GNPA ratios than Private Sector Banks. The average GNPA ratio of PSBs was 8.75%,

compared to 3.69% for PVBs, indicating a greater asset quality challenge in the public banking sector. The GNPA ratio of PSBs reached its highest level of 14.58% in 2018, while PVBs recorded their peak GNPA ratio of 5.45% in 2020. This reflects the severe impact of stressed assets on the banking industry during these years. Both sectors witnessed a consistent decline in GNPA ratios after their peak years. By 2025, the GNPA ratio decreased to 2.58% for PSBs and 1.75% for PVBs, indicating substantial improvement in asset quality due to regulatory reforms, better credit monitoring, and recovery mechanisms. The standard deviation of PSBs (4.06) is higher than that of PVBs (1.41), showing greater fluctuations in NPAs among Public Sector Banks. The coefficient of variation (CV) is also higher for PSBs (46.40%) compared to PVBs (38.30%), indicating relatively higher instability in PSB asset quality. The negative CAGR values of -13.25% for PSBs and -4.70% for PVBs indicate a declining trend in GNPA ratios over the study period. The steeper decline in PSBs suggests a stronger improvement in reducing NPAs compared to Private Sector Banks.

Findings of the study

1. Significant Decline in Gross NPAs of Public Sector Banks decreased from a peak of ₹8,95,601.30 crore in 2018 to ₹2,83,650.43 crore in 2025.
2. Strong Growth in Gross Advances increased from ₹39,11,175.56 crore in 2016 to ₹1,09,77,761.67 crore in 2025, with a CAGR of 10.87%, reflecting continuous expansion in lending activities.
3. The negative CAGR of Gross NPAs (-3.80%) coupled with the positive CAGR of Gross Advances (10.87%) suggests that Public Sector Banks have successfully reduced bad loans while increasing credit deployment.
4. Gross Advances of Private Sector Banks increased significantly from ₹19,72,658.82 crore in 2016 to ₹75,74,750.01 crore in 2025, registering a CAGR of 14.40%.
5. Gross NPAs increased from ₹55,853.12 crore in 2016 to ₹1,32,646.46 crore in 2025, with a CAGR of 9.03%. Although NPAs increased over the study period, the growth rate of Gross Advances (14.40%) was higher than that of Gross NPAs (9.03%).
6. The average Gross NPA Ratio of Public Sector Banks was **8.75%**, compared to **3.69%** for Private Sector Banks. However, both sectors exhibited a declining trend in NPAs, as evidenced by the negative CAGR of **-13.25%** for Public Sector Banks and **-4.70%** for Private Sector Banks.

Suggestions of the Study

1. Gross NPAs of Public Sector Banks decreased from 2018 to 2025 banks should focus on asset quality management and implement strong recovery mechanisms.
2. The CAGR 10.87% in growth advances of public sector banks, should extend the lending activities to the various sectors.
3. The CAGR 14.40% in growth advances of private sector banks, banks should strengthen credit monitoring systems to ensure that rapid loan growth does not adversely effect on asset quality.
4. Adopting advanced credit assessment techniques, early warning systems and efficient recovery mechanisms can help sustain the declining trend in NPAs and improve overall asset quality.

Conclusion

The comparative analysis of Gross NPA ratios reveals that Public Sector Banks (PSBs) consistently recorded higher NPA levels than Private Sector Banks (PVBs) during 2016–2025, indicating greater asset quality challenges in the public banking sector. However, PSBs also demonstrated a substantial reduction in NPAs over the years, as reflected by their stronger negative CAGR. Private Sector Banks maintained relatively lower and more stable NPA ratios throughout the study period, indicating better credit risk management and asset quality. The lower standard deviation and coefficient of variation further confirm the greater stability of PVBs compared to PSBs.

Overall, both sectors have shown significant improvement in managing non-performing assets, with declining GNPA ratios by 2025. While Private Sector Banks performed better in terms of asset quality and consistency, Public Sector Banks achieved remarkable progress in reducing NPAs. Therefore, the Indian banking sector as a whole has strengthened its financial health and resilience through effective NPA management and regulatory measures.

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Original Article

Corporate Restructuring through Mergers and Acquisitions: A Study of Punjab National Bank

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Corporate restructuring is an important strategic tool used by businesses to reduce risks, enhance operational efficiency, and achieve sustainable growth. Among various restructuring strategies, mergers and acquisitions play a significant role in the banking sector by facilitating business expansion, increasing market reach, strengthening financial stability, and achieving geographical diversification. In India, several large banks have merged with smaller and weaker banks to enhance operational capabilities, improve customer outreach, and mitigate financial risks. The present study examines the impact of mergers and acquisitions on the financial performance of Punjab National Bank (PNB) following its merger. The study is based on secondary data collected from the bank's annual reports, covering the pre-merger period from 2017–2019 and the post-merger period from 2020–2024. Percentage analysis, mean, standard deviation, and paired t-test were employed to analyse the data and assess the significance of changes in financial performance indicators after the merger. The findings reveal that the financial performance of PNB improved significantly during the post-merger period. The results indicate enhanced operational efficiency, stronger financial stability, and improved overall banking performance following the merger. Therefore, the study concludes that mergers and acquisitions serve as an effective corporate restructuring strategy in the banking sector, contributing to the strengthening of banking operations, expansion of market presence, and long-term organisational growth.

Keywords: Corporate Restructuring, Mergers and Acquisitions, Financial Performance, Punjab National Bank, Banking Sector, Paired t-test.

Introduction

A business may expand gradually over time as customers increasingly recognize the value of its products and services. However, this organic growth process is often slow and requires sustained effort. Alternatively, a company can achieve rapid expansion through inorganic growth strategies, which involve an immediate increase in workforce, customer base, infrastructure, and operational resources, leading to higher revenues and profitability. Corporate restructuring serves as an effective mechanism for such growth. It is a strategic process through which an organization reorganizes and consolidates its business operations to enhance efficiency, strengthen its market position, and achieve both short-term and long-term corporate goals. Corporate restructuring encompasses various strategies, among which mergers and acquisitions (M&A) have emerged as significant tools in the banking sector for enhancing operational efficiency, financial performance, market share, and competitiveness. In India, banking sector consolidation gained momentum following the economic reforms of 1991 and has been actively promoted by the Government of India and the Reserve Bank of India. The primary objective of these consolidation initiatives is to create larger, financially stronger, and globally competitive banks that can effectively support economic growth, strengthen financial stability, and meet the evolving needs of the economy.



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Banks take advantage of M & as by growing their operations and reducing their expenses at considerable rates. Furthermore, the formation of banking alliances reduces the number of players in financial markets and therefore lessens competition in the banking industry. The present study titled “Impact of Mergers and Acquisitions in Banks – an analytical study with reference to Punjab National Bank” examines the financial performance of PNB before and after merger activities using secondary data.

Review of Literature

Sharma and Ho. J (2002) mentioned that bank mergers improve operational efficiency and financial performance through better utilisation of resources and economies of scale.

Beena (2004) explained how mergers and acquisitions in the Indian banking sector enhance market and financial growth but also create integration challenges.

Ravichandran (2010) discussed that mergers in the banking sector benefited positively after the merger in terms of profitability, liquidity and customer services in the long run.

Kumar and Rajib (2017) they examined mergers among public sector banks improve asset quality and operational efficiency while reducing non -performing assets.

Singh and Das (2018) state that mergers in the banking sector are horizontal mergers, and such mergers help in strengthening the capital base and expanding market presence.

Gupta and Aggarwal (2021) evaluated post-merger performance on Indian public sector banks and found significant growth in deposits, advances and branch networks after mergers.

Research Methodology

Objectives of the study

1. To analyse the impact of mergers and acquisitions on the financial performance of PNB.
2. To study the changes in balance sheet indicators before and after the merger.

Sources of Data: Secondary data compiled from annual reports.

Period of the Study: Pre-Merger Period 2017-2019 and Post-Merger Period 2020 – 2024.

Statistical Tools used: Percentage analysis, Mean, SD, paired t-test.

Hypothesis:

H₀: There is no significant difference in the financial performance of PNB before and after mergers and acquisitions.

H₁: There is a significant difference in the financial performance of PNB before and after mergers and acquisitions.

Data analysis

Table 1.1 Balance Sheet Analysis of Punjab National Bank (₹ in Crores)

Financial Indicators	Pre-merger mean	Pre-merger mean	Standard Deviation	% change
Total assets	7,12,450	12,84,320	2,15,440	80.2%
Deposits	6,45,320	11,18,750	2,86,750	73.4%
advances	4,22,680	7,54,230	1,42,115	78.4%
Net profit	1,245	3,985	1,120	22.01%
Capital adequacy ratio (%)	11.2	14.8	1.56	32.1%

Source: Computed by using MS-Excel

Table 1.1 shows that after the merger, there is a significant improvement in the financial performance of PNB. Performance in terms of total assets, deposits, advances and net profit increased considerably during the post-merger period. The impact of mergers and acquisitions is evaluated in terms of the capital adequacy ratio. The rise in capital adequacy ratio indicates significant improvement in financial stability and a stronger capital structure.

Table 1.2 Paired t-test analysis

Variables	t-value	P-value	Result
Total assets	3.92	0.004	Significant
Deposits	3.65	0.006	Significant
advances	3.48	0.008	Significant
Net profit	4.11	0.003	Significant
Capital adequacy ratio (%)	2.96	0.015	Significant

Source: Computed by using MS-Excel

Interpretation: Since the p-values are less than 0.05 for all selected variables, the null hypothesis is rejected, and the alternative hypothesis is accepted. This indicates that the mergers and acquisitions had a significant positive impact on the financial performance of PNB.

Findings of the study

1. After the merger, the total assets and deposits were significantly improved.
2. Advances and bank lending capacity was considerable improved after the merger.
3. Profitability of PNB was improved during the post-merger.
4. The capital adequacy ratio improved after merger indicates stronger financial stability.

5. The paired t-test confirmed significant differences between pre-merger and post-merger performance.

Suggestions

1. The bank should prepare a detailed post-merger integration plan relating to operational performance, efficiency improvement, and technology adoption for the smooth conduct of business.
2. The bank should focus on improving digital banking and customer services.
3. Training programs should be conducted to help employees adapt to new systems, processes, and organisational structures.
4. Regular evaluation of financial and operational performance should be undertaken to assess whether the merger objectives are being achieved.
5. Effective governance practices, accountability mechanisms, and regulatory compliance should be emphasised to enhance transparency and stakeholder confidence.

Conclusion

Mergers and acquisitions help the banking sector to expand its banking operations, enhance market size and reduce competition. The study concludes that mergers and acquisitions have positively influenced the financial performance and operational efficiency of PNB. The post-merger performance witnessed substantial growth in assets, deposits, profitability and capital adequacy. The paired t-test result indicates that bank performance improved after the merger. Hence, mergers and acquisitions are considered an effective reconstruction strategy for strengthening the banking sector and enhancing financial stability when implemented efficiently.

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Original Article

Drivers and Barriers of Omnichannel Retailing Adoption among Selected Retail Stores: Evidence from Bengaluru

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Abstract

Omnichannel retailing has become an important retail strategy because customers now expect both physical store support and digital shopping convenience. However, many retailers face both encouraging factors and serious barriers while adopting omnichannel practices. This study examines the influence of market-related, digital readiness, and support-based drivers on omnichannel retailing adoption among selected retail stores in Bengaluru. It also analyzes the negative influence of resource-related, operational, and risk and resistance barriers. Furthermore, this study compares the level of omnichannel adoption across specialty stores, supermarkets, and departmental stores. The study is based on primary data collected from 210 retailers, with 70 respondents from each of the three selected retail formats, using a structured questionnaire. Descriptive statistics, reliability analysis, correlation, multiple regression, and ANOVA were used for data analysis. The findings indicate that drivers positively influence omnichannel adoption, whereas barriers restrict the actual level of adoption. The study also shows differences in adoption across different retail formats. The results provide useful insights for retailers, policymakers, and digital service providers to support seamless omnichannel adoption.

Keywords: Omnichannel retailing; Retail adoption; Digital readiness; Retail barriers; Speciality stores; Supermarkets; Departmental stores; Bengaluru

Introduction

Omnichannel retailing refers to a connected retail system in which physical shops, websites, mobile devices, social media, and other touchpoints work together to provide customers with a smooth shopping experience (Piotrowicz & Cuthbertson, 2014). Traditional retailing mainly depends on physical stores, where buying, payment, and delivery occur inside the shop itself (Aiolfi & Sabbadin, 2018). Multichannel retailing uses more than one channel, but these channels often work separately, which may create gaps in information, price, service, and customer experience (Saghiri et al., 2017). Omnichannel retailing removes these gaps by integrating online and offline channels, allowing customers to move from one channel to another without difficulty (Lim et al., 2022). Combining physical stores with digital channels is important because modern customers expect convenience, speed, product information, and personal support while shopping (Gerea et al., 2021). Retailers increasingly use mobile apps, digital coupons, online payment options, click-and-collect, and home delivery to connect offline and online shopping experiences (Steinmann & Zielke, 2026). Services such as buy-online-and-pick-up-in-store show how online ordering and physical store fulfilment can work together to improve customer convenience (Gao & Su, 2017). Digital supply chains also help retailers improve inventory visibility, order tracking, fulfilment speed, and operational flexibility across channels (Ishfaq et al., 2022). Omnichannel retailing is important in urban markets such as Bengaluru because customers in cities are more exposed to smartphones, digital platforms, online search, and connected shopping practices (Thaichon et al., 2024).

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Specialty stores, supermarkets, and departmental stores are suitable for this study because different retail formats may respond differently to channel integration and customer expectations. Supermarkets are especially relevant because consumers increasingly prefer a blend of physical and online channels for convenience in daily shopping. Departmental stores are also suitable because customers value consistent content and processes across different shopping channels. Therefore, it is necessary to study both the drivers of omnichannel adoption and the barriers that may restrict retailers from adopting it.

Background of the Study

Retail buying has changed because customers are no longer dependent on physical stores. Today, many customers search for product details online, compare prices, check reviews, use digital payments, place orders through mobile phones, and expect quick delivery or store pickup (Steinmann & Zielke, 2026). This change has pushed retailers to connect offline and online channels to provide customers with a smooth and convenient shopping experience (Li & Gong, 2024). However, the level of omnichannel adoption may not be the same among all retailers because implementation requires technology, trained staff, inventory visibility, delivery support, and proper coordination (Radomska et al., 2024). Supermarkets may have better digital payment systems, delivery facilities, and customer data than many specialty stores, whereas departmental stores may have stronger processes and channel consistency (Kopot & Cude, 2021). Therefore, it is important to study the drivers and barriers to omnichannel adoption among selected retail stores in Bengaluru.

Review of Literature

1. Concept of Omnichannel Retailing

Omnichannel retailing refers to the integration of all customer touchpoints to ensure a smooth shopping experience across physical stores, websites, mobile apps, social media, and other channels (Thaichon et al., 2024). In this system, customers can search for product details through one channel, compare options through another channel, and complete the purchase through a store or digital platform without facing gaps in service (Juaneda-Ayensa et al., 2016). Unlike multichannel retailing, where channels may work separately, omnichannel retailing connects online and offline channels into a single coordinated system (Aiolfi & Sabbadin, 2018). The main aim is to provide a consistent customer experience, where the customer feels that they are interacting with the same retailer and not with separate channels (Gerea et al., 2021). Omnichannel retailing also requires strong backend support, such as inventory visibility, order tracking, fulfilment systems, and delivery coordination (Ishfaq et al., 2022).

2. Drivers of Omnichannel Retailing Adoption

Earlier studies have shown that changing customer expectations are a major driver of omnichannel retailing because customers now expect convenience, speed, choice, and easy movement between stores and digital channels (Peiris et al., 2021). Market competition also encourages retailers to adopt omnichannel practices because customers can easily compare retailers through different online and offline touchpoints (Thaichon et al., 2024). Digital readiness, such as the ability to use mobile apps, websites, digital catalogues, and online enquiry systems, supports better channel integration (Juaneda-Ayensa et al., 2016). Staff capability is also important because trained employees are needed to manage online enquiries, customer communication, order handling, and store-based support (Mrutzek-Hartmann et al., 2022). Payment and delivery support help retailers complete the customer journey through digital payment, home delivery, and pick-up services (Song et al., 2019). Support from service providers, suppliers, logistics partners, and technology vendors further strengthens omnichannel adoption by helping retailers manage integration, visibility, and customer service (Joshi et al., 2022).

3. Barriers to Omnichannel Retailing Adoption

The literature shows that a lack of finance is one of the major barriers because omnichannel adoption needs investment in technology, software, payment systems, delivery systems, and staff training (Radomska et al., 2024). A lack of staff and digital knowledge also creates problems because retailers need people who can handle online orders, customer messages, digital catalogues, and data-based decisions (Thaichon et al., 2024). Managing stock and orders becomes difficult when the same product is sold through physical stores, websites, apps, and social media platforms (Aiolfi & Sabbadin, 2018). Delivery and return problems are serious barriers because customers expect timely delivery, easy return, and correct order fulfilment (Ishfaq et al., 2022). Online fraud risk, privacy concerns, and fear of digital misuse may reduce retailer and customer confidence in omnichannel systems (Gerea et al., 2021). Resistance from owners or staff can also delay adoption when retailers are not ready to change their traditional business practices (Mrutzek-Hartmann et al., 2022).

4. Retail Type and Omnichannel Adoption

Omnichannel adoption may differ across retail types because specialty stores, supermarkets, and departmental stores differ in size, product range, resources, customer base, and operating systems (Lim et al., 2022). Specialty stores usually focus on a limited product category, so they may use simple digital tools such as WhatsApp, Instagram, or online catalogues, but they may face limits in finance, technology, and manpower (Mrutzek-Hartmann et al., 2022). Supermarkets may have a better scope for omnichannel adoption because they handle regular-use products, and

customers expect convenience, quick billing, digital payment, home delivery, and online ordering support (Peiris et al., 2021). Departmental stores may have stronger systems because they sell many product categories and require consistency in product information, pricing, service processes, and customer experiences across channels (Kopot & Cude, 2021). Therefore, retail type is an important factor in understanding why some retailers adopt omnichannel practices faster than others.

Research Gap

Most previous studies on omnichannel retailing have focused on customer experience, technology use, logistics, supply chain integration, online platforms, and large, organised retailers. However, limited attention has been given to the adoption of omnichannel retailing from the perspective of selected physical retail stores in Bengaluru. There is also less evidence on how adoption differs among speciality stores, supermarkets, and departmental stores. Furthermore, earlier studies have not clearly examined how market-related drivers, digital readiness drivers, support-based drivers, resource-related barriers, operational barriers, and risk and resistance barriers influence omnichannel adoption. Hence, this study attempts to fill this gap.

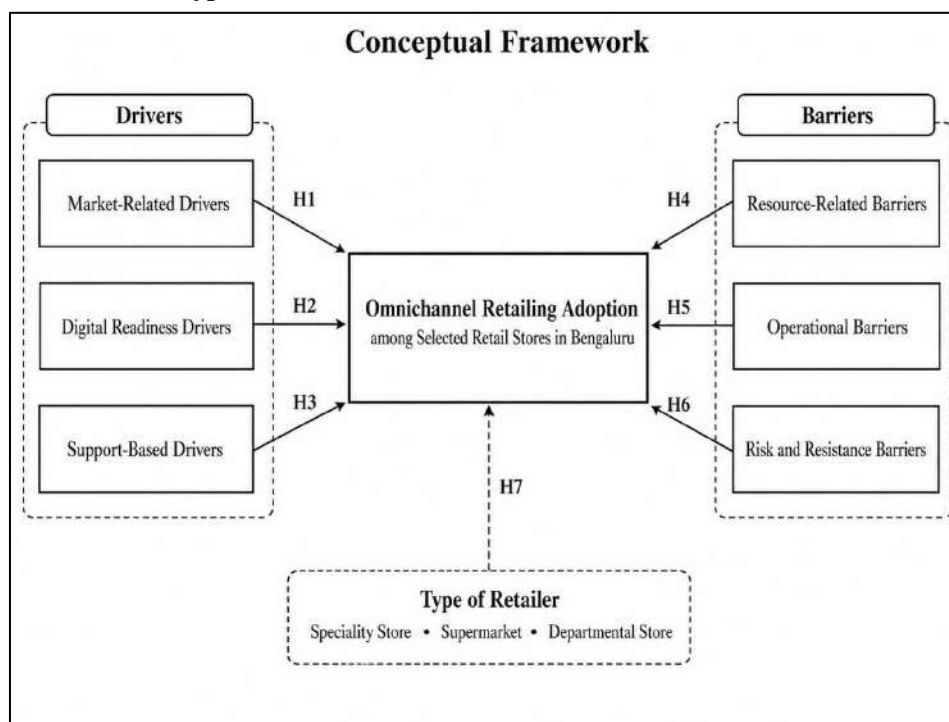
Statement of the Problem

Although omnichannel retailing is becoming important in modern retail businesses, many selected retail stores still face difficulties in fully adopting it. Some retailers are encouraged by customer demand, competition, digital tools and external support. At the same time, they face problems such as limited finances, lack of trained staff, operational difficulty, online risk, and resistance to change. In Bengaluru, where customers are digitally active, it is important to understand why some retailers adopt omnichannel practices and why others hesitate to do so. Therefore, this study examines the drivers and barriers to omnichannel retailing adoption among speciality stores, supermarkets, and departmental stores in Bengaluru.

Objectives

1. To examine the influence of drivers on omnichannel retailing adoption among selected retail stores in Bengaluru.
2. To analyse the influence of barriers on omnichannel retailing adoption among selected retail stores in Bengaluru.
3. To compare omnichannel retailing adoption across different types of retailers in Bengaluru.

Conceptual Framework and Hypotheses



H1: Market-related drivers have a significant positive influence on omnichannel retailing adoption among selected retail stores in Bengaluru.

H2: Digital readiness drivers have a significant positive influence on omnichannel retailing adoption among selected retail stores in Bengaluru.

H3: Support-based drivers have a significant positive influence on omnichannel retailing adoption among the selected retail stores in Bengaluru.

H4: Resource-related barriers have a significant negative influence on omnichannel retailing adoption among selected retail stores in Bengaluru.

H5: Operational barriers have a significant negative influence on omnichannel retailing adoption among selected retail stores in Bengaluru.

H6: Risk and resistance barriers have a significant negative influence on omnichannel retailing adoption among selected retail stores in Bengaluru.

H7: There is a significant difference in omnichannel retailing adoption across speciality stores, supermarkets, and departmental stores.

Research Methodology

This study adopted a descriptive and analytical research design. It is descriptive because it explains the present level of omnichannel retailing adoption among the selected retail stores in Bengaluru. This study is analytical because it examines the influence of drivers and barriers on omnichannel adoption and compares adoption across different retailer types. The study was conducted in Bengaluru, Karnataka, as it is a major urban retail market with a growing use of digital payments, online search, delivery services, and social media-based retail communication. The study population comprised selected physical retail stores in Bengaluru, specifically specialty stores, supermarkets, and departmental stores. A pilot study was conducted with 30 retailers prior to the main survey. Based on the pilot study, minor wording changes were made to the questionnaire. The final sample included 210 retail stores, with 70 stores selected from each retail format. A quota-based purposive sampling method was used to ensure equal representation of the three types of retailers. The respondents were store owners, managers, or store-in-charges, as they were directly involved in business decisions, customer handling, digital communication, payment systems, order management, and delivery-related tasks. Primary data were collected using a structured questionnaire. The questionnaire used a five-point Likert scale, where 1 represented strongly disagree and 5 represented strongly agree. Before the main survey, a pilot study was conducted to check the questionnaire's clarity, relevance, and reliability. Reliability was tested using Cronbach's alpha. Validity was examined using the KMO, Bartlett's test, factor loadings, Composite Reliability, and Average Variance Extracted. The collected data were analysed using descriptive statistics, correlation, multiple regression, and one-way ANOVA. Ethical care was taken by obtaining consent from the respondents, ensuring voluntary participation, and maintaining the confidentiality of the information collected.

Data Analysis and Results

1. Respondent Profile

A total of 210 retail stores participated in this study. To ensure a balanced representation, the sample consisted of 70 specialty stores, 70 supermarkets, and 70 Departmental Stores. The equal representation of different retail formats enabled a meaningful comparison of omnichannel adoption practices across retailer types.

Table 1. Distribution of Respondents by Retailer Type

Retailer Type	Frequency	Percentage (%)
Speciality Store	70	33.3
Supermarket	70	33.3
Departmental Store	70	33.3
Total	210	100

2. Validity and Reliability Analysis

Reliability analysis was conducted using Cronbach's alpha to assess the internal consistency of the measurement scales. The results indicate that all constructs exceeded the recommended threshold value of 0.70, demonstrating a satisfactory reliability.

Table 2. Reliability and Convergent Validity Results

Construct	Items	Cronbach's Alpha	Loading Range	CR	AVE
Omnichannel Adoption	8	0.899	0.710–0.805	0.919	0.587
Market-Related Drivers	5	0.816	0.736–0.778	0.872	0.576
Digital Readiness Drivers	5	0.83	0.753–0.799	0.881	0.596
Support-Based Drivers	5	0.824	0.742–0.790	0.877	0.587
Resource Barriers	5	0.846	0.758–0.835	0.89	0.619
Operational Barriers	5	0.824	0.682–0.799	0.877	0.588
Risk and Resistance Barriers	5	0.814	0.734–0.787	0.871	0.574

Test	Value
KMO Measure of Sampling Adequacy	0.92
Bartlett's Test of Sphericity: Chi-square	3782.647
df	703
Sig.	< .001

The KMO value of 0.920 indicates that the data were highly suitable for factor analysis. Bartlett's test was significant, $\chi^2(703) = 3782.647$, $p < .001$, confirming that the correlation matrix is appropriate for factor extraction. Factor analysis was conducted on the 38 measurement items. Therefore, Bartlett's test reported $df = 703$. Cronbach's alpha values ranged from 0.814 to 0.899, Composite Reliability values were above 0.70, and AVE values were above 0.50. Hence, the measurement model shows acceptable reliability and convergent validity.

9.3 Descriptive Statistics

Descriptive statistics were computed to understand retailers' overall perception of omnichannel adoption drivers and barriers.

Table 3. Descriptive Statistics

Variable	N	Mean	Standard Deviation	Minimum	Maximum
Market-Related Drivers	210	4.099	0.426	3	5
Digital Readiness Drivers	210	3.53	0.483	2	4.8
Support-Based Drivers	210	3.669	0.482	1.8	5
Resource Barriers	210	3.838	0.665	2	5
Operational Barriers	210	3.757	0.629	2.2	5
Risk and Resistance Barriers	210	3.543	0.592	2	4.8
Omnichannel Adoption	210	2.705	1.062	1.125	5

The descriptive statistics show that market-related drivers recorded the highest mean score ($M = 4.099$, $SD = 0.426$), indicating that customer expectations, competition, and online visibility are strongly perceived as important factors that encourage omnichannel adoption. Support-based drivers ($M = 3.669$, $SD = 0.482$) and digital readiness drivers ($M = 3.530$, $SD = 0.483$) also recorded moderate-to-high mean values, showing that digital tools, staff capability, payment platforms, technology support, and external guidance are relevant for adoption.

Among the barriers, resource barriers recorded the highest mean score ($M = 3.838$, $SD = 0.665$), followed by operational barriers ($M = 3.757$, $SD = 0.629$), and risk and resistance barriers ($M = 3.543$, $SD = 0.592$). This indicates that retailers face serious constraints related to finance, staff, digital knowledge, order handling, delivery, returns, online fraud and resistance to change. The mean score of omnichannel adoption was 2.705, with a standard deviation of 1.062, showing that adoption is moderate and varies considerably across retailers.

9.4 Correlation Analysis

Pearson's correlation analysis was conducted to examine the relationships among the study variables.

Table 4. Correlation Matrix

Variable	OA	MRD	DRD	SBD	RB	OB	RRB
OA	1						
MRD	0.423**	1					
DRD	0.356**	0.461**	1				
SBD	0.319**	0.383**	0.426**	1			
RB	-0.681**	-0.170*	-0.089	-0.079	1		
OB	-0.724**	-0.188**	-0.166*	-0.128	0.631**	1	
RRB	-0.611**	-0.189**	-0.153*	-0.164*	0.499**	0.541**	1

Note: OA = Omnichannel Adoption; MRD = Market-Related Drivers; DRD = Digital Readiness Drivers; SBD = Support-Based Drivers; RB = Resource Barriers; OB = Operational Barriers; RRB = Risk and Resistance Barriers. Correlations are two-tailed ** $p < .01$, * $p < .05$.

The correlation results indicate that market-related drivers, digital readiness, and support-based drivers are positively associated with the adoption of omnichannel retailing. In contrast, resource, operational, and risk and resistance barriers demonstrate significant negative relationships with omnichannel adoption.

9.5 Multiple Regression Analysis

Multiple regression analysis was performed to identify the influence of drivers and barriers to omnichannel adoption.

Table 5. Multiple Regression Results

Predictor	B	SE	Beta	t	p	VIF
Constant	4.627	0.559	—	8.271	< .001	—
Market-Related Drivers	0.432	0.105	0.173	4.103	< .001	1.374
Digital Readiness Drivers	0.255	0.094	0.116	2.707	0.007	1.412
Support-Based Drivers	0.223	0.09	0.101	2.46	0.015	1.301
Resource-Related Barriers	-0.494	0.077	-0.309	-6.436	< .001	1.776
Operational Barriers	-0.605	0.084	-0.359	-7.227	< .001	1.897
Risk and Resistance Barriers	-0.35	0.08	-0.195	-4.385	< .001	1.528

Note. *B* = unstandardised coefficient; *SE* = standard error; *Beta* = standardised coefficient; *VIF* = variance inflation factor.

Model Summary

Statistic	Value
R	0.858
R ²	0.736
Adjusted R ²	0.729
F-value	94.476
Significance	<0.001

The multiple regression model was statistically significant, $F(6, 203) = 94.476, p < .001$, indicating that the selected drivers and barriers jointly influenced omnichannel retailing adoption among the selected retail stores. The model explained **73.6% of the variance** in omnichannel adoption, with $R^2 = 0.736$ and **Adjusted $R^2 = 0.729$** . The model explains 73.6% of the variance in the omnichannel adoption. The remaining 26.4% is explained by factors not included in this study. This indicates that the model has a strong explanatory power. Among the positive predictors, **market-related drivers** showed the strongest positive influence on omnichannel adoption ($\beta = 0.173, p < .001$), followed by **digital readiness** ($\beta = 0.116, p = .007$) and **support-based drivers** ($\beta = 0.101, p = .015$). This indicates that customer expectations, market competition, digital tools, staff ability, payment support, and external guidance encourage retailers to adopt omnichannel practices.

Among the barriers, **operational barriers** had the strongest negative influence on omnichannel adoption ($\beta = -0.359, p < .001$), followed by **resource-related barriers** ($\beta = -0.309, p < .001$) and **risk and resistance barriers** ($\beta = -0.195, p < .001$). This means that problems related to order handling, stock updating, delivery, returns, lack of finance, shortage of trained staff, fear of online fraud, and resistance to change reduce the level of omnichannel adoption. Overall, the findings show that drivers encourage adoption, but barriers, especially operational barriers, strongly restrict the actual implementation. All VIF values were below 2, confirming that multicollinearity was not a serious problem in the regression model. Tolerance is calculated as $\text{Tolerance} = 1 / \text{VIF}$

9.6 Analysis of Variance (ANOVA)

A one-way ANOVA was conducted to determine whether omnichannel adoption differed across retailer types.

Table 6. Omnichannel Adoption across Retailer Types

Retailer Type	Mean Adoption Score	Standard Deviation
Speciality Store	3.961	0.511
Supermarket	2.259	0.593
Departmental Store	1.895	0.576

Table 7. ANOVA Results

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	170.273	2	85.137	270.15	< .001
Within Groups	65.234	207	0.315		
Total	235.508	209			

Comparison	Mean Difference	p-value	Result
Speciality Store – Supermarket	1.702	< .001	Significant
Speciality Store – Departmental Store	2.066	< .001	Significant
Supermarket – Departmental Store	0.364	0.001	Significant

The one-way ANOVA results show a significant difference in omnichannel adoption across retailer types, $F(2, 207) = 270.153, p < .001$. Post-hoc Tukey results show that specialty stores differ significantly from supermarkets and department stores. Supermarkets also differ significantly from departmental stores. Speciality stores recorded the highest adoption level, followed by supermarkets and departmental stores.

9.7 Hypothesis Testing Summary

Table 8. Summary of Hypothesis Testing

Hypothesis	Statement	Result
H1	Market-related drivers positively influence omnichannel adoption	Supported
H2	Digital readiness positively influences omnichannel adoption	Supported
H3	Support-based drivers positively influence omnichannel	Supported

	adoption	
H4	Resource barriers negatively influence omnichannel adoption	Supported
H5	Operational barriers negatively influence omnichannel adoption	Supported
H6	Risk and resistance barriers negatively influence omnichannel adoption	Supported
H7	Omnichannel adoption significantly differs across retailer types	Supported

The findings demonstrate that both adoption drivers and barriers significantly influence retailers' omnichannel adoption. While market opportunities, digital readiness, and institutional support encourage adoption, operational challenges, resource limitations, and risk perceptions continue to hinder the implementation of omnichannel retailing. Furthermore, adoption levels vary considerably across retailer formats, with speciality stores exhibiting significantly higher adoption levels than supermarkets and departmental stores.

Discussion

The findings show that market-related drivers have the strongest positive influence on omnichannel retailing adoption among selected retail stores in Bengaluru. This means that customer expectations, market competition, online visibility, and pressure from online sellers are the main reasons retailers adopt omnichannel practices. Retailers are trying to use digital channels not only because technology is available, but also because customers now expect quick product information, digital payment, online communication, home delivery, and convenient shopping. Digital readiness also has a significant and positive influence on adoption. This indicates that stores with smartphones, Internet access, digital payment facilities, and staff who can use WhatsApp, social media, or other online platforms are more likely to adopt omnichannel retailing. Thus, digital readiness is the basic foundation for omnichannel adoption. Support-based drivers also positively influenced the omnichannel adoption. This shows that support from technology service providers, payment platforms, suppliers, distributors, government agencies, and business associations helps retailers move towards digital and omnichannel practices. Many retailers may not have sufficient technical knowledge to independently adopt digital channels. Therefore, training, payment platform support, supplier guidance, and low-cost technology support can encourage adoption. Simultaneously, the study shows that barriers reduce adoption. Among these barriers, operational barriers had the strongest negative influence. This means that difficulties in managing online orders, updating stock, handling delivery, managing returns, replying to online enquiries, and maintaining the same information across channels are the biggest practical problems faced by retailers.

Resource-related barriers also negatively affect adoption. Lack of money, trained staff, time, and digital knowledge make omnichannel adoption difficult, especially for small and medium retailers. Risk and resistance barriers also reduce adoption, although their effect is weaker than that of operational and resource barriers. Fear of online fraud, fake orders, payment problems, and resistance from owners or staff may slow digital adoption. The ANOVA results show that omnichannel adoption differs significantly across retailer types. Specialty stores showed the highest adoption, followed by supermarkets and department stores. This may be because specialty stores deal with focused product categories and can easily use WhatsApp, Instagram, digital catalogues, and direct customer communication. Overall, the study indicates that retailers are interested in omnichannel adoption, but operational, resource, risk, and resistance barriers prevent them from fully adopting it.

Implications

This study has practical and policy implications for retail stores, technology providers, business associations, and government agencies. Retailers can improve omnichannel adoption by strengthening digital readiness, staff training, online customer communication, digital payment systems, stock management, delivery support, and handling returns. Technology providers can design simple, low-cost, and easy-to-use digital solutions that are suitable for small and medium retail stores. Business associations and government agencies can promote adoption through training programs, awareness campaigns, digital safety guidance, and affordable technology support. Such measures can reduce fear, improve confidence, and help retailers adopt omnichannel practices more effectively.

Limitations of the Study

The present study had certain limitations. First, the study is limited to Bengaluru city; therefore, the findings may not fully represent retail stores in other cities or rural areas. Second, the study focuses only on three types of retailers: specialty stores, supermarkets, and departmental stores. Other retail formats, such as kirana stores, convenience stores, shopping malls, online sellers, and franchise stores, were not included. Third, the study is based on primary data collected through a structured questionnaire; therefore, the findings depend on the opinions given by owners, managers, or store-in-charges. Fourth, the study did not include customer responses, which may have provided a wider understanding of customer expectations and experiences. Finally, this study does not compare large national retail chains with small local retailers.

Scope for Future Research

Future studies should extend the research to other cities in Karnataka and different parts of India to improve the wider applicability of the findings. Further research may compare retailer and customer perspectives or study a specific retail category in depth, such as fashion, grocery, electronics, or pharmacy retailing. Future studies may also examine the effect of omnichannel adoption on sales, customer loyalty, and business performance, and include digital platforms, online marketplaces, and quick-commerce firms.

Conclusion

Omnichannel retailing is becoming an important requirement for selected retail stores in Bengaluru because customers increasingly expect a seamless connection between physical stores and digital channels. The study shows that retailers are encouraged to adopt omnichannel practices mainly due to market demand, changing customer expectations, competition from online sellers, digital readiness, and support from payment platforms, technology providers, suppliers, and business associations. Simultaneously, the study also reveals that adoption is not easy for all retailers. Many stores face barriers such as a lack of finance, a shortage of trained staff, limited digital knowledge, difficulty in managing online orders, stock updates, delivery, returns, online fraud risk, and resistance from owners or employees. The findings clearly identify market-related drivers as the strongest positive influence and operational barriers as the strongest negative influence on the adoption of an omnichannel. The study also shows that adoption differs significantly across speciality stores, supermarkets, and departmental stores, with speciality stores showing higher adoption. Overall, this study contributes to understanding why retailers adopt or hesitate to adopt omnichannel practices. It also provides useful suggestions for retailers, policymakers, technology providers, and business associations to improve digital readiness, reduce barriers, and support effective omnichannel adoption in the future.

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Original Article

Accounting and Financial Frauds in the Corporate Sector in India: Emerging Challenges of Digital Fraud and Corporate Governance

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Abstract

The rapid digitalization of business operations has transformed the corporate sector in India, creating new opportunities for growth and efficiency. However, technological advancements have also increased the vulnerability of organizations to accounting, financial, and digital frauds. Corporate frauds involving financial statement manipulation, embezzlement, cybercrime, phishing attacks, digital payment frauds, and misuse of accounting systems have emerged as significant challenges for organizations and regulators. Several corporate scandals in India have highlighted weaknesses in internal controls, auditing mechanisms, and corporate governance practices. The increasing adoption of digital financial systems, cloud-based accounting, and artificial intelligence has further expanded the scope of sophisticated fraudulent activities. The study is based on secondary data collected from published reports, regulatory publications, and scholarly literature. The findings indicate that digital frauds are growing rapidly and pose significant financial and reputational risks to organizations. Strengthening governance mechanisms, technological safeguards, and forensic auditing practices can contribute significantly to reducing fraud risks and enhancing stakeholder confidence in the corporate sector.

Keywords: Accounting Fraud, Financial Fraud, Digital Fraud, Corporate Governance, Cybercrime, Corporate Sector, India.

Introduction

The corporate sector serves as a vital pillar of economic development by generating employment, investment opportunities, and financial stability. The credibility of corporate organizations largely depends upon the accuracy and transparency of their accounting and financial reporting systems. However, instances of accounting manipulation and financial fraud have become a major concern worldwide, including in India. Corporate fraud not only causes financial losses but also damages investor confidence, organizational reputation, and overall market integrity. Accounting fraud refers to the intentional manipulation of financial statements to present a misleading picture of an organization's financial position. Such frauds may involve overstating revenues, understating liabilities, inflating assets, or concealing losses. Financial fraud extends beyond accounting irregularities and includes embezzlement, insider trading, misappropriation of funds, and fraudulent financial transactions. The emergence of digital technologies has introduced a new dimension to corporate fraud through cyberattacks, phishing, ransomware, identity theft, online payment frauds, and manipulation of digital accounting systems. India has witnessed several major corporate fraud cases over the years, including the Satyam scandal, the Punjab National Bank fraud, and other financial irregularities that exposed weaknesses in governance and control mechanisms. With the increasing use of Enterprise Resource Planning (ERP) systems, cloud accounting, digital banking, and artificial intelligence, fraudsters have developed sophisticated methods to exploit technological vulnerabilities. Consequently, digital fraud has emerged as a critical challenge for modern corporations. Corporate governance acts as an essential mechanism for preventing and detecting fraud. Strong governance frameworks ensure accountability, transparency, ethical behavior, and effective oversight of management activities.



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Regulatory bodies such as the Ministry of Corporate Affairs, Securities and Exchange Board of India (SEBI), and Reserve Bank of India (RBI) have introduced several reforms to strengthen governance standards and fraud prevention mechanisms. In this context, understanding the relationship between accounting fraud, digital fraud, and corporate governance has become increasingly important. This study explores emerging fraud risks in the Indian corporate sector and highlights the significance of governance practices in ensuring financial integrity and sustainable business operations.

Review of Literature

- 1. Beasley et al. (2010)** found that weak internal controls and ineffective board oversight significantly increase the likelihood of financial statement fraud. The study emphasized the importance of independent audit committees and strong governance practices in detecting and preventing fraudulent financial reporting within corporate organizations.
- 2. Dorminey et al. (2012)** examined the growing role of forensic accounting in fraud detection. The study concluded that forensic auditing techniques help organizations identify complex financial irregularities and strengthen internal control systems against emerging fraud risks in the corporate environment.
- 3. PwC (2022)** reported that cybercrime and digital fraud have become among the most common economic crimes affecting businesses globally. The study highlighted the increasing frequency of phishing attacks, data breaches, and digital payment frauds resulting from rapid technological adoption.
- 4. KPMG (2023)** observed that digital transformation has expanded fraud risks in organizations through sophisticated cyber-enabled financial crimes. The report emphasized the importance of technological controls, employee awareness, and continuous monitoring systems in mitigating fraud-related vulnerabilities.
- 5. ACFE (2024)** revealed that occupational fraud and cyber-enabled fraud continue to generate significant financial losses worldwide. The study stressed the need for whistleblower mechanisms, fraud risk assessments, and governance frameworks to enhance organizational resilience against fraud.
- 6. Gupta and Sharma (2024)** examined corporate governance practices in Indian companies and found a significant relationship between governance quality and fraud prevention. Strong board independence, transparency, and regulatory compliance were identified as key factors reducing fraudulent activities.

Objectives of the Study

1. To examine the major corporate accounting and financial fraud cases in India.
2. To analyse the growth of reported digital fraud cases in India.
3. To study the corporate governance and fraud prevention measures in Selected Companies in India.

Methodology of the Study

The study is descriptive and analytical in nature. It is based entirely on secondary data collected from research articles, corporate governance reports, annual reports, publications of SEBI, RBI, Ministry of Corporate Affairs, PwC, KPMG, and other credible sources. Relevant literature related to accounting fraud, financial fraud, digital fraud, and corporate governance has been reviewed and analysed to identify emerging trends, challenges, and preventive mechanisms in the Indian corporate sector.

Results and Discussion

Table1: Major Corporate Accounting and Financial Fraud Cases in India

Year	Company	Nature of Fraud	Estimated Amount Involved (₹ Crore)
2009	Satyam Computer Services	Financial Statement Manipulation	7,136
2018	Punjab National Bank (PNB)	Banking and Loan Fraud	13,000
2019	IL&FS	Financial Misreporting and Debt Concealment	91,000
2020	DHFL	Loan Diversion and Financial Fraud	31,000
2023	Various Corporate Cyber Frauds	Digital Financial Fraud	4,500

Source: Authors Compiled Data

The table indicates that accounting and financial frauds have caused substantial financial losses in the Indian corporate sector. The Satyam scandal exposed weaknesses in accounting transparency, while the PNB and DHFL frauds highlighted failures in financial monitoring and governance. The increasing value of digital frauds demonstrates the growing complexity of corporate financial crimes. These incidents reveal the urgent need for stronger internal controls, regulatory oversight, and corporate governance mechanisms.

Table 2: Growth of Reported Digital Fraud Cases in India

Year	Reported Digital Fraud Cases (Lakhs)	Estimated Loss (₹ Crore)
2019	0.44	1,200
2020	0.58	1,850
2021	0.82	2,700
2022	1.10	3,400
2023	1.56	4,800
2024	2.05	6,200

Source: Authors Compiled Data

The data shows a continuous increase in digital fraud cases and financial losses from 2019 to 2024. The rapid adoption of digital payment systems, online banking, cloud accounting, and electronic transactions has increased organizational exposure to cyber-enabled fraud. Fraudsters increasingly exploit technological vulnerabilities through phishing, hacking, identity theft, and malware attacks. The trend suggests that cybersecurity and digital risk management have become critical priorities for corporate organizations.

Table 3: Corporate Governance and Fraud Prevention Measures in Selected Companies

Governance Measure	Percentage of Companies Adopting (%)
Internal Audit System	92
Independent Directors	88
Audit Committee Monitoring	85
Whistleblower Mechanism	81
Cybersecurity Framework	76
Forensic Audit Practices	64

Source: Authors Compiled Data

The table reveals that most organizations have adopted traditional governance practices such as internal audits and audit committees. However, comparatively fewer firms have implemented advanced measures such as forensic auditing and cybersecurity frameworks. This indicates that while governance structures are improving, companies must further strengthen technology-driven fraud prevention mechanisms. Effective governance combined with digital monitoring systems can significantly reduce fraud risks.

Conclusion

The study concludes that accounting, financial, and digital frauds represent significant challenges for the Indian corporate sector. While traditional forms of fraud such as financial statement manipulation and fund misappropriation continue to exist, digital frauds have emerged as a rapidly growing threat due to increased technological dependence. Cyber-enabled crimes, digital payment frauds, and unauthorized access to corporate systems create substantial financial and reputational risks for organizations. The findings highlight that effective corporate governance plays a crucial role in mitigating fraud risks through strong internal controls, independent audits, transparent reporting practices, and ethical leadership. Organizations must adopt advanced cybersecurity measures, forensic accounting techniques, continuous monitoring systems, and employee awareness programs to combat emerging fraud threats. Strengthening governance standards and regulatory compliance can enhance investor confidence and ensure sustainable corporate growth. A proactive approach combining technology, governance, and risk management is essential for building fraud-resistant organizations in the digital era.

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Original Article

Digital Inclusion and the Empowerment of Rural Women Entrepreneurs: Insights from Tumkur District

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Abstract

In the contemporary globalized economy, access to Information and Communication Technologies (ICTs) and the internet serves as a foundational catalyst for economic expansion, financial inclusion, and localized societal progress. Despite sweeping digital transformations across urban landscapes, a stark digital divide continues to persist within rural areas. Rural women entrepreneurs face unique, deeply structural limitations that severely restrict their capacity to fully participate in the growing digital economy. This study examines the localized digital divide and its direct empirical consequences on rural women entrepreneurs operating within the Tumkur District of Karnataka, India. Utilizing primary data collected from 56 active rural women entrepreneurs, the research investigates demographic profiles, structural and economic barriers, and the operational usage of digital platforms. Descriptive analysis evaluates proficiency variations across standard business domains, while inferential statistics—specifically One-Sample t-tests and One-Way Analysis of Variance (ANOVA)—test the structural impact of technology access on marketing, financial management, and human resource functionalities. The empirical findings confirm that while basic mobile device ownership is high, significant variations exist in advanced digital literacy, creating pronounced operational constraints. Inferential metrics reject all null hypotheses, illustrating that the digital divide significantly dictates an entrepreneur's marketing expansion, financial recording capabilities, and workforce coordination efficiency. This paper concludes with targeted policy frameworks and multi-stakeholder intervention recommendations designed to create an inclusive, language-friendly, and accessible digital ecosystem to catalyze the socioeconomic empowerment of grassroots female enterprises.

Key words: Empowerment, Digital Platform, technology, co-ordination etc.

Introduction

1. Context and Background

The international community has increasingly recognized that bridging the digital divide—defined as the developmental and structural imbalance separating those with reliable access to modern ICTs from those without—is deeply tied to the achievement of the United Nations' Sustainable Development Goals (SDGs), particularly gender equality (SDG 5) and decent work and economic growth (SDG 8). Technology has fundamentally altered standard business systems, transitioning conventional brick-and-mortar trade channels into highly networked, web-enabled marketplaces. In the context of emerging markets like India, rural entrepreneurship serves as a vital economic engine, driving poverty alleviation, mitigating forced migration, and promoting decentralized wealth accumulation. When women in rural locales assume entrepreneurial identities, the resulting developmental dividends are compound: households benefit from diversified, resilient revenue streams, and systemic gender disparities are challenged as women gain autonomy and decision-making leverage. However, the intersection of geography and gender creates a compounded vulnerability. Rural women entrepreneurs are severely constrained by a pronounced digital divide. This exclusion is not merely a matter of missing infrastructure; it represents a multi-layered web of challenges, including lack of device affordability, deficient technical literacy, and entrenched socio-cultural norms that heavily govern physical mobility and individual agency.



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2. Statement of the Problem

While technology presents massive potential to modernize small enterprises, a large segment of rural women entrepreneur's remains disconnected from the broader digital landscape. They operate in localized isolation, struggling against poor connectivity, minimal functional literacy, and high data or hardware costs.

This technical isolation limits their business capacity across three core pillars:

1. **Market Isolation:** They are forced to rely on shrinking, highly localized middleman networks rather than tapping into regional digital marketplaces or leveraging social media promotion.
2. **Financial Information Deficits:** Without structured digital ledger solutions, their ability to systematically track cash flow, manage credit accounts, or compile the financial histories necessary to secure formalized bank capital remains severely limited
3. **Operational Disadvantages:** Manual management of workforce administrative tasks reduces overall efficiency, driving up relative overhead and limiting competitive scale.

Without highly intentional, empirically grounded interventions, these digital gaps risk pushing grassroots female-led enterprises even further to the economic periphery.

3. Objectives of the Study

This research is structured around the following empirical objectives:

1. To assess the current demographic and business profiles of rural women entrepreneurs in the Tumkur District.
2. To evaluate the level of digital literacy, tool usage frequency and technological proficiency across basic and advanced tasks.
3. To identify the structural, financial, and socio-cultural barriers hindering technology adoption.
4. To statistically test the impact of the digital divide on specific operational domains: marketing, finance, and human resources.
5. To propose actionable, context-sensitive intervention frameworks to advance inclusive digital literacy.

Review of Literature

The scholarly discourse surrounding rural female entrepreneurship and technological adoption highlights a complex interplay of social, financial, and digital constraints.

1. **Microfinance and Economic Baseline Realities:** Historically, interventions focused primarily on capital access. Sharma (2018) notes that microfinance institutions successfully drove baseline financial inclusion by delivering credit to rural women, boosting household incomes, and providing an initial foundation for micro-enterprise growth. However, physical capital injections show diminishing returns when entrepreneurs remain cut off from digital information channels, modern supply infrastructure, and systemic market transparency.
2. **Social Innovation and Digital Marketing Adaptations:** Transitioning businesses toward online operations requires specialized support models. Ali (2018) analyzed targeted social innovation frameworks aimed at marginalized groups, demonstrating that structured e-business training modules directly improve marketing performance. When rural entrepreneurs are trained to manage dedicated social media business pages, their market awareness and operational reach expand considerably.
3. **Socio-Cultural Dynamics and Demographic Variables:** The adoption of digital tools is closely linked to demographic realities and cultural constraints. Esteban et al. (2021) observed that social media utilization styles vary significantly across age brackets and family structures, requiring formalized, institutional digital training tracks rather than relying on informal self-learning. In rural India, Nath (2021) highlighted that a pervasive lack of legal awareness, financial literacy, and technical confidence often stops women from handling complex business and regulatory processes. This points to an urgent need for supportive environments that foster capacity building across operational functions.
4. **Digital Financial Inclusion as an Empowerment Engine:** Modern literature focuses heavily on the institutional integration of digital finance. Yang et al. (2022) leveraged large-scale indices to show that digital financial inclusion reduces credit constraints, bridges information gaps, and increases business flexibility. Crucially, this effect is strongest among vulnerable, less-educated women living in areas with high gender inequality, proving that technology can act as an equalizer when effectively deployed.
5. **The Reality of Interventions:** Despite national pushes like the "Digital India" campaign, significant gaps remain on the ground. Debbarma and Chinnadurai observed that deep-seated gender biases and localized access issues continue to slow technology adoption in rural areas, highlighting the need for highly tailored, subsidized training initiatives. Similarly, Yoganandham et al. (2024) and Nayak et al. (2024) argue that while digital infrastructure is a prerequisite, true transformation requires building specific individual competencies—such as risk-taking, leadership, and digital confidence—to turn simple internet access into long-term business growth.

Conceptual Framework

Understanding how the digital divide impacts rural women entrepreneurs requires a holistic framework that connects systemic access barriers to specific business outcomes.

The digital divide is driven by three main factors: high device/data costs, limited localized infrastructure, and socio-cultural constraints on mobility and education. These forces create a *Digital Literacy Gradient*. Rather than a simple

binary of "connected" versus "unconnected," entrepreneurs move along a spectrum from basic usage (voice calls, YouTube videos) to advanced capabilities (mobile banking, online marketing, automated record-keeping). An entrepreneur's position on this literacy gradient directly affects the three core pillars of business survival and growth:

1. **Marketing Aspect:** Moving past local consumer circles by using social media and digital marketplaces to reach broader customer bases.
2. **Financial Aspect:** Shifting from cash transactions to secure digital payments (UPI), mobile app balance tracking, and structured digital expense ledgers.
3. **Human Resource (HR) Aspect:** Improving staff coordination, attendance tracking, and payroll processing through messaging platforms and software solutions.

Research Methodology

1. Research Design and Sampling

This study utilizes an empirical, descriptive, and diagnostic research design, combining qualitative insights with structured quantitative metrics. The geographical scope was confined to rural areas within the Tumkur District of Karnataka, India. . Primary data was collected using structured questionnaires distributed via Google Forms and targeted field visits. Purposive and simple random sampling was employed to identify **56 active rural women entrepreneurs** across various micro-enterprise sectors.

2. Data Collection Instruments and Reliability

The primary data collection tool was designed around Likert-scale statements (ranging from Strongly Disagree to Strongly Agree) to measure perceptions, alongside categorical questions covering demographic backgrounds and digital tool adoption levels. To ensure the instrument's structural validity and internal consistency, a statistical reliability analysis was performed.

The dataset included 55 fully valid cases (98.2%), with 1 case excluded via listwise deletion due to missing values. The resulting **Cronbach's Alpha score was 0.934**, indicating exceptionally strong internal consistency and confirming the instrument's reliability for inferential analysis.

3. Statistical Analytical Framework

The collected data was processed using descriptive and inferential statistical methods:

1. **Descriptive Metrics:** Frequency tables, percentage distributions, and mean scores were used to profile demographic variables and digital usage habits.
2. **Inferential Testing:** * A **One-Sample t-test** was applied to analyze variations and confidence intervals across basic and advanced digital task proficiencies.
3. **One-Way Analysis of Variance (ANOVA)** tests were conducted to determine whether varying intensities of the digital divide caused statistically significant differences in business performance across marketing, finance, and human resource management.

Data Analysis and Empirical Interpretation

1. Descriptive Demographic and Operational Analysis

Table 5.1: Age-Wise Profile of Respondents

The age distribution of the surveyed entrepreneurs reveals where micro-enterprise leadership sits within rural communities.

Age Category	Frequency	Percentage (%)
Below 25 Years	9	16.07%
26 – 35 Years	14	25.00%
36 – 45 Years	22	39.29%
46 Years and Above	11	19.64%
Total	56	100.00%

Interpretation: The data shows that the largest segment of rural women entrepreneurs (39.29%) falls within the 36–45 age bracket. This indicates that micro-enterprise ownership is most common among women with established household roles and family stability. However, this demographic often faces more rigid gaps in formal digital exposure compared to younger cohorts.

Table 5.2: Educational Qualifications

Education plays a key role in an entrepreneur's baseline comfort level with technical interfaces.

Educational Level	Frequency	Percentage (%)
Primary / Illiterate	12	21.43%
High School / Secondary	21	37.50%
Pre-University (PUC) / Diploma	15	26.79%
Graduate and Above	8	14.29%
Total	56	100.00%

Interpretation: A majority of the respondents (58.93%) have a high school education or less. This educational profile underscores the need for intuitive, visual, and language-friendly software applications, as complex, English-centric text interfaces create immediate barriers to entry.

Table 5.3: Type of Business Enterprise Run by Respondents

The operational sectors show how rural female entrepreneurship is distributed across different micro-industries.

Business Sector	Frequency	Percentage (%)
Retail / Kirana Shop	13	23.21%
Tailoring / Garments	8	14.29%
Farming / Allied Agriculture	7	12.50%
Textile Sales	6	10.71%
Beauty Parlour Services	5	8.93%
Hotel / Eatery	4	7.14%
Handicrafts / Cottage Industry	3	5.36%
Food Processing / Products	3	5.36%
Other Miscellaneous Trade	7	12.50%
Total	56	100.00%

Interpretation: Rural women entrepreneurs are active across a diverse range of business activities, with a strong emphasis on retail trades (23.21%) and service-oriented micro-enterprises like tailoring (14.29%). These localized, high-transaction businesses stand to benefit significantly from adopting digital payment loops and hyper-local online advertising.

2. Descriptive Assessment of Digital Behavior and Gaps

Table 5.4: Core Usage of Digital Platforms and Tools

This table captures the daily functional entry points through which entrepreneurs engage with technology.

Type of Digital Platform Usage	Frequency	Percentage (%)
Basic Smartphone Voice & Messaging Only	11	19.64%
Social Media Apps for Business (WhatsApp/Facebook)	36	64.29%
Online Web Marketplaces (Amazon, Flipkart, etc.)	1	1.79%
Direct Messaging (SMS/Independent Texting)	5	8.93%
No Digital Engagement / Unaware	3	5.36%
Total	56	100.00%

Interpretation: The data reveals that **64.29% of respondents actively utilize accessible social applications—primarily WhatsApp—to market their services** and interface with customers. In contrast, formal e-commerce marketplaces account for a tiny 1.79% share. This emphasizes that mobile, app-based ecosystems are the primary gateway for rural digital inclusion, while more complex, web-based software solutions remain out of reach.

Table 5.5: Self-Assessed Proficiency and Structural Gaps

An analysis of mean scores across distinct tech-interaction categories highlights key operational challenges (measured on a 5-point Likert scale).

Functional Digital Task Statement	Mean Score	Standard Deviation
Secure underlying mobile network connectivity	3.73	0.84
Independent physical access to a smartphone or tablet	3.70	0.91
Comfort performing basic daily tasks on a mobile device	3.64	0.88
Continuous financial affordability of data plans	3.30	1.05
Navigating web search engines for business solutions	2.98	1.12
Formal management of business email and social media accounts	2.98	1.18

Interpretation: While baseline hardware access (3.70) and operational connectivity (3.73) show relatively strong mean scores, confidence dropped sharply to **2.98 for advanced tasks like independent web search navigation and formal account management**. This gap highlights the shift from basic digital consumption to advanced business utilization, pointing to an clear need for targeted, skill-building training programs.

3. Inferential Statistical Testing

1. One-Sample t-test: Digital Literacy Variation Analysis

To evaluate whether digital skills are uniform or vary significantly across the sample, a One-Sample t-test was executed against the population parameters.

Table 5.6: One-Sample t-test Output for Skill Dimensions

Operational Skill Dimension	Sample Mean	Test Value	Calculated t-Statistic	Degrees of Freedom (df)	p-value (Sig. 2-tailed)
Basic Digital Literacy Level	20.34	0	32.852	55	0.000
Advanced Technical Tasks	20.75	0	33.017	55	0.000

Empirical Inference: The One-Sample t-test yielded extremely high t-statistics (32.852 for basic literacy and 33.017 for advanced tasks) with a p-value of 0.000, well below the 0.05 significance threshold. Consequently, **the null hypothesis (\$H_0\$) is rejected**. This confirms that rural women entrepreneurs do not possess uniform digital skills; instead, significant internal variations exist, highlighting the need for targeted training that addresses different proficiency levels rather than a one-size-fits-all approach.

2. One-Way ANOVA: Technology's Impact on Core Business Pillars

Pillar 1: Marketing Operations

This test evaluates whether variations in the digital divide significantly affect an entrepreneur's marketing reach, customer acquisition, and brand promotion.

Table 5.7: ANOVA Coefficients for Marketing Metrics

Source of Variance	Sum of Squares	Degrees of Freedom (df)	Mean Square	Calculated F-Ratio	Significance Value (p-value)	Empirical Decision
Between Groups	1089.570	3	363.191	6.072	0.001	Reject \$H_0\$
Within Groups	3110.356	52	59.815			
Total	4199.929	55				

Empirical Inference: The Mean Square Between Groups (363.191) is substantially larger than the Mean Square Within Groups (59.815), resulting in an **F-ratio of 6.072 with a p-value of 0.001**. Since $p < 0.05$, the null hypothesis is rejected. This demonstrates that the digital divide significantly impacts marketing execution. Entrepreneurs with advanced digital literacy leverage social channels effectively, whereas those caught in the divide face restricted customer engagement and narrow localized markets.

Pillar 2: Financial Management

This test examines whether the digital divide creates significant differences in cash flow management, digital payment adoption, and automated record-keeping.

Table 5.8: ANOVA Coefficients for Financial Performance

Source of Variance	Sum of Squares	Degrees of Freedom (df)	Mean Square	Calculated F-Ratio	Significance Value (p-value)	Empirical Decision
Between Groups	137.109	3	45.703	3.396	0.025	Reject \$H_0\$
Within Groups	699.730	52	13.456			
Total	836.839	55				

Empirical Inference: The financial ANOVA yields a calculated **F-statistic of 3.396 with a corresponding p-value of 0.025**. Because the significance value is below the 0.05 threshold, **the null hypothesis is rejected**. This confirms that the digital divide significantly influences financial management capabilities. Higher digital integration leads to reliable UPI adoption, real-time balance tracking, and structured digital accounting, whereas tech-isolated entrepreneurs remain dependent on inefficient cash-only transactions.

Pillar 3: Human Resource & Workforce Operations

This model tests whether technology access creates significant differences in labor tracking, wage calculations, and employee communication.

Table 5.9: ANOVA Coefficients for Human Resource Aspects

Source of Variance	Sum of Squares	Degrees of Freedom (df)	Mean Square	Calculated F-Ratio	Significance Value (p-value)	Empirical Decision
Between Groups	435.773	2	217.886	9.123	0.000	Reject \$H_0\$
Within Groups	1265.781	53	23.883			
Total	1701.554	55				

Empirical Inference: The HR model shows a very high **F-value of 9.123 with a p-value of 0.000**. This strong statistical significance requires the **absolute rejection of the null hypothesis**. Disparities in technical access deeply impact internal labor management. Connected entrepreneurs streamline operations by using digital messaging for staff coordination and basic apps for payroll tracking, while disconnected enterprises rely entirely on manual administration.

Key Insights and Structural Barriers

The empirical findings paint a nuanced picture of a slow but steady digital integration process that is heavily limited by structural bottlenecks. **The Mobile Gateway and Basic App Concentration:** Smartphones serve as the primary gateway to the digital world, with over 75% of respondents relying on mobile devices for both personal and business needs. Simple, visually driven apps like WhatsApp are widely used for daily consumer messaging and basic promotion.

However, formal business systems like standalone websites, email communication, or specialized CRM tools remain underutilized due to a persistent gap in operational confidence.

1. **The Informal Learning Bottleneck:** A key finding is that most respondents acquired their technical skills through informal channels—such as personal experimentation or help from younger family members—while formalized public training programs showed limited reach. Consequently, digital literacy remains narrowly understood as simply watching videos or placing basic voice calls, leaving women exposed to security vulnerabilities and missing out on advanced business applications.
2. **Core Adoption Barriers:** Technology adoption is slowed by several recurring challenges: high hardware and data costs, weak rural network infrastructure, a lack of localized training centers, and significant anxiety regarding online scams and payment fraud.
3. **Willingness to Adopt:** Despite these challenges, **over 85% of surveyed women expressed a strong belief that digital tools are essential for business growth.** This shows an optimistic, forward-looking mindset, meaning that targeted structural support can expect high adoption rates and active community participation.

Strategic Recommendations and Policy Interventions

To address these empirical findings and close the digital divide for rural entrepreneurs in Tumkur District, a coordinated, multi-stakeholder intervention strategy is required.

1. Developing Targeted, Segmented Training Tracks

Since the t-test confirmed significant variations in baseline skills, training programs must move away from generic, one-size-fits-all formats.

1. **Tiered Training:** Programs should offer clear, sequential learning paths. Foundational tracks should focus on secure smartphone navigation, basic UPI utilization, and online safety. Advanced tracks should cover digital ledger management, dynamic content creation for social platforms, and navigating e-commerce onboarding procedures.
2. **On-Ground Mentorship:** Training should be delivered through localized, peer-led networks, such as training successful local entrepreneurs ("Digital Sakhis") to provide continuous, on-ground technical support.

2. Improving Interface Accessibility and Localized Content

Given the educational profiles of most rural entrepreneurs, language and user interface design present immediate barriers.

1. **Localized Applications:** Software developers and public agencies should prioritize voice-guided navigation, icon-heavy interfaces, and full localization into regional languages like Kannada.
2. **Simplifying Complex Tasks:** Tools for inventory management, invoicing, and tax filing should be redesigned into accessible, mobile-first formats, allowing women with limited formal education to manage complex business operations independently.

3. Reducing Financial Barriers and Building Infrastructure

The financial constraints associated with device ownership and data maintenance require targeted economic support.

1. **Subsidized Hardware:** Microfinance institutions and public livelihood programs should offer specialized asset-credit packages that bundle low-interest microloans with subsidized business smart phones.
2. **Community Digital Access Hubs:** Setting up common service kiosks within Gram Panchayats can provide entrepreneurs with reliable internet access, high-speed scanning services, and localized support without requiring large personal capital investments.

4. Mitigating Fraud Risk and Building Digital Trust

Anxiety regarding digital transaction security and cyber-fraud remains a significant barrier to financial tool adoption.

1. **Cybersecurity Training:** Practical cyber-safety modules must be integrated directly into baseline literacy programs, teaching users how to recognize phishing attempts, manage secure UPI PINs, and handle suspicious links safely.
2. **Dedicated Dispute Support:** Building trusted, community-level support channels ensures that if an entrepreneur experiences a failed digital payment or transaction issue, she can access immediate assistance to resolve the problem and protect her capital.

Conclusion

This study confirms that the digital divide remains a significant barrier to the growth and modernization of rural women-led enterprises in Tumkur District. The statistical analysis demonstrates that technology access is not a marginal concern; rather, it directly impacts core business operations including market expansion, financial security, and workplace efficiency. While basic smartphone access is expanding, a significant gap remains in advanced functional literacy, leaving many entrepreneurs dependent on localized, analog systems. However, the high willingness among rural women to adopt new digital tools highlights a major opportunity for impactful intervention. Closing this divide requires moving beyond basic infrastructure deployment toward building comprehensive, localized capabilities. By implementing language-friendly applications, tiered training initiatives, and community-based support networks, policymakers and local organizations can unlock the full economic potential of rural women entrepreneurs. This transformation not only strengthens individual enterprises but drives inclusive economic growth and sustainable development across rural communities.



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Original Article

Opportunities, Challenges and Policy Implications for MSMEs, Digital Transformation and Economic Growth

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Abstract

Micro, Small and Medium Enterprises (MSMEs) establish a substantial fragment of the global economy and play a key role in generation of employment, industrial development, and inclusive growth and innovation. The rapid progression of digital technologies has affected businesses operations, their competencies, and value creation. Because of digital transformation, MSMEs have been successfully improving productivity, expanding market reach, enhancing customer engagement, and achieving operational efficiency. This paper examines the connection between economic growth and digital transformation, with reference to MSMEs in India. It also highlights the merits and challenges necessary to speed up digital acceptance among MSMEs.

Keywords: MSMEs, Economic Growth, Digital Economy, Innovation, Digital Transformation

Introduction

Micro, Small and Medium Enterprises (MSMEs) are widely recognized as the backbone of national economies. They contribute substantially to employment creation, industrial output, exports, and regional development. In emerging economies such as India, MSMEs play a critical role in promoting entrepreneurship and reducing income disparities. The emergence of digital technologies, including cloud computing, artificial intelligence, big data analytics, e-commerce platforms, digital payments, and the Internet of Things (IoT), has revolutionized business operations. Digital transformation refers to the integration of digital technologies into all aspects of business processes, leading to fundamental changes in organizational structures, operational models, and customer interactions. The growing digital economy presents unprecedented opportunities for MSMEs to overcome traditional business constraints and compete in both domestic and international markets. However, digital transformation also presents challenges related to infrastructure, skills, cybersecurity, and financial resources. This paper investigates how digital transformation influences MSME growth and contributes to broader economic development.

Objectives of the Study

1. To examine the role of MSMEs in economic development.
2. To analyze the impact of digital transformation on MSME performance.
3. To identify challenges faced by MSMEs in adopting digital technologies.
4. To evaluate the contribution of digitally transformed MSMEs to economic growth.
5. To give suggestions regarding policy measures to enhance digital transformation among MSMEs.

Research Methodology

This study adopts a descriptive and analytical approach based on secondary data. Information has been collected from academic journals, government reports, policy documents, international organizations, and industry publications related to MSMEs and digital transformation.

MSMEs and Their Economic Significance

Micro, Small, and Medium Enterprises (MSMEs) serve as vital catalysts for socioeconomic advancement globally. By generating vast employment opportunities, fostering grassroots innovation, nurture entrepreneurial talent, and driving industrial diversification, these enterprises contribute fundamentally to national GDPs.

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Their inherent agility and capacity to adapt swiftly to market shifts position MSMEs as primary engines for equitable, resilient, and sustainable economic growth, especially within emerging markets. Furthermore, MSMEs act as the backbone of global supply chains, frequently serving as specialized ancillary units that feed into larger multinational corporations. In the contemporary economic landscape, their significance is being further amplified by the rapid adoption of digital technologies and e-commerce platforms. This digital transition not only allows smaller enterprises to overcome traditional geographical barriers and access international markets but also enhances their operational efficiency. By bridging the economic partition between rural and urban sectors, a digitally empowered MSME sector ensures that the benefits of modernization and industrialization are distributed more evenly across society.

1. Employment Generation

One of the most significant contributions of MSMEs is their ability to create employment opportunities for a large segment of the population. Since these enterprises are generally labor-intensive, they absorb a considerable portion of the workforce, including semi-skilled and unskilled workers. By providing jobs in both urban and rural areas, MSMEs help reduce unemployment, improve household incomes, and contribute to social and economic stability.

2. Contribution to GDP

MSMEs make a substantial contribution to a country's Gross Domestic Product (GDP) through their involvement in production, manufacturing, trade, and service activities. By creating value and increasing output across various sectors, these enterprises enhance national income and strengthen economic performance. Their contribution becomes particularly important in supporting industrial growth and maintaining economic resilience during periods of uncertainty.

3. Regional Development

The MSME sector plays a vital role in achieving balanced regional development. By establishing business activities in rural and semi-urban regions, these enterprises generate local employment opportunities and stimulate economic activity outside major metropolitan centers. As a result, MSMEs help reduce regional disparities, improve living standards, and encourage the equitable distribution of economic resources across different geographic areas.

4. Innovation and Entrepreneurship

MSMEs are often recognized as centers of innovation and entrepreneurial activity. Their smaller size enables them to respond quickly to changing market conditions and customer preferences. Many small businesses introduce new products, services, and business models that contribute to technological advancement and market competitiveness. Through their innovative initiatives, MSMEs foster an entrepreneurial culture that supports long-term economic development.

Understanding Digital Transformation

Digital transformation refers to the systematic integration and application of digital technologies within business processes, operations, and organizational strategies. It involves leveraging technologies such as cloud computing, artificial intelligence, data analytics, e-commerce platforms, and digital communication tools to enhance efficiency, productivity, and customer engagement. By embracing digital transformation, organizations can improve their competitiveness, adapt to changing market dynamics, and achieve sustainable growth in an increasingly technology-driven business environment.

Understanding Digital Transformation

Digital transformation involves the strategic adoption of digital technologies to improve organizational performance and competitiveness.

Key components include:

1. Digital payment systems
2. E-commerce platforms
3. Cloud computing
4. Artificial Intelligence (AI)
5. Big Data Analytics
6. Internet of Things (IoT)
7. Cybersecurity solutions
8. Digital marketing tools

Digital transformation extends beyond technology adoption and requires changes in organizational culture, leadership, and business strategy.

Impact of Digital Transformation on MSMEs

1. Increased Operational Efficiency

Digital transformation has significantly improved the operational efficiency of Micro, Small, and Medium Enterprises (MSMEs). The adoption of advanced technologies such as automation software, enterprise resource planning systems, and digital management tools has reduced dependence on manual processes. These technologies help minimize human errors, streamline routine business activities, and enhance overall productivity. Furthermore, digital solutions facilitate effective inventory control, accounting management, and supply chain coordination, enabling MSMEs to optimize resources and improve business performance.

2. Enhanced Market Access

The integration of digital technologies has expanded market opportunities for MSMEs by eliminating geographical limitations. Through e-commerce platforms, online marketplaces, and digital marketing channels, businesses can promote and sell their products and services to a wider customer base. This broader market reach enables MSMEs to explore new business opportunities, increase sales, and strengthen their competitive position in both domestic and international markets. Consequently, digital transformation contributes significantly to business growth and revenue generation.

3. Improved Customer Experience

Digital transformation has transformed the way MSMEs interact with their customers. The use of digital communication platforms, social media channels, and customer relationship management systems allows businesses to engage with customers more effectively and provide personalized services. Faster response times, convenient access to information, and efficient service delivery contribute to higher levels of customer satisfaction. As a result, MSMEs can build stronger customer relationships, enhance brand loyalty, and maintain a sustainable competitive advantage.

4. Better Decision-Making

The availability of digital data and analytical tools has improved the decision-making capabilities of MSMEs. Businesses can collect and analyze valuable information related to customer behavior, market trends, and operational performance. These insights enable managers and entrepreneurs to make informed strategic decisions based on evidence rather than intuition. By utilizing data-driven approaches, MSMEs can identify growth opportunities, address operational challenges, and improve overall business effectiveness.

5. Financial Inclusion

Digital transformation has played a crucial role in promoting financial inclusion among MSMEs. The adoption of digital payment systems, mobile banking services, and fintech solutions has simplified financial transactions and improved access to formal financial services. These technologies reduce transaction costs, increase transparency, and facilitate better financial record-keeping. Moreover, enhanced access to credit, digital lending platforms, and online financial services empower MSMEs to secure funding more efficiently, supporting business expansion and long-term sustainability.

Digital Transformation and Economic Growth

The connection between digital transformation and economic growth is increasingly recognized as a significant driver of modern economic development. The adoption of digital technologies by Micro, Small, and Medium Enterprises (MSMEs) not only improves operational efficiency but also contributes to broader economic progress. Digital transformation influences economic growth through multiple channels, including productivity improvement, innovation, employment generation, expansion of the digital economy, and greater integration with global markets.

1. Productivity Enhancement

One of the most important outcomes of digital transformation is the improvement of productivity across various sectors. The integration of digital tools and technologies enables businesses to automate routine tasks, streamline workflows, and optimize the utilization of available resources. As a result, organizations can reduce operational inefficiencies, lower production costs, and achieve higher levels of output. For MSMEs, enhanced productivity strengthens their ability to compete effectively in both domestic and international markets, thereby contributing to overall economic growth.

2. Innovation and Competitiveness

Digital technologies play a crucial role in fostering innovation within enterprises. By leveraging advanced technologies such as artificial intelligence, cloud computing, big data analytics, and digital platforms, MSMEs can create innovative products, improve service delivery, and develop new business models. These innovations enable firms to respond more effectively to changing consumer preferences and market demands. Consequently, businesses become more competitive, leading to increased market share, business expansion, and sustainable economic development.

3. Employment Opportunities

The process of digital transformation also generates new employment opportunities by creating demand for a skilled workforce. As businesses increasingly rely on digital systems and technologies, there is a growing need for professionals with expertise in areas such as information technology, data analytics, cybersecurity, digital marketing, and software development. This shift not only creates new jobs but also encourages workforce upskilling and reskilling. The development of a digitally competent workforce contributes to higher income levels and improved economic well-being.

4. Expansion of the Digital Economy

The widespread adoption of digital technologies by MSMEs contributes significantly to the growth of the digital economy. Digital enterprises facilitate online transactions, digital payments, e-commerce activities, and technology-driven services, all of which increase economic activity. As more businesses embrace digital platforms,

investment in digital infrastructure and technology ecosystems also rises. This expansion generates additional economic output, stimulates innovation, and strengthens the overall economic framework of a nation.

5. Global Market Integration

Digital transformation enables MSMEs to overcome geographical barriers and participate more actively in international markets. Through digital platforms, businesses can connect with customers, suppliers, and partners across the world. This increased connectivity allows MSMEs to become part of global value chains and engage in cross-border trade activities. As a result, enterprises gain access to larger markets, generate export revenues, and contribute to foreign exchange earnings. Greater global integration ultimately enhances national economic growth and improves international competitiveness.

Challenges in Digital Transformation of MSMEs

Although digital transformation offers numerous advantages to Micro, Small, and Medium Enterprises (MSMEs), its implementation is often accompanied by several challenges. These enterprises frequently encounter obstacles that limit their ability to effectively adopt and utilize digital technologies. Factors such as limited financial resources, inadequate digital skills, cybersecurity concerns, infrastructure deficiencies, and resistance to organizational change can significantly hinder the digitalization process. Addressing these challenges is essential for ensuring that MSMEs fully benefit from technological advancements and contribute effectively to economic growth.

1. Financial Constraints

One of the primary barriers to digital transformation among MSMEs is the lack of adequate financial resources. The adoption of advanced technologies often requires substantial investment in hardware, software, digital infrastructure, employee training, and system maintenance. Many small enterprises operate with limited budgets and face difficulties in accessing affordable credit or external funding. Consequently, they may postpone or avoid investments in digital technologies, thereby limiting their competitiveness and growth potential in an increasingly digital business environment.

2. Digital Skill Gaps

The successful implementation of digital technologies depends largely on the availability of skilled personnel. However, many MSMEs face a shortage of employees who possess the technical expertise required to operate and manage digital systems effectively. Limited knowledge of emerging technologies, combined with inadequate training opportunities, creates a significant skills gap within the sector. This lack of digital competence can reduce the effectiveness of technology adoption and slow the overall transformation process.

3. Cybersecurity Risks

As MSMEs become more dependent on digital platforms and online transactions, they are increasingly exposed to cybersecurity threats. Risks such as data breaches, phishing attacks, ransomware, and unauthorized access to sensitive information can result in financial losses and reputational damage. Many MSMEs lack dedicated cybersecurity infrastructure and expertise, making them particularly vulnerable to cyberattacks. Therefore, strengthening cybersecurity measures has become a critical requirement for sustaining digital transformation efforts.

4. Infrastructure Limitations

Adequate digital infrastructure is a fundamental prerequisite for successful digital transformation. However, many MSMEs, particularly those located in rural and semi-urban regions, continue to face challenges related to unreliable internet connectivity, limited access to digital services, and insufficient technological facilities. These infrastructural shortcomings restrict the adoption of digital tools and reduce the efficiency of business operations. Improving digital infrastructure is therefore essential for promoting widespread digital inclusion among MSMEs.

5. Resistance to Change

Organizational resistance is another significant challenge in the digital transformation journey of MSMEs. Business owners and employees who are accustomed to traditional methods of operation may be reluctant to adopt new technologies and processes. Concerns regarding costs, uncertainty about outcomes, and fear of disruption can create resistance to change. Such attitudes may delay the implementation of digital initiatives and reduce the potential benefits that digital transformation can offer. Developing a culture that embraces innovation and continuous learning is crucial for overcoming this challenge.

Government Initiatives Supporting MSME Digitalization

Governments worldwide have introduced policies and programs to promote digital transformation among MSMEs.

In India, notable initiatives include:

1. Digital India Programme
2. Udyam Registration Portal
3. Government e-Marketplace
4. Digital Payment Promotion Schemes
5. MSME Champions Portal
6. Startup India Initiative

These initiatives aim to improve digital access, financial inclusion, and technological adoption among small enterprises.

Recommendations

To accelerate the digital transformation of Micro, Small, and Medium Enterprises (MSMEs), a comprehensive and collaborative approach is essential. Policymakers, financial institutions, technology providers, and business owners must work together to create an environment that supports the adoption of digital technologies and promotes sustainable economic growth.

1. Strengthening Digital Infrastructure

The development of robust digital infrastructure is a fundamental requirement for successful digital transformation. Governments should prioritize the expansion of high-speed broadband networks and reliable internet connectivity, particularly in rural and underserved regions. Improved digital infrastructure will enable MSMEs to access online markets, adopt cloud-based technologies, and participate more effectively in the digital economy.

2. Enhancing Digital Literacy

Digital transformation can only be successful when entrepreneurs and employees possess the necessary technological skills. Therefore, regular training and capacity-building programs should be organized to improve digital literacy among MSME stakeholders. Such initiatives can help business owners understand the benefits of digital technologies and equip employees with the skills required to operate modern digital tools and platforms efficiently.

3. Facilitating Access to Finance

Financial constraints remain one of the major barriers to technology adoption among MSMEs. To address this challenge, governments and financial institutions should introduce specialized credit facilities, low-interest loans, and technology adoption grants. These financial support mechanisms can reduce the cost burden associated with digital investments and encourage businesses to modernize their operations.

4. Promoting Cybersecurity Awareness

As businesses increasingly rely on digital systems, the risk of cyber threats also grows. It is therefore important to create awareness about cybersecurity practices among MSME owners and employees. Governments, industry associations, and technology providers should conduct awareness campaigns and offer affordable cybersecurity solutions to help small businesses protect their digital assets, customer information, and business operations from potential cyberattacks.

5. Encouraging Public-Private Partnerships

Public-private partnerships can play a significant role in accelerating digital transformation initiatives. Collaboration between governments, technology companies, educational institutions, and financial organizations can facilitate the sharing of expertise, resources, and innovative solutions. Such partnerships can support the development of digital ecosystems that enable MSMEs to adopt advanced technologies and enhance their competitiveness in both domestic and international markets.

Conclusion

Digital transformation has emerged as a critical factor influencing the growth and competitiveness of MSMEs. The adoption of digital technologies enables enterprises to enhance productivity, improve customer engagement, access wider markets, and innovate continuously. Consequently, digitally empowered MSMEs contribute significantly to economic growth through increased output, employment generation, and global competitiveness. However, realizing the full potential of digital transformation requires overcoming barriers related to finance, infrastructure, skills, and cybersecurity. Policymakers, industry stakeholders, and educational institutions must work collaboratively to create an enabling ecosystem that supports digital adoption among MSMEs. Such efforts will not only strengthen the MSME sector but also contribute to sustainable and inclusive economic development.

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Original Article

AI-Enabled Digital Transformation and Inclusive Tourism Development: The Role of Inbound Tour Operators in Coastal Karnataka

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Abstract

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The tourism sector is experiencing a paradigm shift through the integration of Artificial Intelligence (AI), digital technologies, and smart tourism innovations. Inbound tour operators serve as vital intermediaries, connecting domestic and international tourists with destinations by facilitating travel planning, marketing, and service coordination. In Coastal Karnataka—renowned for its beaches, cultural heritage, temples, eco-tourism, and rural tourism potential—AI-enabled digital transformation offers opportunities to enhance accessibility, operational efficiency, and inclusive development. This conceptual paper investigates how inbound tour operators leverage AI technologies to advance inclusive tourism development and proposes a framework linking AI adoption, digital transformation, service innovation, tourist satisfaction, and sustainable outcomes. The study contributes to tourism scholarship by illustrating how technology-driven ecosystems can foster sustainable and inclusive regional growth within India's evolving digital economy.

Keywords: Artificial Intelligence, Digital Transformation, Inclusive Tourism, Inbound Tour Operators, Coastal Karnataka, Smart Tourism, Sustainable Tourism Development

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Introduction

The global tourism sector is increasingly shaped by digital transformation, where technologies such as Artificial Intelligence (AI), machine learning, chatbots, predictive analytics, and smart tourism platforms redefine how destinations are marketed, travel is planned, and services are delivered. These innovations enable tourism businesses to enhance operational efficiency, strengthen competitiveness, and provide personalized experiences for diverse visitor segments. Within this evolving landscape, inbound tour operators act as crucial intermediaries, bridging tourists and destinations by facilitating travel planning, customer engagement, and service coordination. Their adoption of AI-driven tools—ranging from smart booking systems to digital marketing platforms—positions them as catalysts of transformation in regional tourism ecosystems. Coastal Karnataka, comprising Dakshina Kannada, Udupi, and Uttara Kannada districts, offers a rich mosaic of tourism resources: pristine beaches, pilgrimage centers, cultural heritage sites, rural villages, and eco-tourism attractions. Despite this potential, challenges persist in accessibility, information dissemination, community participation, and inclusive development. These gaps hinder the region's ability to fully leverage its tourism assets for sustainable growth. AI-enabled digital transformation provides a pathway to address these challenges by enhancing destination visibility, delivering real-time information, and fostering inclusive participation among local communities. By integrating intelligent systems into tourism operations, inbound tour operators can not only improve tourist satisfaction but also contribute to inclusive tourism development through employment generation, rural entrepreneurship, and community empowerment. This paper examines the role of inbound tour operators in facilitating AI-driven tourism transformation in Coastal Karnataka. It proposes a conceptual framework that links AI adoption, digital transformation, service innovation, tourist satisfaction, and inclusive development, thereby contributing to the discourse on sustainable and technology-enabled tourism growth in India.



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Review of Literature

The tourism industry has experienced substantial transformation due to advancements in Artificial Intelligence (AI), digital technologies, and smart tourism systems. Digital transformation has reshaped tourism operations, marketing strategies, customer engagement, and destination management. Inbound tour operators, as intermediaries between tourists and destinations, increasingly utilize AI-driven technologies to enhance service quality and destination competitiveness. In the context of Coastal Karnataka, a region rich in natural, cultural, religious, and rural tourism resources, AI-enabled digital transformation offers significant opportunities for promoting inclusive tourism development. This literature review synthesizes existing studies related to AI in tourism, digital transformation, inbound tour operations, tourism innovation, and inclusive tourism development.

Artificial Intelligence in Tourism

Artificial Intelligence has emerged as a transformative force in the tourism and hospitality industry. According to Buhalis and Leung (2018), AI applications such as chatbots, virtual assistants, recommendation systems, and predictive analytics significantly improve customer service and operational efficiency. AI enables tourism businesses to process large volumes of data, understand consumer preferences, and provide personalized travel experiences.

Research by Tussyadiah (2020) highlights that AI enhances tourists' decision-making processes through intelligent travel recommendations and automated customer support. Similarly, studies indicate that machine learning algorithms improve destination marketing by predicting tourist demand and identifying market trends.

The integration of AI technologies contributes to cost reduction, improved service delivery, and enhanced tourist satisfaction, making it a critical component of modern tourism development.

Digital Transformation in Tourism

Digital transformation refers to the adoption and integration of digital technologies into organizational processes, products, and services. According to Vial (2019), digital transformation fundamentally changes business operations and value creation mechanisms.

In tourism, digital transformation includes online booking systems, mobile applications, social media marketing, cloud computing, big data analytics, and smart tourism platforms. Research by Gretzel et al. (2015) suggests that digital transformation creates interconnected tourism ecosystems where stakeholders exchange information in real time. (1)

Digital platforms facilitate communication between tourists, tour operators, accommodation providers, and destination management organizations. These technologies improve accessibility, transparency, and efficiency throughout the tourist journey.

The emergence of smart tourism destinations demonstrates how digital transformation enhances destination competitiveness through technology-driven service innovations.

Smart Tourism and Technology Adoption

The concept of smart tourism emerged from the broader framework of smart cities and information communication technologies (ICTs). Smart tourism involves the integration of advanced technologies to improve tourism experiences and destination management.

According to Gretzel et al. (2015), smart tourism destinations use sensors, mobile technologies, artificial intelligence, and data analytics to provide personalized services and real-time information. (1)

The Technology Acceptance Model developed by Fred Davis (1989) explains that perceived usefulness and ease of use significantly influence technology adoption. In the tourism sector, tour operators are more likely to adopt AI technologies when they perceive clear benefits in customer service, marketing effectiveness, and operational efficiency. Innovation Diffusion Theory proposed by Everett Rogers (2003) further explains how technological innovations spread among tourism stakeholders, influencing the adoption of smart tourism practices. (2)

Role of Inbound Tour Operators in Tourism Development

Inbound tour operators play a crucial role in destination promotion, itinerary planning, transportation coordination, accommodation arrangements, and customer support services.

According to the United Nations Tourism, inbound tour operators serve as destination ambassadors by connecting international tourists with local tourism products and services. They facilitate market access for local businesses and contribute significantly to destination competitiveness.

Research by Middleton (2012) emphasizes that tour operators influence tourist perceptions through packaging, branding, and destination marketing strategies. Their role extends beyond travel arrangements to include experience design, customer relationship management, and service quality assurance. (3)

In the digital era, inbound tour operators increasingly rely on online platforms, AI-powered customer service systems, and data analytics to meet evolving tourist expectations.

AI and Inbound Tour Operators

Recent studies suggest that AI technologies can significantly enhance the effectiveness of inbound tour operators. AI chatbots provide instant customer support, while machine learning algorithms enable personalized travel recommendations based on tourists' preferences and behavior.

Research by Li et al. (2019) found that AI applications improve customer engagement and operational efficiency in tourism organizations. Predictive analytics helps tour operators forecast demand patterns, optimize pricing strategies, and manage resources effectively. (4)

Virtual assistants and automated booking systems reduce transaction costs and improve service speed. Furthermore, AI-powered digital marketing tools facilitate targeted promotional campaigns, increasing destination visibility in competitive tourism markets.

These technological advancements position inbound tour operators as critical facilitators of digital transformation within tourism ecosystems.

Tourism Service Innovation

Service innovation refers to the development and implementation of new ideas, processes, and technologies that enhance customer experiences and organizational performance.

According to Hjalager (2010), innovation in tourism includes product innovation, process innovation, marketing innovation, and organizational innovation. AI-enabled technologies contribute to all these dimensions by enabling customized services, real-time communication, and efficient resource utilization. (5)

Tourism service innovation is particularly important in creating personalized travel experiences. Through AI-driven data analysis, tourism organizations can tailor products and services to individual tourist preferences, increasing satisfaction and loyalty.

Research consistently demonstrates that innovative tourism services contribute to destination competitiveness and sustainable tourism growth.

Inclusive Tourism Development

Inclusive tourism emphasizes equitable participation and benefit-sharing among all stakeholders, including local communities, women, youth, rural entrepreneurs, and marginalized populations.

The United Nations Sustainable Development Goals highlight tourism's potential contribution to inclusive economic growth, employment generation, and poverty reduction. Inclusive tourism ensures that tourism benefits are distributed fairly across communities while preserving cultural and environmental resources. (6)

According to World Bank (2022), inclusive tourism promotes local entrepreneurship, community empowerment, and social inclusion. Community-based tourism initiatives enable residents to participate directly in tourism activities and benefit from tourism revenues. (7)

Digital technologies further support inclusivity by providing wider market access, facilitating digital entrepreneurship, and improving information accessibility.

Women Entrepreneurship and Rural Tourism

Women entrepreneurs play an increasingly important role in tourism development, particularly in rural areas. Tourism provides opportunities for women to engage in hospitality services, handicrafts, cultural tourism, homestays, and food-related enterprises.

Studies by UN Women indicate that tourism can promote gender equality by creating employment and entrepreneurial opportunities for women. (8)

In rural tourism contexts, digital technologies enable women entrepreneurs to access broader markets through online platforms and digital marketing tools. AI-driven business solutions can further enhance their competitiveness and income generation potential.

Tourism Development in Coastal Karnataka

Coastal Karnataka, comprising the districts of Dakshina Kannada, Udupi, and Uttara Kannada, possesses diverse tourism assets including beaches, temples, cultural heritage sites, wildlife attractions, and rural tourism destinations.

Researchers have identified significant potential for sustainable tourism growth in the region. However, challenges remain in destination promotion, digital infrastructure, service quality, and community participation.

The adoption of AI-enabled tourism technologies can strengthen destination marketing, improve tourist experiences, and support local economic development. Inbound tour operators can play a pivotal role in integrating local tourism products into digital tourism platforms and expanding market reach.

Furthermore, AI-enabled digital transformation can enhance rural tourism development by improving accessibility, providing real-time information, and supporting community-based tourism initiatives.

Research Gap

Although existing scholarship has extensively examined AI applications, digital transformation, tourism innovation, and inclusive tourism development, several critical gaps remain:

1. **Limited integration studies:** Few works explicitly connect AI technologies with measurable inclusive tourism outcomes.
2. **Scarcity of operator-focused research:** The mediating role of inbound tour operators in AI-driven tourism transformation has received minimal scholarly attention.
3. **Regional neglect:** Research on AI-enabled tourism development in emerging destinations such as Coastal Karnataka remains underrepresented.

4. **Unexplored relationships:** The interplay between AI adoption, service innovation, and inclusive development is insufficiently theorized.
5. **Framework deficiency:** There is a lack of comprehensive conceptual models linking AI-enabled digital transformation, inbound tour operators, and inclusive tourism development.

Objectives of the Study

1. To examine the role of AI-enabled digital transformation in tourism development.
2. To analyze the contribution of inbound tour operators to destination competitiveness.
3. To explore the relationship between AI adoption and inclusive tourism development.
4. To propose a conceptual framework for AI-enabled inclusive tourism development in Coastal Karnataka.

Conceptual Framework



Layer 1 – AI Technologies: AI chatbots, machine learning, predictive analytics, smart booking systems, virtual assistants, digital marketing platforms.

Layer 2 – Inbound Tour Operators' Functions: destination marketing, CRM, personalized travel planning, information dissemination, service coordination, smart tourism integration.

Layer 3 – Tourism Service Innovation: customized experiences, improved accessibility, real-time information, efficient resource management, enhanced tourist satisfaction.

Layer 4 – Inclusive Tourism Development: community participation, employment generation, women entrepreneurship, rural tourism development, local economic growth, sustainable tourism practices.

Implications

Theoretical Implications

1. Extends existing scholarship on AI in tourism by linking technological adoption with inclusive development outcomes.
2. Integrates concepts of digital transformation and inclusive tourism into a unified framework.
3. Provides a conceptual model that can guide future empirical studies and comparative analyses.

Practical Implications

1. Offers actionable insights for inbound tour operators to adopt AI technologies for enhanced efficiency and competitiveness.
2. Supports tourism businesses in leveraging smart tourism platforms to improve customer engagement and service delivery.
3. Encourages community-based tourism participation by integrating digital tools into local entrepreneurship and rural tourism initiatives.

Policy Implications

1. Highlights the need for investment in digital infrastructure to enable AI adoption in rural and coastal regions.
2. Recommends capacity-building programs for tourism stakeholders to strengthen digital literacy and innovation.
3. Advocates for AI literacy initiatives targeting entrepreneurs and small operators.
4. Promotes the formulation of smart and inclusive tourism policies that align with sustainable development goals.

Conclusion

AI-enabled digital transformation offers transformative opportunities to strengthen tourism competitiveness and advance inclusive development in Coastal Karnataka. By adopting intelligent technologies, inbound tour operators can act as pivotal facilitators of innovation, bridging tourists with destinations while fostering community engagement. The proposed conceptual framework illustrates how AI integration through chatbots, predictive analytics, smart booking systems, and digital platforms can simultaneously enhance tourist experiences and generate socio-economic benefits for local communities. This study contributes to tourism scholarship by linking AI adoption with service innovation and inclusive outcomes, positioning Coastal Karnataka as a potential model for sustainable smart tourism ecosystems. Future empirical research is essential to validate these conceptual relationships, offering evidence-based insights for policymakers, operators, and communities to harness AI for long-term regional growth.

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Original Article

New Media and Its Transparency: Demarginalizing Information Flows In the Digital Age

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This study examines the transformative role of new media in promoting structural transparency and democratizing political discourses. By breaking down conventional informational monopolies, digital spaces allow historically marginalized groups and alternative perspectives to bypass institutional gatekeepers, creating decentralized information pathways. Operating within a framework of critical information literacy and democratic representation theories, this paper analyzes how digital counter-narratives challenge entrenched hegemonies and foster systemic accountability. However, the democratizing potential of new media is significantly complicated by algorithmic biases, localized governance frameworks, and data commercialization, which often introduce hidden layers of distortion. Through a comprehensive conceptual review, this research addresses the double-edged nature of digital transparency, exploring both its capacity for structural empowerment and the systemic vulnerabilities that limit genuine information neutrality. The paper concludes by emphasizing the critical need for democratic algorithmic regulation and robust media literacy frameworks to preserve the open, egalitarian nature of digital public spheres.

Keywords: New media, structural transparency, information flows, demarginalization, algorithmic bias, digital public sphere.

Introduction

The evolution of the digital landscape has fundamentally altered communication structures, shifting the nature of information exchange from centralized, broadcast-dominated channels to highly networked public spheres. In traditional political communication frameworks, mass media operated as exclusive structural gatekeepers. Editorial boards, corporate conglomerates, and state-aligned institutions maintained absolute authority over the parameters of political discourse, effectively deciding which issues gained visibility and which perspectives were excluded. This dynamic created structural marginalization, relegating non-hegemonic views, local resistance movements, and subaltern groups to peripheral status. The advent of new media—encompassing open digital platforms, decentralized social networks and collaborative web architectures—has structurally disrupted these historical paradigms by lowering operational barriers to entry and enabling multi-directional, peer-to-peer communication pathways. Central to this structural transformation is the concept of digital transparency. In its idealized iteration, new media introduces institutional visibility, allowing citizens to bypass corporate and administrative filters to monitor state activity, expose corruption, and share alternative views. This creates what media theorists identify as a "demarginalization of information flows," where localized content, subaltern resistance movements, and citizen journalism can scale globally without institutional validation. However, this democratizing potential exists alongside profound systemic challenges. While digital architectures dismantle traditional gatekeeping structures, they introduce new, opaque regulatory mechanisms in the form of corporate algorithmic curation, localized digital censorship, and data-driven commercialization. Consequently, true information neutrality remains elusive, as information spaces become battlegrounds where democratic empowerment and technological control constantly intersect.



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Theoretical framework: democratic accountability and critical literacy

This study anchors itself in critical media theories and democratic accountability frameworks to analyze how digital transformations reshape power dynamics. Historically, political systems rely on public spheres to facilitate deliberation, enforce transparency, and maintain institutional checks and balances. Traditional models assumed a uniform public sphere; however, feminist and critical media scholars have long demonstrated that media spaces function as contested battlegrounds where symbolic power is negotiated. Entrenched representation systems often rely on structural exclusions that favor institutional rationality over marginalized perspectives, establishing ideological boundaries that systematically limit true democratic engagement. To unpack the structural dynamics of digital communication, this paper draws upon the conceptual principles of critical information literacy. As established in contemporary adaptations of media and library science axioms, information within any socio-political context is inherently a social construction, embedded with institutional biases and subjective cultural values. Information, knowledge systems, and public messages are rarely value-neutral or fully detached from structural motivations. Therefore, viewing media literacy as a simple set of technical skills is structurally inadequate; it must be understood as an ongoing, dynamic critical awareness. In the digital environment, this requires looking beyond visible surface content to actively interrogate the underlying structural policies, commercial models, and technological frameworks that govern how digital files and socio-political narratives are produced, distributed, and restricted.

Dismantling institutional monopolies and demarginalization

The primary democratic contribution of new media lies in its capacity to break down institutional information monopolies. Under traditional media regimes, structural gatekeeping operated linearly, allowing administrative, political, and economic elites to exercise absolute control over public narratives. This dynamic often suppressed critical research, social movements, and regional grievances, as mainstream channels prioritized elite consensus. New media alters this balance of power by transitioning communication architectures from a "one-to-many" broadcast model to a decentralized "many-to-many" network configuration.

This structural shift enables the demarginalization of information flows across three distinct dimensions:

1. *Hyper-localized visibility*: social movements and grassroots campaigns can bypass regional or national media blockades by broadcasting live updates directly to domestic and international audiences, forcing human rights issues and administrative accountability into the mainstream consciousness.

2. *Disruption of elite narratives*: subaltern communities use digital platforms to construct independent counter-narratives that directly contest paternalistic or corporate framing, asserting their political agency and reclaiming historical narratives.

3. *Decentralized knowledge production*: digital archives and collaborative open-access spaces ensure that investigative reports, whistleblowing disclosures, and critical research remain publicly available, bypassing institutional barriers that seek to limit transparency.

Consequently, digital platforms provide essential tools for political mobilization, allowing scattered groups to discover shared struggles, coordinate collective actions, and challenge entrenched policy directions without requiring massive material infrastructure.

The paradox of digital transparency: algorithmic gatekeeping

Despite its capacity for political demarginalization, new media does not automatically guarantee objective transparency. Instead, the democratization of communication is bounded by a significant structural paradox: as traditional institutional gatekeepers lose their monopoly, they are rapidly replaced by automated, corporate-controlled algorithmic curation systems. Modern digital spaces are not open public squares; they are proprietary platforms governed by sophisticated optimization algorithms designed to maximize platform engagement and commercial monetization. This shift introduces invisible, systemic distortions that compromise the neutrality of public information flows.

Algorithmic systems are deeply shaped by human engineering choices, commercial parameters, and data-driven norms, from their initial conceptualization through to global deployment. Because these development decisions are typically made in isolation by private technology corporations—without considering the diverse socio-political contexts in which they will operate—the underlying models remain hidden from the public. This lack of transparency prevents users from understanding how information is filtered, prioritized, or suppressed. Rather than fostering open deliberation, engagement-driven algorithms frequently create polarized echo chambers, amplify sensationalized misinformation, and systematically downrank nuanced or non-commercial localized content. This creates a secondary layer of marginalization, where corporate algorithms quietly restrict the visibility of critical political discourses under the guise of neutral technical optimization.

Institutional resistance, censorship, and the illusion of openness

In response to the decentralization of information, state institutions and corporate monopolies have developed sophisticated strategies to reassert control over the digital sphere. While open communication legislation is frequently promoted as a tool for public accountability and civic empowerment, absolute transparency often operates as a public myth. Governments and administrative bodies frequently employ legal, technological, and bureaucratic mechanisms to

restrict information flows, utilizing administrative gatekeeping to protect institutional interests from critical public scrutiny.

This institutional resistance manifests through several clear mechanisms:

1. *Targeted content censorship*: authoritarian and illiberal regimes deploy advanced firewalls, deep-packet inspection, and localized internet shutdowns to physically sever digital information networks during periods of active political mobilization.

2. *Legal and administrative barriers*: the strategic use of national security laws, overly broad defamation statutes, and bureaucratic restrictions allows states to penalize independent digital journalists, whistleblowers, and political activists.

3. *Data commercialization and surveillance capitalism*: the monetization of user data transforms digital environments into corporate surveillance ecosystems. This allows state intelligence apparatuses and private actors to track political dissent, map activist connections, and deploy targeted counter-intelligence measures.

These dynamics show that while new media offers unprecedented opportunities for structural transparency, it simultaneously introduces powerful tools for surveillance and discourse manipulation, turning the digital public sphere into a contested space of ongoing political struggle.

Conclusion and policy recommendations

New media represents a profound structural shift in the contemporary political architecture, providing marginalized groups with unprecedented mechanisms to bypass traditional institutional gatekeepers and establish open information pathways. The demarginalization of these information flows has significantly enhanced democratic accountability, allowed hyper-localized struggles to achieve global visibility, and enabled the creation of vital digital counter-narratives. However, this democratizing potential remains constrained by corporate algorithmic curation, state surveillance, and persistent structural biases embedded within proprietary technological platforms. Genuine transparency cannot be achieved through tech-utopian assumptions; it requires continuous, systematic intervention to protect the integrity of the digital public sphere.

To preserve the open and egalitarian nature of digital information flows, this study proposes the following policy interventions:

1. *Mandatory algorithmic auditing*: regulatory frameworks must require large technology platforms to provide complete transparency regarding their content curation models, ensuring that optimization algorithms do not systematically suppress critical political discourse or marginalized perspectives.

2. *Decentralized public architectures*: governments and civil society organizations should invest in and protect non-commercial, decentralized digital communication infrastructures that operate independently of corporate profit motives and state surveillance apparatuses.

3. *Comprehensive critical information literacy*: educational institutions should reform media curricula to integrate critical information literacy, training citizens to systematically analyze algorithmic structures, recognize corporate data collection practices, and identify institutional misinformation.

4. *Protection of digital civic spaces*: international legal standards must be strengthened to classify open internet access as a fundamental human right, penalizing arbitrary network shutdowns and protecting digital journalists, activists, and whistleblowers from state overreach.

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Original Article

E-Commerce and Digital Marketing Strategies for Sustainable Business Growth in Tier-II Cities: A Study of North Karnataka

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Abstract

With the rapid growth of e-commerce and digital marketing, India's business landscape has undergone a transformation, especially in Tier-II cities where the internet and smartphone penetration have surged significantly. The cities of North Karnataka, including Hubballi, Dharwad, Belagavi, Haveri, Gadag and Vijayapura, have turned into a developing business hub with digital business opportunities. The present study is designed to explore the contribution of e-commerce and digital marketing in sustainable growth of business among the enterprises of Tier-II cities in North Karnataka. The study is oriented towards digital platforms, social media marketing, customer engagement online, digital payment systems and logistics support affecting business growth and sustainability. Descriptive research design has been used with secondary data and information from reports. The results show that companies using digital marketing and online commerce see a boost in market penetration, customer loyalty, business efficiency, and profits. This research also points out obstacles like digital literacy, logistics and cybersecurity issues. Notwithstanding these constraints, digital transformation has been a force for the creation of employment and entrepreneurship and for regional economic growth. It is concluded that effective digital marketing strategies with sustainable business practices can be used to enhance the competitiveness of the business in Tier-II cities of North Karnataka.

Keywords: E-Commerce, Digital Marketing, Business, North Karnataka, Tier-II

Introduction

With the advent of Digital technologies, the global business landscape has changed considerably and digital marketing and e-commerce has grown significantly. The advent of internet connectivity, cheap smartphones, e-payment methods, etc., has helped online business practices grow in Indian cities and semi-urban areas. In the past, the e-commerce market was mostly dominated by the metros, however, in recent years Tier-II cities have emerged as significant stakeholders in the Indian digital economy. These cities have a developing consumer base, rising purchasing power and expanding entrepreneurial activities, which can lead to sustainable business development. North Karnataka is one of the most important economic regions having emerging commercial centres like Hubballi-Dharwad, Belagavi, Vijayapura, Gadag, Haveri and Ballari. Online marketing strategies like social media advertising search engine optimization; influencer marketing, email marketing, and online marketplaces are also gaining popularity among businesses in these areas for better customer engagement and market access. With the advent of the e-commerce industry, businesses, retailers, and small-scale industries have had the opportunity to sell beyond their geographical boundaries. This change has led to new possibilities of sustainable business, job creation and economic growth in Tier-II cities. With the evolving customer landscape and increased spending habits on the Internet, digital marketing is a crucial component of any marketing plan. The convenience, availability of products, price comparison and the use of digital payment systems are among the many reasons why more and more customers choose online shopping. As a result, companies are investing in their websites, mobile applications, social media and customer relationship management systems to remain competitive. Digital technologies also play a role in helping to reduce the cost of physical infrastructure, reduce paper consumption and enhance supply chain efficiency, helping to promote environmentally sustainable practices.

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The initiatives by the Government of India like Digital India, Startup India, UPI based payment systems, digitalisation of MSMEs etc. have also boosted the development of digital businesses in small cities. Research shows that MSMEs leveraging digital technologies are more productive, selling more and becoming more efficient. Many businesses in North Karnataka are making the transition from traditional marketing techniques to digital platforms to continue to thrive in today's intensely competitive environment. Even with the opportunities, Tier-II cities' businesses are still facing a number of challenges such as lack of digital literacy, poor logistics infrastructure, cybersecurity threats, and low technological awareness. Financial constraints and a lack of technical skills are two common problems limiting the use of cutting-edge digital strategies for many small businesses. Moreover, rural and semi-urban consumers have trust issues with regard to online transactions and the quality of products. In the context of this, the present work tries to understand the role of e-commerce and digital marketing strategies in the promotion of sustainable business growth in Tier-2 cities of North Karnataka. Digital business practices and their opportunities and challenges to regional economic development are highlighted.

Review of Literature

Bhatia-Kalluri (2021) explored the role of e-commerce with the rural micro entrepreneurs in India. The study concluded that digital marketplaces can help improve market access and economic opportunities for businesses, thus making them more sustainable. But the lack of infrastructure and information is widespread challenges for small businesses to use e-commerce technologies effectively. 3. Nosratabadi et al. (2019) reviewed sustainable business models in various industries and highlighted the importance of digital technologies in achieving economic and environmental sustainability. It was found that SDP models help organizations to create sustainable long-term performance and assist in innovation-driven growth. The study conducted by Almtiri, Miah and Noman (2021) investigated the effect of e-commerce technologies on the operations of SMEs. The study noted that digital business platforms can have an enormous impact on productivity, customer interaction and operational efficiency of SMEs. According to 4. Economic Times Report (2025), over 73% of MSMEs in semi-urban and rural India saw an increase in their businesses following digitalization. The two areas that were identified as driving business growth were UPI payments and operations through smartphones. According to the Economic Times 2026, Tier-II and Tier-III cities are becoming a key player in the growth of e-commerce in India. Better logistics, Internet access, and digital payment has driven an increasing number of online transactions and business opportunities in small cities. According to the 6. TeamLease Employment Outlook Report (2025), the e-commerce and digital retail industries are creating significant job creation opportunities in Tier-II cities. The report highlighted the contribution of digital business growth to regional economic growth and the expansion of entrepreneurs.

Objectives of the Study

1. To examine the role of e-commerce in promoting sustainable business growth in Tier-II cities of North Karnataka.
2. To analyze the impact of digital marketing strategies on customer engagement and market expansion.
3. To identify the opportunities and challenges faced by businesses in adopting digital platforms.

Results of the study

Role of E-Commerce in Sustainable Business Growth

E-commerce has played a significant role in the growth of businesses in tier-II cities of North Karnataka, as it has helped businessmen reach the markets beyond their city boundaries. Internet marketplaces have cut costs of operation and made businesses more efficient. Amazon, Flipkart and local e-commerce platforms are helping small retailers and entrepreneurs boost their sales and customer base. The development of digital payment options such as UPI has boosted customer confidence and ease of online transactions. The rise of e-commerce has also created job opportunities in the logistics, delivery, and digital support industries. Online sales channels are more effective at generating revenue and sustaining a business model than offline sales.

Impact of Digital Marketing Strategies

The way customers are connected with and marketed in Tier-II cities is significantly changed by digital marketing strategies. Social media likes Facebook, Instagram, and WhatsApp are now being increasingly used by businesses to promote their products and engage with customers. The use of SEO, influencers and email marketing has improved brand visibility and customer engagement. The digital marketing offers affordable advertising chances for companies that have restricted budgeting for promotions. Collecting and addressing customer feedback, as well as tailoring marketing strategies, enhances satisfaction and loyalty. Digital marketing strategies have helped companies to be competitive in the regional and national markets and promotes long-term sustainability and growth.

Opportunities and Challenges in Digital Adoption

Digital business transformation provides a number of opportunities such as greater market access, business efficiency, lower marketing expenses, and job creation. The government has also taken several steps to promote digital infrastructure and digitalization for MSMEs, leading to further growth of businesses in Tier-II towns. But companies are struggling with electronic illiteracy, cybersecurity worries, poor supply chain and technological constraints. Small businesses may not have the funds and the know-how to make use of superior digital systems. Then there are consumer

worries about online fraud and product quality that also play a role in digital business adoption. Despite the difficulties, the increasing acceptance of digital platforms suggests good business development potential in the future in the region of North Karnataka.

Conclusion

The study has found that e-commerce and digital marketing strategies are important in the process of sustainable business growth in Tier-II cities of the North Karnataka region. Digital technologies have allowed businesses to reach new markets, engage with customers in new ways, cut costs and boost business efficiency. The popularity of smart phones, digital payment, and online marketplaces have continued to drive entrepreneurial growth and regional economic development. In today's digital age, digital marketing tools have emerged as a must-have for businesses to stay competitive and build customer relationships. While some obstacles, including lack of digital literacy, logistics problems, and cybersecurity threats, persist within the enterprise, the positive effects of digital transformation persist. Growing consumer awareness, enhanced internet connectivity and government support are also bolstering digital business ecosystems in smaller cities. Thus, the successful application of e-commerce and digital marketing can help businesses in Tier-II cities of North Karnataka to sustain growth and maintain competitiveness in the long run.

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Original Article

Evolution and Contemporary Developments of Commodity Futures Markets in India

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Commodity futures markets play a crucial role in price discovery, risk management, and efficient resource allocation in both agricultural and non-agricultural sectors. India has witnessed a significant transformation from traditional forward trading to modern electronic commodity derivative exchanges operating under an evolving regulatory framework. This paper examines the historical evolution and contemporary developments of commodity futures markets in India, highlighting key milestones such as the Forward Contracts (Regulation) Act, 1952, the establishment of the Forward Markets Commission, and its merger with the Securities and Exchange Board of India (SEBI) in 2015. It also discusses recent advancements, including electronic warehouse receipts, commodity options, digital trading platforms, and improved market surveillance. The study identifies major challenges such as fragmented spot markets, infrastructure gaps, regulatory issues, and global price volatility, and concludes that continued policy reforms, technological innovation, and broader market participation are essential for strengthening India's commodity derivatives ecosystem and promoting sustainable economic growth.

Key words: Commodity Futures Market, Commodity Derivatives, Price Discovery, Risk Management, Commodity Exchanges, Electronic Warehouse Receipts, Agricultural Commodities

Introduction

It is widely believed that the futures trade first started about approximately 6,000 years ago in China with rice as the commodity. Basically commodity futures trading have evolved from the need for ensuring continuous supply of seasonal agricultural crops. Futures trade first started in Japan in the 17th century. In Japan, merchants used to store rice in warehouses for future use. In order to raise cash, warehouse holders sold receipts against the stored rice. These were known as "rice tickets". Eventually, such rice tickets became accepted as a kind of general commercial currency. Accordingly, rules came into being to standardize the trading in rice tickets. The first organized futures market was established in 1710 at the Dojima Rice Exchange in Osaka, Japan. Historically the concept of organized trading in commodity futures began in the United States of America (USA) in the middle of the 19th century with maize contracts at the Chicago Board of Trade (CBOT) and a bit later, cotton contracts in New York. In due course, Chicago had emerged as a major commercial hub with railroad and telegraphs lines connecting it with the rest of the world, thereby attracting wheat producers from Mid-West to sell their produce to the dealers and distributors. However, lack of organized storage facilities and the absence of a uniform weighing / grading mechanism often confined them to the mercy of dealer's discretion. This led to inherent need to establish a common meeting place; both for farmers and dealers to transact in "spot" grain - to deliver wheat and receive cash in return. This happened in 1848 when a central marketplace was opened where farmers and dealers could meet to deal in "cash" grain i.e., to exchange cash for immediate delivery of wheat.



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Farmers (sellers) and dealers (buyers) slowly started entering into contract for forward exchanges of grain for cash at some particular future date so that farmers could avoid taking the trouble of transporting and storing wheat (at very high costs) if the price was not acceptable. This system was suitable to farmers as well as dealers. The farmer knew how much he would be paid for his wheat, and the dealer knew his costs of procurement well in advance. Such forward contracts became common and were even used subsequently as collateral for bank loans.

The contracts slowly got “standardized” on quantity and quality of commodities being traded. They also began to change hands before the delivery date. If the dealer decided he didn't want the wheat, he would sell the contract to someone who needed it. Also, if the farmer didn't want to deliver his wheat, he could pass on his contractual obligation to another farmer. The price of the contract would go up and down depending on what was happening in the wheat market. If the weather was bad, supply of wheat would be less and the people who had contracted to sell wheat would hold on to more valuable contracts expecting to fetch better price; if the harvest was bigger than expected, the seller's contract would become less valuable since the supply of wheat would be more. Slowly, even those individuals who had no intention of ever buying or selling wheat began trading in these contracts expecting to make some profits based on their knowledge of the situation in the market for wheat. They were called speculators. They hoped to buy (long position) contracts at low price and sell them at high price or sell (short position) the contracts in advance for high price and buy later at a low price. This is how the futures market in commodities developed in the US. The hedgers began to efficiently transfer their market risk of holding physical commodity to these speculators by trading in futures exchanges. In the early 20th century, as communication and transportation became more advanced, centralized warehouses were built in the principal market centres to distribute goods more economically. Agricultural commodities were the most commonly traded, but it led to the fact that a market can flourish for any. In the 1870s and 1880s, the New York Coffee, Cotton and Produce Exchanges were born. The largest commodity exchanges in USA are the Chicago Board of Trade, the Chicago Mercantile Exchange, the New York Mercantile Exchange, the New York Commodity Exchange and the New York Coffee, Sugar and Cocoa Exchange. Worldwide there are major futures trading exchanges in over 20 countries including Canada, England, India, France, Singapore, Japan, Australia and New Zealand.

Leading Commodity Futures Markets in the World (Recent Trading Activity)

Rank	Commodity Exchange	Country	Major Commodities Traded	Recent Market Volume / Activity*
1	Chicago Mercantile Exchange (CME Group)	USA	Agricultural products, metals, energy, livestock, financial derivatives	One of the world's largest derivatives exchanges, processing billions of futures and options contracts annually.
2	Intercontinental Exchange (ICE)	USA / Global	Brent Crude, WTI, Natural Gas, Coffee, Sugar, Cotton	Reported a record 2.4 billion futures and options contracts traded in 2025 , including approximately 1.4 billion commodity contracts and record average daily commodity volumes.
3	London Metal Exchange (LME)	United Kingdom	Copper, Aluminium, Zinc, Nickel, Lead, Tin	Achieved record trading volumes in 2025 , with an average daily volume of approximately 717,000 futures and options lots , driven by heightened metals market volatility.
4	Shanghai Futures Exchange (SHFE)	China	Copper, Aluminium, Gold, Silver, Steel, Rubber	One of Asia's largest commodity derivatives exchanges with exceptionally high annual trading volumes across industrial metals and energy products.
5	Dalian Commodity Exchange (DCE)	China	Iron Ore, Soybeans, Corn, Palm Oil	Among the world's busiest agricultural and industrial commodity exchanges, handling billions of contracts annually.
6	Zhengzhou Commodity Exchange (ZCE)	China	Wheat, Cotton, Sugar, Rapeseed, PTA	Major agricultural commodity exchange with substantial annual trading activity and strong domestic participation.
7	Multi Commodity Exchange of India (MCX)	India	Gold, Silver, Crude Oil, Natural Gas, Base Metals	India's largest commodity derivatives exchange and the dominant platform for bullion and energy derivatives trading.
8	National Commodity & Derivatives Exchange (NCDEX)	India	Agricultural Commodities	India's leading agricultural commodity derivatives exchange specializing in agri-futures and options.

Evolution Commodity Futures Markets in India:

The history of commodity futures trading in India dates back several centuries, with organized futures trading commencing in 1875 through the establishment of the Bombay Cotton Trade Association, which introduced standardized cotton futures contracts. Following the success of cotton trading, organized futures markets expanded to oilseeds, bullion, jute, spices, and other agricultural commodities through institutions such as the Bombay Cotton Exchange, Gujarati Vyapari Mandali (later Bombay Commodity Exchange), East India Cotton Association (EICA), and Calcutta Hessian Exchange. By the early twentieth century, commodity exchanges had become important centres for facilitating trade in agricultural and commercial commodities across different regions of the country. The outbreak of the Second World War in 1939 marked a significant setback for commodity futures trading, as the government-imposed restrictions and bans on several commodities to control speculation and stabilize prices. Following India's independence, commodity futures regulation became the exclusive responsibility of the Central Government under the Union List of the Constitution. A major institutional milestone was the enactment of the Forward Contracts (Regulation) Act, 1952, followed by the establishment of the Forward Markets Commission (FMC) in 1953 as the statutory regulator for commodity futures markets. Despite these developments, concerns over inflation and shortages resulted in repeated restrictions and bans on futures trading in several essential commodities during the 1960s and 1970s.

Several expert committees, including the Shroff Committee (1950), Dantwala Committee (1966), Khusro Committee (1980), and Kabra Committee (1994), recommended the gradual revival and modernization of commodity futures markets. Economic liberalization initiated in 1991 created renewed momentum for market-oriented reforms, leading to policy changes that encouraged transparent and competitive commodity trading. During the late 1990s and early 2000s, restrictions on several commodities were removed, and the National Agriculture Policy (2000) explicitly supported the expansion of futures trading as an instrument for efficient price discovery and risk management. The year 2002 marked the beginning of a new era with the establishment of modern, nationwide electronic commodity exchanges. The National Multi Commodity Exchange (NMCE) commenced operations in 2002, followed by the Multi Commodity Exchange of India Ltd. (MCX) and the National Commodity & Derivatives Exchange Ltd. (NCDEX) in 2003. These exchanges introduced electronic trading platforms, standardized contracts, nationwide market access, improved transparency, and enhanced participation from producers, traders, processors, exporters, and financial institutions.

A landmark reform occurred in 2015 when the Forward Markets Commission was merged with the Securities and Exchange Board of India (SEBI), creating a unified regulatory framework for securities and commodity derivatives markets. The integration significantly strengthened market surveillance, governance standards, investor protection mechanisms, and regulatory coordination while aligning India's commodity derivatives market with international best practices. The post-merger period has witnessed several structural and technological reforms. SEBI has introduced commodity options trading, expanded product offerings, strengthened risk management systems, and encouraged greater institutional participation. The implementation of the Electronic Negotiable Warehouse Receipt (e-NWR) system under the Warehousing (Development and Regulation) framework has improved transparency in warehouse operations and facilitated better integration between physical and derivatives markets. Digital trading infrastructure, algorithmic surveillance, real-time risk management systems, and improved settlement mechanisms have further enhanced market efficiency. In recent years, Indian commodity derivatives markets have increasingly focused on improving liquidity, expanding participation by farmers and producer organizations, strengthening warehousing and logistics infrastructure, and integrating with global commodity markets. The growing use of digital technologies, fintech innovations, artificial intelligence-based surveillance, and data analytics has further modernized trading practices. Commodity exchanges such as MCX and NCDEX continue to play a critical role in facilitating price discovery and risk management for precious metals, energy products, industrial metals, and agricultural commodities. Overall, the evolution of commodity futures markets in India reflects a gradual transition from fragmented regional exchanges and restrictive regulatory policies to a technologically advanced, nationally integrated, and professionally regulated market ecosystem. Continued policy reforms, technological innovation, and infrastructure development are expected to further strengthen the role of commodity derivatives in supporting economic growth, agricultural resilience, and financial market stability.

Commodities Derivatives Market in India for 2025-26 (₹ '000 Crore)

Total Agricultural turnover	79	13	13	13
Total Non-Agricultural turnover	47,806	6,996	7,311	7,263
Total Futures turnover	5,375	925	847	855
Total Options turnover	42,140	6,021	5,291	6,386

Source: SEBI Annual Report 2025.

From the Table, notable feature of the market is the rapid expansion of the options segment. **Total options turnover reached 42,140 (₹ '000 crore)**, with periodic values of **6,021, 5,291, and 6,386 (₹ '000 crore)**. The considerably higher turnover in options compared with futures indicates a growing preference among market

participants for option contracts, which provide greater flexibility and limited downside risk while enabling effective hedging and speculative strategies.

Overall, the data suggest that the Indian commodity derivatives market in 2025–26 is characterized by the overwhelming dominance of non-agricultural commodities and a clear shift towards options trading. The comparatively small share of agricultural commodities highlights the need for policy measures to deepen participation in agricultural derivatives, improve market liquidity, and strengthen risk management mechanisms for farmers and other stakeholders.

Table: Trends in Commodity Derivatives at NSE

Year / Month	No. of Trading days	Futures											
		Agriculture		Bullion		Energy		Metals		Total Futures		Open Interest at the end of the period	
		No. of contracts	Turnover (₹ crore)	No. of contracts	Turnover (₹ crore)	No. of contracts	Turnover (₹ crore)	No. of contracts	Turnover (₹ crore)	No. of contracts	Turnover (₹ crore)	No. of contracts	Value (₹ crore)
2024-25	258	0	0	197	47	3,647	203	0	0	3,844	250	20	1
2025-26\$	129	0	0	157	51	264108	5493	0	0	264265	5544	246	5

Options														
Year/ Month	No. of Trading days	Bullion						Energy						
		Call Options			Put Options			Call Options			Put Options			Notional Turnover (₹ crore)
		No. of contracts	Premium Turnover (₹ crore)	Notional Turnover (₹ crore)	No. of contracts	Premium Turnover (₹ crore)	Notional Turnover (₹ crore)	No. of contracts	Premium Turnover (₹ crore)	Notional Turnover (₹ crore)	No. of contracts	Premium Turnover (₹ crore)	Notional Turnover (₹ crore)	
2024-25	258	40,910	206	11,678	38,984	166	10,527	1,10,15,423	2,332	7,75,473	90,18,297	1,937	5,07,528	
2025-26\$	129	34,342	54	12,086	17,425	50	5,362	75,90,028	2,470	4,77,582	63,38,900	2,071	3,14,983	

Table: Trends in Commodity Derivatives at NCDEX

Futures												
Year/ Month	No. of Trading days	Agriculture		Agridex Index		Metals		Total Futures		Open Interest at the end of the period		Value (₹ crore)
		No. of contracts	Turnover (₹ crore)	No. of contracts	Turnover (₹ crore)	No. of contracts	Turnover (₹ crore)	No. of contracts	Turnover (₹ crore)	No. of contracts	Value (₹ crore)	
2024-25	248	35,85,600	1,35,620	0	0	16	1	35,85,616	1,35,621	52,433	1,987	
2025-26\$	125	16,53,154	60,642	0	0	0	0	16,53,154	60,642	41,524	1,545	

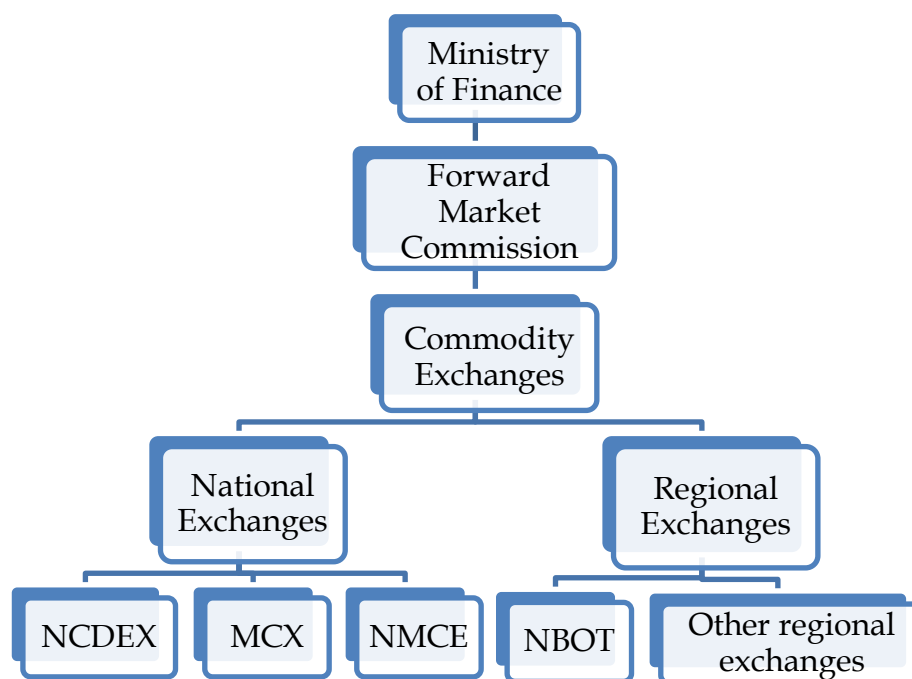
Year/ Month	No. of Trading days	Call Options			Put Options			Total Options			Open Interest of the
		No. of contracts	Premium Turnover (₹ crore)	Notional Turnover (₹ crore)	No. of contracts	Premium Turnover (₹ crore)	Notional Turnover (₹ crore)	No. of contracts	Premium Turnover (₹ crore)	Notional Turnover (₹ crore)	
2024-25	248	1,55,318	54	4,938	2,67,520	51	7,488	4,22,838	104	12,427	5,181
2025-26\$	125	2,38,898	28	6,446	4,35,525	30	10,871	6,74,423	58	17,317	1,153

The data clearly indicate that India's commodity derivatives market is witnessing continued growth and increasing participation, with distinct specialization across exchanges. NSE's commodity options market is heavily dominated by energy derivatives, reflecting strong liquidity and active risk management practices. In contrast, NCDEX

continues to serve as the principal platform for agricultural commodity futures, reinforcing its importance in agricultural price discovery and hedging.

The rise in options trading volumes, particularly on NCDEX during 2025–26, suggests increasing awareness and adoption of derivative instruments among market participants. Nevertheless, the concentration of trading in a limited number of commodity segments highlights the need for broader product diversification and enhanced market participation to strengthen the overall commodity derivatives ecosystem in India.

Structure of Commodity market in India



Why commodity futures market required:

India is among the top five producers of most of the commodities, in addition to being a major consumer of billion and energy products. Agriculture contributes about 25% to the GDP of the Indian economy. Its employees 60% of labor forces on a total of 165 million hectares of land. Agriculture sectors are important factors in achieving GDP growth of 8 to 10%. All this indicates that India can be promoted as a major center for trading of commodity derivatives. The policies of FMC during the most of 1950s to 1980s suppressed the very market it was supposed to encourage and nurture to grow with times. It was a mistake other emerging economics of the world would want to avoid. It is not in India alone that derivative was suspected of creating too much speculation that could be the determinant of the healthy growth of the market and the farmers. Such a suspicions might normally arise due to misunderstanding of the characteristics and role of derivatives product.

It is important to understand why commodities derivatives are required and the role they can play in risk management. It is common knowledge that price of commodities, metals, shares, and currency fluctuates over time. The possibility of adverse price changes in futures creates risk for business. Derivatives are used to reduce or eliminate price risk arising from unforeseen price changes. Futures and option trading therefore helps in hedging the price risk and also provided investment opportunity with speculator who is willing to assume risks for a possible return. Further, future trading and ensuring the discovery of price can help farmer for building competitive edge and enables to business to smoothen their earnings because non-hedging of the risk would increase the volatility of their quarterly earnings. Thus future and option market perform important function that cannot be ignored in modern business environment. At the same time, it is true that too much speculative activities in essential commodities would destabilize the market and therefore, these markets are normally regulated as per the law of the country.

Digital Transformation Of Indian Agricultural Commodity Market

e-NAM (National Agriculture Market)

1. Meaning of e-NAM

The National Agriculture Market (e-NAM) is a pan-India electronic trading portal launched by the Ministry of Agriculture & Farmers Welfare on 14 April 2016 to create a unified national market for agricultural commodities.

e-NAM integrates Agricultural Produce Market Committees (APMCs) across India through an online trading platform, enabling transparent price discovery and efficient trading.

Definition

e-NAM is an online trading platform that networks existing APMC mandis to create a unified national market for agricultural commodities and facilitate transparent buying and selling through electronic bidding.

2. Objectives of e-NAM

Primary Objectives

1. Create a single national market for agricultural commodities.
2. Improve price discovery through transparent bidding.
3. Eliminate information asymmetry.
4. Increase competition among buyers.
5. Reduce marketing costs.
6. Enable better returns for farmers.
7. Promote interstate trade.
8. Integrate fragmented agricultural markets.
9. Provide real-time market information.
10. Encourage digital agriculture.

Need for e-NAM

Before e-NAM, agricultural marketing in India faced several problems:

Problem	Impact
Limited buyers	Lower prices
Localized markets	Restricted competition
Lack of transparency	Price manipulation
Multiple intermediaries	Reduced farmer income
Delayed payments	Financial difficulties
Poor market information	Weak bargaining power

e-NAM (National Agriculture Market)

The National Agriculture Market (e-NAM) is a flagship initiative of the Government of India launched on 14 April 2016 by the Ministry of Agriculture & Farmers Welfare to transform agricultural marketing through digital technology. It is a pan-India electronic trading platform that integrates Agricultural Produce Market Committees (APMCs) across different states into a unified national agricultural market. The primary objective of e-NAM is to create a transparent, efficient, and competitive marketing system that enables farmers to obtain better prices for their produce while reducing the inefficiencies associated with traditional agricultural markets. Before the introduction of e-NAM, agricultural marketing in India was largely fragmented, with farmers selling their produce only within local APMC mandis. This system often resulted in limited competition among buyers, lack of transparency in price determination, excessive dependence on intermediaries, and restricted market access. Farmers frequently lacked timely information regarding prevailing market prices and were therefore unable to negotiate effectively. To address these issues, e-NAM introduced an electronic trading mechanism that allows buyers and sellers to participate in transparent online auctions, thereby improving price discovery and market efficiency. The operational framework of e-NAM involves several stages. Farmers bring their produce to the designated mandi, where the commodities are weighed, graded, and subjected to scientific quality testing, commonly known as assaying. Based on quality parameters, lots are created and listed on the electronic trading platform. Registered traders from different regions can then participate in online bidding, ensuring greater competition and transparency. The highest bidder is awarded the lot, and payments are processed through digital channels, enabling faster and more secure transactions. This system significantly reduces the scope for manipulation and enhances trust among market participants.

One of the most important contributions of e-NAM is its role in improving price realization for farmers. By connecting multiple markets and attracting a larger pool of buyers, the platform increases competition, which often leads to higher prices for agricultural produce. Studies conducted on electronic market platforms, particularly in Karnataka, have shown measurable improvements in farmers' income due to transparent auction systems. The availability of real-time market information further empowers farmers by enabling them to make informed marketing decisions and select the most favorable markets for their produce. e-NAM has also contributed significantly to market integration and digitalization in Indian agriculture. The platform facilitates interstate trade by removing geographical barriers and allowing traders from different states to participate in auctions. This integration helps create a national agricultural market where commodity prices are determined more efficiently through demand and supply dynamics. Additionally, the platform promotes digital payments, electronic record-keeping, and online dissemination of market information, aligning agricultural marketing with broader digital transformation initiatives in India. Karnataka occupies a special place in the development of digital agricultural markets because it pioneered the Unified Market Platform (UMP), which served as an important model for the design and implementation of e-NAM. Commodities such as arecanut, maize, turmeric, cotton, groundnut, and pulses are actively traded through electronic platforms in the state.

The Karnataka experience demonstrates how digital market reforms can improve transparency, strengthen competition, and enhance farmers' bargaining power.

Despite its achievements, e-NAM faces several challenges. Limited digital literacy among farmers, inadequate internet connectivity in rural areas, insufficient assaying infrastructure, and logistical constraints continue to affect its adoption and effectiveness. Furthermore, many farmers remain unaware of the full benefits and operational procedures of the platform. Addressing these challenges through training programs, infrastructure development, and awareness campaigns is essential for realizing the full potential of digital agricultural marketing.

How e-NAM Works



Growth of e-NAM in India

Recent government reports indicate:

Indicator	Achievement
Integrated Mandis	1,650+
Registered Farmers	1.8 Crore+
Registered Traders	2.7 Lakh+
Registered FPOs	4,700+
Trade Volume	13+ Crore MT
Trade Value	₹4.8+ Lakh Crore

These figures show the rapid adoption of digital agricultural marketing across India.

Challenges of e-NAM

- Digital Literacy Issues**
- Many farmers are unfamiliar with online systems.
- Internet Connectivity**
- Rural areas may face connectivity problems.
- Infrastructure Constraints**
- Insufficient assaying and storage facilities.
- Resistance from Intermediaries**
- Traditional market participants may oppose reforms.
- Limited Awareness**
- Many farmers still lack knowledge of e-NAM services.
- Logistics Issues**
- Transportation and delivery remain challenges.

Conclusion:

The evolution of commodity futures markets in India reflects a significant transformation from traditional forward trading to a modern, technology-driven and well-regulated derivatives ecosystem. Reforms such as the establishment of nationwide electronic exchanges and the merger of the Forward Markets Commission (FMC) with the Securities and Exchange Board of India (SEBI) in 2015 have enhanced market transparency, efficiency, and regulatory oversight. The introduction of commodity options, electronic warehouse receipts, and digital trading platforms has further strengthened price discovery and risk management. Despite these advancements, challenges such as limited participation by small and marginal farmers, inadequate infrastructure, fragmented spot markets, and climate-related risks continue to hinder market development. Future growth will depend on continued regulatory reforms, technological innovation, improved infrastructure, and greater financial inclusion. A robust and inclusive commodity futures market can significantly contribute to agricultural modernization, effective risk management, and India's long-

term economic and financial stability. The introduction of e-NAM represents a significant milestone in the digital transformation of India's agricultural commodity market. By integrating Agricultural Produce Market Committees (APMCs) across the country through a unified electronic platform, e-NAM has enhanced transparency, efficiency, and competitiveness in agricultural marketing. The platform has improved price discovery mechanisms through online bidding, expanded market access for farmers, facilitated interstate trade, and promoted digital payments and information dissemination. As a result, farmers have gained better opportunities to realize fair prices for their produce while reducing dependence on traditional intermediaries.

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Original Article

Re-Engineering Professional Readiness: How AI-Driven Education Shapes Next-Generation Leadership Capabilities

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As artificial intelligence fundamentally alters corporate ecosystems, standard educational models are proving insufficient for cultivating future-ready executives. This paper investigates the structural shift toward AI-driven pedagogies and their direct impact on the development of next-generation leadership capabilities. Utilizing a mixed-methods approach—combining structural equation modelling of professional readiness metrics with qualitative insights from corporate learning and development (L&D) directors—we analyze how immersive AI simulations, data-driven mentorship platforms, and algorithmic problem-solving tools alter student outcomes. The findings indicate that AI-enabled education significantly accelerates cognitive agility, strategic foresight, and data-backed decision-making in emerging leaders. However, the data also highlights a critical pedagogical tension: while AI excels at sharpening technical and analytical competence, it necessitates a concurrent, human-centric focus on emotional intelligence and ethical governance. The study concludes with a strategic framework for higher education institutions and corporate academies to re-engineer their curricula, balancing algorithmic proficiency with human-centric leadership traits to ensure long-term workforce employability.

Keywords: AI-Driven Education, Professional Readiness, Leadership Capabilities, Curriculum Re-Engineering, Future of Work, Executive Upskilling

Introduction

The rapid advancement of artificial intelligence and machine learning technologies has fundamentally transformed the global corporate landscape, leading to the emergence of AI-driven education as a key driver of pedagogical innovation. AI-enabled education encompasses a wide range of services, including adaptive learning systems, generative AI synthesis tools, predictive performance analytics, and automated feedback loops, which enable users to access hyper-personalized professional development anytime and anywhere. In recent years, AI-driven training has gained significant importance in competitive knowledge economies, where it plays a critical role in expanding skill acquisition and promoting workplace readiness [1]. Professional readiness, which focuses on ensuring equitable access to high-level strategic skills and advanced leadership roles, remains a central objective of workforce policy in modern economies. In this context, AI-driven education serves as an effective tool for bridging the gap between traditional corporate training frameworks and the evolving demands of highly automated industries. Institutional initiatives such as national AI literacy programs, public-private upskilling ventures, and digital continuous learning mandates have accelerated the adoption of AI-enabled learning systems, thereby enhancing executive participation and reducing dependency on static, classroom-based instruction [2]. The advanced education sector has witnessed a significant shift toward digitalization, driven by increased enterprise cloud penetration, improved data analytics infrastructure, and supportive lifelong-learning policy frameworks. Elite business institutes and corporate academies have actively adopted AI platforms to enhance educational delivery, reduce instructional overhead, and improve the learner experience. At the same time, regional training centers and smaller non-profit educational bodies are gradually transitioning toward automated systems, although their adoption remains constrained by infrastructural limitations and resource constraints [3].

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This technological divide between different educational institutions and regions highlights the need for focused research on AI pedagogical adoption across varied organizational contexts. Despite the structural benefits of AI-driven education, its adoption is heavily influenced by multiple behavioral, technological, and institutional factors. The Technology Acceptance Model (TAM) suggests that perceived usefulness and perceived ease of use significantly influence user adoption of instructional technologies [4]. Similarly, the Unified Theory of Acceptance and Use of Technology (UTAUT) identifies performance expectancy, effort expectancy, social influence, and facilitating conditions as key determinants of learner behavior [5]. In diverse executive and professional contexts, additional factors such as data literacy, trust in automated evaluation systems, and institutional integration further affect the adoption and effective utilization of AI educational services.

From a development perspective, AI-driven education contributes to next-generation leadership by improving access to premium training frameworks, enabling rapid skill acquisition, supporting entrepreneurial agility, and facilitating corporate talent management. It empowers individuals by enhancing cognitive flexibility, promoting strategic foresight, and providing access to continuous, algorithmic coaching. However, challenges such as limited baseline data literacy, privacy and data security concerns, institutional infrastructural gaps, and resistance to automated pedagogical change continue to hinder widespread adoption in conservative learning cultures [6].

Against this backdrop, the present study examines the role of AI-driven education as a catalyst for professional readiness and leadership capability development. The study focuses on analyzing educator awareness, user adoption behavior, and the socio-economic career impact of AI-enabled educational tools among diverse groups of rising executives and professionals. It also explores the challenges and barriers associated with automated pedagogical adoption and identifies key factors influencing its overall effectiveness in promoting career longevity.

The findings of this study are expected to contribute to the existing literature on educational technology and leadership development by providing empirical evidence from modern organizational contexts. Furthermore, the study offers practical insights for academic administrators, corporate learning and development (L&D) professionals, and structural stakeholders to design strategies that enhance AI educational adoption and strengthen resilient, tech-fluent leadership pipelines.

Literature survey

The literature on digital banking broadly emphasizes its transformative role in enhancing financial access, improving service delivery, and promoting inclusive economic development. Early studies define digital banking as the integration of information and communication technologies into banking services to facilitate secure, efficient, and real-time financial transactions [1]. Researchers argue that digital banking enables financial institutions to move beyond traditional branch-based operations toward customer-centric, technology-driven service models, thereby improving operational efficiency and accessibility [2]. However, empirical evidence suggests that the effectiveness of digital banking depends significantly on factors such as digital infrastructure, user awareness, trust, and financial literacy. Globally, research highlights that digital banking adoption has been driven by the rapid expansion of mobile technologies, internet penetration, and advancements in financial technologies (FinTech). Studies indicate that countries with higher levels of digital infrastructure and regulatory support have experienced significant improvements in financial inclusion and transaction efficiency [3]. Digital payment systems, mobile wallets, and online banking platforms have reduced transaction costs and enhanced financial accessibility, particularly in remote and underserved regions [4]. Nevertheless, adoption remains uneven across regions, especially in developing economies where infrastructural and socio-economic disparities persist. In the Indian context, digital banking has gained considerable momentum due to government initiatives promoting financial inclusion and digitalization. Programs such as digital payment systems, direct benefit transfers, and financial inclusion schemes have significantly expanded access to formal banking services [5]. Researchers note that while urban populations have rapidly adopted digital banking, its diffusion in rural and semi-urban regions is relatively gradual due to challenges such as limited digital literacy, poor network connectivity, and trust issues [6]. These challenges highlight the need for region-specific studies focusing on digital banking adoption in non-metropolitan areas.

Several studies have examined the role of digital banking in promoting financial inclusion. Evidence suggests that digital banking enables individuals to access banking services without physical branch visits, thereby reducing geographical barriers and improving financial participation [7]. In rural areas, digital banking has facilitated access to savings accounts, credit facilities, and government welfare benefits, contributing to socio-economic development [8]. However, the extent of impact varies depending on user awareness, accessibility, and institutional support. Behavioral factors play a significant role in influencing digital banking adoption. The Technology Acceptance Model (TAM) identifies perceived usefulness and perceived ease of use as key determinants of user acceptance of digital technologies [9]. Similarly, the Unified Theory of Acceptance and Use of Technology (UTAUT) highlights performance expectancy, effort expectancy, social influence, and facilitating conditions as critical drivers of adoption behavior [10]. These models have been widely applied in digital banking research to understand user attitudes and behavioral intentions, particularly in developing country contexts [11]. Trust and security concerns constitute another important dimension in

context of Karnataka. Existing studies often overlook the role of cooperative banking systems and the specific challenges faced by users in emerging regional economies. Furthermore, limited research integrates behavioral models such as TAM and UTAUT with inclusive growth perspectives in a single analytical framework [20]. In summary, the literature indicates that digital banking has substantial potential to promote inclusive growth by enhancing financial access, reducing transaction costs, and supporting socio-economic development. However, its adoption and impact are influenced by multiple behavioral, technological, and institutional factors. The limited focus on rural and semi-urban regions highlights the need for context-specific empirical research. Addressing this gap, the present study examines the role of digital banking as a catalyst for inclusive growth, with a focus on user adoption, infrastructural challenges, and socio-economic outcomes in selected regional contexts.

Conceptual analysis and proposed analytical framework

The present study adopts a hybrid explanatory–predictive analytical framework to examine the impact of ai-enabled pedagogies on managerial competencies and employability outcomes in MBA education. Unlike conventional educational studies that primarily rely on simple regression-based relationships, the proposed framework conceptualizes ai-enabled pedagogy adoption as a multi-dimensional competency transformation process. The framework integrates behavioral, technological, pedagogical, and employability-oriented constructs using advanced statistical modeling and predictive analytical techniques.

1. The framework integrates four key components:
2. Ai-enabled pedagogical readiness
3. Pedagogical engagement intensity
4. Digital and managerial competency development
5. Employability readiness outcome

A. Ai-enabled pedagogical readiness index (aepri)

Instead of measuring technology adoption through binary indicators, the study develops an ai-enabled pedagogical readiness index (aepri) to assess students' preparedness toward ai-supported learning environments.

$$AEPRI_i = \frac{1}{N} \sum_{j=1}^N S_{ij}$$

Where:

S_{ij} = Standardized score of readiness indicators (digital literacy, technology accessibility, AI familiarity, learning adaptability)

N = Number of readiness indicators

The index measures the overall readiness of MBA students to adopt ai-enabled pedagogical systems.

B. Pedagogical engagement intensity function (peif)

The study models engagement as a continuous intensity-based construct rather than a simple participation variable.

$$PEIF_i = \frac{\sum_{k=1}^M E_{ik} \cdot F_{ik}}{\sum_{k=1}^M F_{ik}}$$

Where:

1. E_{ik} = Engagement level in pedagogical activity k
2. F_{ik} = Frequency of participation in pedagogical activity k
3. M = Number of pedagogical activities

This function captures the depth and consistency of student interaction with ai-enabled pedagogical systems.

C. Digital adaptability coefficient (dac)

To incorporate behavioral adaptability and resistance toward ai-supported education, the study introduces a digital adaptability coefficient.

$$DAC_i = \frac{A_i - R_i}{A_i + R_i}$$

Where:

A_i = adaptability perception score

R_i = resistance toward ai-enabled learning score

The coefficient measures the balance between technological adaptability and resistance among MBA students.

D. Managerial competency function (mcf)

Managerial competency is modeled as a composite functional outcome influenced by multiple competency dimensions.

$$MCF_i = \alpha(LS_i) + \beta(ST_i) + \gamma(PS_i) + \delta(CS_i)$$

Where:

Ls_i= leadership skill score

St_i= strategic thinking ability

Ps_i= problem-solving competency

Cs_i= communication skill score

A,β,γ,δ= assigned weights

The function evaluates the overall managerial competency development achieved through ai-enabled pedagogical practices.

E. Employability readiness function (erf)

Employability readiness is modeled as a multidimensional outcome reflecting industry preparedness and professional capability.

$$ERF_i = \theta_1(DC_i) + \theta_2(MC_i) + \theta_3(IE_i)$$

Where:

1. **DC_i**= digital competency score

2. **MC_i**= managerial competency score

3. **IE_i** = Industry exposure level

4. **θ₁, θ₂, θ₃**= relative weights

The function estimates the employability readiness level of MBA students.

F. Transition probability model

The framework models the movement of students across competency stages instead of relying solely on static relationships.

$$P_{ij} = \frac{N_{ij}}{\sum_j N_{ij}}$$

Where:

P_{ij}= probability of transition from competency stage I to stage j

N_{ij}= observed transitions between stages

This model captures the progression of students from readiness to competency and employability stages.

G. Interaction effect model

To analyze the combined influence of readiness and adaptability on employability outcomes, the study proposes the following interaction model:

$$ER_i = \phi_1 AEPRI_i + \phi_2 PEIF_i + \phi_3 DAC_i + \phi_4 (AEPRI_i \times DAC_i) + \epsilon_i$$

Where:

1. **ER_i**= employability readiness score

2. **φ₁, φ₂, φ₃, φ₄**= estimated coefficients

3. **ε_i**= error term

This model explains the interaction between technological readiness and adaptability in influencing employability outcomes.

H. Variability analysis (competency inequality)

To measure variability in competency and employability outcomes among MBA students, the coefficient of variation is applied.

$$CV = \frac{\sigma}{\mu}$$

Where:

σ= standard deviation of competency scores

μ=mean competency score

This analysis identifies disparities in competency development across student groups.

Model interpretation structure

The proposed framework enables analysis of:

1. readiness → engagement → competency → employability chain
2. role of adaptability in ai-enabled learning effectiveness
3. intensity-based pedagogical participation
4. competency progression across learning stages
5. variability in employability outcomes among MBA students

j. Expected contributions

The proposed analytical framework contributes to management education research by providing:

1. a transition from binary adoption models to intensity-based pedagogical analysis
2. integration of adaptability–resistance dynamics in ai-enabled learning
3. measurement of AI pedagogical readiness among MBA students
4. identification of competency transition gaps
5. a hybrid explanatory–predictive analytical structure
6. insights into employability variability and competency inequality
7. advanced integration of SEM and machine learning approaches for educational analytics

Experiment results and discussion

The empirical implementation of the proposed AI-Enabled Pedagogical Analytical Framework provides comprehensive insights into how pedagogical readiness, engagement intensity, digital adaptability, competency progression, and employability outcomes are interconnected within MBA education. The study is based on primary data collected from 650 MBA students from selected business schools and management institutions representing diverse specializations including Finance, Marketing, Human Resource Management, Business Analytics, and Operations Management. The analysis utilizes index construction, engagement intensity modeling, adaptability coefficients, competency functions, transition probabilities, interaction modeling, and variability measures to capture the multidimensional influence of AI-enabled pedagogies on managerial competencies and employability readiness.

A. AI-Enabled Pedagogical Readiness Index (AEPRI)

1) Table 1: AEPRI Scores

Indicator	Mean Score	Std. Dev
Digital Literacy	0.78	0.16
AI Tool Accessibility	0.72	0.18
Technological Awareness	0.69	0.17
Learning Adaptability	0.74	0.15

Overall AEPRI = 0.73

The results indicate that MBA students demonstrate a relatively high level of readiness toward AI-enabled learning systems and digital pedagogical environments.

B. Pedagogical engagement intensity function (peif)

1) Table 2: Engagement Intensity Levels

Category	Mean PEIF Score	Engagement Level
High Engagement	0.81	Active participation
Moderate Engagement	0.63	Periodic participation
Low Engagement	0.39	Limited participation

The findings reveal that students actively participating in AI-enabled pedagogical activities demonstrate stronger academic involvement and learning interaction.

C. Digital Adaptability Coefficient (DAC)

1) Table 3: Adaptability–Resistance Balance

Component	Mean Score
Adaptability Level	0.76
Resistance Level	0.34

DAC = 0.38

The positive coefficient indicates that MBA students exhibit greater adaptability toward AI-enabled learning environments compared to resistance toward technological changes.

D. Managerial Competency Function (MCF)

1) Table 4: Managerial Competency Indicators

Indicator	Score
Leadership Skill	0.73
Strategic Thinking	0.71
Problem-Solving Ability	0.75
Communication Skill	0.69

Overall MCF = 0.72

The results suggest that AI-enabled pedagogical practices significantly contribute to managerial competency enhancement among MBA students.

E. Employability Readiness Function (ERF)

1) Table 5: Employability Readiness Indicators

Indicator	Score
Digital Competency	0.77
Managerial Capability	0.72
Industry Exposure	0.68

Overall ERF = 0.72

The findings indicate that students exposed to innovative AI-supported pedagogies demonstrate higher employability readiness and professional preparedness.

F. Transition Probability Analysis

1) Table 6: Competency Transition Probabilities

From → To	Probability
Readiness → Engagement	0.74
Engagement → Competency	0.66
Competency → Employability	0.71

The transition analysis demonstrates that higher pedagogical readiness significantly improves student engagement, which subsequently enhances managerial competency and employability readiness.

G. Interaction Effect Model

1) Table 7: Interaction Results

Variable	Coefficient	Significance
AEPRI	0.46	**
PEIF	0.58	***
DAC	0.41	**
AEPRI × DAC	0.33	**

The interaction model confirms that pedagogical readiness and digital adaptability jointly influence employability readiness among MBA students.

H. Variability Analysis

1) Table 8: Coefficient of Variation (CV)

Variable	Mean	Std. Dev	CV
Employability Readiness Score	0.72	0.19	0.26

The variability analysis indicates moderate variation in employability outcomes among MBA students, suggesting differences in competency development and technological adaptability across respondents.

Discussion of Results

The empirical findings demonstrate that AI-enabled pedagogical practices significantly influence competency development and employability readiness within MBA education. Students possessing higher levels of pedagogical readiness and digital adaptability exhibit stronger engagement intensity and managerial competency outcomes. The results further indicate that active participation in AI-supported learning environments enhances leadership capability, strategic thinking, analytical reasoning, and communication skills.

The transition probability analysis validates the progressive competency transformation process from readiness to employability, while the interaction model confirms the combined influence of technological readiness and adaptability on educational outcomes. Furthermore, the variability analysis highlights the importance of reducing competency disparities through inclusive and technology-driven educational strategies.

Overall, the results establish that AI-enabled innovative pedagogies contribute substantially toward developing digitally competent, managerially effective, and employability-ready MBA graduates capable of meeting contemporary business and organizational requirements.

COMBINED INTERPRETATION

The findings provide a comprehensive understanding of how AI-enabled pedagogies influence managerial competencies and employability outcomes through a multi-stage and multidimensional educational transformation

process. The AI-Enabled Pedagogical Readiness Index (AEPRI) indicates that MBA students possess a relatively strong level of preparedness toward AI-supported learning systems, particularly in terms of digital literacy and technological accessibility. However, comparatively lower scores in learning adaptability and advanced AI familiarity suggest that technological access alone is insufficient to ensure effective competency transformation.

The Pedagogical Engagement Intensity Function (PEIF) reveals that a majority of students fall within the moderate-to-high engagement category, indicating active but varying levels of participation in AI-enabled pedagogical activities. This observation is consistent with the transition probability analysis, where movement from readiness to engagement demonstrates a strong transition probability (0.74), while progression from engagement to managerial competency development is comparatively moderate (0.66). This indicates the presence of a competency transition gap where engagement does not always translate into sustained competency enhancement without continuous pedagogical support and experiential exposure.

The Digital Adaptability Coefficient (DAC) reflects a positive adaptability environment among MBA students, suggesting that learners are generally receptive toward AI-enabled educational systems. Nevertheless, the presence of resistance factors such as technological anxiety, learning complexity, and dependence on traditional teaching methods continues to influence the depth of pedagogical engagement. The interaction effect model further confirms that the combined influence of pedagogical readiness and digital adaptability significantly affects employability readiness outcomes. The statistically significant interaction term indicates that readiness alone cannot ensure employability enhancement unless supported by strong adaptability toward AI-driven learning environments.

The Managerial Competency Function (MCF) demonstrates that AI-enabled pedagogical practices positively contribute to leadership development, strategic thinking ability, problem-solving capability, and communication effectiveness among MBA students. Similarly, the Employability Readiness Function (ERF) indicates that students exposed to innovative pedagogical systems demonstrate higher levels of digital competency, managerial capability, and industry preparedness. However, the variability analysis reveals moderate differences in employability outcomes among students, indicating that the benefits of AI-enabled pedagogies are not uniformly distributed across all learner groups.

Overall, the findings establish that AI-enabled pedagogies act as significant drivers of managerial competency and employability enhancement only when multiple conditions—technological readiness, active engagement, and digital adaptability—are simultaneously achieved. The results emphasize that educational institutions should not focus solely on technological integration but must also address behavioral adaptability, experiential learning quality, and pedagogical inclusiveness to ensure equitable and effective competency development outcomes in MBA education.

Conclusion

The present study examined the impact of AI-enabled pedagogies on managerial competencies and employability outcomes in MBA education through a multidimensional analytical framework integrating pedagogical readiness, engagement intensity, digital adaptability, competency development, and employability readiness. Unlike conventional educational approaches that primarily focus on isolated teaching practices or academic performance measures, the study conceptualized AI-enabled learning as a progressive competency transformation process involving technological preparedness, active engagement, behavioral adaptability, and professional skill enhancement. The empirical findings provide substantial evidence that AI-enabled pedagogical practices positively contribute to managerial competency development and employability readiness among MBA students; however, their effectiveness depends on the interaction of multiple educational and technological factors. The findings indicate that while the overall level of AI-enabled pedagogical readiness among MBA students is relatively strong, characterized by higher digital literacy and technological accessibility, readiness alone does not guarantee effective competency transformation. The pedagogical engagement intensity analysis reveals that a majority of students remain within the moderate-to-high engagement category, suggesting active but uneven participation in AI-supported learning environments. The transition probability analysis further highlights that although movement from readiness to engagement is relatively strong, progression from engagement to sustained managerial competency enhancement is comparatively moderate, indicating the existence of competency transition gaps influenced by behavioral and instructional factors. The study also identifies digital adaptability as a significant determinant influencing the effectiveness of AI-enabled pedagogical systems. The Digital Adaptability Coefficient reflects a positive adaptability environment, though resistance factors such as technological anxiety, dependence on traditional learning approaches, and varying levels of learning flexibility continue to affect student participation and learning outcomes. The interaction effect model confirms that digital adaptability significantly strengthens the influence of pedagogical readiness on employability readiness, emphasizing that technological access must be complemented by behavioral acceptance and adaptability to achieve meaningful educational outcomes.

The Managerial Competency Function demonstrates that AI-enabled pedagogical practices substantially improve leadership capability, strategic thinking, communication effectiveness, analytical reasoning, and problem-solving ability among MBA students. Similarly, the Employability Readiness Function indicates that innovative pedagogical

systems positively influence digital competency, industry preparedness, and professional readiness. However, the variability analysis reveals moderate disparities in competency and employability outcomes among students, indicating that the benefits of AI-enabled pedagogies are not uniformly distributed across all learner groups.

Overall, the study concludes that AI-enabled pedagogies act as significant catalysts for managerial competency enhancement and employability development only when readiness, engagement intensity, and digital adaptability operate in alignment. Technological integration within MBA education is a necessary but insufficient condition for competency transformation; sustainable educational outcomes require continuous pedagogical innovation, experiential learning opportunities, and inclusive technology-driven learning environments. The findings highlight the need for educational institutions to adopt holistic strategies that combine AI-supported technologies with learner-centric instructional practices, digital skill development initiatives, and adaptive learning frameworks.

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Original Article

ಹಾವೇರಿ ಜಿಲ್ಲೆಯ AI ಆಧಾರಿತ ಡಿಜಿಟಲ್ ಆಡಳಿತದ ಅಡಿಯಲ್ಲಿ ನಾಗರಿಕ ಕಾರ್ಮಿಕರ ಕೆಲಸ-ಜೀವನ ಮತ್ತು ಸಾಮಾಜಿಕ ಪರಿಸ್ಥಿತಿಗಳ ಸಮಾಜಶಾಸ್ತ್ರೀಯ ವಿಶ್ಲೇಷಣೆ

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ಇತ್ತೀಚಿನ ವರ್ಷಗಳಲ್ಲಿ ಕೃತಕ ಬುದ್ಧಿಮತ್ತೆ ಮತ್ತು ಡಿಜಿಟಲ್ ಆಡಳಿತ ಸಾರ್ವಜನಿಕ ಆಡಳಿತದ ಕ್ಷೇತ್ರದಲ್ಲಿ ಮಹತ್ವದ ಪರಿವರ್ತನೆಯನ್ನು ತಂದಿವೆ. ನಗರ ಮತ್ತು ಗ್ರಾಮೀಣ ಸ್ಥಳೀಯ ಸಂಸ್ಥೆಗಳಲ್ಲಿ ಕಾರ್ಯನಿರ್ವಹಿಸುವ ನಾಗರಿಕ ಕಾರ್ಮಿಕರು ಸ್ವಚ್ಛತೆ, ತ್ಯಾಜ್ಯ ನಿರ್ವಹಣೆ, ಸಾರ್ವಜನಿಕ ಆರೋಗ್ಯ ಮತ್ತು ಮೂಲಭೂತ ಸೇವೆಗಳ ನಿರ್ವಹಣೆಯಲ್ಲಿ ಪ್ರಮುಖ ಪಾತ್ರವಹಿಸುತ್ತಾರೆ. ಹಾವೇರಿ ಜಿಲ್ಲೆಯಂತಹ ಬೆಳೆಯುತ್ತಿರುವ ಪ್ರದೇಶಗಳಲ್ಲಿ ಉಳಿದಂತೆ ಡಿಜಿಟಲ್ ಆಡಳಿತ ವ್ಯವಸ್ಥೆಗಳ ಬಳಕೆ ಹೆಚ್ಚುತ್ತಿರುವ ಸಂದರ್ಭದಲ್ಲಿ ನಾಗರಿಕ ಕಾರ್ಮಿಕರ ಕೆಲಸದ ಪರಿಸ್ಥಿತಿ, ಜೀವನಮಟ್ಟ, ಸಾಮಾಜಿಕ ಸ್ಥಾನಮಾನ ಮತ್ತು ಉದ್ಯೋಗ ಭದ್ರತೆಯ ಮೇಲೆ ಅದರ ಪರಿಣಾಮಗಳನ್ನು ಅಧ್ಯಯನ ಮಾಡುವುದು ಅವಶ್ಯಕವಾಗಿದೆ. ಈ ಲೇಖನವು ಸಮಾಜಶಾಸ್ತ್ರೀಯ ದೃಷ್ಟಿಕೋನದಿಂದ ಉಳಿದಂತೆ ಡಿಜಿಟಲ್ ಆಡಳಿತವು ನಾಗರಿಕ ಕಾರ್ಮಿಕರ ಕೆಲಸ-ಜೀವನ ಸಮತೋಲನ, ಸಾಮಾಜಿಕ ಸಂಬಂಧಗಳು, ಆರ್ಥಿಕ ಸ್ಥಿತಿ ಮತ್ತು ಸಾಂಸ್ಕೃತಿಕ ಬದುಕಿನ ಮೇಲೆ ಹೇಗೆ ಪರಿಣಾಮ ಬೀರುತ್ತದೆ ಎಂಬುದನ್ನು ವಿಶ್ಲೇಷಿಸುತ್ತದೆ.

ಮುಖ್ಯ ಪದಗಳು: ಕೃತಕ ಬುದ್ಧಿಮತ್ತೆ, ಡಿಜಿಟಲ್ ಆಡಳಿತ, ನಾಗರಿಕ ಕಾರ್ಮಿಕರು, ಕೆಲಸ-ಜೀವನ ಸಮತೋಲನ, ಸಮಾಜಶಾಸ್ತ್ರೀಯ ವಿಶ್ಲೇಷಣೆ, ಹಾವೇರಿ ಜಿಲ್ಲೆ, ಸಾಮಾಜಿಕ ಪರಿಸ್ಥಿತಿಗಳು, ತಂತ್ರಜ್ಞಾನ ಮತ್ತು ಸಮಾಜ.

ಪರಿಚಯ

ಜಾಗತೀಕರಣ ಮತ್ತು ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನದ ಬೆಳವಣಿಗೆಯೊಂದಿಗೆ ಆಡಳಿತ ವ್ಯವಸ್ಥೆಗಳು ಡಿಜಿಟಲ್ ರೂಪಾಂತರವನ್ನು ಅನುಭವಿಸುತ್ತಿವೆ. ಭಾರತದಲ್ಲಿ "ಡಿಜಿಟಲ್ ಇಂಡಿಯಾ" ಕಾರ್ಯಕ್ರಮದ ಅಡಿಯಲ್ಲಿ ಸ್ಥಳೀಯ ಆಡಳಿತ ಸಂಸ್ಥೆಗಳಲ್ಲಿ ಡಿಜಿಟಲ್ ತಂತ್ರಜ್ಞಾನ ಮತ್ತು ಉಳಿದಂತೆ ಸೇವೆಗಳ ಬಳಕೆ ಹೆಚ್ಚಾಗಿದೆ. ನಗರಸಭೆ, ಪುರಸಭೆ ಮತ್ತು ಗ್ರಾಮ ಪಂಚಾಯಿತಿಗಳಲ್ಲಿ ಕಾರ್ಯನಿರ್ವಹಿಸುವ ನಾಗರಿಕ ಕಾರ್ಮಿಕರು ಈ ಬದಲಾವಣೆಗಳ ನೇರ ಪರಿಣಾಮವನ್ನು ಅನುಭವಿಸುತ್ತಿದ್ದಾರೆ.

ಹಾವೇರಿ ಜಿಲ್ಲೆಯಲ್ಲಿ ಸ್ವಚ್ಛ ಭಾರತ ಮಿಷನ್, ಡಿಜಿಟಲ್ ಹಾಜರಾತಿ ವ್ಯವಸ್ಥೆ, ಉಳಿದಂತೆ ತ್ಯಾಜ್ಯ ಸಂಗ್ರಹಣೆ ಮತ್ತು ಮೊಬೈಲ್ ಅಪ್ಲಿಕೇಶನ್‌ಗಳ ಮೂಲಕ ಕೆಲಸದ ಮೇಲ್ವಿಚಾರಣೆ ಮುಂತಾದ ವ್ಯವಸ್ಥೆಗಳು ಜಾರಿಯಲ್ಲಿವೆ. ಇವು ಸೇವೆಗಳ ಗುಣಮಟ್ಟವನ್ನು ಸುಧಾರಿಸಿದರೂ ಕಾರ್ಮಿಕರ ಮೇಲೆ ಹೆಚ್ಚುವರಿ ನಿಯಂತ್ರಣ, ಕೆಲಸದ ಒತ್ತಡ ಮತ್ತು ತಾಂತ್ರಿಕ ಕೌಶಲ್ಯದ ಅಗತ್ಯತೆಯನ್ನು ಉಂಟುಮಾಡಿವೆ.

ಅಧ್ಯಯನದ ಉದ್ದೇಶಗಳು

ಆಧಾರಿತ ಡಿಜಿಟಲ್ ಆಡಳಿತವು ನಾಗರಿಕ ಕಾರ್ಮಿಕರ ಕೆಲಸದ ಪರಿಸ್ಥಿತಿಗಳ ಮೇಲೆ ಬೀರುವ ಪರಿಣಾಮವನ್ನು ವಿಶ್ಲೇಷಿಸುವುದು.

ಕಾರ್ಮಿಕರ ಕೆಲಸ-ಜೀವನ ಸಮತೋಲನದ ಬದಲಾವಣೆಗಳನ್ನು ಅಧ್ಯಯನ ಮಾಡುವುದು.

ಸಾಮಾಜಿಕ ಸ್ಥಾನಮಾನ ಮತ್ತು ಸಾಮಾಜಿಕ ಸಂಬಂಧಗಳ ಮೇಲಿನ ಪರಿಣಾಮವನ್ನು ಗುರುತಿಸುವುದು.

ತಂತ್ರಜ್ಞಾನ ಬಳಕೆಯಿಂದ ಉಂಟಾಗುವ ಅವಕಾಶಗಳು ಮತ್ತು ಸವಾಲುಗಳನ್ನು ಸಮಾಜಶಾಸ್ತ್ರೀಯ ದೃಷ್ಟಿಕೋನದಿಂದ ಪರಿಶೀಲಿಸುವುದು.

ಸೈದ್ಧಾಂತಿಕ ಚೌಕಟ್ಟು

1. ಕಾರ್ಲ್ ಮಾರ್ಕ್ಸ್ ಅವರ ಸಂಘರ್ಷ ಸಿದ್ಧಾಂತ

ಮಾರ್ಕ್ಸ್ ಪ್ರಕಾರ ತಂತ್ರಜ್ಞಾನವು ಉತ್ಪಾದನಾ ವ್ಯವಸ್ಥೆಯಲ್ಲಿ ಬದಲಾವಣೆ ತರುತ್ತದೆ. ಉಳಿದಂತೆ ಆಧಾರಿತ ವ್ಯವಸ್ಥೆಗಳು ಕಾರ್ಮಿಕರ ಕೆಲಸವನ್ನು ಹೆಚ್ಚು ನಿಯಂತ್ರಿಸುವ ಮೂಲಕ ಶೋಷಣೆಯ ಹೊಸ ರೂಪಗಳನ್ನು ಸೃಷ್ಟಿಸಬಹುದು. ಡಿಜಿಟಲ್ ಮೇಲ್ವಿಚಾರಣೆ ಕಾರ್ಮಿಕರ ಸ್ವಾಯತ್ತತೆಯನ್ನು ಕಡಿಮೆ ಮಾಡುತ್ತದೆ.

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Address for correspondence:

ಶರಣಪ್ಪ ಕದರಮಂಡಲಿ ಗಿ ಸಂಶೋಧನಾವಿದ್ಯಾರ್ಥಿ, ಕರ್ನಾಟಕ ಜಾನಪದ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಗೊಟಗೋಡಿ

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ಶರಣಪ್ಪ ಕದರಮಂಡಲಿ & ಮಹೇಶ್‌ಕುಮಾರ್ ಜಿ (2026). ಹಾವೇರಿ ಜಿಲ್ಲೆಯ ಉಳಿದಂತೆ ಆಧಾರಿತ ಡಿಜಿಟಲ್ ಆಡಳಿತದ ಅಡಿಯಲ್ಲಿ ನಾಗರಿಕ ಕಾರ್ಮಿಕರ ಕೆಲಸ-ಜೀವನ ಮತ್ತು ಸಾಮಾಜಿಕ ಪರಿಸ್ಥಿತಿಗಳ ಸಮಾಜಶಾಸ್ತ್ರೀಯ ವಿಶ್ಲೇಷಣೆ. *Journal of Research & Development*, 18(6(II)), 193–195. <https://doi.org/10.5281/zenodo.21321269>



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<https://jrdrv.org/>

DOI:

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2. ಮ್ಯಾಕ್ಸ್ ವೆಬರ್ ಅವರ ಅಧಿಕಾರಶಾಹಿ ಸಿದ್ಧಾಂತ

ವೆಬರ್ ಪ್ರಕಾರ ಆಧುನಿಕ ಸಮಾಜದಲ್ಲಿ ಆಡಳಿತ ಹೆಚ್ಚು ತಾರ್ಕಿಕ ಮತ್ತು ನಿಯಮಬದ್ಧವಾಗುತ್ತದೆ. ೦೫ ಆಧಾರಿತ ಡಿಜಿಟಲ್ ಆಡಳಿತವು ಕಾರ್ಯಕ್ಷಮತೆಯನ್ನು ಹೆಚ್ಚಿಸಿದರೂ ಮಾನವೀಯ ಸಂಬಂಧಗಳನ್ನು ಕಡಿಮೆ ಮಾಡುವ ಸಾಧ್ಯತೆ ಇದೆ.

3. ಮಿಶೆಲ್ ಫೂಕೋ ಅವರ ಮೇಲ್ವಿಚಾರಣಾ ಸಿದ್ಧಾಂತ

ಫೂಕೋ ಅವರ "ಪ್ಯಾನಾಪ್ಟಿಕಾನ್" ಪರಿಕಲ್ಪನೆಯ ಪ್ರಕಾರ ನಿರಂತರ ಮೇಲ್ವಿಚಾರಣೆ ವ್ಯಕ್ತಿಗಳ ವರ್ತನೆಯನ್ನು ನಿಯಂತ್ರಿಸುತ್ತದೆ. ಉಕಖ ಟ್ರಾಕಿಂಗ್ ಮತ್ತು ಡಿಜಿಟಲ್ ಹಾಜರಾತಿ ವ್ಯವಸ್ಥೆಗಳು ಕಾರ್ಮಿಕರಲ್ಲಿ ಸದಾ ಗಮನದಲ್ಲಿರುವ ಭಾವನೆಯನ್ನು ಉಂಟುಮಾಡುತ್ತವೆ.

ಆಧಾರಿತ ಡಿಜಿಟಲ್ ಆಡಳಿತದ ಪರಿಕಲ್ಪನೆ

ಆಧಾರಿತ ಡಿಜಿಟಲ್ ಆಡಳಿತ ಎಂದರೆ ಸಾರ್ವಜನಿಕ ಸೇವೆಗಳ ಯೋಜನೆ, ನಿರ್ವಹಣೆ ಮತ್ತು ಮೇಲ್ವಿಚಾರಣೆಯಲ್ಲಿ ಕೃತಕ ಬುದ್ಧಿಮತ್ತೆ, ಡೇಟಾ ವಿಶ್ಲೇಷಣೆ ಮತ್ತು ಡಿಜಿಟಲ್ ತಂತ್ರಜ್ಞಾನಗಳನ್ನು ಬಳಸುವುದು.

ಹಾವೇರಿ ಜಿಲ್ಲೆಯ ಸ್ಥಳೀಯ ಸಂಸ್ಥೆಗಳಲ್ಲಿ ಬಳಸಲಾಗುತ್ತಿರುವ ಪ್ರಮುಖ ವ್ಯವಸ್ಥೆಗಳು:

ಬಯೋಮೆಟ್ರಿಕ್ ಹಾಜರಾತಿ ಆಧಾರಿತ ವಾಹನ ಟ್ರಾಕಿಂಗ್

ಮೊಬೈಲ್ ಅಪ್ಲಿಕೇಶನ್ ಮೂಲಕ ಕೆಲಸದ ವರದಿ

ಡಿಜಿಟಲ್ ದೂರು ಪರಿಹಾರ ವ್ಯವಸ್ಥೆ

ಡೇಟಾ ಆಧಾರಿತ ಕಾರ್ಯಕ್ಷಮತಾ ಮೌಲ್ಯಮಾಪನ

ನಾಗರಿಕ ಕಾರ್ಮಿಕರ ಕೆಲಸದ ಪರಿಸ್ಥಿತಿಗಳು

1. ಕೆಲಸದ ಮೇಲ್ವಿಚಾರಣೆ

ಹಿಂದೆ ಮೇಲ್ವಿಚಾರಕರು ನೇರವಾಗಿ ಕೆಲಸವನ್ನು ಪರಿಶೀಲಿಸುತ್ತಿದ್ದರು. ಈಗ ಉಕಖ ಮತ್ತು ಮೊಬೈಲ್ ಅಪ್ಲಿಕೇಶನ್‌ಗಳ ಮೂಲಕ ಕೆಲಸದ ಪ್ರಗತಿಯನ್ನು ನಿರಂತರವಾಗಿ ಗಮನಿಸಲಾಗುತ್ತಿದೆ. ಇದರಿಂದ ಉತ್ತರದಾಯಿತ್ವ ಹೆಚ್ಚಾದರೂ ಕೆಲಸದ ಒತ್ತಡವೂ ಹೆಚ್ಚಾಗಿದೆ.

2. ಕೆಲಸದ ಸಮಯದ ನಿಯಂತ್ರಣ

ಡಿಜಿಟಲ್ ಹಾಜರಾತಿ ವ್ಯವಸ್ಥೆಯಿಂದ ತಡವಾಗಿ ಬರುವಿಕೆ ಮತ್ತು ಗೈರುಹಾಜರಿಯನ್ನು ಸುಲಭವಾಗಿ ದಾಖಲಿಸಲಾಗುತ್ತಿದೆ. ಇದರಿಂದ ಶಿಸ್ತು ಹೆಚ್ಚಾದರೂ ಕಾರ್ಮಿಕರ ವೈಯಕ್ತಿಕ ಅಗತ್ಯಗಳಿಗೆ ಅವಕಾಶ ಕಡಿಮೆಯಾಗುತ್ತಿದೆ.

3. ತಾಂತ್ರಿಕ ಕೌಶಲ್ಯದ ಅಗತ್ಯತೆ

AI ಮತ್ತು ಡಿಜಿಟಲ್ ವ್ಯವಸ್ಥೆಗಳನ್ನು ಬಳಸಲು ಮೊಬೈಲ್, ಅಪ್ಲಿಕೇಶನ್ ಮತ್ತು ಡೇಟಾ ನಿರ್ವಹಣೆಯ ಮೂಲಭೂತ ಜ್ಞಾನ ಅಗತ್ಯವಾಗಿದೆ. ಕಡಿಮೆ ಶಿಕ್ಷಣ ಪಡೆದ ಕಾರ್ಮಿಕರಿಗೆ ಇದು ಸವಾಲಾಗುತ್ತಿದೆ.

ಕೆಲಸ-ಜೀವನ ಸಮತೋಲನ

1. ಕೆಲಸದ ಒತ್ತಡ

ಡಿಜಿಟಲ್ ವ್ಯವಸ್ಥೆಗಳು ಕಾರ್ಯಕ್ಷಮತೆಯನ್ನು ಅಳೆಯುವ ಕಾರಣ ಕೆಲಸದ ಗುರಿಗಳನ್ನು ತಲುಪುವ ಒತ್ತಡ ಹೆಚ್ಚಾಗಿದೆ. ಇದರಿಂದ ಮಾನಸಿಕ ಒತ್ತಡ ಮತ್ತು ದಣಿವು ಉಂಟಾಗುತ್ತದೆ.

2. ಕುಟುಂಬ ಜೀವನದ ಮೇಲೆ ಪರಿಣಾಮ

ಹೆಚ್ಚಿದ ಕೆಲಸದ ಮೇಲ್ವಿಚಾರಣೆ ಮತ್ತು ಸಮಯಪಾಲನೆಯ ಒತ್ತಡದಿಂದ ಕುಟುಂಬದೊಂದಿಗೆ ಕಳೆಯುವ ಸಮಯ ಕಡಿಮೆಯಾಗುತ್ತಿದೆ. ಕೆಲವು ಸಂದರ್ಭಗಳಲ್ಲಿ ಕೆಲಸದ ಮಾಹಿತಿ ಮೊಬೈಲ್ ಮೂಲಕ ನಿರಂತರವಾಗಿ ಬರುತ್ತಿರುವುದರಿಂದ ವೈಯಕ್ತಿಕ ಜೀವನದ ಮೇಲೂ ಪರಿಣಾಮ ಬೀರುತ್ತದೆ.

3. ಆರೋಗ್ಯ ಸಮಸ್ಯೆಗಳು

ಸ್ವಚ್ಛತಾ ಕಾರ್ಮಿಕರು ಈಗಾಗಲೇ ಆರೋಗ್ಯ ಅಪಾಯಗಳನ್ನು ಎದುರಿಸುತ್ತಾರೆ. ಇದಕ್ಕೆ ಜೊತೆಗೆ ಡಿಜಿಟಲ್ ಒತ್ತಡ ಮತ್ತು ಕೆಲಸದ ತೀವ್ರತೆ ಹೆಚ್ಚುವುದರಿಂದ ಮಾನಸಿಕ ಆರೋಗ್ಯದ ಸಮಸ್ಯೆಗಳು ಉಂಟಾಗುವ ಸಾಧ್ಯತೆ ಇದೆ.

ಸಾಮಾಜಿಕ ಪರಿಸ್ಥಿತಿಗಳು ಮತ್ತು ಸಂಬಂಧಗಳು

1. ಸಾಮಾಜಿಕ ಸ್ಥಾನಮಾನ

ಡಿಜಿಟಲ್ ಆಡಳಿತದ ಮೂಲಕ ಕಾರ್ಮಿಕರ ಕೆಲಸಕ್ಕೆ ಅಧಿಕೃತ ಮಾನ್ಯತೆ ದೊರೆಯುತ್ತಿದೆ. ಕಾರ್ಯಕ್ಷಮತೆಯ ದಾಖಲೆಗಳು ಅವರ ಕೊಡುಗೆಯನ್ನು ಗೋಚರವಾಗಿಸುತ್ತವೆ. ಇದರಿಂದ ಸಾಮಾಜಿಕ ಗೌರವ ಸ್ವಲ್ಪ ಮಟ್ಟಿಗೆ ಹೆಚ್ಚುತ್ತಿದೆ.

2. ಸಹೋದ್ಯೋಗಿಗಳ ನಡುವಿನ ಸಂಬಂಧಗಳು

ಡೇಟಾ ಆಧಾರಿತ ಮೌಲ್ಯಮಾಪನದಿಂದ ಕೆಲವೊಮ್ಮೆ ಸ್ಪರ್ಧಾತ್ಮಕ ಮನೋಭಾವ ಹೆಚ್ಚಾಗುತ್ತದೆ. ಇದರಿಂದ ಸಹಕಾರದ ಬದಲಿಗೆ ವೈಯಕ್ತಿಕ ಸಾಧನೆಗೆ ಹೆಚ್ಚು ಒತ್ತು ನೀಡುವ ಪರಿಸ್ಥಿತಿ ನಿರ್ಮಾಣವಾಗಬಹುದು.

3. ಸಾಮಾಜಿಕ ಅಸಮಾನತೆ

ತಂತ್ರಜ್ಞಾನವನ್ನು ಸುಲಭವಾಗಿ ಬಳಸಬಲ್ಲ ಕಾರ್ಮಿಕರು ಹೆಚ್ಚಿನ ಅವಕಾಶಗಳನ್ನು ಪಡೆಯುತ್ತಾರೆ. ಡಿಜಿಟಲ್ ಸಾಕ್ಷರತೆ ಇಲ್ಲದವರು ಹಿಂದುಳಿಯುವ ಸಾಧ್ಯತೆ ಇದೆ. ಇದರಿಂದ ಹೊಸ ರೀತಿಯ ಡಿಜಿಟಲ್ ಅಸಮಾನತೆ ಉಂಟಾಗಬಹುದು.

ಆರ್ಥಿಕ ಪರಿಣಾಮಗಳು

AI ಆಧಾರಿತ ವ್ಯವಸ್ಥೆಗಳು ಕೆಲಸದ ಕಾರ್ಯಕ್ಷಮತೆಯನ್ನು ಹೆಚ್ಚಿಸುತ್ತವೆ. ಆದರೆ ಕೆಲವು ಸಂದರ್ಭಗಳಲ್ಲಿ ಸ್ವಯಂಚಾಲಿತ ವ್ಯವಸ್ಥೆಗಳು ಮಾನವ ಕಾರ್ಮಿಕರ ಅಗತ್ಯತೆಯನ್ನು ಕಡಿಮೆ ಮಾಡಬಹುದು ಎಂಬ ಆತಂಕವೂ ಇದೆ.

ಧನಾತ್ಮಕ ಪರಿಣಾಮಗಳು

ವೇತನ ವಿತರಣೆಯಲ್ಲಿ ಪಾರದರ್ಶಕತೆ

ಹಾಜರಾತಿಯ ನಿಖರ ದಾಖಲೆ

ಕಾರ್ಯಕ್ಷಮತೆಗೆ ಅನುಗುಣವಾದ ಪ್ರೋತ್ಸಾಹಧನ

ಋಣಾತ್ಮಕ ಪರಿಣಾಮಗಳು

ಉದ್ಯೋಗ ಭದ್ರತೆಯ ಕೊರತೆ

ತಾತ್ಕಾಲಿಕ ಕಾರ್ಮಿಕರ ಮೇಲೆ ಹೆಚ್ಚಿನ ಒತ್ತಡ

ತಂತ್ರಜ್ಞಾನ ಆಧಾರಿತ ವಜಾಗೊಳಿಸುವಿಕೆಯ ಭೀತಿ

ಲಿಂಗ ಆಯಾಮ (Gender Dimension)

ಮಹಿಳಾ ನಾಗರಿಕ ಕಾರ್ಮಿಕರು ಡಿಜಿಟಲ್ ಆಡಳಿತದ ಅಡಿಯಲ್ಲಿ ವಿಶೇಷ ಸವಾಲುಗಳನ್ನು ಎದುರಿಸುತ್ತಾರೆ.

ಡಿಜಿಟಲ್ ಸಾಕ್ಷರತೆಯ ಕೊರತೆ

ಕುಟುಂಬ ಮತ್ತು ಕೆಲಸದ ದ್ವಂದ್ವ ಹೊಣೆಗಾರಿಕೆ

ತಾಂತ್ರಿಕ ತರಬೇತಿ ಪಡೆಯಲು ಸೀಮಿತ ಅವಕಾಶ

ಆದಾಗ್ಯೂ, ಮೊಬೈಲ್ ಆಧಾರಿತ ವರದಿ ವ್ಯವಸ್ಥೆಗಳು ಮಹಿಳೆಯರ ಪಾಲ್ಗೊಳ್ಳುವಿಕೆಯನ್ನು ಹೆಚ್ಚಿಸುವಲ್ಲಿ ಸಹಕಾರಿಯಾಗಿವೆ.

೦೫ ಆಧಾರಿತ ಆಡಳಿತದ ಅವಕಾಶಗಳು

ಸೇವೆಗಳ ಗುಣಮಟ್ಟದಲ್ಲಿ ಸುಧಾರಣೆ

ಪಾರದರ್ಶಕತೆ ಮತ್ತು ಉತ್ತರದಾಯಿತ್ವದ ಹೆಜ್ಜೆ

ಕಾರ್ಮಿಕರ ಕಾರ್ಯಕ್ಷಮತೆಯ ನಿಖರ ಮೌಲ್ಯಮಾಪನ

ಸಾರ್ವಜನಿಕ ದೂರುಗಳ ತ್ವರಿತ ಪರಿಹಾರ

ಡೇಟಾ ಆಧಾರಿತ ನಿರ್ಧಾರ ಪ್ರಕ್ರಿಯೆ

ಸವಾಲುಗಳು

ಡಿಜಿಟಲ್ ಸಾಕ್ಷರತೆಯ ಕೊರತೆ

ನಿರಂತರ ಮೇಲ್ವಿಚಾರಣೆಯಿಂದ ಉಂಟಾಗುವ ಒತ್ತಡ

ಉದ್ಯೋಗ ಭದ್ರತೆಯ ಬಗ್ಗೆ ಆತಂಕ

ಡೇಟಾ ಗೌಪ್ಯತೆ ಮತ್ತು ಭದ್ರತೆಯ ಪ್ರಶ್ನೆಗಳು

ತಂತ್ರಜ್ಞಾನ ಆಧಾರಿತ ಅಸಮಾನತೆ

ಸಲಹೆಗಳು

ನಾಗರಿಕ ಕಾರ್ಮಿಕರಿಗೆ ನಿಯಮಿತ ಡಿಜಿಟಲ್ ತರಬೇತಿ ನೀಡಬೇಕು.

AI ವ್ಯವಸ್ಥೆಗಳನ್ನು ಮಾನವ-ಕೇಂದ್ರಿತ ರೀತಿಯಲ್ಲಿ ಬಳಸಬೇಕು.

ಕಾರ್ಮಿಕರ ಮಾನಸಿಕ ಆರೋಗ್ಯಕ್ಕೆ ಸಲಹಾ ಕಾರ್ಯಕ್ರಮಗಳನ್ನು ರೂಪಿಸಬೇಕು.

ಡಿಜಿಟಲ್ ಆಡಳಿತದಲ್ಲಿ ಕಾರ್ಮಿಕರ ಭಾಗವಹಿಸುವಿಕೆಯನ್ನು ಹೆಚ್ಚಿಸಬೇಕು.

ಉದ್ಯೋಗ ಭದ್ರತೆ ಮತ್ತು ಸಾಮಾಜಿಕ ಭದ್ರತಾ ಯೋಜನೆಗಳನ್ನು ಬಲಪಡಿಸಬೇಕು.

ನಿರ್ಣಯ

ಆಧಾರಿತ ಡಿಜಿಟಲ್ ಆಡಳಿತವು ಹಾವೇರಿ ಜಿಲ್ಲೆಯ ನಾಗರಿಕ ಕಾರ್ಮಿಕರ ಕೆಲಸ ಮತ್ತು ಸಾಮಾಜಿಕ ಜೀವನದಲ್ಲಿ ಮಹತ್ವದ ಬದಲಾವಣೆಗಳನ್ನು ತಂದಿದೆ. ಇದು ಕಾರ್ಯಕ್ಷಮತೆ, ಪಾರದರ್ಶಕತೆ ಮತ್ತು ಸೇವಾ ಗುಣಮಟ್ಟವನ್ನು ಹೆಚ್ಚಿಸಿದರೂ, ಕೆಲಸದ ಒತ್ತಡ, ಡಿಜಿಟಲ್ ಅಸಮಾನತೆ ಮತ್ತು ಉದ್ಯೋಗ ಭದ್ರತೆಯಂತಹ ಹೊಸ ಸವಾಲುಗಳನ್ನು ಕೂಡ ಸೃಷ್ಟಿಸಿದೆ. ಸಮಾಜಶಾಸ್ತ್ರೀಯ ದೃಷ್ಟಿಕೋನದಿಂದ ನೋಡಿದಾಗ, ತಂತ್ರಜ್ಞಾನವು ಕೇವಲ ಆಡಳಿತದ ಸಾಧನವಲ್ಲ; ಅದು ಸಾಮಾಜಿಕ ಸಂಬಂಧಗಳು, ಅಧಿಕಾರದ ರಚನೆಗಳು ಮತ್ತು ಕಾರ್ಮಿಕರ ಜೀವನಮಟ್ಟವನ್ನು ರೂಪಿಸುವ ಪ್ರಮುಖ ಅಂಶವಾಗಿದೆ. ಆದ್ದರಿಂದ ೦೫ ಆಧಾರಿತ ಆಡಳಿತದ ಯಶಸ್ಸು ತಂತ್ರಜ್ಞಾನ ಮತ್ತು ಮಾನವ ಕಲ್ಯಾಣದ ನಡುವಿನ ಸಮತೋಲನದ ಮೇಲೆ ಅವಲಂಬಿತವಾಗಿದೆ.

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Original Article

ಹಸ್ತಪ್ರತಿಯ ಅರ್ಥ-ಸ್ವರೂಪ-ಮಹತ್ವ ಹಾಗೂ ಸಂರಕ್ಷಣಾ ವಿಧಾನಗಳು

ಡಾ. ಸುಜಾತ ದೇವರಮನಿ

ಕನ್ನಡ ಸಹ ಪ್ರಾಧ್ಯಾಪಕರು, ಸರಕಾರಿ ಪ್ರಥಮ ದರ್ಜೆ ಕಾಲೇಜು, ಹುಬ್ಬಳ್ಳಿ

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ಮಾನವ ಸಂಸ್ಕೃತಿಯ ಇತಿಹಾಸವೆಂದರೆ ಜ್ಞಾನ ಸಂರಕ್ಷಣೆಯ ಇತಿಹಾಸ. ಮುದ್ರಣ ಯಂತ್ರದ ಆವಿಷ್ಕಾರದ ಮೊದಲು, ಜ್ಞಾನವನ್ನು ಉಳಿಸಿ ಮುಂದಿನ ಪೀಳಿಗೆಗೆ ಸಾಗಿಸಲು ಮಾನವರು ಬಳಸಿದ ಪ್ರಮುಖ ಸಾಧನವೇ ಹಸ್ತಪ್ರತಿ ಕೈಯಿಂದ ಬರೆಯಲ್ಪಟ್ಟ ಈ ಗ್ರಂಥಗಳು ಕೇವಲ ಅಕ್ಷರಗಳ ಸಂಕಲನವಾಗಿರದೆ, ಒಂದು ಕಾಲಘಟ್ಟದ ಚಿಂತನೆ, ನಂಬಿಕೆ, ಸಂಸ್ಕೃತಿ ಮತ್ತು ವೈಜ್ಞಾನಿಕ ತಿಳುವಳಿಕೆಯ ಪ್ರತಿಬಿಂಬವಾಗಿವೆ. ಪ್ರಾಚೀನ ಕಾಲದಲ್ಲಿ ತಾಳೆಎಲೆ, ಭೂರ್ಜಪತ್ರ, ಕಾಗದ, ತಾಮ್ರಪತ್ರಗಳ ಮೇಲೆ ರಚಿಸಲ್ಪಟ್ಟ ಹಸ್ತಪ್ರತಿಗಳು ಧಾರ್ಮಿಕ, ಸಾಹಿತ್ಯಿಕ, ವೈಜ್ಞಾನಿಕ ಹಾಗೂ ಆಡಳಿತ ಕ್ಷೇತ್ರಗಳಲ್ಲಿಯೂ ಮಹತ್ವ ಪಡೆದಿದ್ದವು. ವೇದಗಳು, ಪುರಾಣಗಳು, ಕಾವ್ಯಗಳು, ವೈದ್ಯಶಾಸ್ತ್ರ, ಗಣಿತ, ಜ್ಯೋತಿಷ್ಯ ಮುಂತಾದ ಅನೇಕ ಜ್ಞಾನಕ್ಷೇತ್ರಗಳು ಹಸ್ತಪ್ರತಿಗಳ ಮೂಲಕವೇ ಉಳಿದು ಬಂದಿವೆ. ಉದಾಹರಣೆಗೆ, ಭಾರತದ ಪ್ರಾಚೀನ ಶಾಸನ ಪರಂಪರೆಯಲ್ಲಿ Ashoka ಅವರ ಶಾಸನಗಳು ಲಿಖಿತ ಸಂಸ್ಕೃತಿಯ ಮಹತ್ವವನ್ನು ಸಾರುತ್ತವೆ.

ಪ್ರಸ್ತಾವನೆ:

ಹಸ್ತಪ್ರತಿಗಳು ನಮ್ಮ ಸಾಂಸ್ಕೃತಿಕ ಪರಂಪರೆಯ ಅಮೂಲ್ಯ ಸಂಪತ್ತು. ಅವುಗಳಲ್ಲಿ ಅಡಕವಾಗಿರುವ ಮಾಹಿತಿಯು ಭಾಷೆಯ ಬೆಳವಣಿಗೆ, ಸಮಾಜದ ರೂಪುರೇಷೆ, ಧಾರ್ಮಿಕ ಆಚರಣೆಗಳು ಮತ್ತು ಆಡಳಿತ ವ್ಯವಸ್ಥೆಯ ಬಗ್ಗೆ ಅಮೂಲ್ಯ ಬೆಳಕು ಚೆಲ್ಲುತ್ತದೆ. ಪ್ರತಿಯೊಂದು ಹಸ್ತಪ್ರತಿಯೂ ಒಂದು ಇತಿಹಾಸದ ಸಾಕ್ಷಿ. ಇಂದಿನ ಡಿಜಿಟಲ್ ಯುಗದಲ್ಲಿಯೂ ಹಸ್ತಪ್ರತಿಗಳ ಮಹತ್ವ ಕಡಿಮೆಯಾಗಿಲ್ಲ. ಅವುಗಳ ಸಂರಕ್ಷಣೆ, ಸಂಶೋಧನೆ ಮತ್ತು ಡಿಜಿಟಲೀಕರಣದ ಮೂಲಕ ನಾವು ನಮ್ಮ ಪರಂಪರೆಯನ್ನು ಭದ್ರಪಡಿಸಬಹುದು. ಹೀಗಾಗಿ, ಹಸ್ತಪ್ರತಿಗಳ ಅಧ್ಯಯನವು ಕೇವಲ ಸಾಹಿತ್ಯ ಅಧ್ಯಯನವಲ್ಲ, ಅದು ನಮ್ಮ ಸಂಸ್ಕೃತಿ ಮತ್ತು ಜ್ಞಾನಪರಂಪರೆಯ ಅರಿವಿನ ಮಾರ್ಗವಾಗಿದೆ. ಹಸ್ತಪ್ರತಿ ಎಂದರೆ ಕೇವಲ ಕೈಬರಹವಲ್ಲ; ಅದು ನಮ್ಮ ಇತಿಹಾಸದ ಜೀವಂತ ಸ್ಮಾರಕ.

ಹಸ್ತಪ್ರತಿಯ ಅರ್ಥ

“ಹಸ್ತಪ್ರತಿ” ಎಂಬ ಪದವು ಲ್ಯಾಟಿನ್ ಭಾಷೆಯ 'manus' (ಕೈ) ಮತ್ತು 'scriptum' (ಬರೆಯಲ್ಪಟ್ಟದ್ದು) ಎಂಬ ಪದಗಳಿಂದ ಬಂದಿದ್ದು, ಅದರ ಮೂಲ ಅರ್ಥ ಕೈಯಿಂದ ಬರೆಯಲ್ಪಟ್ಟ ಬರಹವೆಂದಾಗಿದೆ.

ಸರಳವ್ಯಾಖ್ಯೆ

“ಮುದ್ರಣ ಯಂತ್ರದ ಸಹಾಯವಿಲ್ಲದೆ ಕೈಯಿಂದ ಬರೆಯಲ್ಪಟ್ಟ ಯಾವುದೇ ಗ್ರಂಥ, ದಾಖಲೆ ಅಥವಾ ಸಾಹಿತ್ಯಿಕ ಕೃತಿಯೇ ಹಸ್ತಪ್ರತಿ”

ವಿಸ್ತೃತಅರ್ಥ :

1. ಲೇಖಕ ಅಥವಾ ಲಿಪಿಕಾರನ ಕೈಬರಹದಲ್ಲಿ ರಚಿಸಲ್ಪಟ್ಟ ಮೂಲ ಅಥವಾ ಪ್ರತಿಲಿಪಿ.
2. ತಾಳೆಎಲೆ, ಭೂರ್ಜಪತ್ರ, ಕಾಗದ, ತಾಮ್ರಪತ್ರ ಮುಂತಾದ ತಳಹದಿಗಳ ಮೇಲೆ ಬರೆಯಲ್ಪಟ್ಟ ಬರಹ.
3. ಮುದ್ರಣಕ್ಕೂ ಮುಂಚಿನ ಜ್ಞಾನ ಸಂಗ್ರಹದ ಪ್ರಮುಖ ಮಾಧ್ಯಮ.



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Address for correspondence:

ಡಾ. ಸುಜಾತ ದೇವರಮನಿ ಕನ್ನಡ ಸಹ ಪ್ರಾಧ್ಯಾಪಕರು, ಸರಕಾರಿ ಪ್ರಥಮ ದರ್ಜೆ ಕಾಲೇಜು, ಹುಬ್ಬಳ್ಳಿ

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4. ಹಸ್ತಪ್ರತಿ ಎಂದರೆ ಕೇವಲ ಕೈಬರಹದ ಪುಸ್ತಕವಲ್ಲ; ಅದು ಒಂದು ಕಾಲಘಟ್ಟದ ಜ್ಞಾನ, ಸಂಸ್ಕೃತಿ ಮತ್ತು ಇತಿಹಾಸವನ್ನು ಹೊತ್ತಿರುವ ಅಮೂಲ್ಯ ದಾಖಲೆ.

ಹಸ್ತಪ್ರತಿ ಕುರಿತು ವಿದ್ವಾಂಸರ ವ್ಯಾಖ್ಯೆಗಳು

1. ಪಾಶ್ಚಾತ್ಯ ವಿದ್ವಾಂಸರ ದೃಷ್ಟಿ

Fredson Bowers ಅವರ ಪ್ರಕಾರ :

“ಲೇಖಕನ ಕೈಯಿಂದ ಅಥವಾ ಲಿಪಿಕಾರನ ಕೈಯಿಂದ ರಚಿಸಲ್ಪಟ್ಟ ಮುದ್ರಣಕ್ಕೂ ಮುಂಚಿನ ಪಠ್ಯವೇ ಹಸ್ತಪ್ರತಿ.” ಅವರು ಪಠ್ಯವಿಮರ್ಶೆಯ ದೃಷ್ಟಿಯಿಂದ ಮೂಲಹಸ್ತಪ್ರತಿಯ ಮಹತ್ವವನ್ನು ಒತ್ತಿ ಹೇಳುತ್ತಾರೆ.

2. ಗ್ರಂಥಾಲಯಶಾಸ್ತ್ರದ ಪ್ರಕಾರ

Oxford University Press ಪ್ರಕಟಿಸಿದ ನಿಘಂಟಿನ ಪ್ರಕಾರ : “Handwritten book, document, or text.” ಅಂದರೆ ಕೈಬರಹದ ಪುಸ್ತಕ ಅಥವಾ ದಾಖಲೆ.

3. ಭಾರತೀಯ ವಿದ್ವಾಂಸರ ಪ್ರಕಾರ

“ತಾಳೆಎಲೆ, ಭೂರ್ಜಪತ್ರ, ಕಾಗದ ಮುಂತಾದ ತಳಹದಿಗಳ ಮೇಲೆ ಕೈಯಿಂದ ಬರೆಯಲ್ಪಟ್ಟ ಮತ್ತು ಜ್ಞಾನವನ್ನು ಸಂಗ್ರಹಿಸುವ ಪಠ್ಯವೇ ಹಸ್ತಪ್ರತಿ.”

4. National Mission for Manuscripts ಸಂಸ್ಥೆಯ ವ್ಯಾಖ್ಯೆ :

“100 ವರ್ಷಗಳಿಗಿಂತ ಹಳೆಯ ಮತ್ತು ಕೈಬರಹದ ರೂಪದಲ್ಲಿರುವ ಜ್ಞಾನಪೂರ್ಣ ದಾಖಲೆ ಹಸ್ತಪ್ರತಿ.”

4. ಪಠ್ಯ ವಿಮರ್ಶಕರ ಅಭಿಪ್ರಾಯ

“ಲೇಖಕರ ಮೂಲ ಕೈಬರಹ ಅಥವಾ ಅದಕ್ಕೆ ಸಮೀಪವಾದ ಪ್ರತಿಲಿಪಿಯೇ ಹಸ್ತಪ್ರತಿ; ಇದುವೇ ಪಠ್ಯದ ಪ್ರಾಮಾಣಿಕ ಮೂಲ.”

5. ಐತಿಹಾಸಿಕ ದೃಷ್ಟಿಕೋನ

“ಒಂದು ಕಾಲಘಟ್ಟದ ಸಾಮಾಜಿಕ, ಧಾರ್ಮಿಕ, ರಾಜಕೀಯ ಹಾಗೂ ಸಾಂಸ್ಕೃತಿಕ ಮಾಹಿತಿಯನ್ನು ಒಳಗೊಂಡ ಕೈಬರಹದ ದಾಖಲೆ ಹಸ್ತಪ್ರತಿ.”

ಒಟ್ಟಾರೆ ಕೈಯಿಂದ ಬರೆಯಲ್ಪಟ್ಟ, ಜ್ಞಾನವನ್ನು ಸಂಗ್ರಹಿಸುವ ಮತ್ತು ಐತಿಹಾಸಿಕ ಮಹತ್ವ ಹೊಂದಿದ ಪಠ್ಯವೇ ಹಸ್ತಪ್ರತಿ. ವಿಭಿನ್ನ ಕ್ಷೇತ್ರಗಳು ವಿಭಿನ್ನ ರೀತಿಯಲ್ಲಿ ವಿವರಿಸಿದರೂ, ಅದರ ಮೂಲತತ್ವ ಒಂದೇ ಆಗಿದೆ.

ಹಸ್ತಪ್ರತಿಯ ಲಕ್ಷಣಗಳು :

1. ಕೈಬರಹದ ಸ್ವರೂಪ :

ಹಸ್ತಪ್ರತಿಗಳು ಸಂಪೂರ್ಣವಾಗಿ ಕೈಯಿಂದಲೇ ಬರೆಯಲ್ಪಟ್ಟಿರುತ್ತವೆ. ಪ್ರತಿಯೊಬ್ಬ ಲೇಖಕರ ಬರಹ ಶೈಲಿ ವಿಭಿನ್ನವಾಗಿರುವುದರಿಂದ ಅಕ್ಷರರೂಪದಲ್ಲಿ ವೈವಿಧ್ಯ ಕಂಡುಬರುತ್ತದೆ.

2. ಪ್ರಾಚೀನ ಲಿಪಿ ಮತ್ತು ಭಾಷೆ :

ಹಸ್ತಪ್ರತಿಗಳು ಸಾಮಾನ್ಯವಾಗಿ ಹಳೆಯ ಲಿಪಿಗಳಲ್ಲಿ ಬರೆಯಲ್ಪಟ್ಟಿರುತ್ತವೆ. ಉದಾಹರಣೆಗೆ ಕನ್ನಡ ಹಸ್ತಪ್ರತಿಗಳು ಹಳೆ ಕನ್ನಡ ಲಿಪಿಯಲ್ಲಿ ಕಂಡುಬರುತ್ತವೆ. ಸಂಸ್ಕೃತ, ಪ್ರಾಕೃತ, ಪಾಳಿ ಮುಂತಾದ ಭಾಷೆಗಳ ಬಳಕೆ ಹೆಚ್ಚಾಗಿರುತ್ತದೆ.

3. ಬರವಣಿಗೆಗೆ ಬಳಸಿದ ವಸ್ತುಗಳು :

ಹಸ್ತಪ್ರತಿಗಳನ್ನು ವಿವಿಧ ವಸ್ತುಗಳ ಮೇಲೆ ಬರೆಯಲಾಗುತ್ತಿತ್ತು.

1. ತಾಳೆಎಲೆ
2. ಭೂರ್ಜಪತ್ರ
3. ಕಾಗದ
4. ಬಟ್ಟೆ

ಇವು ಹಸ್ತಪ್ರತಿಯ ಪ್ರಾಚೀನತೆಯನ್ನು ಸೂಚಿಸುತ್ತವೆ.

4. ಅಲಂಕಾರಿಕ ಶೈಲಿ

ಕೆಲವು ಹಸ್ತಪ್ರತಿಗಳಲ್ಲಿ ಚಿತ್ರಗಳು, ಅಲಂಕಾರಿಕ ಅಕ್ಷರಗಳು, ಬಣ್ಣಗಳ ಬಳಕೆ ಕಂಡುಬರುತ್ತದೆ. ವಿಶೇಷವಾಗಿ ಧಾರ್ಮಿಕ ಗ್ರಂಥಗಳಲ್ಲಿ ಸುಂದರ ಅಲಂಕಾರಗಳು ಕಾಣಿಸುತ್ತವೆ.

5. ವಿಷಯ ವೈವಿಧ್ಯ

ಹಸ್ತಪ್ರತಿಗಳಲ್ಲಿ ಧರ್ಮ, ಸಾಹಿತ್ಯ, ವಿಜ್ಞಾನ, ವೈದ್ಯಶಾಸ್ತ್ರ, ಗಣಿತ, ಜ್ಯೋತಿಷ್ಯ ಇತ್ಯಾದಿ ವಿಷಯಗಳು ಒಳಗೊಂಡಿರುತ್ತವೆ.

6. ಸಂಗ್ರಹ ಮತ್ತು ಬದ್ಧತೆ

ತಾಳೆಎಲೆ ಹಸ್ತಪ್ರತಿಗಳನ್ನು ರಂಧ್ರ ಮಾಡಿ ದಾರದಿಂದ ಕಟ್ಟಲಾಗುತ್ತಿತ್ತು. ಕೆಲವು ಹಸ್ತಪ್ರತಿಗಳು ಮರದ ಫಲಕಗಳ ನಡುವೆ ಇಡಲಾಗುತ್ತಿತ್ತು.

7. ಕಾಲಚಿಹ್ನೆಗಳು

ಹಳೆಯ ಹಸ್ತಪ್ರತಿಗಳಲ್ಲಿ ಕಾಲದ ಪರಿಣಾಮವಾಗಿ ಹಳದಿ ಬಣ್ಣ, ಕೀಟಹಾನಿ, ಮಸುಕಾದ ಅಕ್ಷರಗಳು ಕಾಣಬಹುದು. ಇದು ಅವುಗಳ ಪುರಾತನತೆಯನ್ನು ತೋರಿಸುತ್ತವೆ.

8. ಲೇಖಕ ಅಥವಾ ಪ್ರತಿಲೇಖಕರ ಉಲ್ಲೇಖ

ಕೆಲವು ಹಸ್ತಪ್ರತಿಗಳಲ್ಲಿ ಕೊನೆಯಲ್ಲಿ ಲೇಖಕರ ಹೆಸರು, ರಚನೆಯ ಕಾಲ, ಸ್ಥಳ ಇತ್ಯಾದಿ ವಿವರಗಳು ಉಲ್ಲೇಖಿತವಾಗಿರುತ್ತವೆ. ಇದನ್ನು “ಕೊಲೊಫಾನ್” ಎಂದು ಕರೆಯುತ್ತಾರೆ.

9. ಅಪರೂಪ ಮತ್ತು ಏಕೈಕತ್ವ

ಹಸ್ತಪ್ರತಿಗಳು ಸಾಮಾನ್ಯವಾಗಿ ಒಂದೇ ಪ್ರತಿಯಾಗಿರಬಹುದು. ಆದ್ದರಿಂದ ಅವು ಅಪರೂಪದ ಮತ್ತು ಅಮೂಲ್ಯ ಸಂಪತ್ತಾಗಿವೆ.

ಹಸ್ತಪ್ರತಿಗಳು ನಮ್ಮ ಸಂಸ್ಕೃತಿ, ಸಾಹಿತ್ಯ ಮತ್ತು ಇತಿಹಾಸದ ಅಮೂಲ್ಯ ದಾಖಲೆಗಳು. ಅವುಗಳ ಲಕ್ಷಣಗಳನ್ನು ತಿಳಿದುಕೊಳ್ಳುವುದು ನಮ್ಮ ಪರಂಪರೆಯ ಬಗ್ಗೆ ಅರಿವು ಹೆಚ್ಚಿಸುತ್ತದೆ.

ಹಸ್ತಪ್ರತಿಯ ಮಹತ್ವ

ಹಸ್ತಪ್ರತಿಗಳು ನಮ್ಮ ಸಂಸ್ಕೃತಿ, ಸಾಹಿತ್ಯ ಮತ್ತು ಜ್ಞಾನಪರಂಪರೆಯ ಅಮೂಲ್ಯ ಸಂಪತ್ತಾಗಿವೆ. ಅವುಗಳ ಮಹತ್ವವನ್ನು ವಿವಿಧ ಆಯಾಮಗಳಲ್ಲಿ ನೋಡಬಹುದು.

1. ಐತಿಹಾಸಿಕ ಮಹತ್ವ

- ಹಸ್ತಪ್ರತಿಗಳು ಒಂದು ಕಾಲಘಟ್ಟದ ಸಾಮಾಜಿಕ, ರಾಜಕೀಯ ಮತ್ತು ಧಾರ್ಮಿಕ ಸ್ಥಿತಿಯನ್ನು ತಿಳಿಸುತ್ತವೆ.
- ಪ್ರಾಚೀನ ಭಾರತದ ಆಡಳಿತ ಮತ್ತು ಧರ್ಮ ಪ್ರಸಾರದ ಕುರಿತು ತಿಳಿಯಲು **Ashoka** ಅವರ ಕಾಲದ ಲಿಖಿತ ದಾಖಲೆಗಳು ಉದಾಹರಣೆಯಾಗಿವೆ.

2. ಸಾಹಿತ್ಯಿಕ ಮಹತ್ವ

- ವೇದಗಳು, ಪುರಾಣಗಳು, ಕಾವ್ಯಗಳು, ನಾಟಕಗಳು ಮೊದಲಾದ ಅನೇಕ ಕೃತಿಗಳು ಹಸ್ತಪ್ರತಿಯ ರೂಪದಲ್ಲೇ ಸಂರಕ್ಷಿಸಲ್ಪಟ್ಟಿವೆ.
- ಅನೇಕ ಮೂಲ ಕೃತಿಗಳ ಪ್ರಾಮಾಣಿಕ ಪಠ್ಯತಿಳಿಯಲು ಹಸ್ತಪ್ರತಿಗಳು ಮುಖ್ಯ ಆಧಾರ.

3. ಸಾಂಸ್ಕೃತಿಕ ಮಹತ್ವ

- ಜನಪದ ಆಚರಣೆಗಳು, ಧಾರ್ಮಿಕ ಸಂಪ್ರದಾಯಗಳು ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ರೂಪುರೇಷೆಗಳನ್ನು ಹಸ್ತಪ್ರತಿಗಳು ಪ್ರತಿಬಿಂಬಿಸುತ್ತವೆ.
- ಭಾಷೆಯ ಬೆಳವಣಿಗೆ ಮತ್ತು ಲಿಪಿಯ ಬದಲಾವಣೆಗಳನ್ನು ಅಧ್ಯಯನ ಮಾಡಲು ಸಹಾಯಕ.

4. ವೈಜ್ಞಾನಿಕ ಮತ್ತು ಜ್ಞಾನ ಮಹತ್ವ

- ವೈದ್ಯಶಾಸ್ತ್ರ, ಗಣಿತ, ಜ್ಯೋತಿಷ್ಯ, ಕೃಷಿ, ತಂತ್ರಜ್ಞಾನ ಮುಂತಾದ ವಿಷಯಗಳ ಜ್ಞಾನ ಹಸ್ತಪ್ರತಿಗಳ ಮೂಲಕ ಉಳಿದಿದೆ.
- ಪುರಾತನ ಭಾರತೀಯ ಜ್ಞಾನವ್ಯವಸ್ಥೆಯನ್ನು ಅರಿಯಲು ಪ್ರಮುಖ ಮೂಲ.

5. ಪಠ್ಯ ವಿಮರ್ಶಾ ಮಹತ್ವ

- ಮೂಲ ಮತ್ತು ಪ್ರತಿಲಿಪಿಗಳ ಹೋಲಿಕೆಯಿಂದ ಶುದ್ಧ ಪಠ್ಯವನ್ನು ಸ್ಥಾಪಿಸಲು ಸಹಾಯ.
- ಲೇಖಕರ ಮೂಲ ಉದ್ದೇಶವನ್ನು ತಿಳಿಯಲು ನೆರವು.

6. ಸಂಶೋಧನಾ ಮಹತ್ವ

- ಇತಿಹಾಸಕಾರರು, ಭಾಷಾಶಾಸ್ತ್ರಜ್ಞರು, ಸಂಸ್ಕೃತಿ ಅಧ್ಯಯನಕಾರರಿಗೆ ಹಸ್ತಪ್ರತಿಗಳು ಪ್ರಮುಖ ಆಧಾರ.
- ಅನೇಕ ಹೊಸ ಸಂಶೋಧನೆಗಳಿಗೆ ಮೂಲವಸ್ತು.
- ಹಸ್ತಪ್ರತಿ ಎಂದರೆ ಕೇವಲ ಹಳೆಯ ಕೈಬರಹದ ಪುಸ್ತಕವಲ್ಲ; ಅದು ಒಂದು ಯುಗದ ಚಿಂತನೆ, ಸಂಸ್ಕೃತಿ ಮತ್ತು ಜ್ಞಾನಪರಂಪರೆಯ ಜೀವಂತ ಸಾಕ್ಷಿ. ಆದ್ದರಿಂದ ಹಸ್ತಪ್ರತಿಗಳ ಸಂರಕ್ಷಣೆ ಮತ್ತು ಅಧ್ಯಯನ ಅತ್ಯಂತ ಅಗತ್ಯವಾಗಿದೆ.

ಹಸ್ತಪ್ರತಿಯ ಸಂರಕ್ಷಣಾ ವಿಧಾನಗಳು

ಹಸ್ತಪ್ರತಿಗಳು ಬಹು ಮೌಲ್ಯವಾದ ಸಾಂಸ್ಕೃತಿಕ ಸಂಪತ್ತಾಗಿರುವುದರಿಂದ ಅವುಗಳನ್ನು ಸರಿಯಾದ ರೀತಿಯಲ್ಲಿ ಸಂರಕ್ಷಿಸುವುದು ಅತ್ಯಂತ ಮುಖ್ಯ. ಸಂರಕ್ಷಣಾ ವಿಧಾನಗಳು ಇಂತಿವೆ:

1. ಉಚಿತ ಸಂರಕ್ಷಣೆ (Proper Storage)

- ತಂಪಾದ ಮತ್ತು ಒಣ ವಾತಾವರಣದಲ್ಲಿ ಇಡಬೇಕು.
- ತೇವಾಂಶ ಮತ್ತು ಅತಿಯಾದ ಬೆಳಕಿನಿಂದ ದೂರವಿರಿಸಬೇಕು.

3. ಕೀಟನಾಶಕ ಕ್ರಮಗಳನ್ನು ಅನುಸರಿಸಬೇಕು.

2. ಶುದ್ಧೀಕರಣ (Cleaning Process)

1. ಧೂಳು, ಕೀಟಗಳಿಂದ ರಕ್ಷಿಸಲು ನಿಯಮಿತವಾಗಿ ಸ್ವಚ್ಛಗೊಳಿಸಬೇಕು.

2. ಪರಿಣಿತರ ಮೂಲಕ ಮಾತ್ರ ಶುದ್ಧೀಕರಣ ಮಾಡಿಸಬೇಕು.

3. ರಾಸಾಯನಿಕ ಚಿಕಿತ್ಸೆ (Chemical Treatment)

1. ಹಾನಿಗೊಳಗಾದ ಹಸ್ತಪ್ರತಿಗಳಿಗೆ ವಿಶೇಷ ರಾಸಾಯನಿಕ ವಿಧಾನಗಳಿಂದ ಸಂರಕ್ಷಣೆ ನೀಡಲಾಗುತ್ತದೆ.

2. ಇದು ಕಾಗದ ಅಥವಾ ತಾಳೆ ಎಲೆಗಳ ಆಯುಷ್ಯ ಹೆಚ್ಚಿಸುತ್ತದೆ.

4. ಡಿಜಿಟಲೀಕರಣ (Digitization)

ಹಸ್ತಪ್ರತಿಗಳನ್ನು ಸ್ಕ್ಯಾನ್ ಮಾಡಿ ಡಿಜಿಟಲ್ ರೂಪದಲ್ಲಿ ಸಂಗ್ರಹಿಸುವುದು. ಇದರಿಂದ ಮೂಲ

ಪ್ರತಿಗೆ ಹಾನಿಯಾಗದಂತೆ ಮಾಹಿತಿ ಉಳಿಸಬಹುದು.

5. ಲ್ಯಾಮಿನೇಷನ್ ಮತ್ತು ರಿಪೇರಿ (Repair & Lamination)

1. ಹರಿದಿರುವ ಭಾಗಗಳನ್ನು ಸರಿಪಡಿಸುವುದು.

2. ವಿಶೇಷ ಸಂರಕ್ಷಣಾ ತಂತ್ರಗಳನ್ನು ಬಳಸುವುದು.

6. ಗ್ರಂಥಾಲಯ ಮತ್ತು ಸಂಶೋಧನಾ ಕೇಂದ್ರಗಳಲ್ಲಿ ಸಂರಕ್ಷಣೆ

1. ಹಸ್ತಪ್ರತಿಗಳನ್ನು ವಿಶೇಷ ಸಂಗ್ರಹಾಲಯಗಳಲ್ಲಿ ಸುರಕ್ಷಿತವಾಗಿ ಇಡಬೇಕು

2. ಸಂಶೋಧಕರಿಗೆ ನಿಯಮಿತ ಪ್ರವೇಶ ಒದಗಿಸಬೇಕು.

ನಾವು ನಮ್ಮ ಇತಿಹಾಸ ಮತ್ತು ಜ್ಞಾನವನ್ನು ಮುಂದಿನ ಪೀಳಿಗೆಗೆ ಸಾಗಿಸಬಹುದು.

ಸಮಾರೋಪ :

ಹಸ್ತಪ್ರತಿಗಳು ನಮ್ಮ ಸಂಸ್ಕೃತಿ, ಸಾಹಿತ್ಯ ಮತ್ತು ಜ್ಞಾನ ಪರಂಪರೆಯ ಅಮೂಲ್ಯ ಸಂಪತ್ತಾಗಿವೆ. ಹಳೆಯ ಕಾಲದ ಪಂಡಿತರು, ಕವಿಗಳು ಮತ್ತು ವಿದ್ವಾಂಸರು ತಮ್ಮ ಜ್ಞಾನವನ್ನು ಹಸ್ತಪ್ರತಿಗಳ ಮೂಲಕವೇ ಮುಂದಿನ ಪೀಳಿಗೆಗೆ ಸಾಗಿಸಿದ್ದಾರೆ. ಈ ಹಸ್ತಪ್ರತಿಗಳಲ್ಲಿ ಧಾರ್ಮಿಕ, ಸಾಹಿತ್ಯಿಕ, ವೈಜ್ಞಾನಿಕ ಹಾಗೂ ಸಾಮಾಜಿಕ ವಿಷಯಗಳ ಕುರಿತ ಅಮೂಲ್ಯ ಮಾಹಿತಿಗಳು ಸಂಗ್ರಹವಾಗಿವೆ. ಆದ್ದರಿಂದ ಹಸ್ತಪ್ರತಿಗಳು ನಮ್ಮ ಇತಿಹಾಸವನ್ನು ತಿಳಿಯಲು ಹಾಗೂ ಪಾರಂಪರಿಕ ಜ್ಞಾನವನ್ನು ಅರಿಯಲು ಮಹತ್ವದ ಮೂಲಗಳಾಗಿವೆ. ಇಂದಿನ ಯುಗದಲ್ಲಿ ಹಸ್ತಪ್ರತಿಗಳನ್ನು ಸಂರಕ್ಷಿಸುವುದು ಅತ್ಯಂತ ಅಗತ್ಯವಾಗಿದೆ. ಸರಿಯಾದ ಸಂರಕ್ಷಣಾ ವಿಧಾನಗಳನ್ನು ಅನುಸರಿಸುವ ಮೂಲಕ ಈ ಅಮೂಲ್ಯ ಸಂಪತ್ತನ್ನು ಮುಂದಿನ ಪೀಳಿಗೆಗೂ ಉಳಿಸಬಹುದು. ಸರ್ಕಾರ, ಗ್ರಂಥಾಲಯಗಳು, ಸಂಶೋಧಕರು ಹಾಗೂ ಜನಸಾಮಾನ್ಯರು ಎಲ್ಲರೂ ಸೇರಿ ಹಸ್ತಪ್ರತಿಗಳ ರಕ್ಷಣೆಗೆ ಪ್ರಯತ್ನಿಸಬೇಕು. ಆದ್ದರಿಂದ ಹಸ್ತಪ್ರತಿಗಳನ್ನು ಕೇವಲ ಹಳೆಯ ದಾಖಲೆಗಳೆಂದು ಅಮೂಲ್ಯ ಸಂಪತ್ತು ಎಂದು ಕಾಪಾಡುವುದು ಪ್ರತಿಯೊಬ್ಬರ ಕರ್ತವ್ಯವಾಗಿದೆ.

ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು :

1. "ಹಸ್ತಪ್ರತಿಶಾಸ್ತ್ರ" - ಡಾ. ಎಂ. ಎಂ. ಕಲಬುರ್ಗಿ
2. "ಹಸ್ತಪ್ರತಿ ಸಂರಕ್ಷಣೆಯ ವಿಧಾನಗಳು" - ಶ್ರೀ ಬಿ. ಎಂ. ಸಣ್ಣಯ್ಯ
3. ಕನ್ನಡ ಹಸ್ತಪ್ರತಿಗಳು ಒಂದು ಅಧ್ಯಯನ : ಡಾ. ಬಿ. ಆರ್. ಹಿರೇಮಠ
4. "ಕನ್ನಡ ಹಸ್ತಪ್ರತಿ ಲಿಪಿಕಾರರು, ಪ್ರಶಸ್ತಿಗಳು" - ಡಾ. ಬಿ. ಆರ್. ಹಿರೇಮಠ
5. "ಸಮಾಲೋಚನ" - ತೀ. ನಂ. ಶ್ರೀಕಂಠಯ್ಯ

Original Article

ಡಿಜಿಟಲ್ ಒಳಗೊಳ್ಳುವಿಕೆ ಮತ್ತು ಸಾಮಾಜಿಕ ಬದಲಾವಣೆ: ಕರ್ನಾಟಕದ ಡವೇರಿ, ನಾಥಪಂಥಿ, ಡೌರಿಗೋಸಾವಿ ಸಮುದಾಯದ ಸಾಮಾಜಿಕ ಅಧ್ಯಯನ

ಉದಯಕುಮಾರ ಶಿ.ಕುರುಬರ¹, ಡಾ. ಮಲ್ಲಿಕಾರ್ಜುನ ಬಿ ಮಾನ್ವಡೆ²

¹ಸಂಶೋಧನಾರ್ಥಿ, ಕರ್ನಾಟಕ ಜಾನಪದ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಗೊಟಗೋಡಿ

²ಸಹಲೇಖಕರು, ಮಾರ್ಗದರ್ಶಕರು, ಸಹಾಯಕ ಸಂಶೋಧನಾ ಅಧಿಕಾರಿ
ಕರ್ನಾಟಕ ಜಾನಪದ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಗೊಟಗೋಡಿ

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ಭಾರತದಲ್ಲಿ ಡಿಜಿಟಲ್ ಕ್ರಾಂತಿಯು ಸಮಾಜದ ವಿವಿಧ ಕ್ಷೇತ್ರಗಳಲ್ಲಿ ಮಹತ್ತರ ಬದಲಾವಣೆಗಳನ್ನು ತಂದಿದೆ. ಡಿಜಿಟಲ್ ಇಂಡಿಯಾ, ಇ-ಆಡಳಿತ, ಆಧಾರ್, ಆನ್ಲೈನ್ ಶಿಕ್ಷಣ, ಡಿಜಿಟಲ್ ಬ್ಯಾಂಕಿಂಗ್ ಮತ್ತು ಮೊಬೈಲ್ ತಂತ್ರಜ್ಞಾನಗಳ ಮೂಲಕ ನಾಗರಿಕರಿಗೆ ವಿವಿಧ ಸೇವೆಗಳು ತಲುಪುತ್ತಿವೆ. ಆದರೆ ಸಮಾಜದ ಅಂಚಿನಲ್ಲಿರುವ ದಾವೇರಿ, ನಾಥಪಂಥಿ ಮತ್ತು ಧಾವರಿಘೋಸಾವಿ ಮುಂತಾದ ಅಲೆಮಾರಿ ಮತ್ತು ಅರೆ-ಅಲೆಮಾರಿ ಸಮುದಾಯಗಳು ಡಿಜಿಟಲ್ ವ್ಯವಸ್ಥೆಗಳಲ್ಲಿ ಸಂಪೂರ್ಣವಾಗಿ ಒಳಗೊಳ್ಳಲು ಇನ್ನೂ ಸವಾಲುಗಳನ್ನು ಎದುರಿಸುತ್ತಿವೆ. ಈ ಲೇಖನವು ಕರ್ನಾಟಕದ ಈ ಸಮುದಾಯಗಳಲ್ಲಿ ಡಿಜಿಟಲ್ ಒಳಗೊಳ್ಳುವಿಕೆಯ ಪ್ರಭಾವ, ಸಾಮಾಜಿಕ ಬದಲಾವಣೆ, ಶಿಕ್ಷಣ, ಉದ್ಯೋಗ, ಸಾಮಾಜಿಕ ಚಲನಶೀಲತೆ ಹಾಗೂ ಸಾಂಸ್ಕೃತಿಕ ಪರಿವರ್ತನೆಗಳನ್ನು ಸಮಾಜಶಾಸ್ತ್ರೀಯ ದೃಷ್ಟಿಕೋನದಿಂದ ವಿಶ್ಲೇಷಿಸುತ್ತದೆ. ಇತ್ತೀಚಿನ ಅಧ್ಯಯನಗಳು ನಾಥಪಂಥಿ ಸೇರಿದಂತೆ ಅಲೆಮಾರಿ ಸಮುದಾಯಗಳ ಸಾಮಾಜಿಕ-ಆರ್ಥಿಕ ಸ್ಥಿತಿಗತಿಗಳನ್ನು ಸರ್ಕಾರವು ದಾಖಲಿಸಲು ಮುಂದಾಗಿರುವುದನ್ನು ಸೂಚಿಸುತ್ತವೆ.

ಪ್ರಮುಖ ಪದಗಳು : ಡಿಜಿಟಲ್ ಒಳಗೊಳ್ಳುವಿಕೆ, ಸಾಮಾಜಿಕ ಬದಲಾವಣೆ, ನಾಥಪಂಥಿ, ಧಾವರಿಘೋಸಾವಿ, ದಾವೇರಿ, ಅಲೆಮಾರಿ ಸಮುದಾಯಗಳು, ಡಿಜಿಟಲ್ ಇಂಡಿಯಾ, ಸಾಮಾಜಿಕ ಚಲನಶೀಲತೆ, ಕರ್ನಾಟಕ, ಸಮಾಜಶಾಸ್ತ್ರೀಯ ಅಧ್ಯಯನ

ಪರಿಚಯ

ಜಾಗತೀಕರಣ ಮತ್ತು ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನದ ಬೆಳವಣಿಗೆಯು ಭಾರತೀಯ ಸಮಾಜದ ರಚನೆ ಮತ್ತು ಕಾರ್ಯವೈಖರಿಯಲ್ಲಿ ಮಹತ್ವದ ಬದಲಾವಣೆಗಳನ್ನು ಉಂಟುಮಾಡಿದೆ. ಡಿಜಿಟಲ್ ತಂತ್ರಜ್ಞಾನಗಳು ಶಿಕ್ಷಣ, ಆರೋಗ್ಯ, ಬ್ಯಾಂಕಿಂಗ್, ಆಡಳಿತ ಮತ್ತು ಉದ್ಯೋಗ ಕ್ಷೇತ್ರಗಳಲ್ಲಿ ಹೊಸ ಅವಕಾಶಗಳನ್ನು ಸೃಷ್ಟಿಸಿವೆ. ಆದರೆ ಎಲ್ಲಾ ಸಮುದಾಯಗಳು ಈ ಬದಲಾವಣೆಗಳಿಂದ ಸಮಾನವಾಗಿ ಪ್ರಯೋಜನ ಪಡೆಯುತ್ತಿಲ್ಲ. ಕರ್ನಾಟಕದಲ್ಲಿ ದಾವೇರಿ, ನಾಥಪಂಥಿ ಮತ್ತು ಧಾವರಿಘೋಸಾವಿ ಸಮುದಾಯಗಳು ಐತಿಹಾಸಿಕವಾಗಿ ಅಲೆಮಾರಿ ಮತ್ತು ಸಾಮಾಜಿಕವಾಗಿ ಹಿಂದುಳಿದ ಸಮುದಾಯಗಳಾಗಿವೆ. ಇವುಗಳು ಶಿಕ್ಷಣದ ಕೊರತೆ, ಬಡತನ, ಸಾಮಾಜಿಕ ಬಹಿಷ್ಕಾರ ಮತ್ತು ಸೀಮಿತ ಸಂಪನ್ಮೂಲಗಳಿಂದಾಗಿ ಮುಖ್ಯವಾಹಿನಿಯಿಂದ ದೂರ ಉಳಿದಿವೆ. ಇತ್ತೀಚೆಗೆ ಕರ್ನಾಟಕ ಸರ್ಕಾರವು ನಾಥಪಂಥಿ ಸೇರಿದಂತೆ ಹಲವು ಅಲೆಮಾರಿ ಸಮುದಾಯಗಳ ಸಾಮಾಜಿಕ ಮತ್ತು ಆರ್ಥಿಕ ಸ್ಥಿತಿಯನ್ನು ಅಧ್ಯಯನ ಮಾಡಲು ಜನಾಂಗಶಾಸ್ತ್ರೀಯ ಸಮೀಕ್ಷೆಗಳನ್ನು ಕೈಗೊಂಡಿದೆ.

ಅಧ್ಯಯನದ ಉದ್ದೇಶಗಳು

1. ದಾವೇರಿ, ನಾಥಪಂಥಿ ಮತ್ತು ಧಾವರಿಘೋಸಾವಿ ಸಮುದಾಯಗಳಲ್ಲಿ ಡಿಜಿಟಲ್ ಒಳಗೊಳ್ಳುವಿಕೆಯ ಮಟ್ಟವನ್ನು ವಿಶ್ಲೇಷಿಸುವುದು.
2. ಡಿಜಿಟಲ್ ತಂತ್ರಜ್ಞಾನಗಳಿಂದ ಉಂಟಾದ ಸಾಮಾಜಿಕ ಬದಲಾವಣೆಗಳನ್ನು ಅಧ್ಯಯನ ಮಾಡುವುದು.
3. ಶಿಕ್ಷಣ ಮತ್ತು ಉದ್ಯೋಗ ಕ್ಷೇತ್ರಗಳಲ್ಲಿ ಡಿಜಿಟಲ್ ಪ್ರಭಾವವನ್ನು ಪರಿಶೀಲಿಸುವುದು.
4. ಡಿಜಿಟಲ್ ಅಂತರ (ಆಯೋಜಿತ ಅನುಜ್ಞೆ) ಮತ್ತು ಅದರ ಪರಿಣಾಮಗಳನ್ನು ಅರ್ಥಮಾಡಿಕೊಳ್ಳುವುದು.
5. ಸಾಮಾಜಿಕ ಚಲನಶೀಲತೆ ಮತ್ತು ಸಮುದಾಯ ಅಭಿವೃದ್ಧಿಯಲ್ಲಿ ಡಿಜಿಟಲ್ ತಂತ್ರಜ್ಞಾನದ ಪಾತ್ರವನ್ನು ವಿಶ್ಲೇಷಿಸುವುದು.

ಸಂಶೋಧನಾ ವಿಧಾನ

ಈ ಅಧ್ಯಯನವು ಗುಣಾತ್ಮಕ ಮತ್ತು ವರ್ಣನಾತ್ಮಕ ಸಂಶೋಧನಾ ವಿಧಾನವನ್ನು ಆಧರಿಸಿದೆ. ದ್ವಿತೀಯಕ ಮಾಹಿತಿಗಳನ್ನು ಸಂಶೋಧನಾ ಲೇಖನಗಳು, ಸರ್ಕಾರಿ ವರದಿಗಳು, ಸಮಾಜಶಾಸ್ತ್ರೀಯ ಅಧ್ಯಯನಗಳು ಹಾಗೂ ಡಿಜಿಟಲ್ ಒಳಗೊಳ್ಳುವಿಕೆ ಕುರಿತ ಸಾಹಿತ್ಯದಿಂದ ಸಂಗ್ರಹಿಸಲಾಗಿದೆ. ಅಲೆಮಾರಿ ಮತ್ತು ಹಿಂದುಳಿದ ಸಮುದಾಯಗಳ ಕುರಿತ ಇತ್ತೀಚಿನ ಸಮಾಜಶಾಸ್ತ್ರೀಯ ಅಧ್ಯಯನಗಳನ್ನು ಸಹ ಬಳಸಲಾಗಿದೆ.

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ಡಿಜಿಟಲ್ ಒಳಗೊಳ್ಳುವಿಕೆಯ ಪರಿಕಲ್ಪನೆ

ಡಿಜಿಟಲ್ ಒಳಗೊಳ್ಳುವಿಕೆ ಎಂದರೆ ಪ್ರತಿಯೊಬ್ಬ ವ್ಯಕ್ತಿಗೂ ಮಾಹಿತಿ ಮತ್ತು ಸಂವಹನ ತಂತ್ರಜ್ಞಾನಗಳ ಸಮಾನ ಪ್ರವೇಶ ಮತ್ತು ಬಳಕೆಯ ಅವಕಾಶ ದೊರೆಯುವ ಪ್ರಕ್ರಿಯೆ. ಇದರಲ್ಲಿ ಇಂಟರ್ನೆಟ್, ಸ್ಮಾರ್ಟ್ಫೋನ್, ಡಿಜಿಟಲ್ ಸಾಕ್ಷರತೆ ಮತ್ತು ಆನ್ಲೈನ್ ಸೇವೆಗಳ ಲಭ್ಯತೆ ಪ್ರಮುಖ ಅಂಶಗಳಾಗಿವೆ. ಮಾನುಯಲ್ ಕ್ಯಾಸ್ಪೆಲ್ ಅವರ "ನೆಟ್ವರ್ಕ್ ಸೊಸೈಟಿ" ಸಿದ್ಧಾಂತದ ಪ್ರಕಾರ ಮಾಹಿತಿ ಮತ್ತು ಸಂವಹನ ಜಾಲಗಳು ಆಧುನಿಕ ಸಮಾಜದ ಪ್ರಮುಖ ಶಕ್ತಿಯಾಗಿವೆ. ಡಿಜಿಟಲ್ ತಂತ್ರಜ್ಞಾನಗಳಿಗೆ ಪ್ರವೇಶವಿಲ್ಲದವರು ಅಭಿವೃದ್ಧಿಯ ಅವಕಾಶಗಳಿಂದ ವಂಚಿತರಾಗುವ ಸಾಧ್ಯತೆ ಇದೆ.

ಕರ್ನಾಟಕದ ಡೇವಿ, ನಾಥಪಂಥಿ, ಡೊರಿಗೋಸಾವಿ ಸಮುದಾಯಗಳ ಸಾಮಾಜಿಕ ಹಿನ್ನೆಲೆ

ಈ ಸಮುದಾಯಗಳು ಸಾಂಪ್ರದಾಯಿಕವಾಗಿ ಧಾರ್ಮಿಕ ಆಚರಣೆಗಳು, ಭಿಕ್ಷಾಟನೆ, ಜಾನಪದ ಕಲೆಗಳು ಮತ್ತು ಸಣ್ಣಪುಟ್ಟ ವ್ಯಾಪಾರಗಳನ್ನು ಜೀವನೋಪಾಯವಾಗಿ ಅವಲಂಬಿಸಿವೆ. ಶಿಕ್ಷಣದ ಕೊರತೆ, ಶಾಶ್ವತ ವಸತಿ ಅಭಾವ ಮತ್ತು ಸಾಮಾಜಿಕ ತಾರತಮ್ಯ ಇವರ ಅಭಿವೃದ್ಧಿಗೆ ಅಡ್ಡಿಯಾಗಿದೆ. ನಾಥಪಂಥಿ ಸಮುದಾಯವು ಧಾರ್ಮಿಕ ಪರಂಪರೆಯೊಂದಿಗೆ ಸಂಬಂಧ ಹೊಂದಿದ್ದು, ಸಾಮಾಜಿಕ ಮತ್ತು ಆರ್ಥಿಕವಾಗಿ ಹಿಂದುಳಿದ ವರ್ಗಗಳಲ್ಲಿ ಒಂದಾಗಿದೆ. ಇತ್ತೀಚಿನ ಅಧ್ಯಯನಗಳು ಅಲೆಮಾರಿ ಸಮುದಾಯಗಳು ಮೂಲಭೂತ ಸೌಲಭ್ಯಗಳ ಕೊರತೆಯಿಂದ ಬಳಲುತ್ತಿರುವುದನ್ನು ಸೂಚಿಸುತ್ತವೆ.

ಡಿಜಿಟಲ್ ಒಳಗೊಳ್ಳುವಿಕೆಯ ಪರಿಣಾಮಗಳು

1. ಶಿಕ್ಷಣದಲ್ಲಿ ಬದಲಾವಣೆ

ಡಿಜಿಟಲ್ ಶಿಕ್ಷಣವು ಗ್ರಾಮೀಣ ಮತ್ತು ಹಿಂದುಳಿದ ಸಮುದಾಯಗಳ ಮಕ್ಕಳಿಗೆ ಹೊಸ ಅವಕಾಶಗಳನ್ನು ಒದಗಿಸಿದೆ. ಸ್ಮಾರ್ಟ್ಫೋನ್ ಮತ್ತು ಆನ್ಲೈನ್ ಶಿಕ್ಷಣ ವೇದಿಕೆಗಳ ಮೂಲಕ ವಿದ್ಯಾರ್ಥಿಗಳು ಶಿಕ್ಷಣವನ್ನು ಪಡೆಯಲು ಸಾಧ್ಯವಾಗಿದೆ. ಆದಾಗ್ಯೂ, ಇಂಟರ್ನೆಟ್ ಸೌಲಭ್ಯಗಳ ಕೊರತೆ, ಸಾಧನಗಳ ಅಭಾವ ಮತ್ತು ಡಿಜಿಟಲ್ ಸಾಕ್ಷರತೆಯ ಕೊರತೆ ಈ ಸಮುದಾಯಗಳ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಪ್ರಮುಖ ಅಡೆತಡೆಗಳಾಗಿವೆ.

2. ಉದ್ಯೋಗ ಮತ್ತು ಆರ್ಥಿಕ ಸಬಲೀಕರಣ

ಡಿಜಿಟಲ್ ಬ್ಯಾಂಕಿಂಗ್, ಗಣಕ ಪಾಠಶಾಲೆ ಮತ್ತು ಆನ್ಲೈನ್ ಉದ್ಯೋಗ ಮಾಹಿತಿ ಸೇವೆಗಳು ಸಮುದಾಯದ ಸದಸ್ಯರಿಗೆ ಆರ್ಥಿಕ ಅವಕಾಶಗಳನ್ನು ಹೆಚ್ಚಿಸಿವೆ. ಯುವಜನರು ಮೊಬೈಲ್ ಆಧಾರಿತ ಉದ್ಯೋಗ ಮತ್ತು ಸ್ವಯಂ ಉದ್ಯೋಗ ಚಟುವಟಿಕೆಗಳಲ್ಲಿ ತೊಡಗಿಕೊಳ್ಳುತ್ತಿದ್ದಾರೆ.

3. ಸಾಮಾಜಿಕ ಜಾಗೃತಿ

ಸಾಮಾಜಿಕ ಮಾಧ್ಯಮಗಳು ಮತ್ತು ಡಿಜಿಟಲ್ ಮಾಧ್ಯಮಗಳು ಸಮುದಾಯದ ಸದಸ್ಯರಲ್ಲಿ ಶಿಕ್ಷಣ, ಆರೋಗ್ಯ, ಹಕ್ಕುಗಳು ಮತ್ತು ಸರ್ಕಾರಿ ಯೋಜನೆಗಳ ಬಗ್ಗೆ ಜಾಗೃತಿಯನ್ನು ಹೆಚ್ಚಿಸಿವೆ.

4. ರಾಜಕೀಯ ಭಾಗವಹಿಸುವಿಕೆ

ಡಿಜಿಟಲ್ ತಂತ್ರಜ್ಞಾನಗಳು ರಾಜಕೀಯ ಮಾಹಿತಿಗೆ ಸುಲಭ ಪ್ರವೇಶವನ್ನು ಒದಗಿಸಿವೆ. ಇದರ ಪರಿಣಾಮವಾಗಿ ಸಮುದಾಯದ ಸದಸ್ಯರು ರಾಜಕೀಯ ಪ್ರಕ್ರಿಯೆಗಳಲ್ಲಿ ಹೆಚ್ಚಿನ ಆಸಕ್ತಿ ತೋರಿಸುತ್ತಿದ್ದಾರೆ. ಅಲೆಮಾರಿ ಸಮುದಾಯಗಳಲ್ಲಿ ರಾಜಕೀಯ ಸಂಘಟನೆ ಮತ್ತು ಪಾಲ್ಗೊಳ್ಳುವಿಕೆಯ ಕುರಿತು ಸಮಾಜಶಾಸ್ತ್ರೀಯ ಅಧ್ಯಯನಗಳು ಈ ಬದಲಾವಣೆಯನ್ನು ದಾಖಲಿಸಿವೆ.

ಸಾಮಾಜಿಕ ಬದಲಾವಣೆ ಮತ್ತು ಚಲನಶೀಲತೆ

ಪಿಟಿರಿಂ ಸೊರೋಕಿನ್ ಅವರ ಸಾಮಾಜಿಕ ಚಲನಶೀಲತೆ ಸಿದ್ಧಾಂತದ ಪ್ರಕಾರ ಶಿಕ್ಷಣ ಮತ್ತು ಹೊಸ ಅವಕಾಶಗಳು ಸಾಮಾಜಿಕ ಸ್ಥಾನಮಾನದಲ್ಲಿ ಬದಲಾವಣೆಗೆ ಕಾರಣವಾಗುತ್ತವೆ.

ಡಿಜಿಟಲ್ ಒಳಗೊಳ್ಳುವಿಕೆಯ ಪರಿಣಾಮವಾಗಿ:

1. ಶಿಕ್ಷಣದ ಮಟ್ಟ ಹೆಚ್ಚಾಗಿದೆ.
2. ಉದ್ಯೋಗಾವಕಾಶಗಳು ವಿಸ್ತರಿಸಿವೆ.
3. ಸಾಮಾಜಿಕ ಜಾಲಗಳು ಬಲಗೊಂಡಿವೆ.
4. ಮಹಿಳೆಯರ ಸಬಲೀಕರಣ ಹೆಚ್ಚಾಗಿದೆ.
5. ಸರ್ಕಾರಿ ಸೇವೆಗಳಿಗೆ ಸುಲಭ ಪ್ರವೇಶ ದೊರೆತಿದೆ.

ಸಿದ್ಧಿ ಮತ್ತು ಇತರ ಹಿಂದುಳಿದ ಸಮುದಾಯಗಳ ಅಧ್ಯಯನಗಳು ಶಿಕ್ಷಣ ಮತ್ತು ಸರ್ಕಾರಿ ಯೋಜನೆಗಳ ಮೂಲಕ ಸಾಮಾಜಿಕ ಚಲನಶೀಲತೆ ಹೆಚ್ಚುತ್ತಿರುವುದನ್ನು ತೋರಿಸುತ್ತವೆ.

ಡಿಜಿಟಲ್ ಅಂತರ

ಡಿಜಿಟಲ್ ಒಳಗೊಳ್ಳುವಿಕೆಯ ಪ್ರಯೋಜನಗಳಿದ್ದರೂ ಕೆಲವು ಸಮಸ್ಯೆಗಳು ಮುಂದುವರಿದಿವೆ:

ತಾಂತ್ರಿಕ ಅಡೆತಡೆಗಳು

1. ಇಂಟರ್ನೆಟ್ ಸಂಪರ್ಕದ ಕೊರತೆ
2. ಸ್ಮಾರ್ಟ್ಫೋನ್‌ಗಳ ಅಭಾವ
3. ವಿದ್ಯುತ್ ಸಮಸ್ಯೆಗಳು

ಸಾಮಾಜಿಕ ಅಡೆತಡೆಗಳು

1. ಕಡಿಮೆ ಶಿಕ್ಷಣ
2. ಲಿಂಗ ಅಸಮಾನತೆ
3. ಬಡತನ

ಸಾಂಸ್ಕೃತಿಕ ಅಡೆತಡೆಗಳು

1. ತಂತ್ರಜ್ಞಾನದ ಬಗ್ಗೆ ಅರಿವಿನ ಕೊರತೆ
2. ಸಾಂಪ್ರದಾಯಿಕ ಜೀವನಶೈಲಿಯ ಪ್ರಭಾವ

ಮಹಿಳೆಯರು ಮತ್ತು ಡಿಜಿಟಲ್ ಸಬಲೀಕರಣ

ಡಿಜಿಟಲ್ ತಂತ್ರಜ್ಞಾನಗಳು ಮಹಿಳೆಯರಿಗೆ ಹೊಸ ಅವಕಾಶಗಳನ್ನು ಒದಗಿಸಿವೆ. ಸ್ವಸಹಾಯ ಗುಂಪುಗಳು, ಆನ್ಲೈನ್ ಬ್ಯಾಂಕಿಂಗ್ ಮತ್ತು ಡಿಜಿಟಲ್ ತರಬೇತಿಗಳ ಮೂಲಕ ಮಹಿಳೆಯರು ಆರ್ಥಿಕ ಚಟುವಟಿಕೆಗಳಲ್ಲಿ ಹೆಚ್ಚು ಭಾಗವಹಿಸುತ್ತಿದ್ದಾರೆ.

ಆದಾಗ್ಯೂ, ಡಿಜಿಟಲ್ ಸಾಧನಗಳ ಲಭ್ಯತೆ ಮತ್ತು ಶಿಕ್ಷಣದ ಕೊರತೆಯಿಂದ ಮಹಿಳೆಯರ ಭಾಗವಹಿಸುವಿಕೆ ಇನ್ನೂ ಸೀಮಿತವಾಗಿದೆ.

ಸವಾಲುಗಳು

1. ಡಿಜಿಟಲ್ ಸಾಕ್ಷರತೆಯ ಕೊರತೆ.
2. ಆರ್ಥಿಕ ಹಿಂದುಳಿತ.
3. ಸಾಮಾಜಿಕ ತಾರತಮ್ಯ.
4. ಗುಣಮಟ್ಟದ ಶಿಕ್ಷಣದ ಕೊರತೆ.
5. ಸರ್ಕಾರಿ ಯೋಜನೆಗಳ ಸಮರ್ಪಕ ಅನುಷ್ಠಾನ ಇಲ್ಲದಿರುವುದು.
6. ಮೂಲಸೌಕರ್ಯಗಳ ಅಭಾವ.

ಸಲಹೆಗಳು

1. ಡಿಜಿಟಲ್ ಸಾಕ್ಷರತಾ ಕಾರ್ಯಕ್ರಮಗಳನ್ನು ವಿಸ್ತರಿಸಬೇಕು.
2. ಉಚಿತ ಅಥವಾ ಕಡಿಮೆ ವೆಚ್ಚದ ಇಂಟರ್ನೆಟ್ ಸೇವೆ ಒದಗಿಸಬೇಕು.
3. ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಡಿಜಿಟಲ್ ಸಾಧನಗಳನ್ನು ವಿತರಿಸಬೇಕು.
4. ಮಹಿಳೆಯರಿಗೆ ವಿಶೇಷ ಡಿಜಿಟಲ್ ತರಬೇತಿ ನೀಡಬೇಕು.
5. ಸಮುದಾಯ ಆಧಾರಿತ ಡಿಜಿಟಲ್ ಕಲಿಕಾ ಕೇಂದ್ರಗಳನ್ನು ಸ್ಥಾಪಿಸಬೇಕು.
6. ಅಲೆಮಾರಿ ಸಮುದಾಯಗಳ ಕುರಿತು ಹೆಚ್ಚಿನ ಸಂಶೋಧನೆಗಳನ್ನು ಕೈಗೊಳ್ಳಬೇಕು.

ಸಮಾರೋಪ

ದಾವೇರಿ, ನಾಥಪಂಥಿ ಮತ್ತು ಧಾವರಿಘೋಸಾವಿ ಸಮುದಾಯಗಳಲ್ಲಿ ಡಿಜಿಟಲ್ ಒಳಗೊಳ್ಳುವಿಕೆಯು ಶಿಕ್ಷಣ, ಉದ್ಯೋಗ, ಸಾಮಾಜಿಕ ಜಾಗೃತಿ ಮತ್ತು ರಾಜಕೀಯ ಪಾಲ್ಗೊಳ್ಳುವಿಕೆಯಲ್ಲಿ ಗಮನಾರ್ಹ ಬದಲಾವಣೆಗಳನ್ನು ತಂದಿದೆ. ಆದರೆ ಡಿಜಿಟಲ್ ಅಂತರ, ಬಡತನ ಮತ್ತು ಶಿಕ್ಷಣದ ಕೊರತೆ ಇನ್ನೂ ಪ್ರಮುಖ ಸವಾಲುಗಳಾಗಿವೆ. ಸಮರ್ಪಕ ನೀತಿಗಳು ಮತ್ತು ಸಮುದಾಯ ಕೇಂದ್ರಿತ ಅಭಿವೃದ್ಧಿ ಕಾರ್ಯಕ್ರಮಗಳ ಮೂಲಕ ಈ ಸಮುದಾಯಗಳನ್ನು ಡಿಜಿಟಲ್ ಸಮಾಜದ ಮುಖ್ಯವಾಹಿನಿಗೆ ತರುವ ಸಾಧ್ಯತೆ ಇದೆ. ಡಿಜಿಟಲ್ ಒಳಗೊಳ್ಳುವಿಕೆ ಕೇವಲ ತಾಂತ್ರಿಕ ಬದಲಾವಣೆ ಮಾತ್ರವಲ್ಲ; ಅದು ಸಾಮಾಜಿಕ ನ್ಯಾಯ ಮತ್ತು ಸಮಾನತೆಯತ್ತ ಸಾಗುವ ಒಂದು ಪ್ರಮುಖ ಮಾರ್ಗವಾಗಿದೆ.