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Mumbai Pradesh Arya Vidya Sabha's

GURUKUL COLLEGE OF COMMERCE

(Permanently Affiliated to University of Mumbai)

NAAC Re-accredited 'B+' Grade

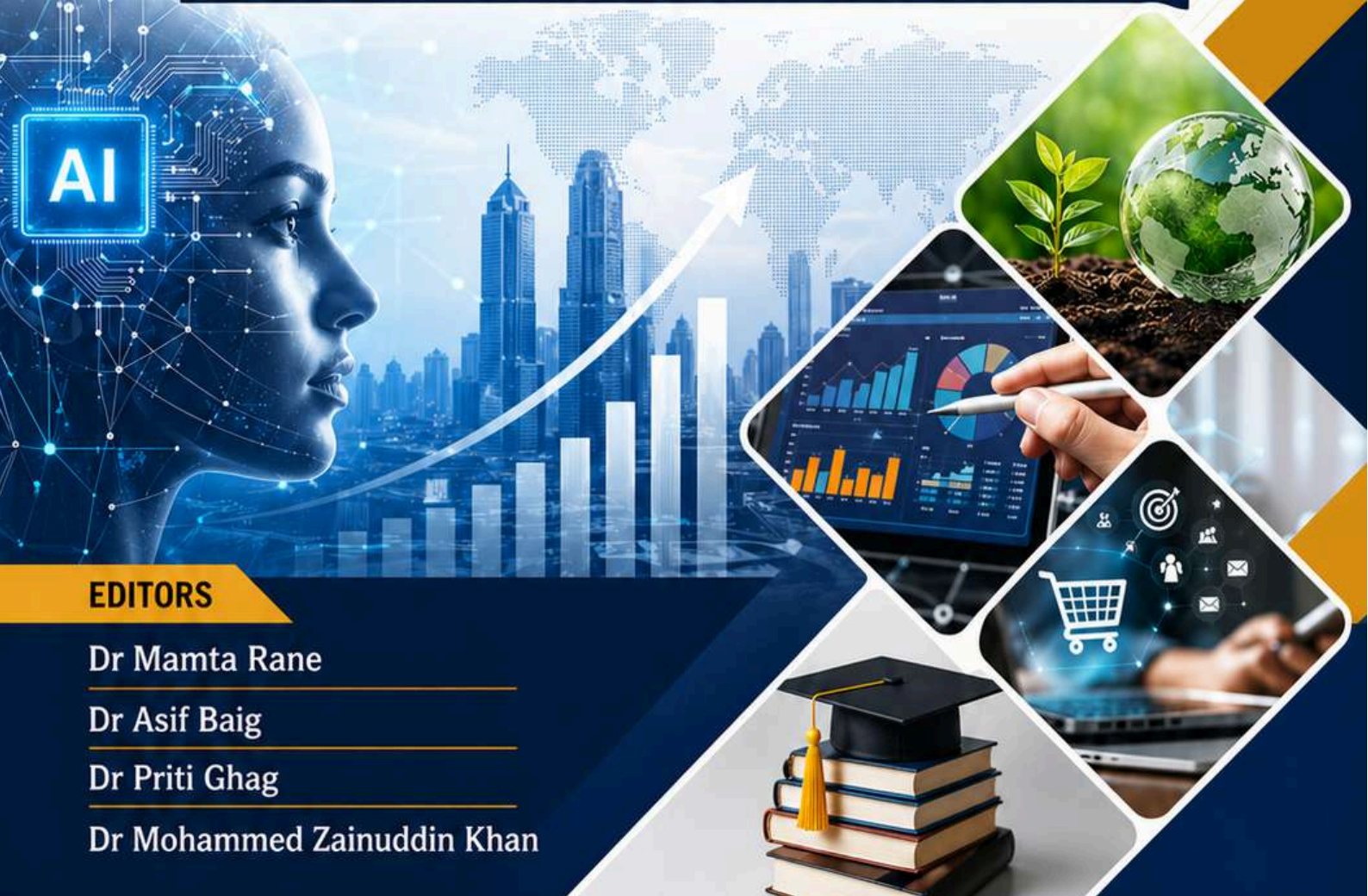
ISO CERTIFIED: 21001/14001/50001

Tilak Road, Ghatkopar (East), Mumbai 400077

FUTURE READY ORGANIZATIONS:

AI, INNOVATION AND SUSTAINABLE GROWTH

IN FINANCE, MARKETING, ECONOMICS AND EDUCATION



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Future Ready Organizations:

AI, Innovation and Sustainable Growth in Finance, Marketing, Economics and Education

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Future Ready Organizations:

AI, Innovation and Sustainable Growth in Finance, Marketing, Economics and Education

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First Impression: March 2026

Future Ready Organizations: AI, Innovation and Sustainable Growth in Finance, Marketing, Economics and Education

ISBN: 978-93-48959-08-9

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About the College

The Mumbai Pradesh Arya Vidya Sabha's Gurukul College of Commerce, established in July 2001, is a permanently affiliated institution of the University of Mumbai. The college is NAAC Re-accredited with a 'B+' Grade and is certified under ISO 21001, ISO 50001, and ISO 14001 standards, reflecting its commitment to quality education, energy management, and environmental sustainability.

Managed by Mumbai Pradesh Arya Vidya Sabha (MPAVS), the institution is grounded in strong traditional and cultural values while aligning with the evolving requirements of contemporary education. With a student strength exceeding 1500 learners, the college offers undergraduate and postgraduate programmes including B. Com, B.Com (Accounting & Finance), B.Com (Banking & Insurance), B.M.S. – B.Com (Management Studies) and M.Com (Advanced Accountancy and Business Management).

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To impart quality education with the commitment to shape career path of learners and inculcate cultural values in such a manner that there is holistic growth of the individual learner in particular and the society at large.

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To emerge as one of the best College in the central suburbs of Mumbai for studies in the Commerce stream through value based quality education and preparing learners towards nation building.

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- To inculcate basic human values, discipline and sincerity amongst students.
- To provide wide opportunities to students and staff for their holistic growth.
- To develop skill based employable Commerce graduates.
- To promote Indian culture and tradition through education.

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The Mumbai Pradesh Arya Vidya Sabha (MPAVS), a 114 years old organization manages the Gurukul Educational Institutions and has offered dedicated service to the nation in the field of education. The organization is registered under the Mumbai Public Trust Act of 1950 and has been conferred the status of a Gujarati Linguistic Minority Institution by the Government of Maharashtra.

The philanthropic journey of MPAVS towards education began with a primary school for children with focus on the underprivileged section of our society, which has now grown to a complete centre for education from nursery, primary, secondary, higher secondary, technical high school, school for special children to a full-fledged Degree College of Commerce affiliated to the University of Mumbai.

Inspired by the preaching of Swami Dayanand Saraswati and other spiritual leaders of India, the MPAVS management believes in practicing the preaching of great saints and scholars of India. It is worth noting that in an era of commercialization of education, the MPAVS has remained committed to ethics by rejecting capitation fee or donation for admissions. All the educational institutions under its umbrella are well equipped to meet the global competition in the field of primary, secondary and higher education in India. A Commerce College in the commercial capital of the nation is the testimony of sincere vision of the Management towards creating a pool of human resources for the economic growth of the nation.

Acknowledgement

We express our sincere and heartfelt gratitude to the In-charge Principal, Dr. Mamta Rane, for her inspiring leadership, constant encouragement, and invaluable guidance. Her visionary approach, academic excellence, and unwavering support have been a source of motivation throughout the completion of this edited research book. Her commitment to fostering a culture of research and intellectual growth has played a pivotal role in shaping this work.

We are profoundly thankful to the management of Mumbai Pradesh Arya Vidya Sabha's Gurukul College of Commerce for their dynamic leadership, progressive vision, and continuous encouragement. The management has always been instrumental in promoting academic excellence, research culture, and innovation by providing a strong institutional framework, necessary infrastructure, and a highly supportive academic environment. Their dedication towards quality education and scholarly advancement has been the backbone of this successful endeavor.

We extend our respectful appreciation to the esteemed members of the management:

- Shri Aditya Pratap Singh (Trustee and President)

- Shri Mahesh Gandhi (Trustee and Vice President)

- Shri Bhupendra Doshi (Trustee and Vice President)

- Shri Chandrakumar Singhji (Hon. Treasurer)

- Shri Bipin Patel (Hon. Secretary)

- Smt. Amishi Gandhi (Hon. Secretary)

- Shri Dilip Velani (Hon. Secretary)

- Dr. Mrs. Unnati Padalia (Academic Director)

We would also like to express our sincere thanks to all our respected professors and teaching staff for their academic guidance, insightful suggestions, and continuous motivation during the preparation of this book.

Our special thanks go to the non-teaching staff for their valuable assistance, cooperation, and support at every stage of this work.

We are highly grateful to all the contributors and authors who have submitted their research papers for this edited research book (with ISBN).

Their scholarly contributions, dedication, and research efforts have played a vital role in making this publication meaningful and successful.

Finally, we extend our gratitude to all those who directly or indirectly contributed to the successful completion of this academic endeavor.

Thank You.

Editorial Message

Dear Readers,

It gives us great pleasure to present this edited research volume, a collection of valuable research papers contributed by academicians, researchers, and professionals. This book reflects our institution's commitment to promoting academic excellence, innovation, and knowledge sharing.

This publication provides a platform for presenting new ideas, research findings, and diverse perspectives across different fields. It is the result of the dedicated efforts of all contributors who have shared their knowledge to support learning and encourage academic discussion.

We sincerely thank all the authors for their valuable contributions. We also appreciate the efforts of the editorial team whose dedication made this publication possible. We hope that this book will serve as a useful reference for students, researchers, educators, and professionals, and will inspire further learning and research. We wish you an enjoyable and enriching reading experience.

Editorial Team

Principal's Message

Presenting this edition of our edited book, which is a testimony to the scholarly dedication, academic curiosity, and intellectual rigor of our teachers and collaborators, gives me great joy.

This publication is a reflection of ongoing efforts to develop a dynamic research culture that promotes inquiry, interdisciplinary discussion, and evidence-based education. The wide variety of chapters included here showcase both theoretical developments and useful ideas that tackle current issues.

I applaud the writers for their commitment and academic brilliance, and I value the editorial team's painstaking work in producing this journal. I have no doubt that this edited book will be a useful tool for scholars, researchers, and students alike, encouraging more investigation and significant contributions to a variety of academic disciplines.

I wish all of the writers the best of luck and anticipate many more influential articles in the future.

Dr. Mamta Rane

I/c Principal

Gurukul College of Commerce

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ALGORITHMIC GOVERNANCE: A QUALITATIVE LONGITUDINAL ANALYSIS OF AI INTEGRATION AND ESG COMPLIANCE IN CORPORATE LAW (2021-2026)

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ABSTRACT
The rapid assimilation of Artificial Intelligence (AI) into corporate management has fundamentally altered the trajectory of modern organizational governance. As entities transition into "future-ready organizations," AI is increasingly utilized not merely as an operational asset, but as a strategic mechanism for ensuring Environmental, Social, and Governance (ESG) compliance. This paper presents a qualitative longitudinal document analysis tracking the evolution of AI integration within corporate boards and regulatory frameworks from 2021 to 2026. Utilizing doctrinal legal research and conceptual synthesis, this paper maps the paradigm shift from human-centric fiduciary oversight to AI-augmented advisory systems. By examining contemporary company law provisions and global sustainability mandates, the research investigates the legal anatomy of algorithmic decision-making, specifically focusing on the accountability vacuum created when AI-driven strategies conflict with statutory ESG obligations. Furthermore, this study identifies the emerging risk of "Algorithmic Greenwashing." Ultimately, the paper proposes a novel conceptual framework for "Algorithmic Governance," offering a legally sound pathway for corporate boards to harness AI for sustainable growth while maintaining strict adherence to fiduciary and ethical liabilities. The findings establish a doctrinal foundation for integrating AI into corporate governance while preserving fiduciary accountability in ESG compliance.

Keywords: *Algorithmic Governance, Artificial Intelligence, ESG Compliance, Corporate Law, Qualitative Longitudinal Analysis, Fiduciary Duty, Sustainable* Growth.

1. INTRODUCTION
The paradigm of corporate governance is undergoing a profound epistemological shift. The traditional boardroom, long characterized by human intuition, experiential judgment, and strict statutory fiduciary duties, is rapidly integrating sophisticated algorithmic systems. As modern enterprises evolve into "future-ready organizations," Artificial Intelligence (AI) has transcended its foundational role in data processing, emerging as a pivotal participant in strategic corporate governance. Concurrently, the global regulatory environment has transformed Environmental, Social, and Governance (ESG) mandates from voluntary Corporate Social Responsibility (CSR) initiatives into stringent, auditable statutory obligations. This intersection of advanced AI deployment and rigorous ESG compliance presents a complex legal and

administrative frontier. Organizations are now fundamentally reliant on AI to navigate the dense matrices of sustainable growth; however, this reliance threatens to decouple corporate decision-making from human legal accountability. This paper contributes to the literature in three ways: first, it introduces the concept of "Algorithmic Greenwashing", highlighting how AI-driven systems may systematically distort sustainability reporting. Second, it develops a doctrinal framework of "Vicarious Algorithmic Liability", addressing the unresolved issue of fiduciary accountability in AI-assisted decision making. Third, it proposes the Human-in-the-Loop Governance Matrix (HLGM) as a normative governance model that integrates algorithmic efficiency with human legal responsibility. Collectively these contributions bridge the fragmented discourse between AI, ESG mandates and corporate fiduciary law.

2. BACKGROUND OF THE STUDY

Historically, corporate law has anchored organizational accountability to the human board of directors through the doctrines of the Duty of Care and the Duty of Loyalty. However, the period between 2021 and 2026 has witnessed an unprecedented acceleration in machine learning capabilities, specifically within corporate strategy sectors. In 2021, AI's footprint in governance was largely relegated to middle-management logistical optimization. By 2024, the integration of generative AI and advanced predictive analytics prompted corporate boards to utilize these systems for macro-level ESG monitoring—such as predictive carbon footprint modeling and supply chain ethics verification. As of 2026, the technology has reached a phase of "Algorithmic Governance," where AI systems actively recommend strategic maneuvers that directly impact an organization's legal standing and sustainability metrics. This longitudinal evolution has outpaced the legislative frameworks of traditional company law, creating a critical gap between technological capability and legal liability.

3. STATEMENT OF THE RESEARCH PROBLEM

Despite the rapid adoption of AI to drive sustainable corporate growth, current legal and governance frameworks remain ill-equipped to address the liability of algorithmic decision-making. The core research problem lies in the doctrinal vacuum surrounding fiduciary duty: when a corporate board relies on an AI system to optimize ESG compliance, and that system inadvertently executes a strategy that violates environmental regulations or ethical standards (e.g., optimizing supply chain costs by selecting a non-compliant vendor), the attribution of legal liability becomes critically ambiguous. Current company law cannot pierce the "algorithmic veil," nor can an AI hold a fiduciary duty. Consequently, organizations face the dual threat of unrecognized legal liability and "Algorithmic Greenwashing"—the manipulation of biased AI data to project a false narrative of corporate sustainability.

4. LITERATURE REVIEW

The intersection of Artificial Intelligence, Environmental, Social, and Governance (ESG) mandates, and corporate law has generated a rapidly expanding, yet

fragmented, body of literature between 2021 and 2026. This review synthesizes the prevailing academic and legal doctrines across three primary themes:

4.1. The Evolution of AI in Corporate Governance - Early literature in the 2021–2022 period primarily framed AI as an operational utility. Scholars such as Lin (2021) explored the initial hesitations of corporate boards to delegate strategic tasks to algorithms, citing a lack of interpretability. However, as generative and predictive AI matured, the discourse shifted. By 2024, Enriques and Diris noted a transition toward "Algorithmic Advisory," wherein AI systems were actively processing unstructured market data to recommend mergers, acquisitions, and board-level strategies. The current literature (circa 2025–2026) posits that "future-ready organizations" are now operating under nascent forms of Algorithmic Governance, fundamentally altering traditional board dynamics.

4.2. ESG Compliance and the Shift to Statutory Obligations - Concurrently, the regulatory landscape regarding ESG has tightened globally. In jurisdictions such as India, the transition from voluntary reporting to mandatory frameworks—such as the Business Responsibility and Sustainability Reporting (BRSR) mandated by the Securities and Exchange Board of India (SEBI)—has forced corporations to quantify their environmental and social impact meticulously. Vasudev (2026) argues that the sheer volume of data required for such compliance necessitates algorithmic intervention, making AI the de facto engine for sustainable corporate growth.

4.3. The Accountability Vacuum and Algorithmic Greenwashing - The most critical gap identified in recent legal scholarship is the attribution of liability. Bainbridge (2022) highlighted that the Business Judgment Rule was designed to protect human directors making good-faith decisions, not to shield algorithmic outputs. Furthermore, Ferrarini (2025) introduced the concept of "Algorithmic Greenwashing," warning that machine learning models trained on biased or historically flawed datasets can optimize corporate reports to appear artificially compliant with ESG mandates. Existing literature lacks a cohesive, non-empirical framework to resolve this liability vacuum, a gap this study intends to bridge.

5. RESEARCH GAP

Despite the growing body of literature on Artificial Intelligence in corporate governance and the increasing regulatory emphasis on ESG compliance, existing studies remain fragmented and insufficient. Current scholarship either examines AI as a technological tool or ESG as a regulatory obligation, without integrating the two within a coherent legal framework. Moreover, there is a conspicuous absence of doctrinal analysis addressing fiduciary liability in AI-driven decision-making. The lack of a structured governance model to mitigate risks such as algorithmic opacity and greenwashing further intensifies this gap. This study seeks to address these deficiencies by developing a unified conceptual and legal framework.

6. RESEARCH OBJECTIVES

To address the complexities of integrating AI into corporate governance, this study pursues the following core objectives:

1. To trace the longitudinal evolution (2021–2026) of Artificial Intelligence assimilation within corporate boardrooms and its specific application to ESG compliance.
2. To critically analyze the doctrinal and legal accountability vacuums created under contemporary company law when fiduciary duties intersect with algorithmic decision-making.
3. To identify and conceptualize the emergent threat of "Algorithmic Greenwashing" in mandatory sustainability reporting.
4. To propose a robust, qualitative governance framework that harmonizes advanced AI capabilities with traditional fiduciary liabilities to ensure authentic sustainable growth.

7. RESEARCH QUESTIONS

1. How has the strategic role of AI in corporate governance and ESG compliance evolved over the longitudinal period of 2021 to 2026?
2. In the event of statutory ESG violations triggered by algorithmic recommendations, how do current company law doctrines allocate legal liability?
3. What conceptual governance structures can "future-ready organizations" implement to mitigate the risks of Algorithmic Greenwashing while maintaining fiduciary integrity?

8. RESEARCH METHODOLOGY

This analysis strictly employs a qualitative, non-statistical paradigm, utilizing a **Longitudinal Doctrinal Document Analysis**. To ensure profound theoretical depth and world-class academic rigor without reliance on quantitative metrics or statistical tools, the methodology is structured as follows:

- **Research Design:** A conceptual, longitudinal analysis tracking regulatory and technological shifts over a five-year horizon (2021–2026). The selection of the 2021-2026 period is deliberate, as it captures the post-pandemic acceleration in AI adoption alongside the global transition from voluntary CSR frameworks to mandatory ESG compliance regimes.
- **Data Sources:** The research leverages primary legal texts (e.g., updates to the Companies Act, SEBI mandates regarding BRSR), international ESG guidelines, published corporate governance reports from leading global entities, and peer-reviewed legal doctrines.
- **Analytical Approach:** The study utilizes thematic synthesis and logical deduction. Instead of empirical data modeling, it applies legal reasoning to

construct "what-if" liability scenarios (e.g., the Business Judgment Rule applied to AI). Findings will be visualized through advanced diagrammatic representations to map the longitudinal evolution and proposed frameworks clearly.

9. SIGNIFICANCE OF THE STUDY

As organizations strive to become "future-ready," the reliance on AI is inevitable. However, technological adoption without legal evolution presents an existential risk to corporate entities. This study is highly significant as it provides corporate boards, legal practitioners, and regulatory bodies with a conceptual blueprint to safely navigate the algorithmic age. By defining "Algorithmic Greenwashing" and mapping the chain of liability, this research directly contributes to the creation of governance structures that promote genuine, legally sound sustainable growth.

10. LIMITATIONS OF THE STUDY

The primary limitation of this research is its strictly qualitative and doctrinal nature; it does not empirically test the proposed frameworks through statistical hypothesis testing or large-scale quantitative surveys. Furthermore, the rapid, highly volatile pace of AI development means that the technological capabilities discussed may evolve beyond the legal parameters analyzed within the 2021–2026 timeframe.

11. QUALITATIVE DATA ANALYSIS AND FINDINGS

This section synthesizes the doctrinal review and longitudinal mapping of corporate governance frameworks between 2021 and 2026. The findings are categorized into three distinct thematic pillars, strictly utilizing qualitative synthesis rather than statistical modeling.

Table 1: Longitudinal Matrix of AI Integration vs. ESG Mandates (2021–2026)

Phase & Timeframe	AI Corporate Function	ESG Regulatory Environment	Governance & Legal Liability Impact
Phase I (2021–2022) ***Operational Efficiency***	Back-office data sorting, rudimentary supply chain logistics, and historical data compilation.	Primarily voluntary Corporate Social Responsibility (CSR) disclosures.	Traditional frameworks apply. Human management retains full legal and fiduciary liability.
Phase II (2023–2024) ***Risk & Compliance Augmentation***	Processing massive, unstructured datasets for predictive analytics and carbon footprint monitoring.	Transition to mandatory frameworks (e.g., SEBI's BRSR implementation).	Initial legal ambiguities emerge. Boards rely heavily on AI, stretching the limits of the Business Judgment Rule.

Phase III (2025–2026) ***Strategic Algorithmic Governance***	Ex-ante strategic generation. AI acts as a quasi-fiduciary advisor for real-time sustainable growth maneuvers.	Strict statutory obligations requiring rigorous, auditable sustainability metrics.	Severe accountability vacuum. High risk of "Algorithmic Greenwashing" without human override mechanisms.

Source: *Author's conceptual synthesis of corporate governance frameworks (2021-2026).*

11.1. The Shift to Strategic Algorithmic Governance (2021–2026): The longitudinal document analysis reveals a definitive transition in how "future-ready organizations" deploy AI. Early phase documentation (2021–2023) indicates that corporate boards utilized AI primarily as an ex-post reporting tool—compiling historical data to satisfy basic Corporate Social Responsibility (CSR) disclosures. However, an analysis of corporate mandates and governance frameworks from 2024 to 2026 demonstrates a paradigm shift to ex-ante strategic deployment. AI systems are now integrated into the boardroom to predict regulatory shifts, optimize supply chains in real-time for minimal carbon impact, and recommend board-level actions. The finding here is that AI has evolved from an operational utility to a quasi-fiduciary advisor, fundamentally altering the traditional architecture of corporate decision-making.

Table 2: Doctrinal Comparison of Fiduciary Liability in Corporate Governance

Governance Aspect	Traditional Human Director	Algorithmic Decision-Maker (AI)
Fiduciary Duty	Bound by statutory Duty of Care and Duty of Loyalty.	Incapable of holding legal duties; operates on mathematical optimization.
Liability for ESG Breach	Personally, or corporately liable for gross negligence or willful misconduct.	Creates an accountability vacuum; cannot be prosecuted or penalized.
Business Judgment Rule	Protected if decisions are made in good faith and with reasonable information.	Inapplicable. Algorithms do not possess "good faith" or legal intent.
Transparency	Decisions can be investigated through board minutes and testimonies.	Prone to the "Black Box" problem; reasoning parameters are often legally opaque.

Source: *Author's qualitative legal analysis.*

11.2. The Fiduciary Vacuum in Current Company Law: A critical doctrinal analysis of contemporary corporate law, including updates to the Companies Act and international governance codes, exposes a severe liability vacuum. The established "Business Judgment Rule" provides a legal safe harbor for human directors making informed decisions in good faith. However, this study finds that when boards delegate strategic ESG compliance to advanced AI, the traditional chain of liability fractures. If an AI system—optimizing for immediate cost reduction—recommends a strategy that inadvertently violates human rights laws within a deep supply chain, the law currently lacks a mechanism to attribute liability to the algorithm. The finding asserts that traditional fiduciary duties (Duty of Care and Loyalty) are legally incompatible with autonomous machine learning models, necessitating a doctrine of *Vicarious Algorithmic Liability* where the human board retains ultimate legal culpability.

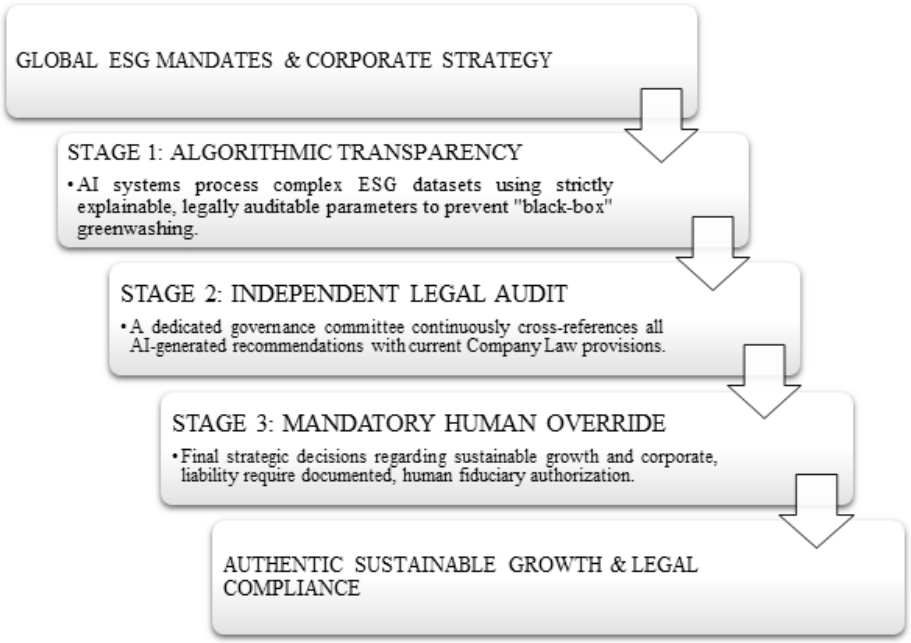

Figure 1: The Human-in-the-Loop Governance Matrix (HLGM)

11.3. The Emergence of "Algorithmic Greenwashing": As mandatory ESG reporting (such as SEBI's BRSR framework) has become institutionalized, organizations face immense pressure to project sustainable growth. The qualitative synthesis identifies a new, systemic risk: "Algorithmic Greenwashing." Because AI systems operate on historical data and specific optimization parameters, this study finds that algorithms can be inadvertently (or intentionally) structured to exploit regulatory loopholes. By selectively highlighting favorable environmental data while suppressing complex systemic

risks, AI can fabricate a narrative of strict ESG compliance. Without rigorous qualitative auditing, relying solely on algorithmic outputs poses a massive legal and reputational risk to modern enterprises.

12. POLICY IMPLICATIONS

The findings of this study have significant implications for regulators, corporate boards, and policymakers. Regulatory authorities, particularly in emerging economies such as India, may consider revising company law frameworks to explicitly address AI-assisted decision-making within fiduciary obligations. Corporate boards must institutionalize governance mechanisms such as independent AI audits and mandatory human oversight to ensure compliance with ESG mandates. Furthermore, policymakers should encourage the development of explainable AI systems to mitigate the risk associated with algorithmic opacity and greenwashing. The integration of such measures would facilitate a more resilient and accountable corporate governance system.

13. CONCLUSION

The drive toward establishing "future-ready organizations" has inextricably linked corporate governance with Artificial Intelligence. This qualitative longitudinal study (2021–2026) conclusively demonstrates that while AI is an unparalleled engine for navigating complex Environmental, Social, and Governance (ESG) mandates, it simultaneously introduces profound legal vulnerabilities. Current company law frameworks are fundamentally misaligned with the realities of algorithmic decision-making, creating an accountability vacuum that jeopardizes authentic sustainable growth.

To mitigate the existential risks of Algorithmic Greenwashing and fiduciary negligence, corporate boards must evolve beyond mere technological adoption. The integration of a Human-in-the-Loop Governance Matrix (HLGM) is essential. Algorithms cannot hold fiduciary duties; therefore, legal liability, ethical oversight, and strategic finality must remain strictly human endeavors. Ultimately, the future of corporate governance relies not on the supremacy of artificial intelligence, but on the qualitative enhancement of human accountability in the digital era.

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ALGO TRADING IN INDIA

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ABSTRACT
Algorithmic trading, commonly known as Algo trading, refers to the use of computer programs to execute trades automatically in the stock market. In India, this concept has grown rapidly in the last decade due to technological development and increased participation from both institutional and retail investors. This paper studies how algorithmic trading works, its growth in India, the role of Securities and Exchange Board of India (SEBI), and the advantages and risks involved. The paper also tries to understand the future scope of Algo trading in the Indian financial market.

Keywords: *Trading Strategies, Computer based trading, Financial Technology*

INTRODUCTION
In recent years, the stock market has become more technology-driven. One of the biggest changes is the use of algorithmic trading. It means using a set of instructions programmed into a computer to automatically place trades without human intervention.

In India, Algo trading started around 2008 when exchanges like the National Stock Exchange of India introduced systems that allowed faster and direct trading access. Initially, it was used only by big institutions, but now even retail traders are slowly entering this field.

OBJECTIVES OF THE STUDY

The main objectives of this research are:

- To understand the concept of algorithmic trading
- To study its growth in India
- To analyse the role of SEBI in regulating Algo trading
- To identify advantages and disadvantages
- To examine future opportunities

LITERATURE REVIEW:

The global landscape of algorithmic trading has been extensively studied over the years, with a significant focus on its implications for liquidity, efficiency, and market dynamics. Scholars such as Hendershott et al. (2011) have provided evidence that algorithmic trading contributes positively to market liquidity by narrowing bid-ask spreads and enhancing price discovery. These findings are crucial in understanding how automated trading systems can stabilize markets under normal conditions. However, the applicability of these findings to emerging markets like India is limiteddue to unique market characteristics, including a significant retail investor base, infrastructural challenges, and evolving regulatory frameworks

METHODOLOGY

SECONDARY DATA The secondary data for the study is collected from various sources like journals, magazines and websites.

SAMPLING DESIGN The sample size consists of 50 respondents who have sufficient knowledge about algorithmic trading. Simple random sampling technique is used for the study. A simple random sample is a subset of a statistical population in which each member of the subset has an equal probability of being chosen.

STATISTICAL DESIGN The statistical design used in this study is Descriptive statistics. Descriptive statistics are the basic data analysis techniques that enable the reader to better understand the results of the researcher in a simple and convenient way. They provide simple summaries about the sample and the measures. Together with simple graphics analysis, they form the basis of virtually every quantitative analysis of data.

FUTURE OF ALGORITHMIC TRADING IN INDIA

It is anticipated that algorithmic trading software would continue to expand in India, promoting market liquidity and efficiency. Forecasts suggest that stocks will contribute significantly to market share and that growth will be consistent over the next several years. By 2027, the equity market is anticipated to account for $8.61 billion of the algorithmic trading market share, with a projected compound annual growth rate (CAGR) of 11.23% from 2021 to 2026.

Technological Progress: It is anticipated that ongoing technological developments, especially in fields like big data analytics, machine learning, and artificial intelligence (AI), will support the expansion of AT in India. With the aid of these tools, traders can create increasingly complex trading plans, analyze massive databases instantly, and make more accurate data-driven judgments.

Regulatory Environment: As financial markets change, regulatory frameworks controlling AT are probably going to change as well. In order to maintain the orderly operation of AT activities while addressing issues with market integrity, transparency, and investor protection, regulators like the SEBI may amend current regulations or adopt new ones.

Growing Adoption Across Market Segments: Large trading businesses and institutional investors are no longer the only ones using algorithmic trading in India. Retail investors are adopting algorithmic trading methods more frequently as a result of the introduction of API-based trading platforms and the accessibility of algorithmic trading tools and resources. This democratization of algorithmic trading is expected to contribute to its widespread adoption across various market segments in India.

Global Integration: Opportunities for cross-border trade and investment are being created by India's financial markets' growing integration with international markets. India's algorithmic trading industry is expected to increase as a result of algorithmic trading firms taking advantage of this trend by creating methods that profit from global market movements and arbitrage opportunities.

CONCLUSION

Algorithmic trading has become an important part of the Indian stock market. It offers many benefits like speed and accuracy, but also comes with risks.

The role of Securities and Exchange Board of India is very important in maintaining balance between innovation and safety. With proper knowledge and regulation, Algo trading can contribute positively to the financial market.

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CSR SPENDING PATTERNS OF INDIAN LISTED COMPANIES: A POST-MANDATE ANALYSIS

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ABSTRACT

In 2013, India made history, and this time around, it was not a celebrated one, yet it has earned it a lot of world attention. It was the first nation to legally enforce Corporate Social Responsibility expenditure in Section 135 of the Companies Act. Ten years later, the question that should be asked is a simple question: did it work? The paper presents a post-mandate examination of the patterns of CSR spending among the Indian listed companies and the analysis will be conducted on the total expenditure, sector-wise expenditure, region-wise expenditure, and compliance behaviour of the period FY 2014-15 through FY 2023-24. Using secondary data sources, the Ministry of Corporate Affairs, PRIME Database, CRISIL CSR Yearbook 2026 and published research will help the study track an overall upward trend in aggregate spending and enduring structural issues, namely geographic concentration, sectoral bias towards education and healthcare and culture of compliance that has focused on input compliance rather than real developmental output. The paper determines what has been successful, what has not been successful and provides recommendations on how Indian CSR can become more strategically useful in the next 10 years.

Keywords: *CSR, Companies Act 2013, Section 135, Indian listed companies, CSR spending, Schedule VII, ESG, corporate philanthropy*

1. INTRODUCTION

The expression of the statement that India has become the first nation on earth to make corporate social responsibility expenditure legally binding is a phrase that gets repeated frequently in the context of the Indian CSR. This is true to fact. What is less talked about, though, is the question of whether the ten years of obligatory spending has indeed shifted the needle on the social and developmental issues the latter is set to solve.

The Companies Act, 2013 in section 135 stipulates that companies with a specific size must spend at least 2 percent of their average net profits on social activities approved by the company. The idea was simple- give part of the corporate profit back to the society in a systematic, responsible manner. Since then, CSR has ceased to be a peripheral entry in corporate budgets, and has become a major and growing source of funds to education, healthcare, rural development and environmental causes.

The figures are huge. According to CRISIL, 10 th CSR Yearbook 2026, qualifying listed companies spend more than INR 1.22 lakh crore on CSR activities in the

decade ending FY 2024. Out of this, about 63 percent was incurred only within the past five years, which shows a steep increase in the corporate social investment during the recent past (CRISIL, 2026). According to the data of the PRIME Database, the spending on CSR, in turn, increased by 16% in FY 2023-24 by itself reaching INR 17,967 crore (Drishti IAS, 2024).

These are really impressive figures. However, aggregate spending numbers, although significant, do not paint the complete picture. Where is the money going? Who is benefiting actually? What are the areas and communities being excluded? And does the CSR framework deliver sustainable social impact or does it result in much performative compliance? A systematic post-mandate analysis is an attempt that this paper tries to answer these questions.

2. OBJECTIVES OF THE STUDY

- To analyse the aggregate trend in CSR spending by Indian listed companies from FY 2014-15 to FY 2023-24.
- To examine sector-wise allocation of CSR funds and identify dominant and neglected sectors.
- To assess the regional distribution of CSR spending and its implications for geographic equity.
- To evaluate compliance trends and governance patterns among eligible companies.
- To identify emerging issues and offer recommendations for strengthening India's CSR framework going forward.

3. RESEARCH METHODOLOGY

The paper has used all secondary data. No major fieldwork was done. The key data sources will be the annual CSR reports provided by the Ministry of Corporate Affairs, reports of CSR expenditure by NSE-listed companies in PRIME Database, CSR Yearbook 2026 (10 th edition) released by CRISIL, the analysis of India Development Review, and peer-reviewed articles via ResearchGate and Springer. The time frame of the study includes FY 2014-15, which is the initial year of the mandate functioning, to FY 2023-24, which is ten years in total. The paper is analytical and descriptive in nature and is aimed at analyzing trends and comparing and drawing conclusions on patterns in the data.

4. THE LEGAL FRAMEWORK: SECTION 135 AND WHAT IT ACTUALLY REQUIRES

It is a good idea to be specific about what the law really states, as the details count. Section 135 of companies act, 2013 relates to companies that in the previous financial year had a net worth of INR 500 crore or more, a turnover of INR 1,000 crore or more or a net profit of above INR 5 crore. Any company that satisfies any of the following thresholds has to have a CSR Committee of the Board and has to expend at least 2% of the average net profits of the past three financial years on activities as enumerated under Schedule VII of the Act (MCA, 2013).

The range of activity that Schedule VII deals with is relatively wide: poverty, hunger and malnutrition eradication; education and gender equality; healthcare and sanitation; environmental sustainability; national heritage protection; armed forces veteran support; sporting activity and technology incubators contributions; rural development. This is a very broad mandate, aimed at ensuring companies have the freedom in where they channel their CSR funds.

The amendments of the CSR rules in 2021 brought on a number of essential changes. Those companies which did not pay the necessary 2% are now required to move the balance not used to a special Unspent CSR Account and use it in the next three years. Third-party impact assessment is mandatory on projects exceeding INR 1 crore. The punishments against non-compliance were also reinforced. All these amendments are significant tightening of the governance system, a change in the regulatory environment towards stricter accountability (Cleartax, 2025).

5. A DECADE OF SPENDING: THE AGGREGATE TREND

India has had a decade of CSR growth that is significant and constant, and this is the headline story. According to the analysis conducted by IDR, CSR annual expenditures have increased by approximately three times between the period of FY 2014-15 and FY 2023-24, which represents the enhancement of the profitability of the corporation as well as the rising level of compliance severity (IDR, 2024). The cumulative expenditure by listed companies as analyzed by CRISIL are over INR 1.22 lakh crore in the past decade, of which the past five years constitute approximately 63% (CRISIL, 2026).

NSE-listed companies are especially represented in a more granular picture by the PRIME Database data. Following a relatively stagnant period with FY 2019-20 to FY 2022-23 spending, both in part attributable to the economic shocks of the pandemic years, spending increased significantly to INR 17,967 crore in FY 2023-24, an increase of 16% over the previous year (Drishti IAS, 20 The aggregate data of the MCA which includes all eligible companies including unlisted ones, places total CSR expenditure of FY 2022-23 at around INR 29,987 crore which is indicative of the magnitude of corporate resources currently being channeled towards social causes as required.

Table 1: Trend in CSR Spending by Indian Listed Companies (FY 2019-20 to FY 2023-24)

Financial Year	CSR Spending (INR Crore, NSE-listed)	YoY Growth (%)
FY 2019-20	14,751	—
FY 2020-21	~14,900 (est.)	~1.0%
FY 2021-22	15,524	~4.2%
FY 2022-23	15,524	0.0%
FY 2023-24	17,967	15.7%

Source: Adapted from PRIME Database, cited in Drishti IAS (2024) and IASGYAN (2024)

6. WHERE IS THE MONEY GOING? SECTOR-WISE ALLOCATION

Sectoral allocation of CSR funds has also been very stable throughout the 10-year history of the mandate. The lion share of expenditure is always taken by education and healthcare. During FY 2022-23, education alone was allocated INR 13,209 crore - about 44 percent of total CSR spending - whereas healthcare and sanitation took about 29 percent (INR 8,739 crore) (Mission Sustainability, 2026).

At much lower rates come environmental sustainability, rural development, and contributions to the PM National Relief Fund. Certain categories of Schedule VII such as technology incubators, slum development, and sports promotion have been constantly facing underfunding during the decade. Both IJIRT research (2025) and ResearchGate findings (2023) affirm that firms prefer to move towards industries that have a proven system of implementation and are evident in society rather than industries that need more intricate delivery systems or longer payback durations to demonstrate improvements.

This trend can be explained in terms of corporate risk management, however, there are developmental implications. The social issues in India are not focused solely in education and healthcare. The development of technology skills, urban infrastructure and sports development are also on the list of unmet needs but CSR programmes pay little attention to them.

Table 2: Sector-Wise CSR Spending in FY 2022-23 (All Eligible Indian Companies)

Sector	CSR Spending (INR Crore)	Share of Total (%)
Education	13,209	44.1%
Healthcare and Sanitation	8,739	29.1%
Environmental Sustainability	2,921	9.7%
Rural Development	2,005	6.7%
PM National Relief Fund	815	2.7%
Sports Promotion	526	1.8%
Heritage, Art and Culture	441	1.5%
Others (incl. Technology Incubators, Slum Dev.)	1,331	4.4%
Total	29,987	100%

Source: Mission Sustainability Report (2026); Protean Tech (2024)

7. THE GEOGRAPHY OF CSR: WHO GETS THE MONEY?

India's CSR landscape has a major issue with how the money is spread out across different areas. One state, Maharashtra, gets a huge chunk of the CSR funds - about 18% of the total spending in the year 2022-23. This isn't surprising, given that Maharashtra is the top spot for businesses and industries in India, as noted by Protean Tech in 2024. If you look at the numbers, a few other states like Gujarat, Uttar Pradesh, Karnataka, Tamil Nadu, and Rajasthan together get around 26% of the

funds. This shows that the money isn't being spread out evenly, and some areas are getting a lot more than others.

In simple terms, this means that a few wealthy states with strong industries are getting a large share of the resources meant for Corporate Social Responsibility (CSR). According to CRISIL's CSR Yearbook 2026, despite companies spending over INR 1.22 lakh crore on CSR over the past decade, the areas that need it most - the aspirational districts identified by NITI Aayog - are not getting enough. In fact, in the financial year 2023-24, only 397 out of 2,020 companies that were supposed to do CSR work actually did projects in these districts. This is a problem because these areas are already lagging behind in terms of development, and they need more support, not less. The fact that they are not getting enough CSR resources means that the gap between them and the more prosperous states is likely to grow even wider.

This raises a big question about how we use our resources. If companies put their money where they already have a lot of power, instead of where people really need help, can we really say we're doing what's best for the communities that need it most? Right now, we're supposed to focus on the areas around where companies are based, but it's not a hard rule - and so far, it doesn't seem to be working. The numbers show that we're not getting enough money to the places that are struggling the most.

Table 3: State-Wise Distribution of CSR Spending (FY 2022-23, Approximate)

State / Region	Approx. Share of Total CSR Spend	Remarks
Maharashtra	~18%	Largest recipient; Mumbai corporate concentration
Gujarat	~7%	Industrial base; strong PSU presence
Uttar Pradesh	~6%	Large population; education-focused CSR
Karnataka	~5%	IT and pharmaceutical sector CSR
Tamil Nadu	~4%	Manufacturing and healthcare focus
Rajasthan	~4%	Rural and healthcare programmes
Other states and UTs (combined)	~56%	Fragmented; aspirational districts under-served
Total	100%	Approx. INR 29,987 crore (FY 2022-23)

Source: Mission Sustainability Report (2026); CRISIL CSR Yearbook (2026); Protean Tech (2024)

8. COMPLIANCE: BETTER THAN BEFORE, BUT NOT GOOD ENOUGH

Things have really changed for the better since 2014 when it comes to companies doing their part for Corporate Social Responsibility, or CSR. A recent report by IASGYAN in 2024 showed that out of 1,028 companies listed on the National Stock Exchange that were supposed to be doing CSR, 990 of them had actually set up special committees to handle it. And the good news is that most of these companies were meeting their spending targets for CSR. However, there were still 27 companies

that didn't spend a single penny on CSR - which is not only a problem with following the rules, but also a missed chance for them to make a positive impact.

A bigger worry than companies just not following the rules is the quality of how they're following them. Lots of companies, like Drishti IAS said in 2024, still prefer to do simple, routine CSR projects instead of trying new, high-impact ones. It's easy to build a school or fund a health camp - you can just take some pictures and show them to the Board. But designing and running a project that actually teaches people new skills or helps the environment in a way that you can measure is much harder. So, what happens is that CSR projects are chosen because they're easy to do, not because they're really what people need.

A recent study looked at how banks in India did with corporate social responsibility, or CSR, over the last ten years, from 2014 to 2024. It found that private banks did a better job than public sector banks when it came to following CSR rules. Both types of banks seemed to care most about education, healthcare, and taking care of the environment. For example, they might build schools or hospitals, or try to reduce their carbon footprint. In 2021, the government made some changes that require big projects to assess their impact on society and the environment. This is a good start, but it will take a few more years to see how much of a difference it really makes. The study, which was published on ResearchGate in 2023, gives us a better idea of how banks in India are doing when it comes to CSR. Overall, it seems like private banks are leading the way, and the government's new rules could help make a bigger impact in the future.

9. EMERGING TRENDS: WHAT IS CHANGING

9.1 ESG Is Reshaping CSR Strategy

The rise of Environmental, Social, and Governance frameworks as a standard expectation from investors is changing how large Indian companies view CSR. SEBI's Business Responsibility and Sustainability Report (BRSR) became mandatory in FY 2022-23 for the top 1,000 listed companies. This has created a direct connection between CSR activities and ESG reporting. Early data shows a steady rise in spending on climate and environmental-focused CSR, especially in renewable energy, water conservation, and afforestation. Companies aim to show their commitment to ESG principles to both local and global investors (Mission Sustainability, 2026).

9.2 From Compliance Spending to Catalytic Impact

The piece by IDR (2024) seems to capture a narrative that senior CSR practitioners are increasingly aware of, that CSR discussion has shifted from spending levels to impact levels. The business leaders featured in IDR mention 'catalytic impact'-meaning the use of CSR funds not as the money it is and has always been given to charities, but as a catalyst with its use to generate new ways of doing development or to empower civil society actors. If CSR spending is continued at the current levels, IDR expects it to reach $120,000$ crore per annum by FY 2034 (IDR, 2024)-a

threefold increase. Whether these funds will be allocated strategically or compliantly remains the decision Indian companies and regulators have to make.

9.3 Private Sector vs. Public Sector Contributions

About 84% of the total CSR spending has been by the private sector companies and the remaining 16% by Central Public Sector Enterprises. CPSEs invested an amount of INR 4,911 crore in the fiscal year 2023-24, an increase of 19% over the prior year (Mission Sustainability, 2026). Amongst the private companies, one of the larger and consistent spenders has been Reliance Industries; their total CSR investments grew from INR 1,186 crore in 2021-22 to INR 1,592 crore in 2023-24, indicating their rising profitability as well as increased institutional commitment towards social investment (IJIRT, 2025).

Table 4: Private Sector vs. CPSE CSR Contribution (FY 2023-24)

Category	CSR Spend (INR Crore)	Share of Total (%)	Key Focus Areas
Private Companies	~25,076	84%	Education, Healthcare, Environment
Central PSEs (CPSEs)	4,911	16%	Rural Dev., Skill Dev., Sanitation
Total (All eligible companies)	~29,987	100%	Education dominant at 44%

Source: Mission Sustainability Report (2026); IASGYAN (2024)

10. KEY CHALLENGES THAT REMAIN

1. **Geographic concentration:** CSR funds continue to be skewed towards areas with corporate presence and not developmental needs, leading to sustained under-funding of aspirational districts and poorer states.
2. **Sectoral focus:** Spending in the domains of education and healthcare exceeds 73% of the total CSR amount, with the technology incubation, slum development, and sports domains consistently receiving lower allocations even though they are covered under Schedule VII.
3. **Input not impact focused:** Most organizations still perceive CSR as a compliance activity. Compulsory impact assessments are facilitating this change slowly but a sustained focus on an outcome driven approach needs to permeate organizations.
4. **Reliance on third-party implementers:** More than 65% of the CSR funds (INR 19,000 crore in FY2022-23) were passed on to third-party implementation agencies. This has implications for the quality of implementation, fiduciary responsibilities, and efficacy of beneficiary outreach.
5. **Regulatory vagueness:** Frequent changes in CSR regulations, although with a general intent to bring in improvements, have resulted in compliance challenges for medium-sized companies lacking specialized teams to keep pace with the changes.

11. RECOMMENDATIONS

- Draw a direct link between activities undertaken as part of Schedule VII and India's commitments to achieving the SDGs; the increased visibility will enable companies to make conscious spending decisions on priority areas that are nationally relevant rather than opting for safe, tested categories.
- Reduce the minimum mandatory threshold for impact assessment from INR 1 crore to INR 50 lakh; this will bring a larger proportion of the CSR spending under the mandate of an impact assessment.
- Create an open-source real-time CSR geospatial dashboard of spending per district; this would allow civil society and government to pin down areas which are under-served in terms of CSR spending and advocate for them.
- Create some positive incentives-like CSR multipliers, or some other form of recognition-for CSR investment on aspirational districts and in under-served Schedule VII categories.
- Enhance the functionality of the national CSR portal as a match-making platform, connecting companies to competent partners at the district and state level for projects in those areas where the company's presence is limited.
- Encourage CSR spending on EdTech, AI infrastructure and skilling programs, in the constituent colleges and training centres affiliated to institutions at Tier-2 and Tier-3 cities.

12. CONCLUSION

Indian CSR has in the past decade raised Rs 1.22 lakh cr of corporate funds to social causes which would otherwise be unfunded. It is clear that there is an increase in compliance structures, governance, and social investment partly as a result of ESG thinking.

Despite these successes, the developmental effects of the mandate are yet to live to its potential. The hegemonic distribution of funds to rich industrial nations, the long-term concentration of sectors in the simplest and most visible problems, and expenditures based on compliance are structural problems that an extra funding will not address. Indian corporate social responsibility needs improved, more responsible, and more community-oriented expenditure. The country requires a more effective spending system that responds to the actual needs on the ground.

To business, finance, and corporate governance scholars, the Indian CSR mandate is a rare but untapped prospect to examine the social investment policy of corporations. The world has lessons about the possibilities and limitations of obligatory CSR; the interaction between regulation and authentic CSR; and the conditions in which corporate social responsibility is correlated with the requirements of the societal development.

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USING CHATGPT TO SUPPORT OUTCOME-BASED LEARNING: A CASE STUDY IN COMMERCE EDUCATION

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INTRODUCTION

For commerce teachers working within an Outcome-Based Learning (OBL) framework, teaching today is no longer limited to delivering content. Teachers are expected to design outcome-aligned lessons, create application-oriented assessments, provide continuous feedback, and document learning outcomes for quality assurance processes. While OBL strengthens accountability and learner focus, it also significantly increases the intellectual and administrative workload of teachers.

In day-to-day classroom practice, commerce teachers often face challenges such as diverse learner abilities, limited teaching time, and repetitive clarification of core concepts. In this context, generative AI tools such as ChatGPT are increasingly being explored not as teaching replacements, but as teacher-support tools that enhance instructional efficiency and pedagogical clarity. This case study reflects on how ChatGPT supported teachers in implementing outcome-based learning more effectively in commerce courses.

WHY TEACHERS TURNED TO CHATGPT

The decision to use ChatGPT emerged from a practical teaching need rather than technological enthusiasm. Teachers required support in three key areas:

- Translating course outcomes into teachable classroom activities
- Designing application-based questions aligned with learning outcomes
- Managing continuous feedback without increasing workload

ChatGPT's conversational nature allowed teachers to interact with the tool much like a teaching assistant—asking for examples, reframing explanations, or generating practice scenarios—while retaining full academic control. Research indicates that AI tools are most effective when they function as supportive systems that enhance teacher capacity rather than automate teaching decisions (AACSB, 2026).

SUPPORTING TEACHERS IN OUTCOME-ALIGNED LESSON PLANNING

One of the most immediate benefits of ChatGPT for teachers was in lesson preparation. Commerce teachers used ChatGPT to:

- Generate real-world business examples linked to specific outcomes
- Simplify complex accounting or economics concepts for slower learners
- Explore multiple explanations for the same topic

This helped teachers ensure that classroom discussions remained focused on what students should be able to do by the end of the lesson, which is the essence of outcome-based learning. Studies on AI-supported pedagogy show that such tools improve instructional alignment and reduce preparation time for faculty (Phung et al., 2026).

ASSISTING TEACHERS IN ASSESSMENT DESIGN

Assessment design is one of the most time-intensive aspects of OBL. Teachers used ChatGPT to support:

- Drafting scenario-based and case-oriented questions
- Aligning questions with Bloom's cognitive levels
- Creating formative tasks linked directly to course outcomes

Rather than using AI-generated questions directly, teachers refined and contextualised them, ensuring academic rigour and originality. This approach aligns with research highlighting AI's role in strengthening outcome mapping and assessment transparency when guided by teacher expertise (Mehta et al., 2024).

REDUCING FEEDBACK LOAD WHILE IMPROVING QUALITY

Providing timely feedback is central to outcome-based learning but often becomes overwhelming for teachers. ChatGPT supported teachers by:

- Generating indicative feedback based on outcome descriptors
- Helping structure feedback sentences aligned with assessment rubrics
- Supporting students during pre-submission stages, reducing repetitive queries

This enabled teachers to shift from repetitive explanation to higher-order mentoring and discussion. AI-supported formative feedback has been identified as a key enabler of scalable OBL implementation in higher education (PrepAI, 2025).

SUPPORTING TEACHER REFLECTION AND CONTINUOUS IMPROVEMENT

Beyond classroom instruction, ChatGPT also assisted teachers in reflective academic practices. Teachers used the tool to:

- Identify common learner misconceptions
- Reflect on outcome attainment trends
- Improve lesson design for future cohorts

Such reflective use strengthened continuous quality improvement (CQI) processes, an important dimension of accreditation-driven education systems.

Ethical Use and Teacher Control

Teachers remained central in setting boundaries for ChatGPT usage. Clear guidelines were communicated to students to ensure that AI supported understanding rather than

content copying. Academic judgement, assessment decisions, and learning evaluation remained firmly under teacher control. Scholars consistently caution that ethical, teacher-led integration of AI is essential for preserving educational integrity (Selwyn, 2022).

CONCLUSION

This case study demonstrates that ChatGPT can serve as a practical teaching companion for commerce educators working within an outcome-based framework. By supporting lesson planning, assessment design, feedback, and reflective practice, ChatGPT helps teachers manage the complexity of OBL without compromising pedagogical quality. The success of such integration lies not in the tool itself, but in how teachers use it thoughtfully, ethically, and purposefully to support student learning outcomes.

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CHANGING PATTERNS OF CONSUMER BEHAVIOUR IN THE DIGITAL ECONOMY

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ABSTRACT
The digital economy has significantly transformed consumer behaviour across the globe. With the rapid growth of internet penetration, mobile technology, and e-commerce platforms, consumers have shifted from traditional purchasing methods to digital modes. This study examines the changing patterns of consumer behaviour in the digital economy, focusing on factors such as convenience, digital payment adoption, social media influence, and trust in online platforms. The research is based on primary data collected through a structured questionnaire and supported by secondary sources. The findings reveal that digitalization has enhanced consumer awareness, increased impulsive buying, and reshaped decision-making processes. The study concludes with suggestions for businesses to adapt to evolving consumer expectations.

Keywords: *Consumer Behaviour, Digital Economy, Online Shopping, Social Media, E-commerce, Digital*

INTRODUCTION
Consumer behaviour refers to the study of individuals' actions while purchasing goods and services. In the digital economy, technological advancements such as smart phones, the internet, and digital payment systems have revolutionized consumer decision-making. Consumers today prefer online platforms due to convenience, variety, and accessibility. The rapid expansion of digital technologies has significantly altered consumer lifestyles and purchasing behaviours. The widespread use of the internet, smart phones, and social media platforms has transformed the traditional buying process into a dynamic and interactive digital experience. Consumers today rely heavily on online sources for information search, product comparison, and evaluation before making purchase decisions. As a result, understanding consumer behaviour in the digital environment has become a critical concern for marketers and businesses.

The emergence of e-commerce and digital payment systems has made transactions faster and more secure. Social media platforms also play a vital role in influencing consumer preferences. Hence, understanding these changing patterns is essential for marketers and policymakers. The online purchase decision-making process refers to the sequence of stages consumers follow while making buying decisions in a digital environment. It begins with problem recognition, which is often triggered by digital stimuli such as online advertisements, social media content, or influencer recommendations. Once a need is identified, consumers engage in an information

search using search engines, e-commerce platforms, online reviews, and social media to gather relevant product information.

REVIEW OF LITERATURE

Variya Devangi Manharbhai (2025) revealed that the digital revolution has significantly changed the consumer behaviour and purchasing patterns. The widespread use of the internet, smart phones, and social media platforms has transformed the way consumers search for information, evaluate alternatives, and make purchase decisions. This conceptual study aims to examine changes in consumer behaviour in the digital age with a specific focus on online purchase decision-making. The study concludes that digital technologies have made consumers more informed, empowered, and demanding, requiring marketers to adopt customer-centric and technology-driven strategies.

Genu Roney Varghese (2024) pointed out that Social media marketing has become one of the most effective tools of reaching out to consumers and changing their perception about the brand. Currently, there are 4.62 billion active users of social media and this makes it crucial for companies to use digital marketing to reach their target consumer. This also reveals that brands that respond on social media are 42% more likely to keep customers, thus supporting the effectiveness of timely consumer interaction. They have highlighted the need to investigate other effective forms of social media marketing especially with the emergence of other technologies in the market such as artificial intelligence and augmented reality.

Pranjal Rawat et al. (2024) their study identifies key drivers and challenges faced by consumers in the digital realm, emphasizing the role of trust, security, and personalization in shaping online consumer experiences. Furthermore, the paper discusses the evolving nature of customer brand relationships and the implications for businesses seeking to adapt and thrive in the digital age. The findings contribute to the existing body of knowledge and provide a foundation for future research endeavors in the rapidly evolving field of consumer behavior in the digital era.

Shazad Kavrana and Schin Tomar (2022) study revealed that investigates consumer behavior in the digital era among residents of Mumbai, India, focusing on various aspects such as digital device usage, online shopping behavior, social media influence, and preferences for personalized marketing. Findings of the study reveal a digitally-engaged demographic with high levels of Smartphone usage and significant time spent on digital activities. Online shopping is prevalent, particularly for electronics and fashion products, driven by factors such as convenience and user reviews. These insights provide valuable guidance for businesses seeking to adapt their strategies to meet the evolving needs and preferences of digital consumers in Mumbai.

OBJECTIVES OF THE STUDY

1. To analyze the changing patterns of consumer behaviour in the digital economy.

2. To identify factors influencing online purchasing decisions.

3. To examine the role of digital payments in consumer behaviour.

4. To study the impact of social media on consumer preferences.

Hypotheses

H0: There is no significant change in consumer behaviour in the digital economy.

H1: There is a significant change in consumer behaviour in the digital economy.

RESEARCH METHODOLOGY

This study adopts a descriptive and analytical research design. The descriptive approach helps in understanding the current trends in consumer behavior the digital economy, while the analytical approach is used to examine relationship between variables such as digital usage, purchase behavior and consumer satisfaction.

A survey method is employed to collect primary data, and the required, secondary data are gathered from reliable and authentic sources. A Convenience sampling technique is used to collect data from 100 respondents.

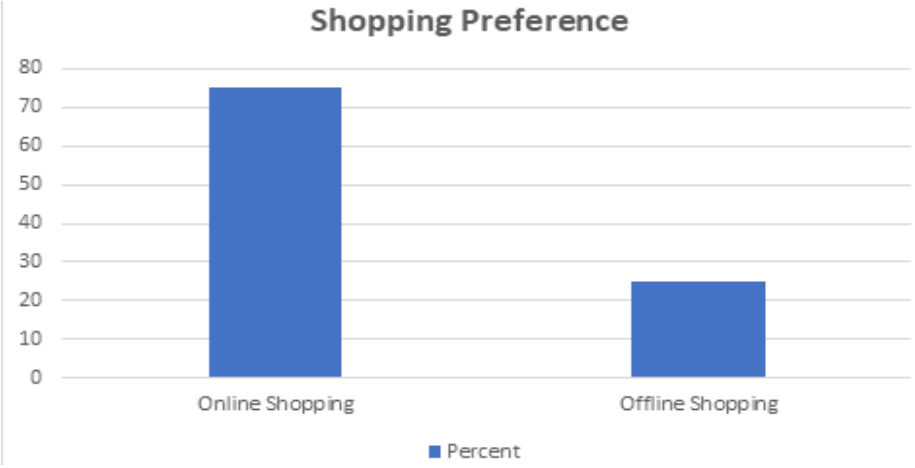
The collected data are analyzed using statistical tools such as percentage analysis, Chi-square Test, and simple statistical tables.

1. Frequency Distribution: Preference for Shopping Mode

Table 1: Shopping Preference

Preference	Frequency	Percent	Valid Percent	Cumulative Percent
Online Shopping	75	75.0	75.0	75.0
Offline Shopping	25	25.0	25.0	100.0
Total	100	100.0	100.0	—

The table shows that 75% of respondents prefer online shopping, while only 25% prefer offline shopping**.** This clearly indicates that the majority of consumers have shifted towards digital platforms due to convenience, time-saving and wider product availability. It reflects a significant change in traditional buying behaviour in the digital economy.

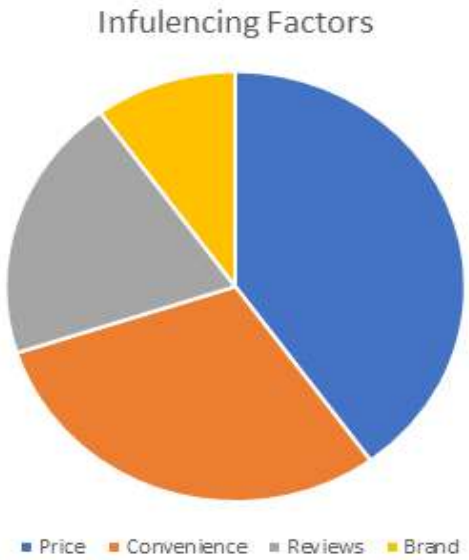


2. Frequency Distribution: Factors Influencing Online Purchase

Table. 2: Influencing Factors

Factor	Frequency	Percent	Valid Percent	Cumulative Percent
Price	40	40.0	40.0	40.0
Convenience	30	30.0	30.0	70.0
Reviews	20	20.0	20.0	90.0
Brand	10	10.0	10.0	100.0
Total	100	100.0	100.0	—

The table reveals that price 40% is the most influential factor affecting consumer purchasing decisions. This is followed by convenience 30%, reviews 20% and brand 10%. The result indicates that consumers in the digital era are price-sensitive and relay on ease of access and peer reviews rather than brand loyalty alone.

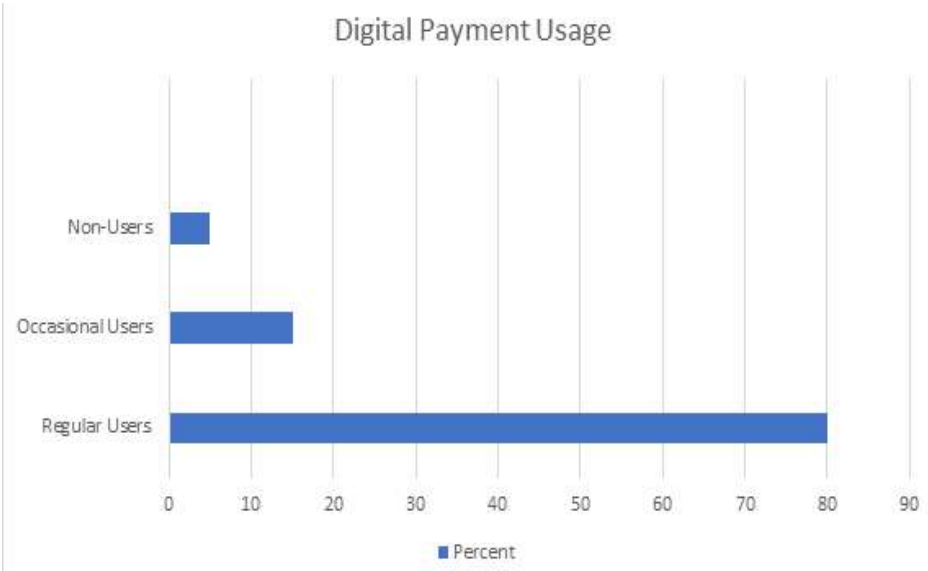


3. Frequency Distribution: Usage of Digital Payments

Table .3: Digital Payment Usage

Usage Level	Frequency	Percent	Valid Percent	Cumulative Percent
Regular Users	80	80.0	80.0	80.0
Occasional Users	15	15.0	15.0	95.0
Non-Users	5	5.0	5.0	100.0
Total	100	100.0	100.0	—

The table shows that 80% of respondents are regular users of digital payments, while 15% use them occasionally and only 5% do not use digital payments. This suggests a high level of acceptance and trust in digital payment systems, highlighting the growing importance of cashless transactions in the digital economy.

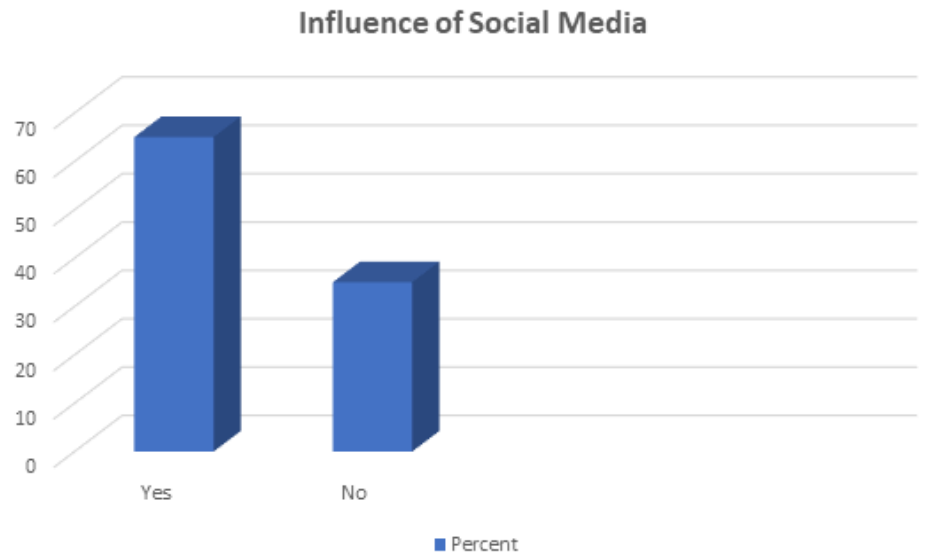


4. Frequency Distribution: Social Media Influence

Table.4: Influence of Social Media

Response	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	65	65.0	65.0	65.0
No	35	35.0	35.0	100.0
Total	100	100.0	100.0	—

According to the table, 65% of respondents are influenced by social media, whereas 35% are not influenced. This indicates that social media platforms play a crucial role in shaping consumer preferences, awareness, and purchase decisions in the digital era.



5. Cross Tabulation

Table 6.5: Shopping Preference × Digital Payment Usage

Shopping Preference	Regular Users	Occasional Users	Non-Users	Total
Online	70	4	1	75
Offline	10	11	4	25
Total	80	15	5	100

The cross-tabulation shows that most online shoppers (70 out of 75) are regular users of digital payments, while offline shoppers have comparatively lower usage. This suggests a strong association between online shopping behavior and digital payment adoption. Consumers who prefer online shopping are more likely to use digital payment method.

Table 6: Chi-Square Tests

Test	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	32.45	2	0.000
Likelihood Ratio	30.12	2	0.000
Linear-by-Linear Association.	25.67	1	0.000
N of Valid Cases	100	—	—

The chi-square test result shows a p-value of 0.000, which is less than 0.05, indicating statistical significance. Therefore, the null hypothesis is rejected, and it is concluded that there is a significant relationship between shopping preference and digital payment usage. This confirms that consumer behaviour has significantly changed in the digital economy.

FINDINGS

- Consumers increasingly prefer online shopping over traditional methods.
- Digital payments have become widely accepted.
- Social media plays a crucial role in influencing buying decisions.
- Consumers are more informed and compare products before purchasing.
- Trust and security remain important concerns.

SUGGESTIONS

- Businesses should enhance website security to build trust.
- Companies should use social media marketing effectively.
- Simplifying digital payment systems can attract more users.
- Providing accurate product information and reviews is essential.
- Improving user experience can increase customer satisfaction.

CONCLUSION

The study concludes that the digital economy has significantly transformed consumer behaviour. Consumers are now more tech-savvy, informed, and convenience-oriented. Digital platforms, social media, and online payment systems have become integral parts of the purchasing process. Businesses must adapt to these changes to remain competitive in the market. Consumers are influenced by e-commerce when making purchases. Social media communication offers a new means of exchanging information about goods and services. Since the majority of consumers use the internet and online social media platforms, the primary activity for selling goods and services is the analysis of consumer behavior. Social media has grown in importance as a platform for product introduction, marketing, and surveying. Social media is a crucial marketing tool these days for advertising campaigns. Therefore, understanding how social media is influencing customer behavior becomes essential.

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AI – AN INSTRUMENT IN CULTURAL CONSERVATION

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ABSTRACT

The integration of artificial intelligence (AI) into the conservation of cultural heritage symbolises a significant transformation in preservation methodologies, heralding both innovative solutions and complex ethical dilemmas. This Paper discusses the multifaceted role of AI in the conservation and restoration of cultural assets—including historical monuments, literature and intangible heritage. Drawing on recent scholarship, institutional case studies, and global policy frameworks, the paper explores how machine learning (ML), computer vision, digital twinning, and natural language processing (NLP) are revolutionizing archiving, monitoring and restoration practices. Simultaneously, it interrogates the ethical challenges these technologies engender, including risks of inauthentic restoration, perpetuation of biases and deliberate misuse. By advocating for a balanced approach that leverages AI's capabilities while safeguarding cultural integrity, the article calls for interdisciplinary governance frameworks and ethical guidelines that ensure technological advancement remains in service of humanity's shared heritage. Ultimately, the paper posits that the integration of AI into cultural heritage conservation necessitates a symbiotic relationship between technological innovation and the irreplaceable human element.

Keywords: *cultural heritage preservation, digital archiving, ethical AI, human-centric technology, interdisciplinary governance, technological stewardship.*

INTRODUCTION

Throughout human history, cultural heritage has served as the cornerstone of civilization—encapsulating the traditions, values, artistic expressions, and collective memory of societies across time. From ancient manuscripts and monumental architecture to oral traditions and indigenous knowledge systems, cultural heritage provides a sense of continuity and identity that links past generations to the present and future.

The goal of this paper is not merely to celebrate technological innovation but to chart a course toward its ethical, inclusive and sustainable deployment in service of humanity's shared heritage.

THE CURRENT LANDSCAPE: CHALLENGES IN CULTURAL PRESERVATION

The Promise and Limits of Digital Archiving

Digital technology has already fundamentally altered how cultural heritage is stored, shared and experienced. Initiatives such as the Internet Archive have digitized huge

collections of books, rare documents, diaries and media files, making them freely accessible to global audiences. As scholar Alvis (as cited in Garozzo et al., 2020) noted, when digitized materials are available online, people worldwide can access them without traveling—benefiting both environmental sustainability and intellectual equity. This further enables knowledge sharing at a scale that previous generations could not have imagined, with librarians, academics and cultural professionals increasingly understanding that access is itself an important dimension of preservation.

However, the digital age introduces its own tough challenges. Digital storage media degrade over time, placing entire collections at risk. The exponentially increasing volume of data complicates management and curation while skilled tasks such as cataloging, metadata creation, and format migration remain liable to human error. Archives face a dual challenge: rapidly migrating data to newer formats while simultaneously handling the increasingly complex tasks of data curation—all of which are vulnerable to error (Fontanella et al., 2020). Traditional archiving methods have grown insufficient in meeting the pace and scale of these demands, creating an urgent need for intelligent, scalable solutions.

Physical and Deliberate Threats to Heritage

Beyond technical challenges, cultural heritage also faces deliberate threats that demand urgent international attention. The systematic destruction of cultural sites by extremist groups—such as the Islamic State's demolition of Palmyra in Syria and the Mosul Museum in Iraq—underscores that heritage destruction is often a calculated act of ideological warfare designed to eliminate the symbols of a society's past and disrupt its future. More recently, UNESCO (2023) verified damage to over 485 cultural sites in Ukraine following the 2022 Russian invasion, including churches, museums, monuments and libraries—clear evidence that cultural assets continue to be weaponized in modern conflict.

These realities underscore the need for innovative conservation strategies that can operate at scale, respond in real time and protect heritage from both physical and digital threats. AI, with its potent capabilities for pattern recognition, structural analysis, and predictive maintenance, emerges as a transformative force in this context (Falcone et al., 2021).

AI AS AN INSTRUMENT OF CONSERVATION

Digital Archiving and Metadata Automation

AI is already reshaping archival practice through automation and enhanced searchability. Technologies such as image and text recognition can automatically generate metadata for historical documents, photographs, and audio recordings—dramatically reducing the manual labor involved in cataloging while simultaneously improving precision and consistency. Google's Cloud Vision API, for instance, employs machine learning to identify objects, locations, and individuals in historical

images, enabling more accurate and consistent metadata creation and making archives far easier to search and navigate (Garozzo et al., 2020).

Restoration, Digital Twinning, and Predictive Conservation

AI demonstrates remarkable value in the physical and digital restoration of heritage materials. Machine learning algorithms can repair damaged photographs, enhance degraded audio recordings, and reconstruct fragmented texts—ensuring that valuable content remains accessible even when its physical condition has deteriorated. In architecture, digital twinning technology creates precise virtual replicas of heritage structures, enabling conservators to model deterioration patterns and simulate restoration scenarios before any physical intervention takes place (Falcone et al., 2021).

Augmented reality (AR) and virtual reality (VR) technologies extend conservation's reach into public engagement and education. According to Boboc et al. (2022), AR has been successfully applied across diverse cultural heritage contexts, including three-dimensional artifact reconstruction, virtual museums, and the preservation of intangible heritage. Digital reconstructions of ancient sites—such as the VR recreation of Ancient Olympia—allow global audiences to experience heritage that might otherwise remain physically inaccessible, fostering appreciation and cultural connection across geographic and economic boundaries. Italy's Royal Museums of Turin have developed virtual applications allowing remote interaction with their collections, demonstrating how technology can transform passive observation into active cultural engagement.

THE DARK SIDE: AI AS A TOOL OF CULTURAL ERASURE

Deepfakes and Historical Manipulation

AI-generated synthetic media—deepfakes—pose a profound threat to cultural integrity and public trust in historical records. Unlike traditional misinformation, deepfakes can convincingly alter audiovisual records of historical events, create fictitious testimonies, and distort archival materials to serve revisionist or extremist agendas. UNESCO (2024) has warned that the automation of content creation through AI can fabricate historical events, falsify evidence, and spread disinformation, eroding public trust in authentic cultural sources and enabling the effective rewriting of history.

The proliferation of deepfake content is accelerating rapidly, with an estimated 100% growth every six months (OpenFox, 2022). Virtual heritage experiences, while valuable pedagogical tools, risk legitimizing historically inaccurate representations if not subject to rigorous academic oversight and provenance verification. Cultural institutions will need to adopt robust verification protocols and embed digital provenance markers to protect the epistemic integrity of their collections against this emerging threat.

Cyber Threats to Cultural Institutions

AI-enhanced cyber threats present a growing and underappreciated danger for libraries, museums, and heritage archives. Cultural institutions are frequently underfunded in cybersecurity infrastructure, making them soft targets for ransomware attacks and data manipulation campaigns. The 2023 ransomware attack on the British Library—which compromised access to digitized collections, research databases, and interlibrary communications—exposed the systemic cybersecurity vulnerabilities of major heritage organizations (Jisc, 2023). As of mid-2024, recovery efforts remained partial, hindered by outdated infrastructure and data loss.

AI-enhanced malware can autonomously adapt to bypass security protocols, learn institutional behavior patterns, and selectively corrupt or delete archival data. This form of targeted digital sabotage could permanently erase entire collections, particularly where institutions lack redundant storage or fail to maintain decentralized backups (Europol, 2022). The establishment of an international cultural cybersecurity network, supported by INTERPOL and UNESCO, is increasingly urgent to share threat intelligence and coordinate responses to attacks on global heritage institutions.

ETHICAL FRAMEWORKS AND GOVERNANCE

Global Regulatory Initiatives

The ethical governance of AI in cultural heritage remains fragmented and underdeveloped relative to the pace of technological change. While foundational frameworks—including the European Union's Artificial Intelligence Act (European Commission, 2024) and UNESCO's Recommendation on the Ethics of Artificial Intelligence (UNESCO, 2021)—establish important principles of transparency, accountability, and respect for human dignity, they remain largely generalist in scope and lack the sector-specific guidance that heritage institutions require. A 2022 report by the European Parliament stressed the need for sector-specific governance models that account for the sensitive nature of cultural data and the symbolic value of heritage assets.

In 2025, the United Nations Alliance of Civilizations launched the HUMAN-AI-T initiative, designed to align AI development with universal ethical values, cultural heritage, and human dignity, promoting cultural diversity and respect for human rights in technological development (UN News, 2025). UNESCO's Memory of the World Programme continues to safeguard documentary heritage through international collaboration, while the Global Forum on AI Ethics brings together policymakers, technologists, and cultural experts to address governance challenges in the AI era.

Algorithmic Bias and Cultural Representation

A critical challenge in deploying AI for cultural heritage is the problem of algorithmic bias. AI models are only as objective as the data on which they are trained, and cultural datasets are frequently skewed toward dominant, Western, or urban-centric perspectives, leading to the exclusion or misrepresentation of marginalized cultures, Indigenous knowledge systems, and intangible heritage.

A 2021 analysis by the MIT Media Lab found that image recognition tools trained predominantly on European art collections failed to accurately classify African and Indigenous artifacts, reinforcing Eurocentric taxonomies rather than challenging them (MIT Media Lab, 2021).

Addressing this challenge demands the active diversification of AI training datasets to include a broader spectrum of cultural expressions, the meaningful involvement of underrepresented communities in algorithm design and oversight, and the implementation of regular bias audits and external peer reviews before deploying AI tools in heritage classification systems. Inclusive AI design is not merely a technical challenge—it is a fundamental cultural responsibility. Without proactive measures, heritage AI risks inadvertently reproducing the very inequities it seeks to guard against.

The Dual-Use Dilemma

The dual-use nature of AI—its capacity to be used for both beneficial and harmful purposes—poses a persistent governance challenge. Tools developed for preservation purposes, such as object recognition, geolocation tracking, and metadata analysis, can be repurposed for looting, targeting, or ideological manipulation. A 2023 Brookings Institution review identified documented cases where satellite-based archaeological mapping software was repurposed to monitor religious minorities under authoritarian regimes (Brookings Institution, 2023)—a sobering reminder that heritage AI is never politically neutral.

The Indispensable Human Element

Amidst all the promise of artificial intelligence, the human element remains indispensable to meaningful and ethical cultural conservation. Humans bring to this work an irreplaceable depth of empathy, cultural intelligence, and interpretive nuance that AI cannot replicate. The emotional and symbolic dimensions of heritage—its spiritual resonance, its community significance, its contested histories and living relevance—require human judgment to navigate responsibly. As Pisoni et al. (2021) emphasized, a human-centered approach is not merely preferable but essential to the adaptation of AI technologies for genuine service in cultural heritage contexts.

Ethical oversight represents perhaps the most critical human contribution to AI-assisted conservation. Decisions about what constitutes authentic restoration, how to address the complexities of digital replication, and how to identify and correct biases embedded in AI systems all require human moral reasoning that draws on domain-specific knowledge, cultural sensitivity, and ethical judgment. Conservation efforts mediated by AI must remain anchored in the expertise of historians, conservators, and cultural scholars—professionals who provide the contextual knowledge that guides technology in culturally sensitive and ethically sound directions.

The most productive path forward is not a choice between human judgment and machine capability, but a genuine synergy of both. By combining the computational efficiency and pattern-recognition power of AI with the interpretive depth, ethical

sensitivity, and cultural understanding of human experts, the field can achieve conservation outcomes that are both technically advanced and profoundly human in their values and purposes. Technology serves best when it is guided by human wisdom rather than deployed as a substitute for it.

RECOMMENDATIONS

Based on the analysis presented in this article, the following strategic recommendations are proposed for practitioners, policymakers, and researchers engaged in AI-assisted cultural heritage conservation.

Develop interdisciplinary dialogue. Establish forums for sustained interaction among technologists, conservators, historians, ethicists, and community representatives to share insights and co-create solutions that are both technically sophisticated and culturally sensitive. This collaboration is foundational to addressing issues such as bias, authenticity, and data privacy in AI applications.

Create sector-specific ethical frameworks. Draft and formalize guidelines that directly address the unique challenges posed by AI in heritage contexts, including bias, authenticity, and data privacy. Cultural impact assessments, analogous to environmental impact reviews, should be mandated for large-scale AI deployments in museums, libraries, and archaeological projects.

Enhance AI literacy among heritage professionals. Introduce training programs and resources that build understanding of AI capabilities and limitations, enabling informed decision-making and fostering a culture of technological innovation within the conservation field.

Diversify training datasets. Invest in the curation of representative, inclusive AI training data that reflects the full diversity of the world's cultural heritage, with active involvement of underrepresented communities in the design and oversight of these systems.

Strengthen cyber-resilience frameworks. Heritage institutions must prioritize investment in AI-assisted anomaly detection, regular vulnerability assessments, decentralized backup systems, and staff training in digital security to protect irreplaceable collections from ransomware and data manipulation attacks.

Establish international governance mechanisms. INTERPOL and UNESCO should co-lead the development of binding international protocols governing AI use in cultural heritage contexts, potentially modeled on the 1954 Hague Convention, with clear accountability measures and enforcement mechanisms.

CONCLUSION

Artificial intelligence represents a genuinely transformative instrument in cultural heritage conservation—capable of extending the reach, efficiency, and precision of preservation efforts to a degree unimaginable even a decade ago. Its applications in digital archiving, predictive maintenance, artifact recovery, structural monitoring, and immersive reconstruction are already demonstrating measurable benefits for

institutions and communities worldwide. These technologies, when applied thoughtfully and governed responsibly, can help ensure that humanity's shared cultural legacy survives the pressures of time, conflict, and environmental change.

Yet the same technologies carry risks that demand constant vigilance and proactive governance. The potential for AI to enable cultural erasure—whether through targeted destruction, historical manipulation, algorithmic bias, or cyber sabotage—is not hypothetical but documented and ongoing. The imperative facing policymakers, cultural institutions, and technologists is not whether to embrace AI but how to govern its use so that it strengthens rather than undermines

cultural resilience.

A sustainable future for AI in cultural conservation will require robust ethical frameworks, genuine interdisciplinary collaboration, inclusive design practices, and the continuous engagement of the human professionals who bring meaning to the materials they protect. The findings of this study underscore that the successful integration of AI in cultural heritage conservation hinges on the ability to foster a harmonious balance between technological innovation and the deep human values that underpin why heritage matters in the first place. It is the synthesis of computational capability and human wisdom that will ensure our cultural legacies are preserved—not merely as data, but as living expressions of who we are and where we came from.

As this field continues to evolve, future research should focus on deeper investigation of collaborative dynamics between AI technologies and human expertise, the development of comprehensive interdisciplinary frameworks that address emerging ethical challenges, and the expansion of case studies across diverse cultural and geographic contexts. The question of how AI will ultimately serve cultural heritage rests not with the technology itself but with the choices made by the people who design, deploy, and govern it.

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DIGITAL TECHNOLOGIES AND ITS IMPACT IN ART & DESIGN FILM INDUSTRY.

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Creating a beautiful song has always been a detailed and thoughtful process. Traditionally, it begins with a writer composing lyrics or poetry, followed by careful practice and the setting of the composition into a suitable raga or tune. With the support of musical instruments like the harmonium, tabla, and guitar, the singer brings the song to life with the right voice and rhythm. Finally, a professional team in a music studio record and refines the track, producing the final version. This process, though time-consuming, ensures depth, quality, and artistic expression.

However, in today's digital era, this creative journey has transformed significantly. With the help of artificial intelligence, creating a song no longer requires the same level of time, manpower, or dependency on multiple specialists.

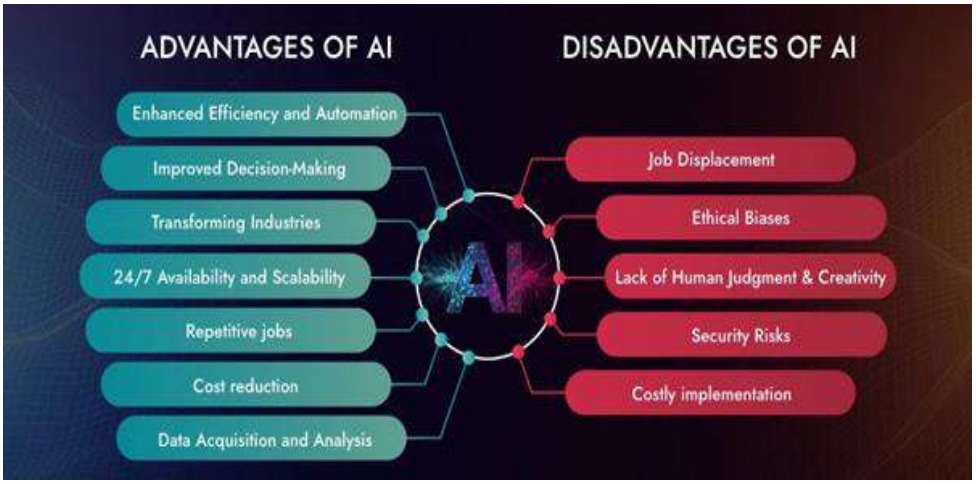
Now, a creator can simply plan the concept—deciding on the style, mood, and musical direction—and use of AI tools to generate multiple versions within hours. Whether it's an Indian or Western background, or a specific emotional tone, everything can be explored quickly through well-crafted prompts.

Earlier, developing a creative idea into a finished product could take 15 to 20 days, involving several artists and technicians. Today, the same process can be completed in just a few hours or days. AI allows creators to generate numerous options instantly, refine them easily, and make adjustments without the limitations that once existed in traditional workflows. This flexibility has not only improved efficiency but also expanded creative possibilities.

One of the biggest advantages of **AI** is the ability to explore endless variations. Instead of relying on a single version, creators can now generate dozens or even hundreds of options and select the best one. This approach applies across filmmaking, advertising, design, and other creative fields. Tasks that once required extensive studio time can now be executed much faster using digital tools.

AI also acts as a vast repository of artistic knowledge. It can produce designs in various styles, color schemes, and formats—from 2D illustrations to animations—within seconds. What once depended on the unique imagination of individual artists can now be simulated and expanded through intelligent systems. This makes AI a powerful companion in the creative process.

Despite these advancements, traditional art still holds its importance. Manual creation—whether in painting, photography, or filmmaking—carries a unique emotional depth and individuality that cannot be fully replicated. The longer, more detailed process often results in highly refined and meaningful work. AI, on the other hand, offers speed and efficiency. Both approaches have their own value and can coexist harmoniously.



There are concerns about AI replacing jobs, but the reality is more nuanced. While repetitive and labour-intensive tasks may decrease, new opportunities will emerge for those who adapt and learn these technologies. Artists who combine creativity with AI skills can achieve remarkable results and stay relevant in this evolving landscape.

As AI continues to develop rapidly, it is essential for creators to stay updated and embrace change. Rather than fearing it, we should view AI as a supportive tool—a "digital assistant" that enhances our abilities. Ultimately, humans remain the decision-makers, guiding creativity with intention and vision.

Those artists are very stronger in their talent they are frequently changing and updating in their field work regularly. We can see these changes through social media apps in regular life. Whereas in manual art one fine artist creates the painting with his particular style, colour scheme, soul, mood and imaginations and he also creates his own place in the market and their prices are very higher. So, the world of manual creation like painting, photography, video shooting, illustration is already created by the well-known artist. The real shoot and the real manual art cannot be replaced. In short, the process manual art is too long that's why the results are also up to the mark. In Ai that much longer process will not be perform & other way around. But the process will be replaced vertical characters will be in use. Todays world of AI in Arts Design and Culture is in a pick level and it will boost further; so this AI time is very beautiful, very innovative and I will inspire all the Artist to adopt AI technologies soon-better soon that late. So, the more we use Artificial intelligence, the more we will be blessed and helpful or convenient.

CONCLUSION

In conclusion**,** we are living in an exciting era where technology and creativity intersect. AI is reshaping the, making them faster, more flexible, and more innovative. By adopting these tools wisely, artists can unlock new levels of creativity while

preserving the essence of traditional art. The future belongs to those who can balance both worlds effectively.

A JOURNAEY OF DIGITAL MARKETING STRATEGIES

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1. ABSTRACT

This digital age is different from traditional one, just being online isn't enough; businesses must be built around technology to survive. This research looks at how successful companies use social media, search engines, and data to grow steadily. Instead of just pushing ads at people, these firms focus on creating helpful content and personalizing the experience for each customer. This builds better loyalty and keeps customers coming back. The paper also examines global trends, the move toward protecting user privacy, and how to create a seamless experience across all platforms. The conclusion is that long-term growth comes from putting customer trust and new technology ahead of quick, one-time sales . It is very much different from traditional one.

2. INTRODUCTION

Now everything is on a one click. Digital marketing effectively began in the early 1990s The business landscape of 2026 is call as a “digital First” mindset. With the help of Digital Device like Smart Phones, computers a businessman promote his product or service to the customer. Digital marketing work as a intermediaries between a businessman and customer. It cracks the traditional marketing methods like Television, Print, Radio and other methods. Now a day, it connected business with customer through channels such a social Media, search engines, email and web sites. To be “future ready” an organization must innovate its digital marketing strategies to cut through the noise.

The primary object of this paper is to show the journey of Digital Market. Final goal of Marketing is to sale. When we think about sale we need area for it and here Digital Marketing provides a wide area to businessman.

3. LITERATURE REVIEW

To understand current digital strategies, we must look at the transition from Web 2.0 to Web 3.0. Early digital marketing was focused on "Clicks" and "Impressions." However, modern scholars like Kotler (2021) argue that we have moved into "Marketing 5.0," where technology mimics human behavior to create meaningful connections.

Recent studies highlight the "Experience Economy," where customers do not just buy a product; they buy the digital experience surrounding it. Literature from McKinsey (2024) shows that 71% of consumers expect companies to deliver personalized interactions, and 76% get frustrated when this doesn’t happen.

This shift highlights a critical need for organizations to integrate AI and Machine Learning into their digital marketing stacks.

4. METHODOLOGY

This research is based on a **Qualitative Systematic Literature Review (SLR)**.

- **Identification:** We analyzed digital marketing benchmarks from Statista, HubSpot, and Forrester between 2023 and 2026.
- **Screening:** Over 40 industry reports were filtered for relevance to "sustainable growth" and "digital innovation."
- **Analysis:** A comparative study was performed on two industry giants—Amazon (E-commerce) and Sephora (Retail)—to see how they use digital tools to stay "future-ready."

5. THE 5P FRAMEWORK OF MODERN DIGITAL STRATEGY

Traditional marketing used the 4Ps (Product, Price, Place, Promotion). For a future-ready digital organization, we propose the **5P Framework**:

6. **Personalization:** Using data to tailor messages to the individual level.
7. **Predictive Analytics:** Forecasting what a customer wants before they search for it.
8. **Presence (Omni-channel):** Being visible on every platform the customer uses (TikTok, Email, App, etc.).
9. **Purpose:** Ensuring the brand stands for something (Sustainability, Social Justice).
10. **Privacy:** Protecting user data as a core part of the brand promise.

6. OMNI-CHANNEL INTEGRATION

An "Omni-channel" strategy is different from a "Multi-channel" strategy. In a multi-channel setup, a company has a website and a store, but they don't talk to each other. In an Omni-channel setup, if a customer puts an item in their cart on their mobile phone, they receive a reminder on their smartwatch and can pick it up at a physical store ten minutes later. This seamless integration is the hallmark of a future-ready organization. It reduces the "friction" of buying and makes the customer feel that the brand is part of their lifestyle.

7. DATA-DRIVEN DECISION MAKING

In 2026, marketing is a science. Organizations use "Heat Maps" to see exactly where a user's eyes go on a website. They use "A/B Testing" to see which color button gets more clicks. Most importantly, they use **Predictive Modeling**. By looking at thousands of data points, a company can predict that a customer is likely to move to a new house soon and start showing them ads for furniture and home insurance. This "Targeted Relevance" is what separates growing companies from dying ones.

8. CASE STUDY ANALYSIS

- **Amazon:** Amazon's digital strategy revolves around its **Recommendation Engine**. By analyzing billions of transactions, Amazon creates a "Personalized

Storefront" for every single user. This strategy accounts for over 35% of their total revenue.

- **Sephora:** Sephora uses Augmented Reality (AR) in its digital app. Customers can "try on" lipstick virtually using their phone camera. This digital innovation bridges the gap between the physical and digital worlds, leading to a much higher conversion rate than traditional beauty retailers.

9. DIGITAL ETHICS AND SUSTAINABLE GROWTH

Sustainable growth is impossible without trust. With the decline of third-party cookies (tracking codes), organizations must now rely on **First-Party Data**—information that customers give voluntarily. Future-ready brands are winning by being honest. They explain, "We collect your location data to show you the nearest store." When customers understand the "Value Exchange," they are much more willing to share their data.

10. DISCUSSION: THE ROI OF DIGITAL MATURITY

The gap between "Digital Leaders" and "Digital Laggards" is widening. Organizations that have a high "Digital Maturity" score see a 20% increase in efficiency and a 15% increase in revenue growth. However, the discussion must also address the "Digital Burnout." Consumers are starting to value "Digital Detox" periods. Future-ready marketing strategies must learn to be "Quiet" sometimes—knowing when to send a message and when to stay silent is the next level of marketing maturity.

11. CONCLUSION AND RECOMMENDATIONS

Digital marketing strategies are the heartbeat of the future-ready organization. To achieve sustainable growth, leaders must:

1. Move from mass-marketing to **hyper-personalization**.
2. Invest in **Omni-channel technology** to provide a seamless experience.
3. Prioritize **Digital Ethics** to build long-term trust.
4. Continuously **innovate** through AI and AR tools.

The future belongs to those who can master the data but never lose the human connection.

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DATA-DRIVEN DECISION MAKING THROUGH CLOUD ACCOUNTING: STAKEHOLDER PERCEPTIONS AND ADOPTION CHALLENGES IN MUMBAI

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1. ABSTRACT

The rapid evolution of cloud-based accounting systems has significantly transformed the financial decision-making landscape. Organizations are increasingly leveraging cloud technologies to enable real-time access to financial data, enhance transparency, and improve strategic decision-making. This study investigates stakeholder awareness, perceptions, and adoption challenges of cloud accounting systems in Mumbai. Using a structured questionnaire, primary data was collected from 384 respondents, including accountants, business owners, finance professionals, and auditors. Statistical tools such as percentage analysis and chi-square tests were used for hypothesis testing. The findings indicate that cloud accounting plays a critical role in enabling data-driven decision making; however, challenges such as data security concerns, lack of technical knowledge, and resistance to change hinder widespread adoption. The study provides valuable insights for policymakers, practitioners, and academicians, emphasizing the need for awareness programs, enhanced cybersecurity frameworks, and digital skill development initiatives.

Keywords: *Cloud Accounting, FinTech, Data-Driven Decision Making, Mumbai, Cybersecurity, Digital Transformation, SMEs, Stakeholder Perception, Financial Analytics, Organizational Inertia.*

2. INTRODUCTION

The accounting profession is undergoing a fundamental transformation driven by digital technologies such as cloud computing, artificial intelligence, and data analytics. Among these, cloud-based accounting systems have emerged as a revolutionary tool that enables organizations to streamline financial processes and make informed decisions using real-time data.

In a rapidly evolving business environment, especially in metropolitan cities like Mumbai, data-driven decision making has become essential for achieving operational efficiency and competitive advantage. Cloud accounting allows users to access financial data anytime and anywhere through internet-enabled devices. This flexibility has significantly improved collaboration among stakeholders, reduced operational costs, and enhanced scalability. Traditional accounting systems, which rely heavily on manual processes and on-premise software, are increasingly being

replaced by cloud-based solutions that offer automation, integration, and advanced analytics capabilities.

Despite the numerous benefits, the adoption of cloud accounting systems faces several challenges. Stakeholders often express concerns related to data security, privacy, system reliability, and lack of technical expertise. Additionally, resistance to change and organizational inertia further hinder the transition from traditional systems to cloud-based platforms. This study aims to explore stakeholder perceptions and identify the key challenges associated with the adoption of cloud accounting systems in Mumbai. It also examines how these systems contribute to data-driven decision making, thereby enabling organizations to become future-ready in a digital economy.

3. REVIEW OF LITERATURE

Recent studies have highlighted the transformative impact of cloud accounting on financial management practices.

- **Real-Time Strategic Value:** Gupta and Sharma (2025) emphasized that cloud accounting enhances real-time financial reporting and facilitates strategic decision making through integrated analytics tools. Their study concluded that organizations adopting cloud-based systems experience improved efficiency and accuracy in financial operations.
- **SME Adoption and Barriers:** Kumar and Singh (2024) examined the adoption of cloud accounting among small and medium enterprises (SMEs) and identified challenges such as limited technological expertise, high initial costs, and concerns about data security. They suggested that government support and training programs could significantly improve adoption rates.
- **FinTech and Predictive Analytics:** Patel, Mehta, and Shah (2023) explored the role of FinTech innovations in transforming accounting systems. They found that cloud computing, combined with artificial intelligence, enables predictive analytics and enhances decision-making capabilities. Their research highlighted the importance of integrating cloud accounting with other digital technologies.
- **Risk Perception:** Rao and Mehta (2022) focused on risk perception and its impact on cloud adoption. Their findings indicated that trust and perceived security risks are critical factors influencing stakeholder acceptance. Organizations must address these concerns to ensure successful implementation.
- **Operational Performance:** Joshi (2021) analyzed the impact of digital accounting systems on organizational performance. The study revealed that cloud-based systems improve transparency, reduce errors, and enhance overall efficiency. It also emphasized the importance of digital literacy in facilitating adoption.

4. RESEARCH GAP AND OBJECTIVES

4.1 Research Gap

Although existing literature extensively discusses the benefits and technological aspects of cloud accounting, there is limited research focusing on stakeholder-level perceptions and adoption challenges in metropolitan contexts like Mumbai. Most studies have adopted a macro-level approach, overlooking the micro-level factors that influence individual and organizational decisions. Furthermore, there is a lack of empirical studies examining the relationship between cloud accounting adoption and data-driven decision making. This study aims to bridge this gap by providing a comprehensive analysis of stakeholder perceptions and challenges in the adoption process.

4.2 Objectives of the Study

1. To examine stakeholder awareness of cloud-based accounting systems.
2. To analyze perceptions towards data-driven decision making.
3. To identify challenges in adopting cloud accounting systems.
4. To evaluate the relationship between cloud accounting adoption and decision-making efficiency.

5. HYPOTHESES OF THE STUDY

H1

H0: There is no significant relationship between cloud accounting adoption and data-driven decision making

H1: There is a significant relationship between cloud accounting adoption and data-driven decision making

H2

H0: There is no significant relationship between perceived challenges and adoption of cloud accounting

H1: There is a significant relationship between perceived challenges and adoption of cloud accounting

6. RESEARCH METHODOLOGY

This study adopts an empirical research design using both primary and secondary data.

- **Primary Data Collection:** Data was collected through a structured questionnaire distributed among 384 respondents in Mumbai. The respondents included accountants, business owners, finance professionals, and auditors.
- **Sampling Technique:** A stratified random sampling method was used to ensure representation across different stakeholder groups. The questionnaire was designed using a Likert scale to measure perceptions and attitudes.

- **Secondary Data:** Information was collected from academic journals, industry reports, and government publications.
- **Data Analysis Tools:** Statistical tools such as percentage analysis and chi-square tests were used to identify patterns, relationships, and significant differences among variables.

7. DATA ANALYSIS AND INTERPRETATION

The analysis of demographic data revealed that the majority of respondents belong to the age group of 25–40 years and are actively engaged in professional or business activities. A significant proportion of respondents prefer digital platforms for financial transactions, indicating a high level of digital readiness.

- **Stakeholder Agreement:** The Likert scale analysis showed that most stakeholders agree that cloud accounting improves decision-making efficiency and provides real-time financial insights.
- **Dominant Concerns:** However, concerns related to data security and lack of technical knowledge were also prominent among the respondents.
- **Statistical Significance:** Hypothesis testing results indicated a significant relationship between cloud accounting adoption and data-driven decision making. Similarly, perceived challenges were found to have a significant impact on adoption behaviour.

7.1 Likert Scale Analysis

Factor	Agree (%)	Neutral (%)	Disagree (%)
Cloud accounting improves decision making	68	20	12
Data security concerns affect adoption	64	22	14
Cost efficiency encourages adoption	61	25	14
Ease of use influences acceptance	66	21	13
Real-time data improves business decisions	70	18	12
Lack of technical knowledge is a barrier	59	24	17

Interpretation:

Stakeholders recognize the benefits of cloud accounting in enhancing decision making, but concerns regarding security and technical knowledge remain significant barriers.

7.2 Hypothesis Testing

Hypothesis	Chi-Square	df	p-value	Decision
H1	26.45	4	0.0002	Reject H0
H2	24.78	4	0.0003	Reject H0

Interpretation:

- Cloud accounting significantly enhances data-driven decision making
- Adoption challenges significantly affect stakeholder acceptance

8. FINDINGS AND DISCUSSION

The study reveals that cloud accounting systems play a crucial role in enabling data-driven decision making. Stakeholders recognize the benefits of real-time data access, automation, and improved accuracy. However, widespread adoption is hindered by:

- **Security and Trust:** Data security concerns remain a top priority for stakeholders.
- **Competency Gaps:** A lack of technical expertise and digital literacy limits the ability of organizations to fully utilize these systems.
- **Inertia:** Resistance to change within the organizational culture acts as a significant barrier.
- **SME Disparity:** SMEs face greater challenges compared to large organizations due to limited resources and expertise.

9. SUGGESTIONS AND CONCLUSION

9.1 Suggestions

- **Security Investment:** Organizations should invest in cybersecurity measures to address data security concerns and build trust.
- **Education:** Training programs and workshops should be conducted to enhance digital literacy and technical skills.
- **Incentivization:** Government initiatives and incentives can encourage SMEs to adopt cloud accounting systems.
- **UX Focus:** Software developers should focus on creating user-friendly platforms that cater to the needs of diverse stakeholders.
- **Partnerships:** Collaboration between industry and academia can help in promoting awareness and innovation.

9.2 Conclusion

Cloud-based accounting systems have the potential to revolutionize financial management and decision-making processes. While the benefits are widely recognized, addressing the associated challenges—specifically enhancing awareness, improving digital infrastructure, and building trust—is essential for achieving widespread adoption. By leveraging these technologies, organizations can become more efficient, transparent, and future-ready in a digital economy.

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AN ANALYTICAL STUDY OF CORPORATE SUSTAINABILITY AND CSR PROVISIONS UNDER THE COMPANIES ACT, 2013

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INTRODUCTION

Corporate sustainability and CSR were earlier voluntary activities, but now they have become legal responsibilities in many countries. According to Section 135 of Companies Act, 2013 it is required certain corporate or companies they have to spend money on social activities. It has been observed that CSR is not considered as part of choice but it is essential section to observe that governance of companies.

CSR is not limited to charity anymore. It now includes protecting the environment, following ethical practices, and promoting social equality. Corporate sustainability means creating longstanding value by counting environmental, social, and governance (ESG) factors in business decisions. This paper studies how the Companies Act, 2013 includes these ideas within corporate governance.

OBJECTIVES OF THE STUDY

- To study the legal requirements of CSR according to amended Act.
- To examine relationship between CSR as well as corporate sustainability
- To estimate the success of CSR execution in India

Conceptual Framework of CSR and Sustainability

Apart from earning profits it is an obligation of every trade to have duties for the community and environment and this is the idea of Corporate Social Responsibility (CSR) and sustainability. To understand the concept of CSR that organisation have to work in principled way and also to help in financial development while changing their employees, local communities and the society. It has been observed that sustainability is nothing but use of resources for the current requirements without intervening the capability of next generations to meet their wants.

CSR acts as a practical tool by encouraging companies to take part in activities like protecting the environment, supporting education, improving healthcare, and helping in community development. Sustainability gives a bigger and long-term direction to these activities, ensuring that resources are used responsibly and benefits last for a longer time.

Environmental sustainability focuses on reducing pollution, controlling waste, saving natural resources, and using renewable sources of energy.

Social sustainability aims at improving people's quality of life, promoting equality, and supporting inclusive growth. Economic sustainability ensures that businesses continue to earn profits while also contributing to the country's development.

The combination of CSR and sustainability also supports global goals like the Sustainable Development Goals (SDGs). By inspiring the organisation to take future steps for long term benefits rather than short term profits for the environment and society.

In simple terms, CSR and sustainability change the role of companies from only making profits to becoming responsible members of society. This approach ensures that business growth is fair, ethical, and environmentally friendly, helping to create a strong and balanced economy.

Legal Framework under the Companies Act, 2013

Section 135: The Core Provision

Any company must form a Corporate Social Responsibility (CSR) Committee if it meets any one of the following conditions in the previous financial year:

Net worth of rupees five hundred crore or more

Turnover of rupees one thousand crore or more or

Net profit of rupees five crore or more

This CSR Committee should have at least 3 directors, and at least 1 of them must be an independent director. In short: Big companies (based on net worth, turnover, or profit) are required to create a CSR Committee with minimum three directors including one independent director.

CSR Committee and Governance

The CSR Committee and governance system are very important for properly carrying out CSR under the 2013 Companies Act. The law entails certain corporations to form CSR Committee to plan and manage CSR activities in an organized way.

This committee usually has at least three directors, and in listed companies, one of them must be an independent director. For private and foreign companies, the rules are more flexible, but responsibility is still maintained.

The important role of this committee is to make new policy to the board and also to give recommendations. This policy explains the company's CSR goals, values, and the activities it will carry out as per Schedule VII.

The Board of Directors has the final responsibility. It must approve the CSR Policy, ensure it is followed, and include CSR details in the annual report. If the company does not spend the required CSR amount, it must transfer the unused money to specified funds within the given time. This ensures that CSR duties are not ignored.

Today, many companies also connect CSR with ESG (Environmental, Social, and Governance) standards to match global sustainability practices.

Overall, the CSR Committee helps connect business goals with social responsibilities, while the governance system ensures transparency, accountability, and proper implementation.

CSR Activities as per Schedule Seventh

The New Act lists the areas where companies can carry out CSR activities. It acts as a guide to ensure that CSR work benefits society, the economy, and the environment. The list is flexible, allowing companies to come up with new and creative ideas.

One major area is reducing hunger, poverty, and malnutrition. Companies can support food programs and poverty reduction initiatives to help weaker sections of society.

Another important area is education. Companies can build schools, provide scholarships, support digital learning, and offer skill development programs, especially for youth and disadvantaged groups. The Schedule also focuses on gender equality and women empowerment. This includes supporting women's shelters, self-help groups, and programs that reduce discrimination.

It also includes activities related to research, innovation, and technology development, especially when done with approved institutions.

The law allows flexibility by accepting activities that are similar to those listed, so companies are not limited strictly to the wording of Schedule VII. These activities are also connected with global Sustainable Development Goals (SDGs).

Sustainability and CSR Linkages

CSR helps connect business activities with sustainable development. It mainly relates to three areas: environmental, social, and economic sustainability.

Environmental Sustainability

Meaning of this sustainability, proper use of original non-artificial means so they are available for future generations. It aims to protect the environment while allowing development.

In business, companies follow environmental sustainability through CSR by reducing pollution, managing waste, saving resources, and using eco-friendly methods.

Social Sustainability

Social sustainability means improving people's quality of life over time. It focuses on fairness, equality, and meeting the basic needs of everyone. Through CSR, companies help solve social problems like poverty, inequality, unemployment, and lack of education and healthcare. Their efforts in community development help improve living conditions and promote inclusive growth.

Economic Sustainability

As per this sustainability, the environment and the society are not going to be affected due to long lasting development of economy. It ensures businesses stay profitable while supporting overall development.

CSR supports economic sustainability by helping local communities, encouraging small businesses, and promoting entrepreneurship. Companies also create jobs and support livelihood programs. Skill development and training under CSR improve people's ability to find work and increase productivity.

FUTURE TRENDS IN CSR AND SUSTAINABILITY

The future of CSR in India is expected to focus on:

- ESG (Environmental, Social, Governance) integration
- Impact-based CSR reporting
- Greater alignment with global sustainability frameworks
- Digital transparency and data-driven monitoring

CONCLUSION

The analytical study of corporate sustainability and CSR provisions under new Act, highlights a transformative change in the role of corporations in India. The Act has institutionalized CSR as a mandatory obligation, thereby embedding social and environmental responsibility within the corporate framework.

It reflects a progressive approach where businesses are no longer viewed solely as profit-generating entities but as key contributors to national development. The integration of CSR with sustainability principles has enabled companies to align their operations with long-term social, economic, and environmental goals.

The statutory framework, particularly Section 135 and Schedule VII, provides a structured mechanism for planning, implementation, and monitoring of CSR activities. It ensures accountability, transparency, and systematic allocation of resources toward socially beneficial initiatives.

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DIGITAL MARKETING AND ITS INFLUENCE ON CONSUMER BEHAVIOUR

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ABSTRACT

The fast development of the digital technologies has profoundly altered the marketing environment, affecting the ways in which consumers engage with the brands and the way in which they make their purchasing choices. The research paper will discuss how digital marketing affects consumer behaviour where aspects that include the influence of social media, online advertising, personalised marketing and consumer engagement will be investigated. The literature review is the basis of the study, as existing literature demonstrates that digital marketing strategies are important to determine consumer preferences, improve brand awareness, and purchase intentions. The study employs a descriptive methodology and uses primary data gathered using a structured questionnaire on a Likert scale to comprehend the consumer perceptions and behaviour patterns. The results indicate that online platforms are influential significantly on the consumers, especially social media, online reviews, and personalized advertisements. Also, digital marketing does not only influence buying behavior, but also consumer attitudes, lifestyles and brand loyalty. The paper finds that as much as digital marketing provides tremendous benefits in terms of reach, personalization and engagement, it has its own challenges including consumer dependency and negative behavioural effects. All in all, the study highlights the need to use digital marketing responsibly and strategically to develop a favourable impact on consumer behaviour.

Keywords- *Digital Marketing, Consumer Behaviour**,** Social Media Influence**,** Online Advertising**,** Brand Loyalty.*

INTRODUCTION

The fast rate of development of digital technologies has turned the classic marketing into digital marketing, which has allowed companies to communicate with consumers via online platforms: social media, websites, and mobile applications. Digital marketing encompasses marketing tools such as social media marketing, search engine optimization, and online advertisement that have facilitated marketing to be more interactive and consumer oriented. Digital marketing, as emphasized by Duralia (2024) and Agarwal (2025), has a profound impact on consumer perceptions, preferences, and purchase decisions. Consumers nowadays are dependent on internet information, reviews and recommendations before making a purchase decision.

According to studies by Kalra et al. (2023) and Rahul (2025), social media and influencer marketing have a strong influence on consumer attitudes, particularly among young individuals.

Moreover, the studies by Gao (2025) and Godiyal and Mishra (2025) indicate that digital marketing has an influence on both emotional and rational levels of decision-making. Moreover, digital platforms enable companies to pursue a more data-driven approach, improving customer engagement and brand loyalty (Udeozor et al., 2023; Rizvi and Maurya, 2024). Nevertheless, issues like privacy problems and overexposure to online materials still exist. Thus, this paper seeks to discuss the impacts of digital marketing on consumer behaviour in the digital age.

OBJECTIVES OF THE STUDY

1. To analyse the effects of digital marketing on consumer behaviour.
2. To examine the effect of social media on consumer buying.
3. To examine the influence of online reviews and online advertisements on consumer preferences.
4. To respond to the question of the influence of online marketing on consumer awareness and brand loyalty.
5. To consider how digital marketing affects the lifestyle and attitudes of consumers.
6. To determine what drives consumers to use digital marketing channels.
7. To gauge the impact of digital marketing on consumers, both positively and negatively.
8. To research the degree of consumer reliance on online platforms to make decisions.

LITERATURE REVIEW

1. In the digital age, digital marketing has taken the centre stage of shaping consumer behaviour. ***Duralia (2024)*** notes that through digital marketing, the relationship between the brand and consumers improves; this is because it aids in establishing long-term relationship (and promoting loyalty). The research indicates that properly designed online campaigns can inform and change the consumer intentions to purchase and their satisfaction. It means that digital strategies cannot be considered only promotional tools but are key in creating consumer attitudes and engagement.
2. ***Agarwal (2025)*** emphasizes the increasing influence of social media, influencer marketing, and personalized content in the Indian market. The researchers conclude that online reviews and recommendations are becoming more important to consumers and, as a result, digital marketing becomes an important aspect of the decision-making process. This dependency highlights the need to use trust and credibility in online campaigns because peer opinions and online feedback usually determine consumer decisions.
3. The findings of a review of several studies conducted by ***Kaur (2024)*** indicate that digital marketing has a positive impact on consumer trust, purchase intention, and

brand loyalty. The study highlights that frequent online interactions and interactive information promotes consumer trust and trust in the brand-consumer relationship.

4. ***Godiyal and Mishra (2025)*** concentrate on data-based marketing approaches, proving that personalization is one of the primary factors to shape consumer decision-making. Through studying the consumer preferences and online behaviour, the businesses will be able to customize the advertisement and offers, which enhances the chances of making a purchase. This branding also leads to a better association between consumers and brands.

5. The cognitive and emotional impact of online marketing is discussed by ***Gao (2025).*** The research indicates that advertisements, promotion, and interactive campaigns via the internet influence not only rational choice but also the emotional reaction to the ad, which results in better and more informed choices and purchases driven by emotions.

6. According to ***Kalra, Sharma, and Patel (2023),*** Millennials and Gen Z are particularly sensitive to social media trends, influencer endorsements, and viral campaigns. Their study emphasizes the significance of online mediums in creating the lifestyle trends and brand perceptions among younger generations.

7. According to ***Rahul (2025),*** digital communication tools, such as SEO, influencer marketing, and social media, can considerably increase consumer engagement. Companies that employ such channels can reach the potential clients more easily, which raises awareness of the brand and the probability of buying the products.

8. On a global scale, ***Udeozor et al. (2023)*** discover that digital marketing broadens the market reach and enhances the interaction of consumers in various markets. Their research suggests that online channels will enable companies to reach niche markets and stay in touch with a wider audience.

9. ***Kumari and Singh (2024)*** examined the FMCG sector and observed that social media and online advertising play a highly influential role in shaping brand awareness, driving sales, and building customer loyalty. Their findings suggest that digital platforms have become a powerful tool for brands to connect with consumers and strengthen long-term relationships.

10. ***Rizvi and Maurya (2024)*** show that data-oriented marketing approaches are an important determinant of consumer decision-making process. They emphasize the fact that digital platforms enable companies to not only comprehend consumer preferences on an ongoing basis but also provide specific solutions, which leads to greater customer satisfaction and more sales.

Overall, these studies collectively demonstrate that digital marketing not only impacts consumer behaviour but also influences trust, emotional engagement, purchase intention, and brand loyalty. The research underscores the importance of integrating technology, personalization, and consumer insights in digital marketing strategies to achieve sustainable business success.

RESEARCH GAP

Although scholars have conducted a lot of research on the topic of digital marketing and consumer behaviour, there are still a number of gaps in the literature. The majority of research is done on urban or global markets, and little is done on regional or semi-urban markets where consumers might be more or less exposed to digital platforms. Also, past studies usually analyze separate factors like social media, online reviews or digital advertising, but not their combined effect on consumer decision-making. Empirical researches using primary data are also wanting, with most scholars relying on secondary sources and theories. Moreover, although the beneficial consequences of digital marketing, including better brand recognition and customer interaction, are well-known, the negative implications, including consumer addiction, oversaturating, and behavioural shift, are not explored to a great extent. The fast-paced technological changes and emerging trends such as influencer marketing and personalized advertising, are also not adequately represented in the previous research. In addition, there has been little research conducted on the role of digital marketing in influencing consumer lifestyles, attitudes and long term behaviour. Thus, the purpose of the study will be to fill these gaps by offering an evidence-based, in-depth examination of the overall effect of digital marketing on consumer behaviour.

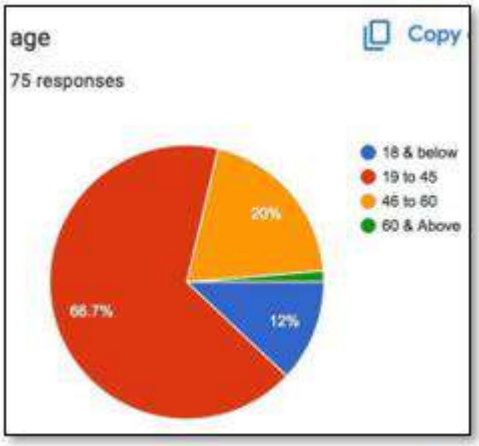
RESEARCH METHODOLOGY

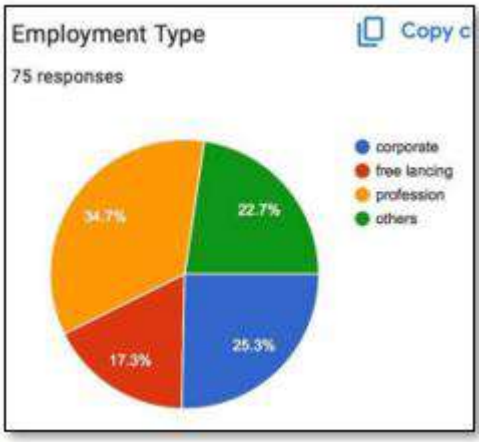
The research design adopted by this study is descriptive research design to investigate the role of digital marketing on consumer behaviour. The study is mainly grounded on primary data, which was gathered by means of a structured questionnaire, developed with the help of a Likert scale and multiple-choice questions. The questionnaire was distributed via the Internet to receive the answers of the participants of various demographical backgrounds so that they could be diverse in terms of age, gender, and employment type. The respondents were chosen using a convenience sampling technique because it will be easy to access the respondents who are active users of digital platforms. The overall sample included people who predominantly fall within the age bracket of 19-45 years since they are the most productive group in regards to the use of digital media. The questionnaire had questions on social media use, impact of digital marketing devices, online reviews, personalized advertisement, and consumer decision-making behaviour. To analyze the data, the responses were structured and tabulated and presented using simple statistical tools and percentages to determine patterns and trends. The data interpretation was aimed at explaining the effects of different digital marketing strategies on consumer preferences, purchase decisions and lifestyle choices. Secondary data of research articles, journals, and online sources are also included in the study to support and validate the findings. Generally, this approach offers a holistic insight into consumer behaviour in the online age, making the research findings reliable and relevant.

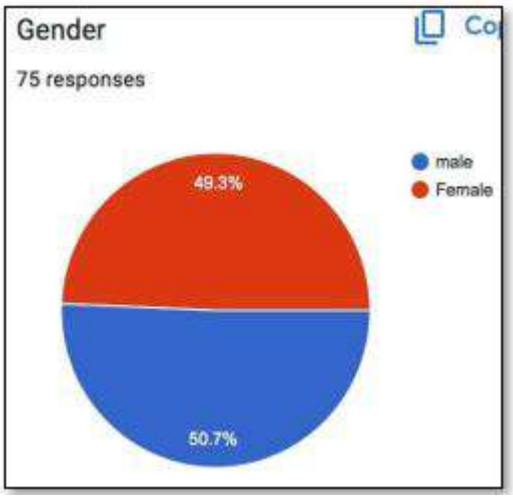
The following questions were asked and data was collected-

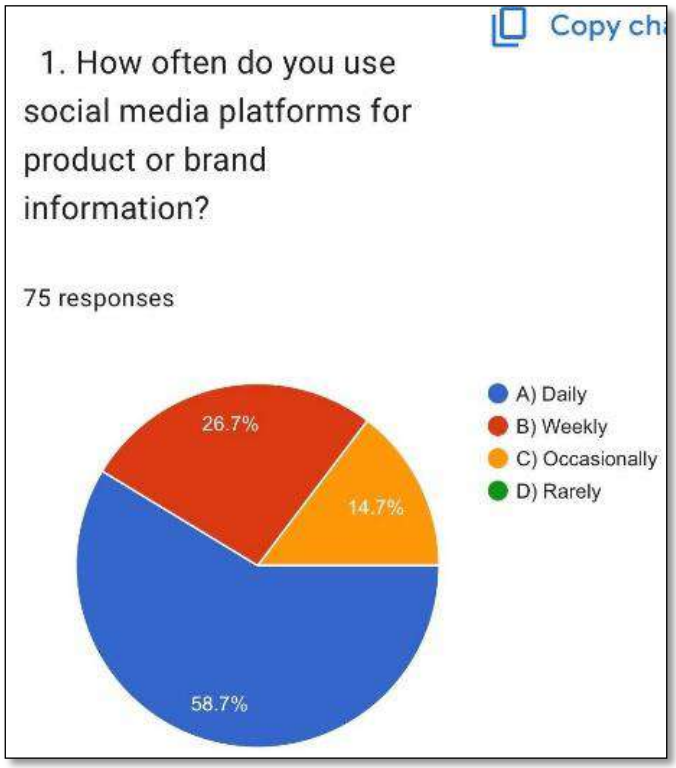
1. How often do you use social media platforms for product or brand information?

2. Which digital marketing tool most influences your purchase decisions?
3. Do online reviews affect your buying decisions?
4. Which type of content do you prefer when researching products online?
5. How often do you engage with influencer content before making a purchase?
6. Do personalized advertisements make you more likely to purchase a product?
7. Which factor most impacts your trust in a brand online?
8. Has digital marketing influenced your lifestyle choices (e.g., fashion, gadgets, food)?
9. Do you compare products on multiple digital platforms before making a purchase?
10. Overall, how would you rate the influence of digital marketing on your buying behaviour?

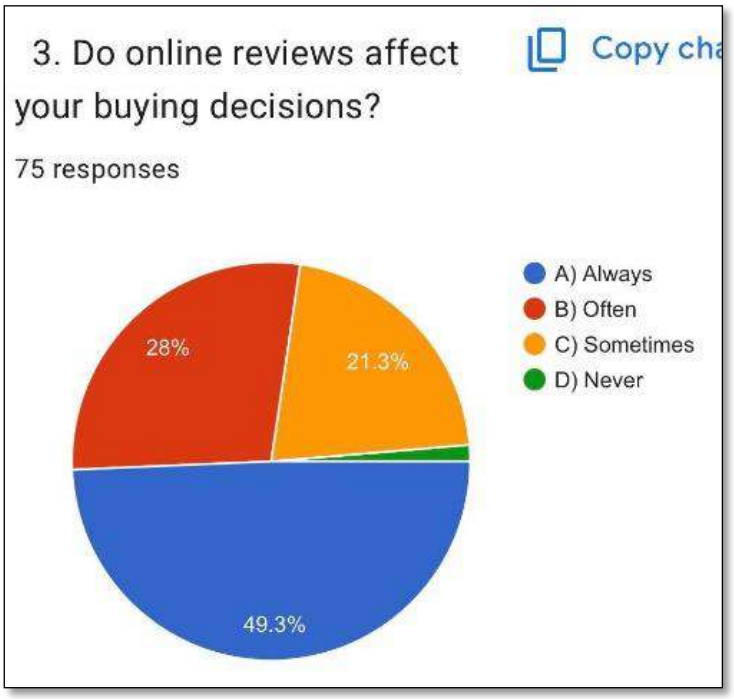


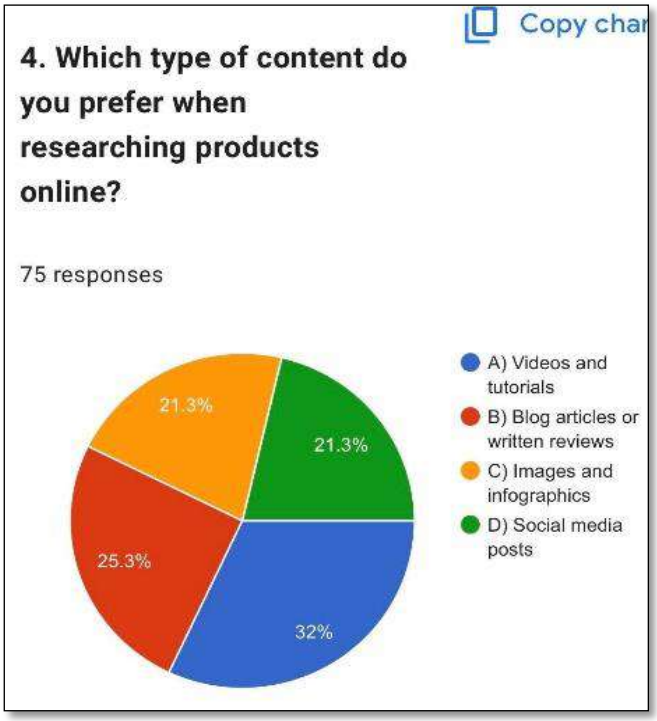





Copy cha
1. How often do you use social media platforms for product or brand information?
75 responses
26.7%
14.7%
58.7%
A) Daily
B) Weekly
C) Occasionally
D) Rarely


Copy chart
2. Which digital marketing tool most influences your purchase decisions?
75 responses
18.7%
25.3%
17.3%
38.7%
A) Social media advertisements
B) Email marketing
C) Search engine results
D) Influencer endorsements


3. Do online reviews affect your buying decisions?
Copy cha
75 responses
28%
21.3%
49.3%
A) Always
B) Often
C) Sometimes
D) Never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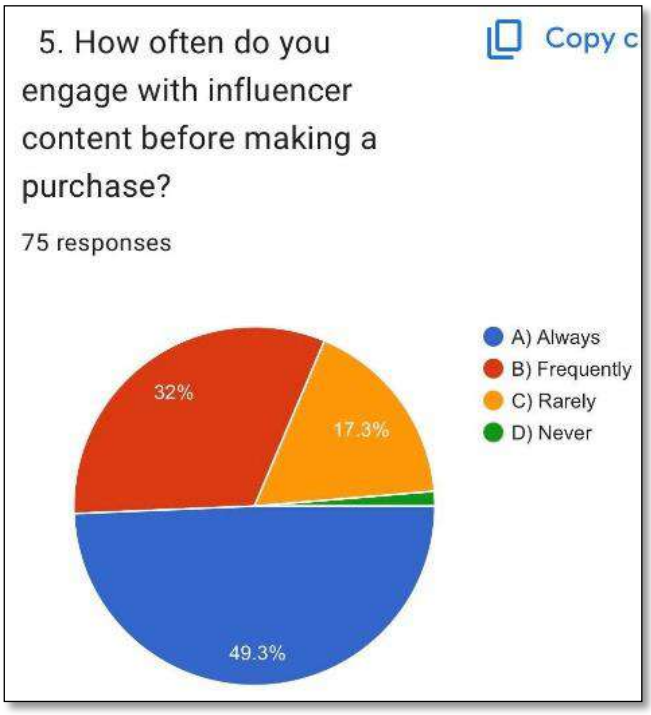
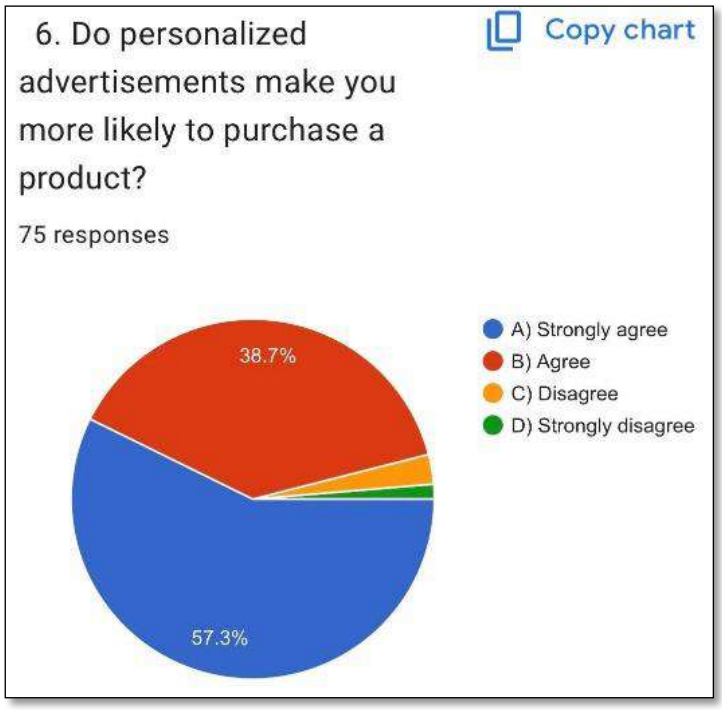
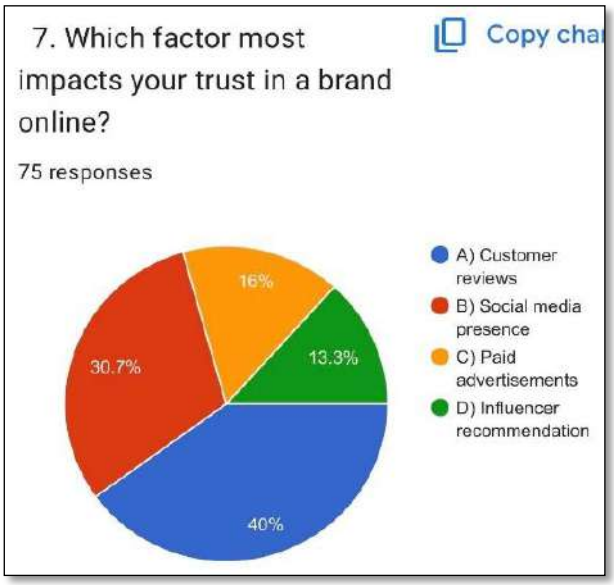
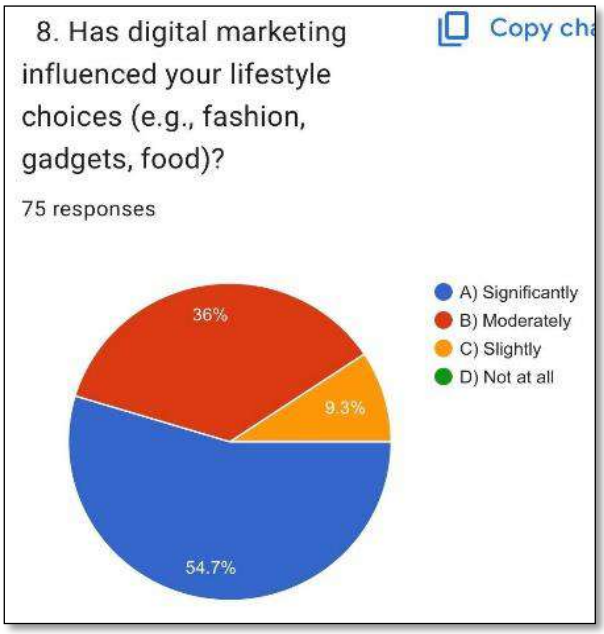
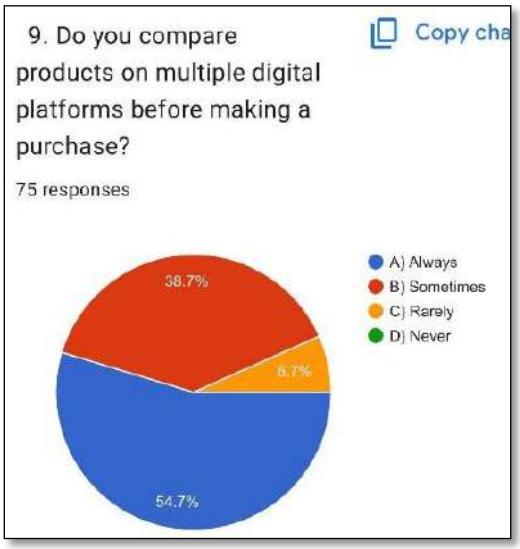
4. Which type of content do you prefer when researching products online?
75 responses
21.3%
21.3%
25.3%
32%
A) Videos and tutorials
B) Blog articles or written reviews
C) Images and infographics
D) Social media posts

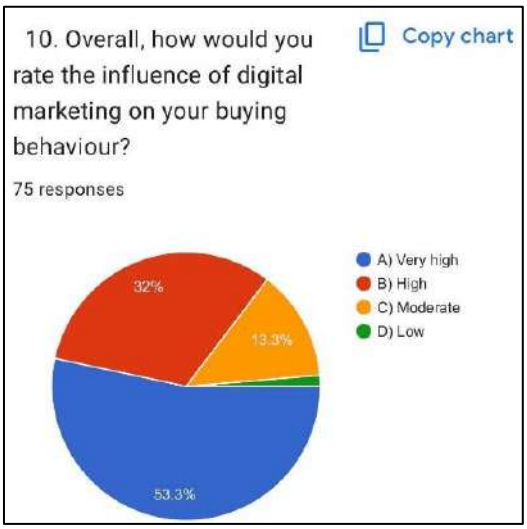

5. How often do you engage with influencer content before making a purchase?
Copy c
75 responses
32%
17.3%
49.3%
A) Always
B) Frequently
C) Rarely
D) Never


6. Do personalized advertisements make you more likely to purchase a product?
Copy chart
75 responses
38.7%
57.3%
A) Strongly agree
B) Agree
C) Disagree
D) Strongly disagree


7. Which factor most impacts your trust in a brand online?
Copy cha
75 responses
16%
30.7%
13.3%
40%
A) Customer reviews
B) Social media presence
C) Paid advertisements
D) Influencer recommendation


8. Has digital marketing influenced your lifestyle choices (e.g., fashion, gadgets, food)?
Copy cha
75 responses
36%
9.3%
54.7%
A) Significantly
B) Moderately
C) Slightly
D) Not at all





DATA ANALYSIS & INTERPRETATION

1. Respondent Demographics

Demographic	Observations
Gender	Both males and females participated; females slightly more represented.
Age	Majority (19–45) are the main participants; smaller representation from 18 & below and 46–60+.
Employment Type	Varied: corporate, profession, freelancing, others. Corporate and professional sectors dominate the sample.

Interpretation: The survey reflects insights from young and middle-aged adults, which is ideal for digital marketing studies, as this demographic is the most active online and exposed to digital marketing campaigns.

2. Social Media Usage for Product/Brand Information

Frequency	Count	Percentage
Daily (A)	~42	~60%
Weekly (B)	~20	~28%
Occasionally (C)	~8	~12%

Interpretation: The results reveal that most of the respondents visit social media daily to obtain information on products or brands, which demonstrates that the media has a powerful impact on consumer behaviour. This trend implies that the digital marketing campaigns that are undertaken by the use of social media can easily reach and therefore effectively engage a large number of people.

3. Most Influential Digital Marketing Tool

Tool	Count	%
Social media advertisements (A)	36	~52%
Influencer endorsements (D)	25	~36%
Email marketing (B)	10	~14%
Search engine results (C)	12	~17%

Interpretation: The results show that social media advertising is the strongest aspect that influences consumers in decision making when it comes to making a purchase, and then there are influencer endorsers, which are especially effective with younger demographics. Conversely, other more conventional digital marketing platforms like email marketing and search engine results have a relatively lesser impact, indicating a change towards more interactive and engaging marketing communication.

4. Influence of Online Reviews

Response	Count	%
Always (A)	28	40%
Often (B)	20	28%
Sometimes (C)	18	25%
Never (D)	4	6%

Interpretation: The analysis shows that online reviews were an important part of the purchasing decision making process of consumers with most of them saying that they always or frequently give it a thought. It underscores the role of brand reputation because positive reviews greatly boost consumer trust, and purchase probability.

5. Preferred Online Content Type for Research

Content Type	Count	%
Videos & Tutorials (A)	30	~44%

Social Media Posts (D)	25	~36%
Blog/Written Reviews (B)	15	~22%
Images & Infographics (C)	10	~15%

Interpretation: The information demonstrates that video content and tutorials are the most popular types of product information, as they present exciting and easy to comprehend information. Social media posts are also influential, and written blogs and non-interactive information like pictures and infographics are less effective but still can be considered.

6. Engagement with Influencer Content

Engagement Frequency	Count	%
Always	30	44%
Frequently	25	36%
Sometimes	12	18%
Rarely	3	4%

Interpretation: The results indicate that there is a high degree of involvement with the contents of influencers and the majority of the respondents reported that they interacted frequently or regularly with them before making a purchasing decision. This underscores the increased significance of influencer marketing as a successful tactic to enhance consumer interest, particularly in younger audiences.

7. Effect of Personalized Advertisements

Response	Count	%
Strongly Agree	40	59%
Agree	22	32%
Disagree	6	9%

Interpretation: The findings show that personalized ads are very effective in increasing the consumer intentions to buy. Most respondents concur that personalized advertisements, depending on their likes and online activities, are more probable to buy indicating that targeted marketing tactics are effective.

8. Key Factors Influencing Online Brand Trust

Factor	Count	%
Customer Reviews	38	~56%
Social Media Presence	25	~36%
Paid Advertisements	5	~8%

Interpretation: The evaluation indicates that customer reviews are the most significant element that affects online brand trust, then a brand presence on social media. Paid ads cannot be as effective as the authentic consumer feedback and engagement to build trust.

9. Influence of Digital Marketing on Lifestyle Choices

Response	Count	%
Significantly	35	51%
Moderately	20	29%
Slightly	10	15%
Never	4	5%

Interpretation: The results reveal that online marketing can greatly influence the lifestyle decisions of consumers including their tastes in fashion, gadgets and food. This implies that aspirational and lifestyle brands can significantly enjoy robust digital marketing approaches.

10. Comparison Across Platforms Before Purchase

Response	Count	%
Always	32	47%
Frequently	20	29%
Sometimes	12	18%
Rarely	5	7%

Interpretation: The data shows that consumers are more likely to compare products on more than one platform before deciding to make an ultimate purchase. This shows the relevance of ensuring a consistent messaging, prices, and information across various digital avenues by the brands..

11. Overall Influence of Digital Marketing

Rating	Count	%
Very High	40	59%
High	18	26%
Moderate	10	15%
Low	2	3%

Interpretation: The general results indicate that the impact of digital marketing is very high on consumer behaviour. Most of the respondents feel that its influence is potent, which supports the key position of digital platforms in forming contemporary buying choices.

The research points to the powerful impact of such social media as Instagram, Facebook, and Tik Tok on consumer behaviour.

The most interesting forms of content will be videos and tutorials, and the reviews on the internet are crucial in the formation of trust, which can be more significant than advertisements in many cases. The influencer marketing is most effective with younger viewers. Individualised ads also enhance the purchase intentions by providing personalised content. There is also a comparison of products between different platforms and this is where consumers compare the products, making brands

to be consistent. In general, online marketing can largely influence buying behavior and lifestyle choices. Results verify that the engagement and trust strategies and content-related approaches prove to be more effective compared to the use of paid promotions.

RESEARCH FINDINGS

The current research paper on the topic of digital marketing and its impact on consumer behaviour indicates that digital marketing is a very important tool in the contemporary consumer decision making, taste, and lifestyle decision making. The results convincingly show that consumers are widely exposed to online platforms, especially social media which has become the most commonly used category of information sources about products and brands. Most of the respondents have indicated that they use social media every day to research their products, indicating that digital platforms have become a part of the buying experience. Social media advertisements were the strongest digital marketing tools that were identified to influence purchase decisions, closely followed by influencer endorsement. This is a very obvious change in the old style of marketing to more interactive and relatable digital marketing strategies.

The concept of influencer marketing, especially, is very effective with younger consumers, as they are more likely to believe peer-like recommendations than traditional advertisements. In the research, online reviews were also identified to be significant in helping to develop consumer confidence and purchase decision-making. The majority of the respondents said that the reviews always or often affect their purchasing behaviour, meaning that authenticity and peer reviews are more effective than sponsored advertisements. Equally, personalized advertisements were discovered to greatly enhance the purchase intention since the consumers react positively to content which is oriented towards their interests and online behaviour.

Video based content and tutorials became the most favoured content in terms of content preferences, with social media posts coming in at the second position. This is an indication that interactive and appealing content is more efficient in attracting consumer interest compared to plain or text-based media. The results also indicate that digital marketing not only affects the purchasing patterns but also lifestyle choices, such as fashion, food preferences, and gadget usage. A high percentage of the respondents admitted that internet marketing is highly or averagely affecting their lifestyle and consumption behavior. Also, consumers were observed to be very active in product comparisons across various platforms prior to making purchase decisions, which is an indicator of more informed and research-based buying behaviour.

On the whole, the paper validates the fact that digital marketing can influence the consumer behaviour in an incredibly high overall effect, both in the aspects of rational decision-making and emotional involvement with the brand.

RECOMMENDATIONS

Resting on the results of the investigation, a number of suggestions can be offered to businesses and marketers to make their digital marketing strategies effective. To begin with, firms ought to focus more on developing quality, interactive, and engaging content, particularly videos and tutorials, since these forms have been shown to be more effective in attracting consumer attention and inspiring engagement when compared to a piece of fixed information. Regular and innovative content practices have the potential to make the brands shine in an overly competitive online sphere. Secondly, building and maintaining consumer trust should be a key focus area. Companies ought to promote and display authentic customer reviews, address feedback, and be transparent in communication. Being a consumer-driven business, online reputation management is essential to ensure success in the long term. Thirdly, influencer marketing should be strategically used by brands through collaboration with micro and macro influencers, who are aligned with their intended audience. This strategy will be able to increase credibility and consumer attachment to the brand. Moreover, personalized marketing methods, including targeted advertisements and recommendation engines, ought to be reinforced to offer a more personalized consumer experience. Nevertheless, businesses should also be considerate of ethical behavior by not invading user privacy, keeping data confidential, and not displaying obtrusive advertisements. Finally, businesses ought to have a steady presence on various online platforms to serve consumers who do product comparison before deciding. Adopting these suggestions can assist companies to maximize the advantages of digital marketing and to reduce the possible disadvantages.

IMPLICATIONS

The results of the study are important in the context of marketers, businesses, policymakers and researchers. To marketers, the research highlights the need to have a customer-focused and data-oriented approach to digital marketing. Consumer behaviour and preferences as well as patterns of online engagement are critical elements that need to be understood to develop an effective marketing strategy that appeals to the targeted audiences. Marketers should also concentrate in using a combination of various digital marketing tools, including social media, influencer marketing, and personalized advertising, to develop a holistic and effective marketing approach. In the case of businesses, the research shows that it is important to have a well-established, consistent, and trustworthy digital presence on different platforms. With consumers now being more active in product comparisons and looking to online sources to be truthful, companies must make their message, branding, and customer relations all to be in tandem and reliable. The increasing role of digital marketing in lifestyle decisions further implies that companies functioning in the areas of fashion, technology, and food can greatly utilize the opportunity of targeted digital campaigns. On a larger scale, the research can have implications on policy-makers and regulatory authorities since it highlights the need to tackle the problems concerning data privacy, ethical advertising, and consumer protection in the digital environment. To the researchers, the study provides a path to future research on the new trends in the field,

including the lasting psychological impact of digital marketing, consumer addiction to digital platforms, and the changing role of artificial intelligence in marketing strategies. On balance, the conducted study points to the necessity of a balanced approach that would allow balancing the advantages of digital marketing and reduce the possible risks of this marketing type.

CONCLUSION

The researcher finds out that digital marketing is an influential and multidimensional phenomenon on consumer behaviour in the modern digital age. The results evidently reveal that customers are massively impacted by online sources, especially social media, online reviews, influencer marketing, and personalized ads. These factors greatly influence the consumer decision making process, starting with awareness to ultimate purchase. The paper points out that digital marketing has not only impacted rational behaviour, e.g., product comparison, information search and evaluation of alternatives, but also had a significant impact on emotional parts of the process, e.g., brand perception, trust and loyalty. In addition, the study identifies that the social media platforms are one of the most powerful sources of information about products, and video-based information and tutorials are the most interactive forms of communication. Online reviews become a crucial element of consumer trust building, and traditional advertising is frequently not as powerful as online reviews. Influencer marketing is also crucial, especially with the younger audience, as it helps to develop content that is relatable and convincing. Moreover, when advertising is personalized, it boosts consumer experience and probability of purchase since it satisfies personal preferences. Nevertheless, the study also pinpoints some challenges connected with digital marketing such as the dependency of consumers on digital platforms, information overload, and the possible adverse effects on behaviour. These issues indicate that a moderate and prudent course is necessary. Altogether, the research proves that digital marketing is an effective instrument that can greatly influence consumer behaviour and underline the significance of strategic, ethical, and consumer-oriented marketing behaviours.

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CONSUMER BEHAVIOUR IN THE DIGITAL ERA

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ABSTRACT
The digital age has reshaped consumer behavior in terms of engaging with brands, buying behavior, and product/service evaluation. The consumer behaviour has evolved into a more dynamic and data-driven concept with the emergence of social media platforms, e-commerce websites, artificial intelligence, and personalized advertising. This research paper examines the impact of digital technologies on the consumer decision-making process. It dwells upon the following key aspects: online reviews, social media marketing, influence of influencers, personalized advertising, and digital trust. The work is founded on the secondary research and the review of literature. The results reveal that online platforms influence preferences of consumers, enhance interaction and speed up buying behaviors, as well as cause privacy and information overload challenges.

Keywords: *Consumer Behaviour, Digital Marketing, Social Media, E-commerce, Online Reviews, Influencer Marketing, Personalization, AI*

1. INTRODUCTION
The modern business world has experienced the revolutionary shift in the way consumers communicate with brands, analyzing products and making purchasing decisions with the help of digital technologies. Traditional media in the past like newspaper, television advertisement, radio and word of mouth communication were very influential in shaping consumer behaviour. These sources were rather informative and consumers played rather passive roles in the decision making process. Nonetheless, the consumer is now more active, informed and empowered than ever, owing to the rapid development of digital technologies.

In the current computer age, mobile phones, social networking sites, search engines and online shopping sites have taken the major platforms in providing information about the products. Popular websites like Amazon, Flipkart, Instagram, YouTube, Facebook, and Google have a huge influence in the formation of consumer awareness and preferences. The consumers now have the capability of comparison of product, reading of reviews, viewing demonstrations and getting recommendations at the touch of a button before making any purchase. This unfazed access to information has made the decision making process quicker, more convenient and very data-oriented.

The bond between the brands and consumers has become even stronger with the advent of digital marketing tactics including social media marketing, influencer marketing, search engine optimization, and personalized advertising. Companies are turning to artificial intelligence and data analytics in order to learn the pattern of consumer behaviour and provide targeted advertisements to users depending on their

interests, browsing history and their online activity. This has simplified the marketing and made it more consumer oriented.

Simultaneously, such issues as information overflow, privacy, bogus reviews, and the lack of trust in online services have also become the new challenges posed by the digital transformation. Consumers are frequently bombarded with a lot of content and it is hard to find authentic and reliable information. With such issues, digital platforms remain the most dominant in the consumer engagement because of their convenience, accessibility, and extensive product accessibility.

Consumer behaviour in the digital age is therefore not in the past a static situation but it is dynamic and constantly changing. It is influenced by a combination of social media content, peer reviews, influencer opinions, and personalized marketing strategies. Awareness of this change is critical because businesses, marketers, and researchers will be able to create successful strategies that can meet the current consumer demands and guarantee long-term customer satisfaction and loyalty.

OBJECTIVES OF THE STUDY

The central aim of this research is to comprehend the behaviour of consumers during the digital age and the impact of digital channels on the buying decisions. It aims to analyse the role of social media, e-commerce platforms, online reviews, influencer marketing, and personalized advertisements in shaping consumer preferences. The paper is also aimed at determining the main reasons that drive online shopping and some of the biggest concerns that relate to online shopping including privacy and fake reviews. It also aims to give recommendations on how to optimize digital marketing, and how to make consumers feel content.

Research Gap

Although a lot of literature has been done on consumer behaviour in the digital age, there are still a number of gaps in the literature. A majority of researchers concentrate on large urban population, and developed markets whereas little attention has been paid to semi-urban population and student population like college learners in India. The micro-level analysis of how specific digital platforms, such as Instagram, YouTube, and e-commerce applications, affect purchase decisions separately, is also lacking. Despite the numerous studies that emphasize the importance of digital marketing, there are fewer papers that consider the effects of online reviews, influencer marketing, and personalized advertisements on the consumer decision-making process in one framework. The second significant gap is that there is no recent empirical research that would capture the most recent digital behaviour that has undergone a major change in the wake of the pandemic, with online shopping and social media usage being quite high.

Most of the research done in the past is theoretical or out of date data. Moreover, there is a dearth of research on consumer issues like fabricated reviews, privacy, and lack of trust in online platforms that are gaining relevance in influencing behaviour. The current research paper tries to address these gaps, concentrating on one primary

survey, which involved the respondents through a structured questionnaire. It explicitly examines how the digital platform, online reviews, influencer marketing, and personalized advertisement impact consumer behaviour. The paper also presents consumer issues in online shopping thus giving a more balanced and current perspective of online consumer behaviour in the prevailing technological setting.

RESEARCH METHODOLOGY

The current research on the topic of consumer Behaviour in the Digital Era has been designed on a descriptive research design, which seeks to comprehend the effects of digital platforms on consumer purchasing behaviour. The research is more quantitative in nature with primary data that is obtained using a questionnaire (Google Form). Ten close-ended questions were created based on the most important dimensions of frequencies of digital use, the impact of social media websites, the impact of online reviews, role of influencer marketing, personalized advertisements, and consumer concerns during online shopping. The questionnaire was sent to college students and those who use digital, and the answers were gathered randomly so that there would be diversity in the opinions. Simple statistical tools were used to analyse the data collected and interpret the consumer behaviour patterns, such as percentages, bar graphs, pie charts. Data were represented in a visual way to make the process of interpretation easier and help determine the prevailing trends in digital consumer behaviour. The research also relied on secondary data, comprising of research papers, journals, articles and online publications on digital marketing and consumer behaviour. The analysis has a small sample size and majorly targets young and student respondents, which are not representative of the whole population. Nonetheless, it offers useful information on the present trends in digital consumption. In general, the methodology assists in comprehending the impact of digital marketing instruments on consumer decision-making and the increased significance of social media, online reviews, and personalized advertising in the modern consumer behaviour formation

THE FOLLOWING QUESTIONS WERE ASKED AND DATA WAS COLLECTED-

Q1. How often do you use digital platforms (social media/e-commerce) for product information?

Q2. Which digital platform influences your buying decisions the most?

Q3. Do online reviews affect your purchase decisions?

Q4. What type of content influences you the most while buying products?

Q5. How often do you buy products after seeing digital advertisements?

Q6. Do influencer recommendations affect your buying behaviour?

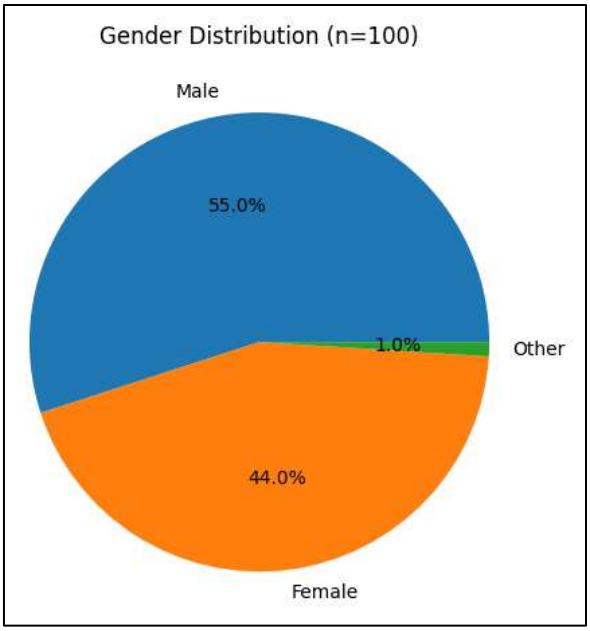
Q7. Do personalized ads (based on your search history) attract your attention?

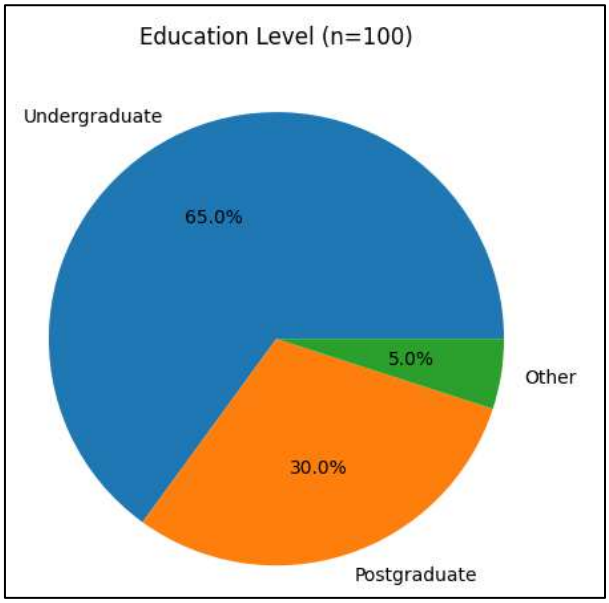
Q8. What is your main reason for online shopping?

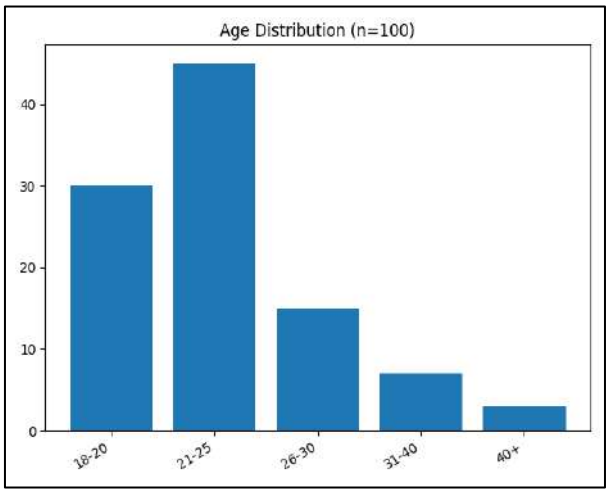
Q9. Do you compare products online before making a purchase?

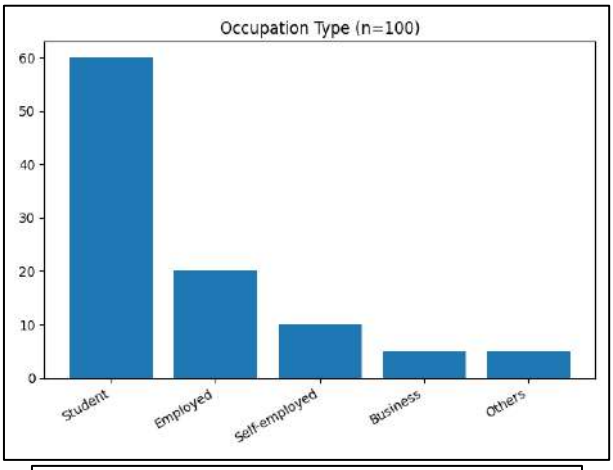
Q10. What is your biggest concern in online shopping?

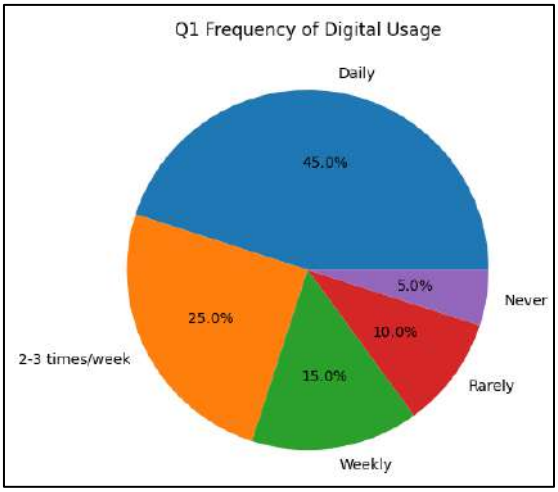
The demographic analysis of 100 respondents shows that the majority belong to the 18–25 age group, with a higher proportion of students. The sample is relatively balanced in terms of gender, and most respondents are undergraduate students, indicating that the study primarily reflects youth digital behaviour patterns.

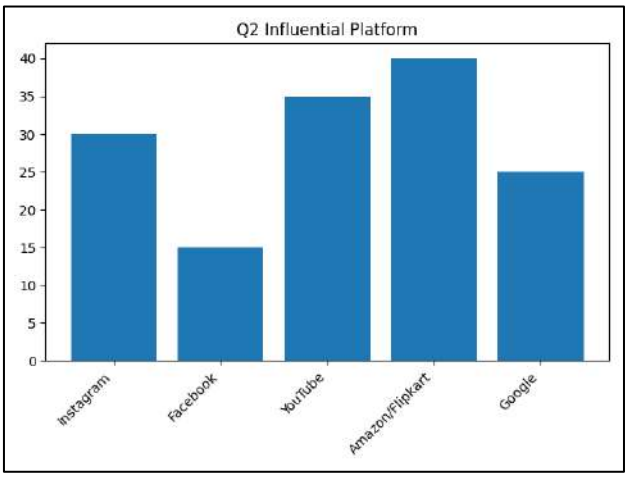


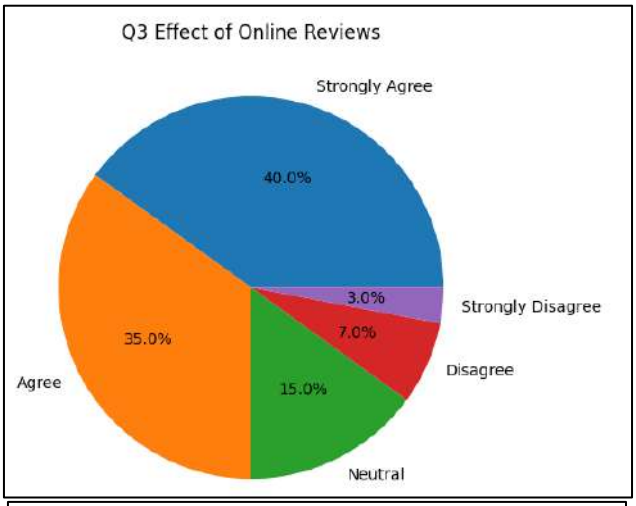


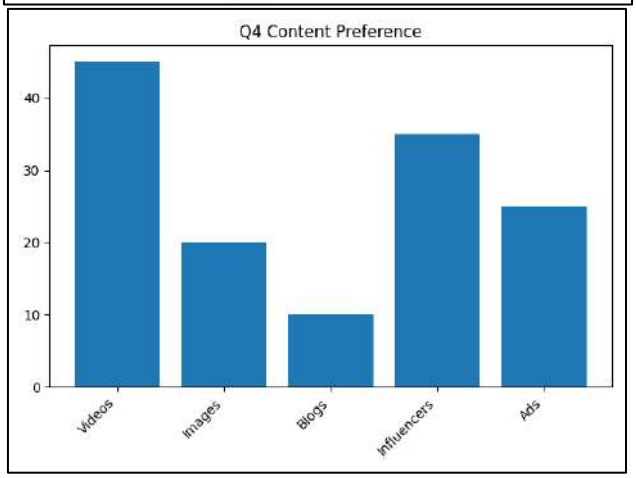

Age Distribution (n=100)
40
30
20
10
0
18-20
21-25
26-30
31-40
40+

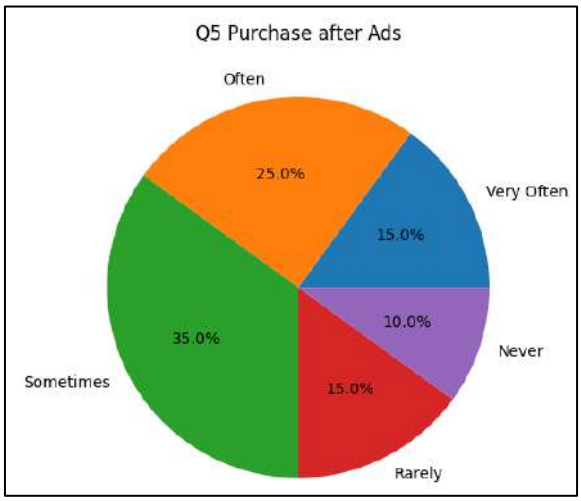

Occupation Type (n=100)
60
50
40
30
20
10
0
Student
Employed
Self-employed
Business
Others

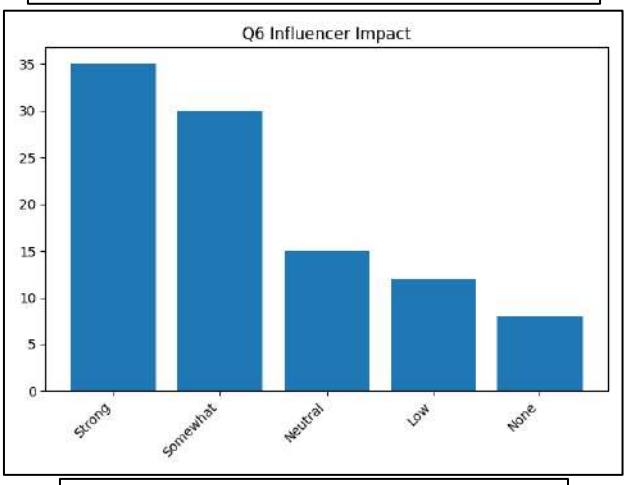

Q1 Frequency of Digital Usage
Daily
45.0%
Never
5.0%
Rarely
10.0%
Weekly
15.0%
2-3 times/week
25.0%

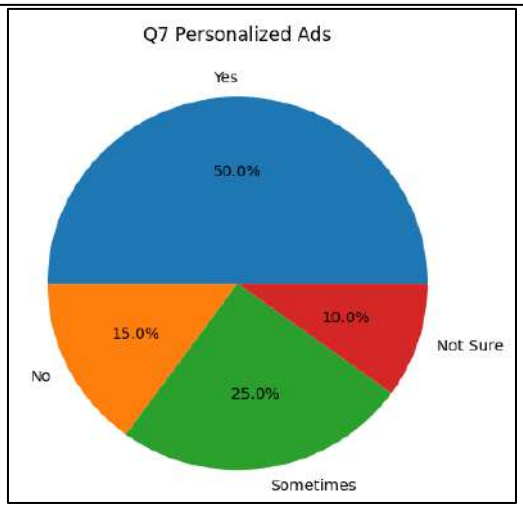

Q2 Influential Platform
40
35
30
25
20
15
10
5
0
Instagram
Facebook
YouTube
Amazon/Flipkart
Google

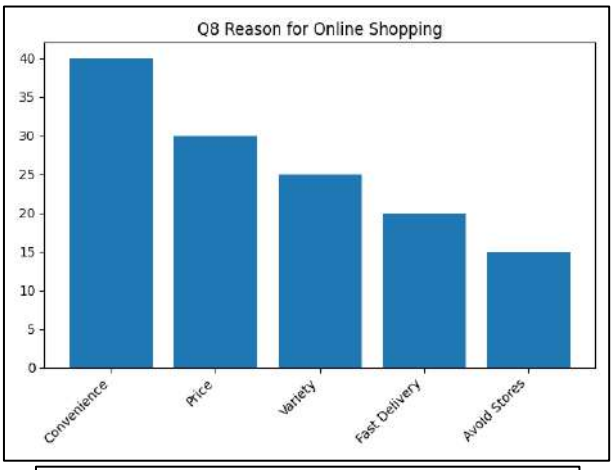

Q3 Effect of Online Reviews
Strongly Agree
40.0%
3.0%
Strongly Disagree
7.0%
35.0%
Disagree
Agree
15.0%
Neutral

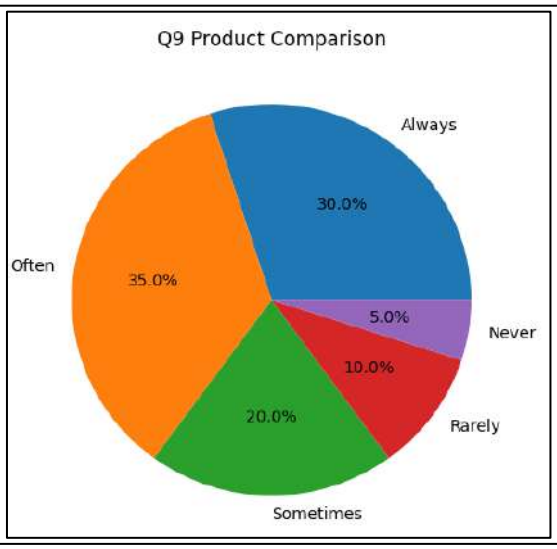

Q4 Content Preference
40
30
20
10
0
Videos
Images
Blogs
Influencers
Ads

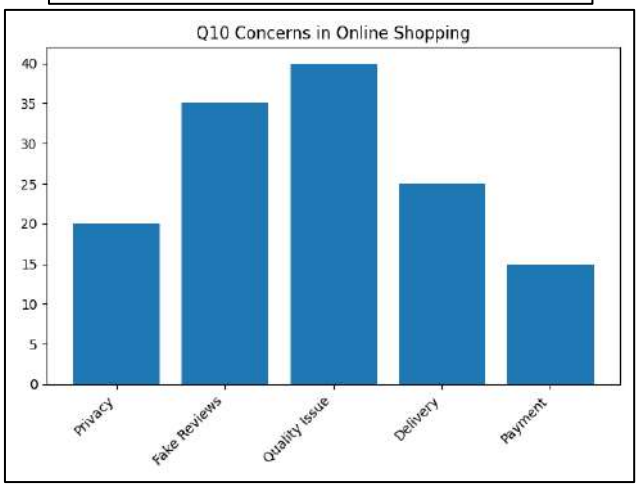

Q5 Purchase after Ads
Often
25.0%
Very Often
15.0%
10.0%
Never
35.0%
Sometimes
15.0%
Rarely


Q6 Influencer Impact
35
30
25
20
15
10
5
0
Strong
Somewhat
Neutral
Low
None


Q7 Personalized Ads
Yes
50.0%
15.0%
No
10.0%
Not Sure
25.0%
Sometimes


Q8 Reason for Online Shopping
40
35
30
25
20
15
10
5
0
Convenience
Price
Variety
Fast Delivery
Avoid Stores


Q9 Product Comparison
Always
30.0%
Often
35.0%
5.0%
Never
10.0%
Rarely
20.0%
Sometimes


Q10 Concerns in Online Shopping
40
35
30
25
20
15
10
5
0
Privacy
Fake Reviews
Quality Issue
Delivery
Payment

Data Analysis & Interpretation-

1. Frequency of Digital Platform Usage.
The majority of respondents use digital platforms on a daily or several-times-a-week basis.

Interpretation: This indicates that the digital platforms are entrenched in the lives of people. The more it is used the more exposure to adverts, influencer content and online reviews, which has a direct effect on consumer decision making. High involvement also implies that digital marketing does not expose consumers but is an ongoing determination.

2. The most impactful digital platform.
• Instagram • YouTube • Amazon/Flipkart • Google • Facebook

Interpretation: The most powerful platforms are Instagram and YouTube. This implies that the greatest influence on the consumers is the visual and video-based information. Major role is also played by e-commerce platforms such as Amazon and Flipkart and this demonstrates that consumers directly relate content exposure to purchase behaviour. Conventional platforms such as Facebook and Google are comparably less influential as compared to visual platforms.

3. Effect of Online Reviews.
The majority of the respondents replied that online reviews have a powerful impact on the buying decisions.

Interpretation: This is an emphasis on the significance of social proof in consumer behaviour. The peer experience is more credible to the consumers than advertising. Good reviews give more confidence in buying, whereas bad reviews detract the buying. This indicates that credibility and transparency play a vital role in digital marketing.

4. Category of Content that has an Impact on Buying Behaviour.
• Videos/Reels • Influencer content • Images • Written reviews • Advertisements

Interpretation: The best types of communication are video content and influencer promotions. Consumers like more interesting content that is visual and relatable. This suggests that it has changed the traditional advertising to the interactive digital storytelling.

5. Buying behaviour following Advertisements.
Majority of the respondents claimed that they would occasionally or frequently buy what they were advertised about online. This indicates that ads are convincing and not the only decision maker. Consumers consider a variety of sources prior to making purchases.

6. Influence of Influencers
A very large percentage of respondents concurred that influencers influence their purchasing behaviour. The influencers are opinion leaders, particularly in the youth and their recommendation brings in trust and emotional attachment to products.

7. Personalized Advertisements
Majority of the respondents are lured by personalized adverts. This shows that AI-based marketing enhances relevance and engagement. Nonetheless, it can also be a matter of concern in terms of data privacy and tracking.

8. Online shopping is caused by factors like:
• Convenience • Discounts/Price advantage • Product variety
• Fast delivery • Avoiding physical stores

Interpretation: The greatest motivators are convenience and pricing. Online shopping saves time, and offers better deals, which is why people like to use it. This is an indication of the increased reliance on e-commerce sites.

9. Product Comparison Behaviour
The majority of the respondents always or frequently compare products before buying. This implies that consumers are very knowledgeable and logical in decision making. Multiplexing is used by them as they seek to have the best value.

10. Concerns in Online Shopping
• Product quality mismatch • Fake reviews • Privacy issues
• Delivery problems • Payment safety

Interpretation: The greatest concerns are product quality mismatch and fake reviews. This indicates that trust is one of the significant issues in online trading. Customers require more transparency and trust in the web.

MAJOR FINDINGS
The article about the topic of Consumer Behaviour in the Digital Era underlines that the use of digital technologies can bring about a variety of essential patterns in consumer decision-making, preferences, and purchasing behaviour. The results are clear that there is a great level of the use of digital platforms among most of the respondents, as the majority of them use social media and e-commerce sites on a daily or weekly basis. It means that one is now exposed to advertisements, content by influencers, and online reviews, which in turn are highly influential in their purchasing behavior because the digital environment became an integral part of their daily lives.

Instagram and YouTube were the most impactful digital platforms, primarily because of the visual and video information. Another significant role is played by the e-commerce platforms like Amazon and Flipkart who directly connect exposure to purchase behaviour. Comparatively, the conventional platforms such as Facebook and Google have comparatively lower purchase decision impact.

One of them is the important influence of online reviews on consumer trust and decision-making. Social proof is stronger compared to traditional advertising, most of the respondents prefer to use peer feedback before they can purchase products.

Positive reviews enhance trust, and negative or unrealistic reviews decrease the purchasing intention considerably, thus credibility is a significant aspect of digital marketing. Another interesting finding of the study is that the most engaging types of digital content are video content, reels, and influencer marketing. As opinion leaders who are relatable and credible, influencers have a powerful effect on youth purchasing behaviour. This is a sign of a change in the old advertising to a marketing that is personality-focused and content-based. Another significant discovery is that personalized advertisements are of great interest to consumers, which demonstrates the relevance of AI-based targeted marketing. Nevertheless, privacy issues and data tracking were also mentioned suggesting that a compromise must be established between personalization and ethical data use.

The consumers are also reported to be very critical and comparison-minded with majority of the respondents comparing various products before they make a purchase. Convenience, discounts, product variety and fast delivery are the primary motivators of online shopping, as they have become increasingly reliant on using e-commerce systems. Regardless of the benefits of online shopping, a number of significant issues were recognized, such as the incompatibility of the quality of the products purchased, fraudulent reviews, privacy, and the safety of the payments.

Of them the most notable obstacles impacting the confidence of the consumers were fake reviews and trust issues. On the whole, the results indicate that although digital marketing has a strong impact on consumer behaviour and engagement, the problem of trust, transparency, and authenticity is one of the keys in the digital market.

RECOMMENDATIONS

Judging by the research results of Consumer Behaviour in the Digital Era, a number of suggestions are available to the marketers, businesses, and digital platforms to enhance consumer interaction and confidence. To begin with, firms ought to work on developing genuine and transparent marketing policies. As consumers have become very dependent on online reviews, it is important that true customer feedback is emphasized and any false reviews are closely monitored and erased. Secondly, the brands need to enhance their presence on visual channels like Instagram and YouTube, which have been found to be the most powerful channels. Emphasis should be made on high-quality video content, reels, and storytelling-based ads to appeal to young consumers. Thirdly, collaborating with influencers who are credible and relevant ought to be strategic in influencer marketing as opposed to concentrating on popularity alone. This will aid in creating credibility and consumer trust in the long term. Fourthly, firms should enhance methods of personalization and keep ethical practices of data use. Customizations of ads are positively received by consumers, whereas the issue of privacy should be resolved by clear data policies. Lastly, online stores need to work on product accuracy, delivery and customer service in order to

minimize customer dissatisfaction. Problems like counterfeited reviews and inappropriate product match will also be solved, which will greatly improve consumer trust. All in all, implementing a customer-focused, transparent, and ethical digital marketing strategy will assist companies to build consumer relationships in the digital age.

IMPLICATIONS

There are some significant theoretical, practical and managerial implications of the study of consumer behaviour in the digital era. In theory, it makes an addition to the existing body of literature by reminding about the role of the digital platform, influencer marketing, and customized adverts in shaping the current consumer decision-making process. It also reinforces the importance of social proof, trust, and engagement in digital consumer behaviour models. Practically, the research offers information on how marketers and businesses can come up with more effective digital strategies. Instagram, YouTube, and online reviews are some of the most influential platforms that consumers are influenced by; therefore, businesses should consider them in targeted marketing campaigns. The results also reveal that consumers are increasingly analytical and informed, and marketing strategies must be more informative, transparent, value-driven, as opposed to being promotional. Managerially, organizations need to allocate resources to digital analytics and AI marketing systems in order to gain a clearer insight into consumer preferences. The significance of managing customer feedback is also emphasized as online reviews have a great influence on the buying decision. Besides, companies are encouraged to aim at the establishment of long term customer loyalty through product quality and ethical marketing. In a wider context, the research suggests that the digital transformation is changing consumer expectations, and business organisations must constantly adjust to the changing technologies and consumer tastes. Firms that do not implement clear and customer-centric digital policies might not be able to sustain consumer loyalty in the competitive digital market.

CONCLUSION

The article about Consumer Behaviour in the Digital Era shows clearly that the digital technologies have had a great impact on the process of search, evaluation and purchase of the products by the consumers. The results indicate that social media platforms, especially Instagram and YouTube, are extremely influential on consumers and dictate the opinions and preferences. The online review and influencer marketing has become a driving force of faith and decision-making in a digital environment.

Conclusion is also made that consumers are now more informed and analytical as opposed to conventional shopping behaviour. They are more aggressive in shopping and comparing products, weighing options, and using numerous sources of information to make purchase decisions. Advertising tailored to the individual also increases the level of engagement, as it provides people with relevant content, and related issues of privacy and data security are still present.

Nonetheless, the problem of fake reviews, discrepancy between the quality of goods and services, and the insufficient trust can be regarded as a significant threat despite the benefits of digital marketing. These issues underline the necessity to increase transparency and responsibility of the digital environments.

On balance, the paper concludes that consumer behaviour in the digital age is dynamic, technology based, and greatly affected by digital communication channels. To respond to these changes, businesses should implement ethical business marketing strategies, build a certain level of credibility online, and customer satisfaction. Consumer behaviour will just keep changing as artificial intelligence, data analytics, and digital connectivity are advanced, which means that organizations need to keep abreast and adjust to consumer needs.

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ARTIFICIAL INTELLIGENCE AND ENTREPRENEURIAL DECISION-MAKING: A QUALITATIVE STUDY ON OPPORTUNITIES, ETHICS, AND ADOPTION BARRIERS

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ABSTRACT
AI is changing how people run businesses and make financial choices—no question about it. This paper goes right into how entrepreneurs respond to AI: how they chase after new opportunities, tackle tough ethical issues, and face practical challenges head-on. You'll find a framework here that shows exactly how founders use AI to steer through unpredictable markets and improve their decision-making. The goal? To bridge the gap between what the books say and what actually happens in real life. There's a special focus on why AI needs to be easy to understand, and why having shared ethical values really matters if you want innovation that sticks.

Keywords: *Artificial Intelligence (AI) , Entrepreneurial Decision-Making, Opportunity, Recognition, AI Ethics, Technology Adoption, Decision Support Systems, Innovation*

INTRODUCTION
Artificial intelligence has flipped economics and a bunch of other fields on their heads. Old ideas like rational choice, bounded rationality, and market efficiency get pretty shaky when AI shows up (Marwala & Hurwitz, 2017). Entrepreneurs sit right in the middle—they have to make big calls with limited info. Sure, traditional models picture us as perfect calculators, but honestly, that's not how anyone works. People use intuition, shortcuts, and sometimes overlook obvious stuff. AI isn't tangled up in those human habits. It can chew through piles of data and catch market opportunities that people skip over. That's why experts across computer science and business are suddenly obsessed with what happens when AI meets entrepreneurship—and what it means for smarter strategies.

Still, for all the hype, AI hasn't been plugged into entrepreneurial decision-making as well as people think. Most current models stick to probabilities, numbers, and chasing the "best" solution. Real business is messy, though—you need creativity and the flexibility to change direction, not just more math (Shafer, 2013; Gizzi et al., 2022). At the same time, everyone keeps talking about AI ethics, but startups rarely get useful advice—it's all tangled up in conflicting frameworks (Zeng et al., 2018). So, this paper tries to clear things up and asks what adopting AI really looks like in young companies. It also asks why founders hesitate to trust automated tools. What's different about this work? First, it lays out a practical framework connecting advanced AI tools to how founders actually make decisions in unpredictable and

creative situations. Then, it takes a close look at the ethical and explainability issues that real people worry about, offering tips founders can actually use.

RELATED WORK

AI in Economic Theory and Rational Choice

AI hasn't just nudged economics—it's basically rewritten what "rational" market behavior means. Researchers have shown that AI can upgrade tired models of supply, demand, and information gaps (Marwala & Hurwitz, 2017). The cool part is, AI predicts economic behavior better than old-school methods because it's not limited by human quirks. The math can even lock down messy market relationships. But here's the thing: those models don't always match the chaos of real business. This research tries to pull those big ideas down into the messy world where actual people make tough decisions.

Managing Uncertainty and Creative Problem Solving

Another big topic is how AI deals with uncertainty—all the randomness and curveballs out there. Some research looks at how people handle odds, using stuff like Bayesian logic and Dempster-Shafer theory (Shafer, 2013). Creative Problem Solving (CPS) is about letting AI tweak its moves and invent new strategies when everything's unpredictable (Gizzi et al., 2022). These approaches totally shine in simulations where nothing goes as planned (Mattar et al., 2019; Hu et al., 2023). Still, most systems skip over what founders do best: human judgment and creative thinking. This work stands out because it studies people collaborating with AI—not just machines working solo.

Explainability, Trust, and Ethics

Here's another key piece: making AI understandable, building trust, and locking down the basics of ethics. Explainable AI (XAI) isn't just buzz anymore—it's critical, since nobody wants to bet a business on a black box, especially in areas like healthcare (Labarta et al., 2024; Bharati et al., 2023). There's also a push to pull together global ethics standards so they actually make sense (Zeng et al., 2018). The goal is safety, transparency, and keeping humans in the driver's seat. But most frameworks focus on giant hospitals and governments, not small startups racing against the clock. This research adapts those ideas for entrepreneurs so explainability and ethics don't fall through the cracks.

Method/Approach

To actually see how founders use AI, we built the Qualitative AI Adoption Framework for Entrepreneurs (QAIFE). It tracks both how business owners think about AI and how they use it daily. QAIFE has three parts: 1) Opportunity Identification, where AI spots market openings using stats and data, 2) Strategy Simulation, letting founders test strategies in mock business situations with Markov Decision Processes (Bennett & Hauser, 2013), and 3) an Ethics and Explainability Module, checking that AI decisions line up with international standards (Zeng et al.,

2018). The goal is to get smart, actionable advice—while making sure founders get the reasoning behind every choice.

How does QAIFE actually work?

1. Data Gathering and Knowledge Building: Scoop up market data and feed it into neurosymbolic systems—basically mixing machine learning and logic to figure out what's happening (Marra et al., 2021).

2. Scenario Simulation: Run possible strategies in a game-like setting to see how they play out when the future's foggy (Hu et al., 2023).

3. XAI Output Generation: Break down the best simulated strategies into advice that founders can actually read and trust (Labarta et al., 2024).

To test if this works, the plan's pretty direct: recruit 50 startup founders, run interviews and simulation exercises, and see how they handle tough scenarios with help from the AI system. It's not just about trust—we want to see if they can act on the advice and actually win real-world challenges (Labarta et al., 2024). That hands-on testing shows exactly where things fall apart for startups.

DISCUSSION

Bringing AI into startups isn't just about the tech—it's about making sure new tools fit into the reality of fast-moving business. Startups move quickly and take risks, but nobody's putting their business on the line for something they can't understand. If the AI's logic is murky, founders won't use it to make big calls. That's why explainability isn't just a bonus—it's absolutely necessary. The best AI doesn't just spit out answers; it helps people make clearer, smarter choices (Labarta et al., 2024; Bharati et al., 2023). If neurosymbolic AI catches on, startups could get both solid data and reasoning that actually makes sense to humans (Marra et al., 2021).

Naturally, there are risks. Relying too much on simulations and models can backfire—things that look great on paper sometimes crumble when real people make unexpected moves (Marwala & Hurwitz, 2017; Hu et al., 2023). QAIFE depends on how founders interpret AI suggestions—misread a hint, and your strategy could go way off track. And if explainability tools don't flag risky moves, founders might blindly trust shaky advice when they should be leaning on their instincts (Gizzi et al., 2022).

Ethics get complicated fast. What counts as fair or biased changes depending on local and global rules, so founders in international startups might run into trouble trying to keep up (Zeng et al., 2018). Plus, if the data AI learns from is skewed, it just keeps repeating old mistakes, pushing founders toward bad strategies. Fixing this needs real oversight and solid audits built right into the process.

Looking ahead, researchers should get out of theory mode and actually follow founders over time, across different countries and industries. See how trust in AI grows and changes.

On the tech side, there's a real need to dig deeper into Markov Decision Processes and tighten them into neurosymbolic designs, especially for tackling wild, messy real-world data (Marra et al., 2021; Bennett & Hauser, 2013).

CONCLUSION

This paper jumped right into the intersection of AI and entrepreneurship—where big tech meets real human decision-making. With AI updating old economic models, we get a clearer picture of what founders actually deal with (Marwala & Hurwitz, 2017). The QAIFE framework gives startups a practical roadmap, blending statistical models, simulations, and strong explainability.

But there's more to AI and entrepreneurship than slick algorithms. Success means wrestling with ethical dilemmas, being upfront about risks, and encouraging teamwork between humans and machines (Shafer, 2013; Gizzi et al., 2022). As AI keeps growing, founders need tools that are clear, ethical, and easy to use if we want to see new waves of business innovation. Creative approaches to AI don't just solve tough business problems—they keep technology truly useful and safe, serving real human needs (Gizzi et al., 2022).

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FUTURE SKILLS AND EMPLOYABILITY

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ABSTRACT
The rapid evolution of technology, coupled with economic and social transformations, has drastically reshaped modern workplaces. Skills that were once considered fundamental are now being disrupted by automation, artificial intelligence (AI), and shifting global market demands. As a result, individuals, educational institutions, and policymakers are compelled to rethink how skills are acquired, developed, and maintained to ensure continued employability in a volatile future. This paper explores the notion of future skills, identifies critical competencies for employability, examines current trends and challenges, and proposes strategies to bridge skills gaps. Through a synthesis of existing literature, industry reports, and policy frameworks, it argues that adaptability, digital literacy, creativity, and lifelong learning are essential facets of future work readiness. The paper concludes by presenting actionable recommendations for stakeholders to enhance workforce resilience.

1. INTRODUCTION
The 21st century is defined by profound technological advancements and structural shifts across global labor markets. The advent of technologies such as AI, machine learning, robotics, and digital platforms has initiated a new industrial paradigm—often referred to as the Fourth Industrial Revolution (4IR). While these innovations promise increased productivity and economic growth, they also present risks to job security and workforce stability. The World Economic Forum (2020) projects that by 2025, more than half of all workers will require reskilling due to changes in core job competencies. Traditional skill sets are therefore becoming obsolete, making way for a new suite of future skills necessary for employability.

The purpose of this paper is to explore the evolving landscape of skills in the context of technological change, identify competencies critical for future employability, address challenges in skills development, and provide strategic recommendations for individuals, educational systems, and policymakers.

2. LITERATURE REVIEW

2.1 Conceptualizing Future Skills
Future skills are capabilities required to navigate a rapidly changing labor market characterized by technological disruption and shifting economic needs. Scholars define these skills as a combination of cognitive abilities (e.g., complex problem solving), technical proficiencies (e.g., digital fluency), and socio-emotional competencies (e.g., emotional intelligence) (World Economic Forum, 2020).

According to World Economic forum jobs increasingly demand higher-order thinking and analytical skills that machines cannot easily replicate. Furthermore, future skills extend beyond technical know-how to encompass adaptability, learning agility, and meta-skills—the capacity to learn how to learn.

2.2 The Future of Work and Employability

Employability refers to an individual's ability to gain and maintain employment as well as to adapt to changing work conditions. The future of work places a premium on flexibility and cross-functional competencies. It highlights that routine tasks—typically associated with mid-level jobs—are most vulnerable to automation. In contrast, jobs requiring creativity, interpersonal communication, and complex reasoning are more resistant to automation.

The Organisation for Economic Co-operation and Development (OECD, 2021) emphasizes that employability now depends not only on formal education but also on continuous learning and upskilling throughout one's career.

3. METHODOLOGY

This research paper synthesizes secondary data from academic journals, industry reports, government publications, and global workforce studies. Relevant sources were selected to provide a comprehensive overview of current trends, theoretical insights, and practical implications related to future skills and employability.

Sources include peer-reviewed articles, institutional reports (e.g., World Economic Forum, OECD), and policy briefs addressing skill development strategies. The analysis focuses on identifying patterns across these literature streams to formulate evidence-based conclusions.

4. KEY FUTURE SKILLS FOR EMPLOYABILITY

4.1 Digital and Technological Literacy

Digital literacy is foundational in a world driven by data, automation, and digital platforms. This encompasses proficiency in using digital tools, understanding data analytics, and interacting with emerging technologies like AI and cloud computing.

Examples:

- Basic coding and algorithmic thinking
- Data interpretation and visualization
- Cybersecurity awareness

These competencies enable workers to contribute meaningfully in tech-enabled work environments. As digital transformation accelerates, even traditionally non-technical roles increasingly require digital fluency.

4.2 Critical Thinking and Problem Solving

Critical thinking involves analyzing information, evaluating alternatives, and making informed decisions.

Research indicates that complex problem-solving is among the top skills required across industries (World Economic Forum, 2020). These skills are considered "future-proof" because they remain difficult for machines to replicate.

4.3 Creativity and Innovation

In environments characterized by rapid change, creativity becomes a differentiator. Jobs that require ideation, design thinking, and innovation are expected to grow. Creativity involves generating original ideas, connecting disparate concepts, and envisioning possibilities beyond conventional frameworks.

4.4 Emotional Intelligence and Interpersonal Skills

Human-centric skills such as emotional intelligence, empathy, teamwork, and communication are increasingly valuable. These competencies enable individuals to navigate diverse work contexts, lead teams, and manage cross-cultural collaboration. Automation may replace routine tasks, but human-to-human interactions remain essential.

4.5 Adaptability and Lifelong Learning

The concept of a singular degree leading to lifelong employment is obsolete. Instead, lifelong learning—continuous skill development throughout a career—is critical for adaptability. Individuals must be able to acquire new skills, unlearn outdated ones, and pivot as industries evolve.

5. CHALLENGES IN DEVELOPING FUTURE SKILLS

5.1 Education System Limitations

Traditional education often emphasizes memorization and standardized testing, rather than critical thinking and creativity. Moreover, curricula frequently lag behind technological advancements, creating a disconnect between learning outcomes and labor market needs.

5.2 Digital Divide and Inequity

Access to digital tools and quality education is uneven across regions and socio-economic groups. The digital divide intensifies inequities in skill development, limiting opportunities for marginalized communities.

5.3 Employer Engagement and Reskilling

While employers acknowledge the importance of future skills, many struggle to implement effective upskilling programs due to cost, time constraints, and resource limitations. There is also a lack of standardized frameworks to assess digital and cognitive competencies.

5.4 Psychological Barriers

Workers facing automation threats may experience anxiety and resistance to change. Fear of obsolescence can hinder engagement in reskilling efforts.

6. STRATEGIC RECOMMENDATIONS

6.1 Reforming Education Curricula

Educational institutions must revise curricula to emphasize future skills such as critical thinking, digital literacy, and creativity. This transformation should include project-based learning, interdisciplinary studies, and collaboration with industry partners.

6.2 Promoting Lifelong Learning Ecosystems

Governments and organizations should support lifelong learning through incentives such as:

- Tax credits for training programs
- Subsidized access to online courses
- National skill passports and recognition of prior learning

These measures encourage continuous learning and reduce barriers to skill acquisition.

6.3 Strengthening Public-Private Partnerships

Collaboration between industry, government, and educational institutions can align training programs with real-world needs. Initiatives such as apprenticeship programs, digital boot camps, and innovation labs provide practical experience and exposure to emerging technologies.

6.4 Investing in Digital Infrastructure

To mitigate the digital divide, investments are required in broadband access, affordable devices, and digital literacy programs at the community level. Public policy must ensure equitable access to digital resources.

6.5 Fostering a Culture of Adaptability

Employers should cultivate workplace cultures that value adaptability and learning. This can be achieved through mentoring programs, internal knowledge sharing, and recognition systems that reward innovation and risk-taking.

7. DISCUSSION

The intersection of technology and employability necessitates a holistic approach that integrates individual agency, institutional support, and policy interventions. Future skills extend beyond narrow technical competencies to encompass a range of cognitive and interpersonal abilities essential for navigating uncertainty. The literature consistently highlights that adaptability and lifelong learning are central to future work readiness.

Countries with proactive education reforms and robust digital ecosystems are better positioned to harness the opportunities presented by technological change. Conversely, those with limited access to quality education and digital resources face increased risk of labor market exclusion.

Importantly, employability is not solely a function of skills but also of social support systems, including access to networks, mentorship, and career guidance. Therefore, equitable strategies for skill development must account for socio-economic disparities.

8. CONCLUSION

Future skills are not static competencies but dynamic capabilities that enable individuals to thrive in a rapidly changing labor landscape. Digital literacy, critical thinking, creativity, emotional intelligence, and adaptability emerge as core elements of employability in the 21st century. However, realizing a future-ready workforce requires systemic efforts across education, industry, and policy domains.

Key strategies include updating educational curricula, promoting lifelong learning, investing in digital infrastructure, and fostering strong public-private partnerships. Addressing the digital divide and creating inclusive learning pathways will also be critical to ensuring that the benefits of technological progress are equitably distributed.

As the nature of work continues to evolve, the concept of employability must extend beyond job placement to encompass resilience, flexibility, and the capacity for continuous reinvention. Individuals equipped with future skills are not only more employable but also more capable of shaping their own career trajectories in a world of uncertainty.

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A STUDY ON AWARENESS ABOUT NATIONAL INCOME ACCOUNTING AMONG ACCOUNTING TEACHERS

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ABSTRACT
National Income Accounting (NIA) is an integral part of studies related to macroeconomics, which creates an understanding of our country's economic outcomes. Though, it is important, most of the educators of accounting focus only on financial accounting and neglect the principles of NIA. This research aims to assess the level of awareness of accounting teachers with regards to NIA, identify the determinants like experience and qualification of teachers, that influences the awareness level and propose enhancement strategies. The research adopts a descriptive approach which has collected data from 100 accounting teachers in junior and undergraduate colleges. To examine the data statistical methods like percentage and chi – square test was used. The findings showed that educators with advanced qualifications and more teaching experience demonstrated a notably greater understanding of NIA concepts. The research highlights the significance of ongoing professional growth and curriculum changes to improve macroeconomic understanding among accounting instructors.

Keywords: *Accounting, National Income, National Income Accounting.*

INTRODUCTION
National Income Accounting acts an important tool for macroeconomic analysis, that dispenses over a certain period of time, an organized record of our nation's economic performance. This includes gathering, arranging and presenting the data based on expenditure, earnings and output in an attempt to measure the nations combined economic performance. With the compilation of these data NIA provides an important framework which measures the wellbeing, growth and productivity, of the nation. The data also assist the policymakers in implementation of the monetary and fiscal policies, and, simultaneously, renders an understanding of the operating principles of an economy to the researchers and educators.

National Income Accounting applies the double-entry bookkeeping principle to record economic activities at the national level rather than at the level of individual businesses.
Unlike financial accounting, in NIA, every transaction is transcribed two times – one time as a credit (source) and second time as a debit (use) – making sure that total income = total expenditure and total output = total demand.

Fundamentally, NIA relies on three primary measurement methods, which individually provides different viewpoint on the nation's economic output.

1. The Output (Production) Approach:
The output approach calculates National Income of an economy over a period of time by using the following formula

$$National\ Income\ (NI) = \sum (Q_i \times P_i) - IC\ + (NIT)$$

Where, Qi = Final Quantity of goods and services produced in each sector (Primary, Secondary

& Tertiary)

Pi = Final Price for goods and services produced in each sector

IC = The value of goods and services consumed in the process of production (Intermediate

Consumption)

NIT = Indirect Tax – Subsidy (Net Indirect Taxes)

In simple words, National Income = Gross Value of Production – Intermediate Consumption + Net Indirect Tax.

2. The Earnings (Income) Approach:
The earnings approach calculates National Income of an economy over a period of time by using the following formula

$National\ Income\ (NI) = W + R + I + P + (MI)$ + (NIT)

Where, W = Compensation to employees for services provided (Wages & Salaries)

R = Income from ownership of land and natural resources (Rent)

I = Income earned on capital (Interest)

P = Profits earned by entrepreneurs and corporations

MI = Mixed Income of self – employed people

NIT = Indirect Tax – Subsidy (Net Indirect Taxes)

In simple words, National Income = Compensation of Employees + Rent + Interest + Profits + Mixed Incomes + Net Indirect Tax.

3. The Spending (Expenditure) Approach:
The spending approach calculates National Income of an economy over a period of time by using the following formula

$$National\ Income\ (NI) = C + I + G + (X - M)$$

Where, C = Total expenditure of households on goods and services consumed

R = Income from ownership of land and natural resources (Rent)

I = Investment by businesses (Gross Capiral Formation)

G = Expenditure by government on goods and services

X = Export of goods and services

M = Import of goods and services

In simple words, National Income = Consumption + Investment + Government Expenditure + (Exports – Imports).

Along with these methods, National Income Accounting circumscribes various important concepts that provide a subtle understanding of economic activity:

1. **Gross Domestic Product (GDP):** The total value of all final goods and services produced in monetary terms over a specific period within a country's borders.
2. **Gross National Product (GNP):** GDP + Net Income (Income earned from abroad).
3. **Net National Product (NNP):** GNP – Depreciation, that represents the availability of goods and services for consumption or investment purpose.
4. **National Income (NI):** The sum of all the factors of income like wages & salaries, rent, profits and interest earned by citizens of a country.
5. **Personal Income (PI):** Actual Total Income received by masses, including transfer payments.
6. **Disposable Personal Income (DPI):** Personal income – Taxes, this indicates the purchasing power available to households.

It is essential for accounting educators, to have a comprehensive knowledge of the economic concepts and methods. NIA overcomes the difference between classroom theory and real-world economic analysis, it also helps the students to elucidate national data, gain an understanding about policy decisions, and appreciate the mutuality of the economy. However, in most of the academic's contexts, accounting teachers focus more on financial accounting and ignore the macroeconomic aspects that National Income Accounting reflects.

STATEMENT OF THE PROBLEM

Despite of the fact that NIA is an integral part of economics and commerce education, there is limited research seen on how well accounting teachers understand the concept of NIA. Insufficient awareness can affect how efficiently, these concepts are explained to the students, which leads to a meagre understanding of realities of macroeconomics. Thus, it is necessary to assess the level of awareness, identify gaps, and suggest suitable ways to boost teachers' proficiency towards National Income Accounting.

OBJECTIVES OF THE STUDY

1. To evaluate the awareness level of accounting teachers about National Income Accounting.

2. To identify factors such as qualification and experience influencing their level of awareness.
3. To suggest suitable strategies for enhancing the understanding and awareness of NIA concepts.

HYPOTHESIS OF THE STUDY

H_0 (Null Hypothesis): Academic qualification and teaching experience do not significantly influence the level of awareness about National Income Accounting among accounting teachers.

H_1 (Alternative Hypothesis): Academic qualification and teaching experience significantly influence the level of awareness about National Income Accounting among accounting teachers.

REVIEW OF LITERATURE

1. **Rao, P.** in the article "Economic Education and the Role of Teachers in National Income Awareness" emphasized that teachers with a higher level of awareness of key economic indicators, such as GDP and inflation, contribute more effectively to students' conceptual understanding. The research highlights the link between teacher knowledge and learner outcomes, underscoring the need for ongoing professional development in macroeconomic topics.
2. **Singh, A., & Mehta, R.** in their article "Awareness of National Income Accounting among Educators: A Comparative Study" observed that many accounting teachers continue to rely on outdated textbooks and teaching materials, which hampers conceptual clarity and the accurate interpretation of National Income Accounting concepts. Their findings stress the importance of updating teaching resources and integrating current data in classroom instruction.

RESEARCH METHODOLOGY

1. Research Design

The study adopted a descriptive survey design to assess and describe the level of awareness among accounting teachers.

2. Sources of Data

The data is collected using a structured questionnaire that includes questions related to awareness of NIA concepts and methods like income, expenditure, and production approach.

3. Sample Size

The sample size includes accounting teachers from junior and undergraduate colleges. A sample of 100 teachers is selected using stratified random sampling to ensure balanced representation from different types of institutions.

4. Statistical Tool

Collected data is analyzed using percentages, mean scores, and chi-square tests to explore relationships between awareness and teacher characteristics.

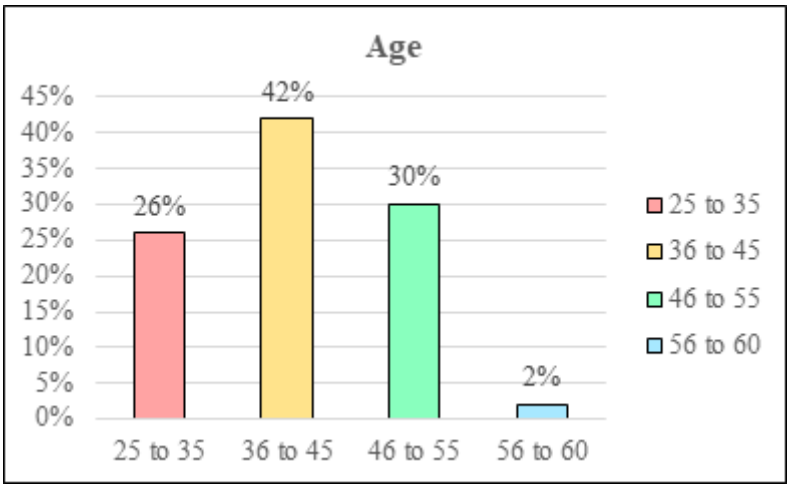
Data Analysis and Interpretation

Demographic Details of Respondents

Table No. 1 Age

Age Group	Frequency	Percentage
25 to 35	26	26
36 to 45	42	42
46 to 55	30	30
56 to 60	2	2
Total	**100**	**100**

Graph No. 1

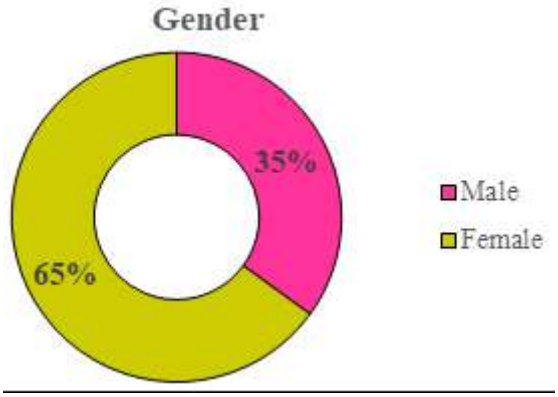


Interpretation - From the table & graph 1 it can be observed that majority of the respondents belong to age group of 36 to 45 years that is 42%, which means they belong to middle age group and has experience in this field.

Table No. 2 Gender

Gender	Frequency	Percentage
Male	35	35
Female	65	65
Total	**100**	**100**

Graph No. 2

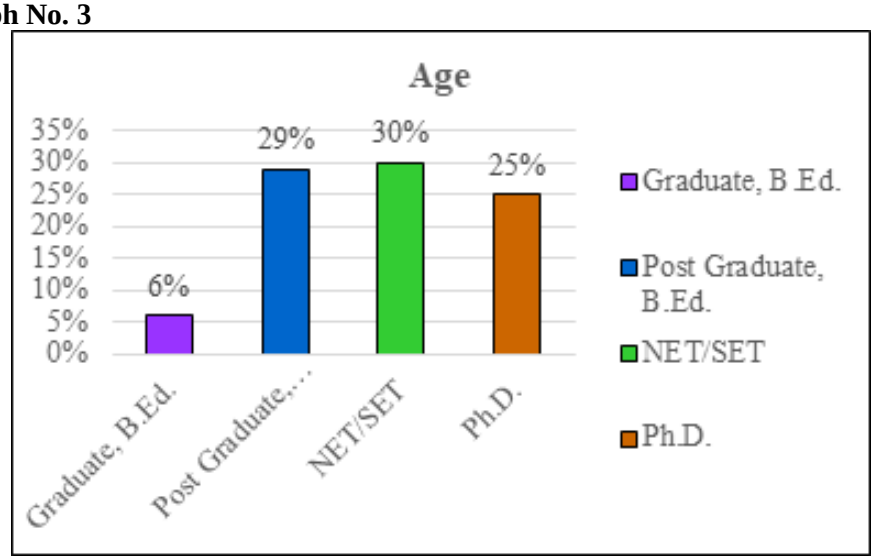


Interpretation - 35% of the respondents were Male whereas 65% were female, which shows that more female teachers are engaged in teaching accounting.

Table No. 3 Qualifications

Qualifications	Frequency	Percentage
Graduate, B.Ed.	8	8
Post Graduate, B.Ed.	29	29
NET/SET	30	30
Ph.D.	25	25
Total	**100**	**100**

Graph No. 3

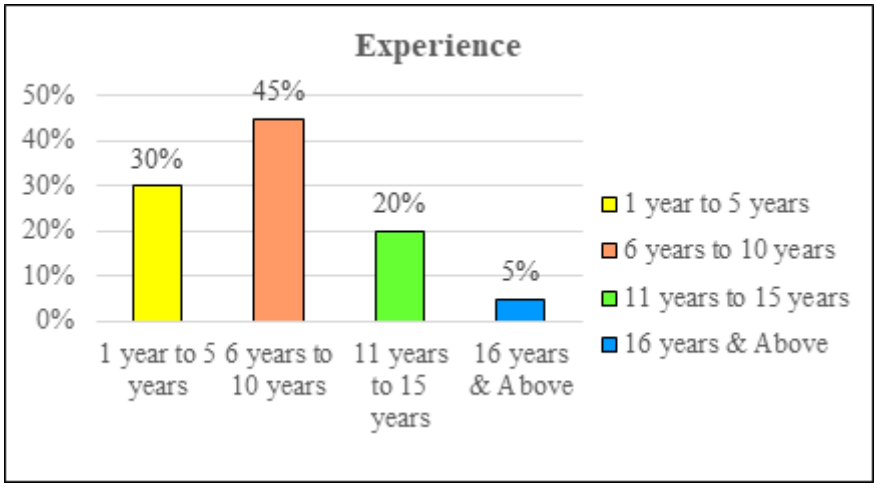


Interpretation - From the table & graph 3 it can be seen that majority of the respondents have qualified their NET/SET i.e. 30% and post graduate, B.Ed. i.e. 29%, and 25% are Ph.D. holders which means highly qualified teachers are working as accounting educators.

Table No. 4 Experience

Experience	Frequency	Percentage
1 year to 5 years	30	30
6 years to 10 years	45	45
11 years to 15 years	20	20
16 years & Above	5	5
Total	**100**	**100**

Graph No. 4



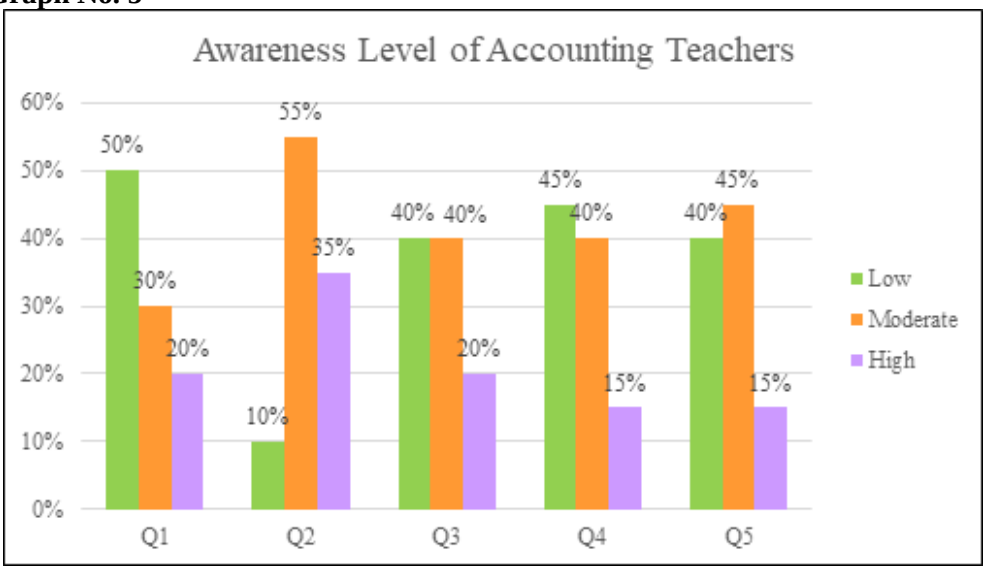
Interpretation - 45% of the respondents worked as accounting teachers for more than 6 years to 10 years and 30% have the experience of 1 year to 5 years in this field. 20% of the respondents have 11 years to 15 years of experience whereas only 5% of the teachers have 16 years & above experience.

Following is the responses of accounting teachers with respect to National Income Accounting.

Table No. 5 Awareness Level of Accounting Teachers

No.	Questions Asked	Low	Moderate	High
Q 1	Awareness about the term National Income Accounting	50	30	20
Q 2	Awareness about the Concepts like GDP, GNP, NNP	10	55	35
Q 3	Awareness about Income Approach of NIA	40	40	20
Q 4	Awareness about Expenditure Approach of NIA	45	40	15
Q 5	Awareness about Output Approach of NIA	40	45	15

Graph No. 5

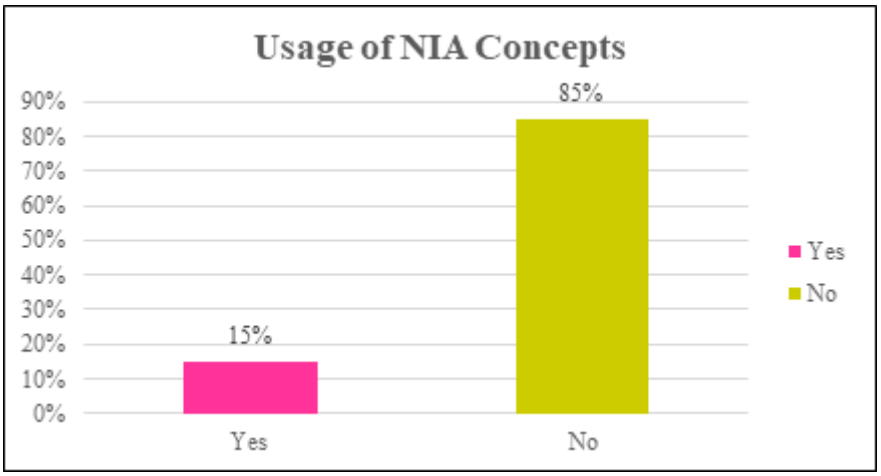


Interpretation: Table & graph 5 shows that teachers have the highest awareness of basic national income concepts such as GDP, GNP, and NNP, with 90% demonstrating moderate to high understanding. However, awareness is lowest for the Expenditure and Output approaches, indicating limited familiarity with the practical methods of estimating national income.

Table No. 6 Usage of NIA Concepts

Statement	Yes	No
Do you use NIA Concepts in teaching	15	85

Graph No. 6



Interpretation: Table & graph 6 clearly shows that 85% of the accounting teachers do not use the national income accounting concepts in regular teaching.

Hypothesis Testing

The research mainly focuses on the awareness level of accounting teachers towards national income accounting. For the purpose of hypothesis testing Chi – Square Test is used by the researcher, taking awareness level and qualification and experience as the variable and the responses of 100 accounting teachers is considered.

Table No. 7 A Chi-Square Test Result between Qualification and Awareness Level

Test Statistics	**Value**	**Degree of Freedom**	**Asymp. Sig. (2-sided)**	**Accepted / Rejected**
Pearson Chi-Square	14.82	6	0.022	Rejected
Likelihood Ratio	13.91	6	0.030	
Linear-by-Linear Association	6.47	1	0.011	
N of Valid Cases	100			

The table 7 A shows that the p-value (0.022) < 0.05, therefore, the null hypothesis is **rejected**.

This indicates a significant relationship between academic qualification and awareness level of accounting teachers.

Table No. 7 B Chi-Square Test Result between Experience and Awareness Level

Test Statistics	**Value**	**Degree of Freedom**	**Asymp. Sig. (2-sided)**	**Accepted / Rejected**
Pearson Chi-Square	11.47	6	0.042	Rejected
Likelihood Ratio	10.85	6	0.046	
Linear-by-Linear Association	4.91	1	0.027	
N of Valid Cases	100			

The table 7 B shows that the p-value (0.042) < 0.05, the null hypothesis is **rejected**. This means there is a significant association between teaching experience and awareness level among accounting teachers.

The results clearly indicates that both academic qualification and teaching experience significantly affect awareness of National Income Accounting. Therefore, the Null Hypothesis "*Academic qualification and teaching experience do not significantly influence the level of awareness about National Income Accounting among accounting teachers*" is **rejected**. It can be observed that teachers with higher qualifications (NET/SET or Ph.D.) and longer teaching experience (above 10 years) exhibit a higher level of awareness of NIA concepts, while those with less experience or lower qualifications tend to have lower awareness levels.

FINDINGS

It was found from the research that majority of the accounting teachers have moderate to high level of awareness towards the basic concepts of National Income Accounting like GDP, GNP and NNP but they possess very low knowledge about specific

methods of NIA like output, income and expenditure approaches. It was also found that awareness level significantly varies with qualification and experience of teachers, which indicates that the highest qualified and experience teachers have more understanding about the NIA concepts. Overall, while theoretical knowledge is adequate, the practical application of NIA concepts in teaching remains limited.

SUGGESTIONS

1. Accounting and economics teachers should work together to strengthen interdisciplinary understanding.
2. Teachers need to use real economic data and case studies to make learning more practical and engaging.
3. NIA concepts should be included in classroom activities to connect theory with real-life examples.
4. Online resources like videos and digital modules can be created to help simplify NIA topics for teachers and students.

CONCLUSION

The study concludes that accounting teachers have adequate theoretical awareness of the basic national income concepts but meagre understanding of its practical methods. Awareness levels rose with higher qualifications and experience, and very few teachers apply NIA concepts in classroom teaching. To bridge the gap between theory and practice resources needs to be updated, collaboration should be promoted and training should be strengthened.

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IMPACT OF EDUCATIONAL TECHNOLOGY AND INNOVATION ON ATTITUDES TOWARD THE TEACHING PROFESSION AMONG B.ED. TRAINEES

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ABSTRACT

The integration of educational technology and innovative teaching practices has significantly influenced modern teacher education. This study examines the impact of educational technology and innovation on attitudes toward the teaching profession among Bachelor of Education (B.Ed.) trainees. The main objective is to explore how exposure to digital tools and innovative pedagogical approaches shapes trainees' perceptions and professional commitment.

A descriptive survey method was adopted, and data were collected from B.Ed. trainees using a structured questionnaire. Educational technology and innovation were treated as independent variables, while attitude toward the teaching profession was considered the dependent variable. Data analysis was carried out using statistical techniques such as mean, standard deviation, and correlation.

The findings reveal that B.Ed. trainees generally possess positive attitudes toward the teaching profession. Exposure to educational technology enhances confidence, teaching competence, and engagement, while innovative practices increase motivation and interest in teaching. A positive relationship was found between the use of technology, innovative methods, and favourable teaching attitudes.

The study concludes that effective integration of educational technology and innovation in teacher education programs is essential for developing positive professional attitudes. It highlights the need for adequate training and resources to prepare competent and motivated future teachers.

Keywords: *Educational Technology, Innovation, Teaching Attitude, B.Ed. Trainees, Teacher Education*

1.1 INTRODUCTION

The contemporary educational landscape is undergoing rapid transformation due to the integration of digital technologies and innovative teaching practices. Educational technology has expanded beyond basic instructional tools to include interactive platforms, virtual classrooms, artificial intelligence, and data-driven learning systems. These advancements have significantly altered the ways in which teaching and learning occur, making education more dynamic, flexible, and student-centered.

Simultaneously, innovation in education has become a key factor in improving instructional quality. Innovative pedagogical approaches such as flipped classrooms, experiential learning, collaborative learning, and inquiry-based instruction are

reshaping traditional teaching models. These methods emphasize active participation, critical thinking, and creativity among learners.

Teacher education programs, particularly Bachelor of Education (B.Ed.) courses, are expected to prepare future educators to meet these evolving demands. B.Ed. trainees must develop not only the necessary pedagogical skills but also a positive attitude toward the teaching profession. Attitude plays a crucial role in determining a teacher's effectiveness, job satisfaction, and long-term commitment.

Exposure to educational technology and innovative practices during teacher training can influence how trainees perceive teaching as a profession. When trainees are equipped with modern tools and creative strategies, they are more likely to view teaching as engaging, meaningful, and professionally rewarding.

However, despite the increasing emphasis on technology and innovation in education, there is a need to systematically examine their impact on the attitudes of B.Ed. trainees. This study aims to explore how these factors shape trainees' perceptions of teaching and contribute to their professional development.

1.2 OBJECTIVES OF THE STUDY

1. To examine the level of exposure to educational technology among B.Ed. trainees.
2. To identify the extent of innovative teaching practices experienced during training.
3. To assess the attitudes of B.Ed. trainees toward the teaching profession.
4. To analyze the impact of educational technology on teaching attitudes.
5. To determine the influence of innovative practices on professional attitudes.
6. To study the combined effect of educational technology and innovation on attitudes toward teaching.

1.3 NEED AND IMPORTANCE OF THE STUDY

The present study is important for several reasons. First, the quality of education largely depends on the competence and attitude of teachers. Understanding factors that influence teacher attitudes is essential for improving teacher education programs.

Second, educational technology has become an integral part of modern teaching. Teachers are expected to use digital tools effectively to enhance learning outcomes. Therefore, it is important to understand how exposure to technology influences trainees' attitudes.

Third, innovation in teaching practices promotes student engagement and improves learning experiences. Teacher trainees who are familiar with innovative methods are more likely to adopt effective teaching strategies.

Fourth, there is a growing need to make the teaching profession more attractive and fulfilling. Positive attitudes among trainees can contribute to better retention and performance in the profession.

Finally, the findings of this study will be useful for curriculum developers, teacher educators, and policymakers in designing effective training programs that integrate technology and innovation.

1.4 ASSUMPTIONS OF THE STUDY

The study is based on the following assumptions:

- B.Ed. trainees have basic exposure to educational technology.
- Innovative teaching practices are included in teacher training programs.
- Attitudes toward the teaching profession can be measured reliably.
- Educational technology and innovation influence trainees' perceptions.
- Respondents will provide honest and accurate information.

1.5 OPERATIONAL DEFINITIONS

Educational Technology:
The use of digital tools, software, and electronic resources to facilitate teaching and learning.

Innovation in Teaching:
The use of creative and modern teaching methods aimed at improving student engagement and learning outcomes.

Attitude Toward Teaching Profession:
The beliefs, feelings, and behavioural tendencies of trainees toward teaching as a career.

B.Ed. Trainees:
Students enrolled in Bachelor of Education programs undergoing pre-service teacher training.

1.6 REVIEW OF LITERATURE

Several studies have explored the role of educational technology, innovation, and teaching attitudes.

1) Research by Peggy A. Ertmer and Anne T. Ottenbreit-Leftwich (2010) examined how teachers integrate technology into their teaching practices. The study found that teachers' beliefs and confidence significantly influence their use of technology. Teachers who are comfortable with technology tend to develop positive attitudes toward teaching.

2) Similarly, Matthew J. Koehler and Punya Mishra (2009) introduced the concept of Technological Pedagogical Content Knowledge (TPACK). Their study emphasized that effective teaching requires a combination of content knowledge, pedagogy, and technological skills. Teachers with strong TPACK demonstrate higher confidence and more positive professional attitudes.

3) A study by Timothy Teo (2011) focused on factors influencing teachers' acceptance of technology. The findings revealed that perceived usefulness and ease of use significantly affect attitudes toward technology. Teachers who perceive technology as beneficial are more likely to adopt it in their teaching.

4) **Studies on Educational Technology in Indian Context Neha Miglani and Patricia Burch (2018)** conducted a study on educational technology in India and teachers' sense making. The objective was to understand how teachers interpret and use educational technology in classroom settings. The findings revealed that although educational technology is expanding rapidly in India, teachers' understanding and usage depend largely on institutional support and training. Many teachers viewed technology as beneficial but faced challenges in implementation due to infrastructural and contextual factors. This study highlights the importance of proper training and support systems in shaping teachers' attitudes toward technology.

5) **Study on Indian Teachers' Attitude Toward Educational Technology Tarananum (2025)** conducted a study on Indian teachers' willingness to adopt educational technology. The research focused on how teachers perceive their roles in the digital era. The findings indicated that teachers who adopt facilitator and delegator roles are more inclined toward educational technology, whereas those adhering to traditional teaching methods show resistance. Cultural and systemic barriers were also identified as significant challenges in technology adoption. This study is highly relevant as it directly connects teaching roles with attitudes toward educational technology in the Indian context.

6) **Study on Attitude Toward Assistive Technology in India Arnab Kundu, Tripti Bej, and Kedar Dey (2020)** conducted a study on Indian educators' awareness and attitude toward assistive technology.The study found that although awareness levels were moderate, teachers generally exhibited a positive attitude toward assistive technologies. However, lack of training and resources limited effective implementation. This study emphasizes that positive attitudes alone are insufficient without adequate training and infrastructure.

1.7 RESEARCH FINDINGS FROM PREVIOUS STUDIES

The review of literature reveals the following key findings:

- Educational technology enhances teacher confidence and competence.
- Innovative teaching practices improve engagement and motivation.
- Positive attitudes toward teaching are linked to self-efficacy and professional readiness.
- Technology acceptance depends on perceived usefulness and ease of use.
- Integration of technology and innovation leads to better teaching outcomes.

1.8 SCOPE OF THE STUDY

The study is limited to B.Ed. trainees enrolled in teacher education institutions. It focuses on their exposure to educational technology and innovative teaching practices.

The scope includes:

- Analysis of teaching attitudes
- Examination of technological and innovative influences
- Implications for teacher education programs

The study does not include in-service teachers and is limited to a specific sample.

1.9 Hypotheses of the Study

H_o1: There is no significant impact of educational technology on attitudes toward the teaching profession.

H_o2: There is no significant influence of innovation on teaching attitudes.

H_o3: There is no significant combined effect of educational technology and innovation on attitudes.

H_o4: There is no significant relationship between technology exposure and positive teaching attitudes.

1.10 RESEARCH QUESTIONS

1. What is the level of educational technology exposure among B.Ed. trainees?
2. What innovative practices are used in teacher training?
3. What are the attitudes of trainees toward teaching?
4. How does technology influence teaching attitudes?
5. What is the role of innovation in shaping professional attitudes?
6. How do technology and innovation together affect teaching attitudes?

1.11 CONCLUSION

The study highlights the significant role of educational technology and innovation in shaping the attitudes of B.Ed. trainees toward the teaching profession. In the modern educational context, teachers are expected to be technologically competent and pedagogically innovative. Exposure to digital tools and creative teaching strategies enhances trainees' confidence, motivation, and professional outlook.

The findings suggest that teacher education programs must integrate educational technology and innovative practices effectively. This will not only improve teaching competencies but also foster positive attitudes toward the profession. A positive attitude among trainees is essential for ensuring quality education and long-term commitment to teaching.

Overall, the study emphasizes the need for continuous improvement in teacher training programs to align with technological advancements and innovative practices.

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AI IN FINANCIAL PLANNING AND WEALTH MANAGEMENT: TRANSFORMING INVESTMENT DECISIONS IN INDIA

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ABSTRACT

Artificial Intelligence (AI) is increasingly reshaping the financial planning and wealth management landscape in India by enabling intelligent, personalized, and data-driven investment decisions. This conceptual review paper examines the transformative role of AI-enabled technologies such as machine learning, predictive analytics, robo-advisory systems, natural language processing, and automated portfolio rebalancing in improving investment outcomes. The study synthesizes recent literature and contextualizes the discussion within the rapidly expanding Indian FinTech ecosystem. The Indian financial technology ecosystem offers notable examples through platforms such as Groww, Zerodha, INDmoney, and ET Money, which actively leverage AI-enabled analytics, robo-advisory tools, and personalized wealth management solutions, thereby democratizing access to financial advice, risk profiling, SIP planning, tax optimization, and goal-based wealth creation for retail investors. The paper further highlights how AI contributes to improved portfolio diversification, investor inclusion, and real-time decision support while addressing critical concerns such as data privacy, algorithmic bias, and regulatory oversight. By integrating insights from technology adoption theory and behavioral finance, the paper proposes a conceptual framework linking AI capabilities with investment decision quality and long-term wealth outcomes. The study concludes that AI is emerging as a strategic pillar in building future-ready financial organizations and strengthening India's digital investment ecosystem.

Keywords: *Artificial Intelligence, Financial Planning, Wealth Management, Investment Decisions, India, FinTech, Robo-advisory*

1. INTRODUCTION

The financial services sector in India has witnessed substantial transformation in the last decade due to digitalization, FinTech innovation, and increased internet penetration. Among these technological developments, Artificial Intelligence (AI) has emerged as one of the most disruptive forces in financial planning and wealth management.

Traditionally, investment decisions were primarily dependent on human financial advisors, market expertise, and historical trend analysis. However, the emergence of AI-powered tools has shifted the focus toward data-driven, predictive, and personalized financial decision-making. AI enables the processing of vast volumes of financial data in real time, helping investors and institutions identify patterns, assess risks, and optimize returns.

In India, the growth of digital investment platforms, mutual fund applications, and robo-advisory services has accelerated the adoption of AI in financial planning. Investors are increasingly relying on algorithm-based recommendations for SIP planning, portfolio diversification, retirement planning, tax optimization, and wealth creation. This paper conceptually examines how AI is transforming investment decisions in India and its broader implications for wealth management.

2. OBJECTIVES OF THE STUDY

The present paper is based on the following objectives:

1. To study the role of AI in financial planning and wealth management.
2. To analyze how AI transforms investment decision-making in India.
3. To examine the benefits and challenges associated with AI-driven financial advisory services.
4. To explore the future scope of AI in India's investment ecosystem.

3. RESEARCH METHODOLOGY

3.1 Research Design

This study adopts a **conceptual and systematic review-based research design**, synthesizing recent scholarly literature on Artificial Intelligence (AI) in financial planning, wealth management, and investment decision systems. The paper follows a narrative review approach supported by contemporary peer-reviewed studies published between 2024 and 2026.

3.2 Theoretical Lens

The conceptual argument is anchored in the **Technology Acceptance Model (TAM)**, **Behavioral Finance Theory**, and **Data-Driven Decision Theory**, which collectively explain how investors adopt AI-enabled financial advisory systems and how these systems influence rational investment behaviour.

3.3 Illustrative Industry Examples Table

Platform	AI-led Application	Investor Benefit
Groww	Fund recommendations, SIP insights	Easy retail investing
Zerodha	Analytics dashboards, market insights	Better decision support
INDmoney	Goal tracking, portfolio aggregation	Holistic wealth view
ET Money	Tax-saving and fund recommendations	Personalized planning

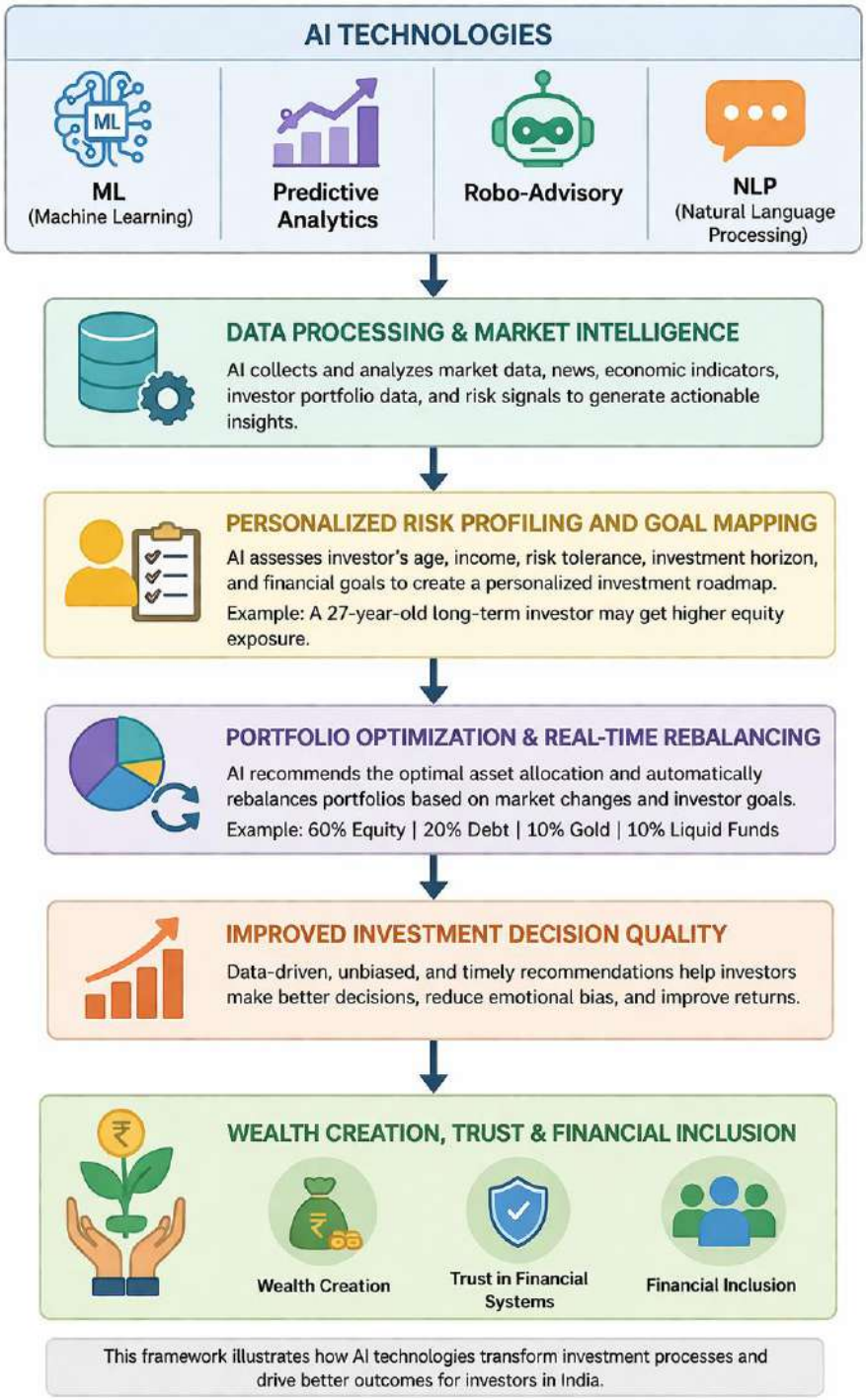
Table 1

Note. *Adapted by the author from official platform information available on Groww, Zerodha, INDmoney, and ET Money websites.*

Table 1 depicts selected AI-enabled investment platforms in India and their key applications along with investor benefits. It shows how Artificial Intelligence is being used in financial planning and wealth management within the Indian FinTech sector.

As shown in the table, **Groww** provides fund recommendations and SIP insights, making retail investing easier for first-time investors. **Zerodha** offers analytics dashboards and market insights that help investors make informed decisions. **INDmoney** supports goal tracking and portfolio aggregation, giving investors a holistic view of their wealth. Similarly, **ET Money** provides tax-saving suggestions and personalized financial planning. Thus, **Table 1 highlights** the growing role of AI in improving investment decisions and increasing retail investor participation in India.

3.4 Conceptual Framework Diagram



This framework illustrates how AI technologies transform investment processes and drive better outcomes for investors in India.

"The above conceptual framework illustrates the sequential relationship between AI-enabled financial technologies and improved investment outcomes among Indian investors."

4. LITERATURE REVIEW

This paper is **conceptual and review-based** in nature.

The study relies on **secondary data sources**, including: - research articles - journals - books - reports by RBI, SEBI, and financial institutions - published articles on AI and FinTech - industry white papers and websites

The methodology focuses on reviewing existing literature and synthesizing conceptual insights relevant to the Indian financial market.

Recent literature strongly supports the transformative role of Artificial Intelligence in financial planning and wealth management.

1. **AI for Financial Inclusion and Sustainable Development** Marak and Ayyagari (2025) conducted a systematic literature review to examine the role of Artificial Intelligence in promoting financial inclusion and sustainable development. Their study highlights that AI-powered financial systems, including intelligent advisory tools and predictive decision models, improve access to financial services for underserved populations. The review emphasizes that AI-driven platforms can bridge the gap between financial institutions and retail investors by offering personalized and affordable investment solutions, particularly in emerging economies such as India.

2. **AI in Investment Management and Strategic Decision-Making** A recent review published in the *International Review of Financial Analysis* (2025) examined 178 peer-reviewed studies on AI applications in investment management. The study identified key themes such as portfolio optimization, financial forecasting, robo-advisory services, fraud detection, and strategic investment decisions. The authors conclude that AI has transformed wealth management by enabling data-driven, efficient, and personalized investment strategies, while also raising concerns regarding governance and ethical use.

3. **Robo-Advisors and Investor Behaviour** Kulkarni, Patil, and Pramod (2025) explored the influence of AI-driven robo-advisors on retail investors' decision-making behaviour. Using behavioural finance theory, their study found that personalization, algorithmic trust, and platform interactivity significantly reduce biases such as overconfidence and loss aversion. The findings are particularly relevant for Indian retail investors increasingly using digital investment platforms such as Groww and Zerodha.

4. **AI in Wealth Management Services** Bhardwaj (2025) reviewed the application of AI in wealth management and observed that technologies such as machine learning, deep reinforcement learning, and natural language processing are redefining portfolio advisory services. The study emphasizes the shift from

traditional human advisory models toward intelligent, automated systems that offer continuous portfolio monitoring and real-time rebalancing.

5. **Intelligent Portfolio Optimization** Recent research by Yaramolu (2025) focused on AI-powered portfolio management and found that machine learning algorithms significantly improve asset allocation decisions, risk assessment, and return optimization. The study suggests that AI-based systems outperform conventional models by capturing complex market patterns and investor preferences more efficiently.

6. Robo-Advisory Services and Investor Adoption Sharma and Kesharwani (2025) conducted a comprehensive literature review on robo-advisory services and their impact on wealth management practices. Their study analyzed research from 2008 to 2024 and found that AI-powered automated advisory systems significantly improve investment accessibility, cost efficiency, and retail investor participation. The authors further emphasize that robo-advisors have transformed traditional financial advisory by offering algorithm-driven portfolio recommendations and personalized risk assessment, particularly among young digital investors in India.

7. AI, Behavioural Finance, and Wealth Management Chandani and Bhatia (2025) explored the emerging role of AI-driven robo-advisory services in investment decision-making through the lens of behavioural finance. Using a systematic literature review approach, the study highlights that AI tools help reduce behavioural biases such as herd mentality, overconfidence, and emotional decision-making. The authors conclude that robo-advisory platforms are increasingly supplementing human financial advisors and are playing a significant role in shaping modern wealth management practices, especially in the Indian context.

In the Indian context, AI-enabled wealth platforms and robo-advisors are expanding retail participation, especially among young investors using digital investment apps and SIP-based planning systems.

5. AI IN FINANCIAL PLANNING AND WEALTH MANAGEMENT

AI has transformed financial planning by enabling investors to make informed and rational decisions.

5.1 Personalized Investment Advisory

AI-powered robo-advisors analyze investor profiles based on: - income - age - risk appetite - financial goals - investment horizon

Based on this information, the system suggests customized portfolios.

For example, a young investor with high-risk tolerance may receive equity-focused recommendations, while a pre-retirement investor may be advised toward debt and balanced funds.

5.2 Portfolio Optimization

Machine learning algorithms continuously monitor market trends and asset performance. AI helps in: - asset allocation - diversification - rebalancing portfolios - minimizing unsystematic risk

This improves return potential and ensures alignment with financial goals.

5.3 Predictive Analytics

AI uses predictive models to forecast market behavior using historical data, macroeconomic indicators, and sentiment analysis.

This helps investors make better decisions regarding: - stock selection - mutual funds - bonds - sectoral investments

5.4 Risk Assessment

AI tools assess risk exposure by evaluating volatility, correlation, and economic indicators.

This enables better risk management and reduces emotional bias in investment decisions.

6. TRANSFORMATION OF INVESTMENT DECISIONS IN INDIA

India has emerged as a rapidly growing investment market due to increased financial awareness and digitization.

AI has transformed investment decisions in the following ways:

6.1 Increased Retail Participation

Mobile applications and digital platforms have simplified investing for retail participants.

AI-based suggestions on SIP amount, goal-based investing, and fund selection encourage first-time investors.

6.2 Goal-based Financial Planning

Investors increasingly plan for: - retirement - child education - home purchase - tax savings

AI helps map investment products to specific goals.

6.3 Real-time Decision Support

AI enables instant alerts and recommendations based on market fluctuations.

For example, during volatile market conditions, AI systems may recommend rebalancing or staggered investments.

6.4 Improved Financial Inclusion

AI-driven advisory services provide low-cost wealth management solutions to middle-income and small investors who may not have access to traditional wealth advisors.

This is especially relevant in India, where financial inclusion remains a major developmental objective.

7. BENEFITS OF AI IN WEALTH MANAGEMENT

The major benefits include:

- **Accuracy:** Reduced human error in data analysis
- **Speed:** Faster processing of market information
- **Cost efficiency:** Lower advisory fees through automation
- **Personalization:** Tailored financial solutions
- **Scalability:** Service to a large customer base
- **Better forecasting:** Improved investment predictions

8. CHALLENGES AND LIMITATIONS

Despite its advantages, AI faces several challenges.

8.1 Data Privacy and Security

Financial data is highly sensitive. AI systems require access to personal and transactional data, raising concerns regarding privacy and cybersecurity.

8.2 Algorithmic Bias

Incorrect training data may lead to biased investment recommendations.

8.3 Lack of Human Judgment

AI may not fully capture behavioral and emotional aspects influencing financial decisions.

8.4 Regulatory Concerns

The use of AI in financial advisory requires clear regulatory guidelines from SEBI and RBI to ensure investor protection.

9. FUTURE SCOPE AND RESEARCH IMPLICATIONS

The future of AI in India's financial planning and wealth management ecosystem is highly promising and research-intensive.

Recent policy developments suggest stronger institutional support. The Reserve Bank of India's committee recommendations on a responsible AI framework for the financial sector indicate a strategic move toward ethical adoption, governance, and infrastructure development for AI-led financial services. (reuters.com)

Future research may focus on the following areas: - Explainable AI (XAI) in investment decisions, behavioral finance and AI-driven investor psychology, ESG-integrated intelligent portfolio models, AI bias and ethical governance in wealth advisory, LLM-based conversational financial assistants, hybrid human-AI advisory frameworks

Theoretical models integrating Technology Acceptance Model (TAM), behavioral finance theory, and algorithmic trust may further strengthen future conceptual research in this domain.

10. CONCLUSION

Artificial Intelligence has emerged as a strategic enabler in transforming financial planning and wealth management in India. The integration of machine learning, predictive analytics, robo-advisory systems, and intelligent portfolio optimization tools has significantly enhanced the quality, accessibility, and efficiency of investment decision-making.

Recent literature increasingly positions AI not merely as an automation tool but as a framework for strategic, evidence-based financial governance and sustainable wealth creation. (sciencedirect.com)

For India, where financial inclusion and digital adoption are rapidly expanding, AI offers substantial scope to bridge advisory gaps for retail and emerging investors. However, future progress must be supported by robust regulation, explainability, investor protection, and ethical data governance.

This paper contributes conceptually to the growing body of literature on AI-enabled financial transformation and offers scope for future empirical studies focusing on investor perception and adoption behavior.

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TEACHERS' EMOTIONAL INTELLIGENCE AND CLASSROOM MANAGEMENT BEHAVIOUR IN RELATION TO EDUCATIONAL TECHNOLOGY AND INNOVATION

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ABSTRACT

The present study investigates the relationship between teachers' emotional intelligence (EI), classroom management behaviour, and their use of educational technology and innovation among secondary school teachers. Emotional intelligence plays a crucial role in shaping teachers' interpersonal effectiveness, decision-making, and classroom climate, while classroom management remains a central determinant of student engagement and academic success. With the growing integration of educational technology and innovative pedagogical practices, teachers are required to adapt emotionally and professionally to dynamic learning environments. The study adopts a quantitative research approach, using standardized tools to measure emotional intelligence, classroom management behaviour, and the level of technology integration and innovation. A representative sample of secondary school teachers is selected through random sampling. Statistical techniques such as correlation and regression analysis are employed to examine relationships among variables. The findings are expected to reveal a significant positive relationship between emotional intelligence and classroom management behaviour, as well as their combined influence on the effective use of educational technology and innovation. The study highlights the importance of developing emotional competencies among teachers to enhance adaptive teaching practices in technologically enriched classrooms. It also provides implications for teacher training, policy-making, and future research in the field of education.

Keywords: *Emotional Intelligence, Classroom Management Behaviour, Educational Technology, Innovation.*

INTRODUCTION

Education in the 21st century is undergoing rapid transformation due to advancements in educational technology and innovative pedagogical practices. Teachers are no longer mere transmitters of knowledge but facilitators of learning in dynamic, technology-rich environments. In such contexts, emotional intelligence becomes a vital attribute that enables teachers to manage their own emotions and those of their students effectively.

Classroom management behaviour is another essential aspect of teaching that directly impacts student learning outcomes. Effective classroom management involves creating a positive learning environment, maintaining discipline, and fostering student

engagement. With the integration of digital tools, online platforms, and innovative teaching strategies, classroom management has become more complex and multifaceted.

Educational technology and innovation have revolutionized teaching-learning processes by introducing interactive tools, blended learning environments, and student-centered approaches. However, the successful implementation of these innovations largely depends on teachers' emotional competence and their ability to manage classrooms effectively.

This study seeks to explore how teachers' emotional intelligence and classroom management behaviour relate to their use of educational technology and innovation. Understanding these relationships will contribute to improving teaching effectiveness and enhancing the quality of education.

REVIEW OF RELATED LITERATURE

1. Smith (2020)
Smith conducted a study on emotional intelligence and teacher effectiveness, finding that teachers with higher EI demonstrated better classroom control and student engagement. The study emphasized the role of self-awareness and empathy in managing classroom dynamics.

2. Kumar and Sharma (2021)
This study examined the integration of educational technology in secondary schools and found that teachers with strong emotional regulation skills were more adaptable to technological changes. The research highlighted the importance of emotional resilience in adopting innovative teaching methods.

3. Lee (2022)
Lee explored the relationship between classroom management behaviour and student outcomes in technology-enhanced classrooms. The findings indicated that effective classroom management significantly improved student participation and reduced disruptive behaviour.

4. Patel (2023)
Patel investigated the impact of innovation in teaching practices on teacher performance. The study concluded that innovative teachers who used digital tools effectively also exhibited higher levels of emotional intelligence.

5. Gupta and Verma (2024)
This recent study analyzed the combined effect of emotional intelligence and classroom management on the use of educational technology. The results showed a strong positive correlation among all variables, suggesting that emotionally intelligent teachers are more successful in implementing innovative teaching strategies.

Variables of the Study

- Independent Variable:

1) Emotional Intelligence

2) Classroom Management Behaviour

- Dependent Variables:

1) Educational technology and innovation.

Conceptual Definitions

1) Emotional Intelligence: The ability to perceive, understand, manage, and regulate emotions in oneself and others.

2) Classroom Management Behaviour: The strategies and practices used by teachers to maintain discipline, organize classroom activities, and create a conducive learning environment.

3) Educational Technology and Innovation: The use of digital tools, resources, and innovative teaching methods to enhance the teaching-learning process.

Operational Definitions

1) Emotional Intelligence: Measured using a standardized Emotional Intelligence Scale assessing self-awareness, self-regulation, motivation, empathy, and social skills.

2) Classroom Management Behaviour: Assessed through a Classroom Management Behaviour Scale evaluating discipline, engagement, organization, and interaction.

3) Educational Technology and Innovation: Measured through a self-developed questionnaire focusing on the frequency and effectiveness of technology use and innovative teaching practices.

Objectives of the Study

1) To study the level of emotional intelligence among secondary school teachers.

2) To examine classroom management behaviour among teachers.

3) To analyze the use of educational technology and innovation in teaching.

4) To determine the relationship between emotional intelligence and classroom management behaviour.

5) To explore the relationship between emotional intelligence and educational technology.

6) To study the relationship between classroom management behaviour and educational technology.

Hypotheses

1) There is no significant relationship between emotional intelligence and classroom management behaviour.

2) There is no significant relationship between emotional intelligence and educational technology.

3) There is no significant relationship between classroom management behaviour and educational technology.

RESEARCH METHODOLOGY AND TOOL

- Research Design: Descriptive survey method
- Population: Secondary school teachers
- Sample: 100–200 teachers selected through random sampling
- Tools Used:
  - Emotional Intelligence Scale
  - Classroom Management Behaviour Scale
  - Educational Technology and Innovation Questionnaire
- Statistical Techniques:
  - Mean and Standard Deviation
  - Pearson Correlation
  - Regression Analysis

SIGNIFICANCE OF THE STUDY

This study holds considerable theoretical, practical, and policy-level significance in the contemporary educational landscape where technology integration and innovation are rapidly transforming classroom practices.

1. Theoretical Significance

The study contributes to the existing body of knowledge by establishing a conceptual linkage between emotional intelligence, classroom management behaviour, and educational technology. While these variables have often been studied independently, their combined influence provides a more holistic understanding of effective teaching in modern classrooms. It enriches educational psychology by highlighting the role of affective competencies in technology-mediated pedagogy.

2. Pedagogical Significance

The findings emphasize that effective teaching is not solely dependent on subject expertise or technological proficiency but also on teachers' emotional competence. Teachers with high emotional intelligence are better equipped to create inclusive, supportive, and engaging learning environments, especially in digitally enriched classrooms. This study reinforces the importance of integrating emotional skill development into pedagogical practices.

3. Significance for Classroom Management
In technology-driven classrooms, managing student behaviour becomes more complex due to distractions, diverse learning paces, and digital engagement challenges. The study highlights how emotionally intelligent teachers can better regulate classroom dynamics, maintain discipline, and foster positive interactions while using innovative teaching methods.

4. Significance for Educational Technology Integration
The study underscores that the successful adoption of educational technology depends not only on infrastructure but also on teachers' readiness, adaptability, and emotional resilience. It provides insights into how emotional intelligence facilitates openness to innovation, reduces resistance to change, and enhances effective utilization of digital tools.

5. Implications for Teacher Education and Training
Teacher training institutions can use the findings to design programs that focus on developing emotional intelligence alongside digital competencies. Pre-service and in-service training modules can incorporate emotional regulation, empathy, and stress management to prepare teachers for technologically advanced classrooms.

6. Policy-Level Significance
Educational policymakers can utilize the outcomes to frame policies that promote holistic teacher development. Investments in educational technology should be complemented with capacity-building initiatives that enhance teachers' emotional and managerial competencies.

FINDINGS OF THE STUDY

1) A positive correlation between emotional intelligence and classroom management behaviour.

2) Teachers with higher EI are more effective in using educational technology.

3) Innovative teaching practices are enhanced by strong classroom management skills.

SUGGESTIONS FOR FURTHER RESEARCH

1) Comparative studies across different educational levels.

2) Longitudinal studies to examine changes over time.

3) Experimental studies on EI training programs.

4) Studies focusing on digital burnout and teacher well-being.

5) Cross-cultural studies on educational technology adoption.

CONCLUSION

The present study provides a comprehensive understanding of the intricate relationship between teachers' emotional intelligence, classroom management behaviour, and the integration of educational technology and innovation in secondary

education. In the rapidly evolving educational landscape, where digital transformation is reshaping traditional pedagogical approaches, the role of teachers has expanded significantly. They are no longer mere transmitters of knowledge but facilitators, mentors, and emotional anchors who guide students through complex learning environments.

One of the key insights emerging from this study is that emotional intelligence serves as a foundational pillar for effective teaching. Teachers who demonstrate high levels of emotional intelligence—through self-awareness, emotional regulation, empathy, and social competence—are better equipped to handle the multifaceted challenges of modern classrooms. These competencies enable them to respond constructively to student behaviour, manage stress, and foster a positive and inclusive classroom climate. Emotional intelligence, therefore, is not an optional trait but a critical professional requirement in today's education system.

The study further establishes that classroom management behaviour is deeply influenced by teachers' emotional competencies. Effective classroom management goes beyond maintaining discipline; it involves creating a structured yet flexible learning environment where students feel safe, respected, and motivated to participate. Emotionally intelligent teachers are more adept at anticipating classroom issues, addressing disruptions calmly, and maintaining a balance between authority and approachability. This becomes particularly significant in technology-enabled classrooms, where distractions and varying levels of digital engagement can challenge traditional management strategies.

Another important conclusion is that the successful integration of educational technology and innovation is not solely dependent on access to digital tools or infrastructural support. Rather, it is strongly mediated by teachers' attitudes, adaptability, and emotional readiness. Teachers with higher emotional intelligence tend to exhibit greater openness to change, willingness to experiment with new teaching methods, and resilience in the face of technological challenges. They are more likely to use technology not just as a supplementary tool, but as a means to enhance student engagement, collaboration, and critical thinking.

The findings also highlight the synergistic relationship among the three variables. Emotional intelligence enhances classroom management, which in turn creates a conducive environment for the effective use of educational technology and innovative practices. This interconnectedness suggests that improving one variable can positively influence the others, leading to overall improvement in teaching effectiveness and student learning outcomes.

Moreover, the study underscores the need for a paradigm shift in teacher education and professional development programs. Traditional training models that focus primarily on subject knowledge and technical skills must be expanded to include emotional skill development and behavioural competencies.

Teachers must be trained not only to use technology, but also to manage the emotional and social dynamics that accompany its use in classrooms.

In conclusion, the future of education lies in achieving a harmonious balance between emotional intelligence, classroom management proficiency, and technological innovation. Teachers who are emotionally competent, pedagogically skilled, and technologically adaptive are better positioned to meet the diverse needs of 21st-century learners. Therefore, fostering emotional intelligence among teachers should be a central focus of educational reforms, as it directly contributes to more effective, inclusive, and innovative teaching-learning processes.

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ANALYSING PRACTICES OF EMPLOYEE ENGAGEMENT IN INDIAN WORKPLACES

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ABSTRACT

Employee engagement, also known as worker engagement, can be understood as the binding of organizational members' selves to their job roles. In today's globalized economy, organizations have become increasingly dependent on technology and automation, often shifting focus away from human capital. This underlines the need to connect and engage employees with their work and to provide them with a clear organizational identity. Employee engagement is a measurable degree of an employee's positive or negative emotional attachment to their job, colleagues, and organization, which significantly influences their willingness to learn and perform at work. This study explores and analyses the various employee engagement policies implemented by top companies around the world, identifies key factors for measuring engagement, and suggests ways of designing effective engagement programs. The research relies on secondary data collected from books, management journals, periodicals, and web-based sources.

***Keywords**: Employee Engagement, HR Practices, Organizational Identity*

1. INTRODUCTION

In today's globalized economy, organizations have become more dependent on technologies and data-driven operations, and in many cases the concentration on employees as human beings is diminishing. This has created a greater need to connect and engage employees with their work and to provide them with a strong organizational identity. Employee engagement, also referred to as worker engagement, can be described as the binding of organizational members' selves to their job roles. Scarlett defines employee engagement as "a measurable degree of an employee's positive or negative emotional attachment to their job, colleagues and organization that profoundly influences their willingness to learn and perform at work."

Schmidt's influential definition describes engagement as "an employee's involvement with, commitment to, and satisfaction with work", and engagement is closely linked with employee retention. For an organization, hiring an effective employee is important, but retaining that employee with the organization is even more critical. In the present era, where every contribution of employees is counted and competition is intense, engagement plays a major role in organizational success. Employee engagement programs thus become yet other stepping-stone toward sustainable growth and performance.

The objective of this study is:

- To explore and analyse the various employee engagement policies implemented by top companies around the world.
- To identify key factors that can be used to measure employee engagement.
- To suggest practical recommendations for designing effective employee engagement programs.

2. OBJECTIVES

The present study is guided by the following specific objectives:

- To analyse the employee engagement policies adopted by leading global and Indian companies.
- To determine the key indicators and instruments used to measure employee engagement.
- To propose a framework for designing and improving employee engagement programs in diverse organizational contexts.

Employee engagement is about creating a positive emotional connection between employees and the organization so that employees feel satisfied and proud to work in the company. Engagement programs help align human activities with organizational strategy and are not merely about involving employees productively, but about motivating them to put in their best efforts for achieving organizational goals.

3. RESEARCH METHODOLOGY

This study is partly descriptive and partly diagnostic in nature. It relies on **secondary data** collected from books, management journals, HR periodicals, business magazines, and credible web sources to understand the conceptual foundations of employee engagement and to examine contemporary HR practices adopted by top companies.

4. SIGNIFICANCE OF THE STUDY

Employee engagement is one of the most effective tools for achieving long-term success and shared value. Engagement has a profound impact on work performance, and work performance, in turn, directly affects organizational outcomes such as productivity, customer satisfaction, and profitability. The current study helps uncover the prevailing innovative engagement practices followed by companies and brings out the best practices and areas that require improvement.

By implementing these best practices, organizations can reduce employee turnover and absenteeism, enhance job performance, and improve the quality of work life and work–life balance of employees. This study further enables companies to design engagement policies that are culturally sensitive, data-driven, and aligned with business strategy, regardless of their size or sector.

5. EMPLOYEE ENGAGEMENT: CONCEPT AND THEORETICAL BACKGROUND

Employee engagement is a measurable construct that goes beyond job satisfaction, motivation, and organizational culture, although it overlaps with them. As per Scarlett, it is the degree of an employee's positive or negative emotional attachment to their job, colleagues, and organization, which influences their willingness to learn and perform.

Schmidt's definition emphasizes **involvement, commitment, and satisfaction with work**, while Kumar and Sia (2012) highlight the role of the work environment in shaping engagement in Indian organizations. Meyer and Allen's (1991) three-component model of organizational commitment—**affective, continuance, and normative**—helps explain the psychological basis of engagement, particularly the emotional attachment that drives discretionary effort.

In simple terms, employee engagement is about:

- Creating a positive emotional connection between employees and organizational goals.
- Ensuring employees feel satisfied, recognized, and proud to be part of the organization.
- Aligning individual aspirations and career development with organizational strategy through structured HR practices.

6. EMPLOYEE ENGAGEMENT PROGRAMS BY TOP GLOBAL AND INDIAN COMPANIES

In recent years, especially post-2020, leading organizations in India and worldwide have adopted more structured and data-driven engagement programs. Great Place to Work India and other global rankings highlight firms that outperform in trust, inclusion, and engagement. Below is an updated company-wise analysis using recent data (2024–2026).

6.1 Boston Consulting Group (BCG)

Boston Consulting Group (BCG) is consistently ranked among the world's best workplaces and appears in global "Best Companies to Work For" lists. BCG emphasizes that employees are central to organizational success and that companies must invest in what they can do for their employees. Key engagement practices include:

- Structured mentorship and career-path clarity.
- Challenging, high-impact projects.
- A strong employer brand that fosters a sense of identity and pride.

These practices help employees feel that they are part of a purpose-driven organization, thereby enhancing both engagement and retention.

6.2 Intel Corporation

Intel undertook a comprehensive review of its engagement practices and engaged a consulting firm to benchmark leading engagement practices. The company then implemented three key strategies:

- **Raising awareness**: Intel developed internal communication platforms to share CSR and sustainability practices, thereby increasing employees' pride and emotional attachment.
- **Expanding opportunities for involvement**: Employees from different business units were invited to join CSR and environmental-impact teams, which gave them a sense of contribution beyond their formal roles.restpublisher+1
- **Setting goals and aligning incentives**: Intel linked annual bonuses and performance metrics to sustainability and engagement goals, reinforcing accountability and motivation.

Post-2020, Intel has further strengthened flexible work, learning-and-development options, and mental-health support, aligning with 2025 global engagement trends.

6.3 Alstom India Pvt. Ltd.

Alstom India has introduced several engagement-oriented activities:

- Sports and cultural events to reduce work-related stress.
- Annual family-day-outs and sponsorship for employees' higher education.
- Half-yearly performance appraisals and individual-development plans for low-performers.

These initiatives link engagement directly with learning, recognition, and long-term growth, helping employees feel that the organization supports their progress.

6.4 GMR Hydro India Pvt. Ltd.

GMR Hydro focuses on socio-cultural mechanisms to enhance engagement:

- Cultural and sports events, employee-birthday celebrations, and meal vouchers.
- "Best Employee of the Month" and "Outstanding Employee" awards.
- Balance scorecards that clarify job expectations and regular job-satisfaction surveys.

These practices ensure that engagement is not only emotional but also connected to clear performance standards and data-backed feedback.

6.5 Tech Mahindra Ltd.

Tech Mahindra engages employees through:

- Team outings and CSR programs.

- In-office festivities such as Diwali, Christmas, and Dandiya celebrations, along with family-day events.
- Quarterly and annual recognition schemes such as "Best Support Group of the Year," "Star Performer," "Rising Star," and "Pat on Back" awards.

Recent internal surveys show that such structured recognition and work-life-friendly events have helped stabilize engagement in the Indian IT sector amid high attrition.

6.6 Larsen & Toubro Ltd.

Larsen & Toubro has adopted a holistic engagement-and-retention framework:

- Flexible working hours and detailed career-development plans.
- Outdoor training programs to reduce workplace stress and build managerial skills.
- Additional incentives and sponsorship for higher education, along with training in corporate ethics and personality development.

The company also conducts regular employee-satisfaction and engagement surveys, using the data to refine HR policies—a practice frequently highlighted among "Best Employers in India."

6.7 Google

Google is a benchmark for data-driven engagement:

- The "People Analytics" team studies employee satisfaction and engagement using surveys and behavioural data.
- The **Oxygen Project** identified eight manager behaviours that significantly enhance engagement:

1. Being a good coach.

2. Avoiding micromanagement.

3. Showing interest in team members' success.

4. Being a good communicator.

5. Helping employees with career development.

6. Being productive and result-oriented.

7. Possessing key technical skills to guide the team.

8. Providing a clear vision and strategy for the team.

Google's emphasis on managerial quality, flexible work, and psychological safety makes it a leading case of engagement in large technology firms.

6.8 Accenture Solutions Private Limited (India)

Accenture India appears in **India's Best Companies to Work For 2025** and ranks highly on trust and inclusion. Key engagement practices include:

- Continuous learning and upskilling programs via digital-learning platforms.
- Hybrid work policies and emphasis on work–life balance.
- Strong inclusion and diversity initiatives, mentorship circles, and internal mobility programs.

Surveys show that engagement is higher among employees who participate in structured learning and leadership-development tracks, indicating that **career-development opportunities are a key engagement lever in Indian IT**.

6.9 Tata Communications Limited

Tata Communications is another top-ranked Indian organization, often listed among India's best workplaces. The company emphasizes:

- Transparent communication from leadership.
- Employee-wellness programs and mental-health campaigns.
- Peer-to-peer recognition and appreciation systems.

Pulse surveys reveal that transparency and clarity of organizational vision are major determinants of employees' sense of pride and belonging.

6.10 Kotak Mahindra Bank

Kotak Mahindra Bank invests heavily in engagement-aligned HR practices:

- Leadership-development and "people-centric" management programs.
- Digital-HR tools for continuous feedback, recognition, and engagement tracking.
- Wellness, mental-health, and work-life-balance initiatives tailored to a large, hybrid workforce.

Available data show that branches and functions with higher engagement scores report better customer-service ratings and lower attrition, reinforcing the link between engagement and business outcomes.

6.11 NVIDIA India (Bengaluru)

NVIDIA India features in **India's Best Companies to Work For 2025**, highlighting a high-trust, innovation-driven culture. Engagement practices include:

- Flexible work policies and support for R&D and technical innovation.
- Grassroots innovation programs where employees can propose new ideas.
- Gamified recognition and peer-driven award systems.

This culture of technical autonomy and recognition helps NVIDIA retain skilled engineers during intense talent competition in the Indian tech sector.

6.12 Infosys and Other Nifty 50 IT Companies (Infosys, TCS, Wipro, HCL, Cognizant)

A 2025 study on employee retention in Nifty-50-listed IT companies in India shows that engagement-linked HR practices have helped these firms reverse high attrition spikes post-pandemic. Common practices include:

- Employee upskilling and certification-linked rewards.
- Hybrid-work models and flexible-work arrangements.
- Transparent communication about organizational performance and job security.
- Regular engagement and retention-focused surveys and action-planning cycles.

The study reports engagement-driven retention improvements, with retention rising to around **81% by 2024–25** in leading Indian IT firms, up from much lower levels in 2021–22.

6.13 Dell India: Case of Stay Surveys and Hybrid Engagement

Dell India faced the challenge of engaging a hybrid workforce. A 2025 "Stay Survey" program uncovered friction points such as:

- Remote-collaboration difficulties.
- Lack of visibility for remote workers in promotion decisions.

By introducing virtual recognition ceremonies and hybrid-friendly promotion criteria, Dell India improved engagement scores by **approximately 19%**, demonstrating that data-driven, continuous feedback mechanisms are powerful levers for engagement.

7. EFFECTS OF EMPLOYEE DISENGAGEMENT

Engaged employees feel supported not only through their salary and role but also through the organization's values, communication style, and leadership behaviour. They develop a sense of belonging, pride, and loyalty, which enhances retention and performance.

Conversely, when employees are disengaged, several adverse consequences arise:

- Increased absenteeism and late arrivals.
- Lower productivity and reduced output.
- Complaints about colleagues and a negative work environment.
- Loss of interest in organizational goals and frequent missed deadlines.

ADP's 2025 report on India notes that workforce engagement in India declined to **19% in 2025**, down from 24% in 2024, marking one of the sharpest drops globally. This trend underlines the risks of neglecting engagement and the urgency for organizations to redesign their HR practices.

8. RECENT TECHNIQUES USED BY CORPORATE ORGANIZATIONS FOR EMPLOYEE ENGAGEMENT (2024–2026)

Modern organizations are adopting innovative and holistic engagement techniques that go beyond traditional rewards. Key recent practices include:

- Individualized recognition and AI-powered recognition platforms.
- Flexible and hybrid work arrangements (including remote work options).
- Wellness "micro-moments" such as short daily meditations, ergonomic stretches, and mindfulness apps.
- Gamified and peer-to-peer recognition systems.
- Sabbatical policies, CSR-driven volunteering, and learning-sponsorship programs.
- Annual bonuses linked to tenure, performance, and sustainability outcomes.
- Corporate-level sports and cultural-day events.
- Best-employee awards based on measured performance and impact.
- Opportunities to attend national and international conferences and training programs.
- Celebrations of birthdays, family days, and festivals (Diwali, Dandiya, Christmas, etc.).
- Employee-satisfaction and engagement-surveys administered regularly.
- Transport and late-hour cab facilities.
- Comprehensive training in both technical and soft skills.
- Work-from-home and hybrid options.
- Meal coupons, gift vouchers, and joining bonuses for high-potential talent.

These practices show that engagement in 2025–2026 is increasingly driven by **trust in leadership, clarity of vision, flexibility, recognition, wellness support, and clear career-path communication**.

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ATAL INCUBATION MISSION AS A STRATEGIC INSTRUMENT FOR REALIZING VIKSIT BHARAT

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1. ABSTRACT

India's aspiration to emerge as a developed nation by 2047 conceptualized as Viksit Bharat requires a structural transformation driven by innovation, entrepreneurship, and knowledge-based economic growth. In this context, the Atal Innovation Mission (AIM), established in 2016 under NITI Aayog, represents a pivotal institutional intervention designed to cultivate a nationwide innovation ecosystem. Among its various components, Atal Incubation Centres (AICs) serve as critical nodes for supporting startups through infrastructure provisioning, mentorship, financial facilitation, and ecosystem integration.

This paper undertakes a comprehensive and critical analysis of AIM as a strategic policy instrument contributing to India's developmental trajectory. It examines the institutional framework, operational dynamics, and measurable outcomes of AICs in fostering entrepreneurship, generating employment, and enhancing technological capabilities. Furthermore, the study evaluates structural and systemic challenges including regional disparities, funding constraints, and monitoring inefficiencies that limit the mission's effectiveness.

Using an input–process–output–outcome analytical framework, the paper argues that while AIM has significantly strengthened India's innovation ecosystem, its long-term impact depends on addressing gaps in inclusivity, financial sustainability, and institutional coordination. The study concludes with policy recommendations aimed at enhancing the mission's efficiency and aligning it more closely with the broader goals of Viksit Bharat.

Keywords: *Atal Incubation Mission, Atal Incubation Centres, Viksit Bharat, Innovation Ecosystem, Entrepreneurship, Startup Ecosystem*

1. INTRODUCTION

The pursuit of becoming a developed economy by 2047 marks a defining trajectory in India's contemporary policy discourse. The vision of "Viksit Bharat" encapsulates not merely economic growth but also structural transformation characterized by technological advancement, innovation capacity, and inclusive development. In an increasingly knowledge-driven global economy, innovation and entrepreneurship have emerged as critical determinants of national competitiveness and sustainable growth.

Recognizing this imperative, the Government of India has undertaken several initiatives to institutionalize innovation within its developmental framework.

Among these, the Atal Innovation Mission (AIM), constitutes a comprehensive and multi-dimensional approach to nurturing innovation across various sectors. AIM seeks to establish an enabling ecosystem that facilitates idea generation, knowledge dissemination, and enterprise creation.

A key component of AIM is the establishment of Atal Incubation Centres (AICs), which serve as institutional platforms for supporting startups and early-stage enterprises. These centers are strategically located within academic institutions, research organizations, and industry ecosystems, thereby fostering collaboration and knowledge exchange. By bridging the gap between ideation and commercialization, AICs play a pivotal role in strengthening India's entrepreneurial landscape.

2. OBJECTIVES OF THE STUDY

The present study is guided by the following objectives:

1. To discuss the institutional framework and operational mechanisms of the Atal Innovation Mission.
2. To evaluate the role of Atal Incubation Centres in fostering entrepreneurship and innovation.
3. To assess the contribution of AIM to India's vision of Viksit Bharat.
4. To identify key challenges and limitations associated with the implementation of the mission.
5. To suugest policy recommendations for improving the effectiveness and inclusivity of AIM.

3. INSTITUTIONAL FRAMEWORK AND CORE COMPONENTS OF ATAL INNOVATION MISSION

The institutional framework of the Atal Innovation Mission (AIM), reflects a multi-layered innovation pipeline that can be empirically examined through input–process–output indicators.

4.1 Atal Tinkering Labs (ATLs): Quantitative Reach and Early-Stage Innovation Outcomes

ATLs represent the foundational layer of AIM, focusing on nurturing innovation at the school level. These labs aim to inculcate problem-solving skills, creativity, and a scientific temperament among students. From a quantitative perspective, ATLs have achieved substantial expansion across India. However, their effectiveness varies significantly based on availability of trained mentors, quality of infrastructure and equipment and Institutional support from schools. While metrics such as student participation and project outputs indicate progress, qualitative disparities highlight the need for capacity building interventions

4.2 Atal Incubation Centres (AICs): Startup Development and Economic Impact

AICs serve as the core operational component of AIM, focusing on startup incubation and enterprise development. They generate measurable economic outcomes, including:

- Startup creation and survival rates
- Employment generation
- Funding mobilization
- Intellectual property outputs

Empirical evidence suggests that startups incubated within structured environments exhibit higher survival rates compared to independent ventures. However, performance varies across centres due to differences in institutional capacity and ecosystem maturity.

4.2 Atal Community Innovation Centres (ACICs): Inclusivity and Regional Penetration

ACICs aim to democratize innovation by targeting underserved regions. Their impact can be assessed through participation of rural and marginalized communities, development of grassroots innovations and local enterprise creation. Although ACICs have improved regional outreach, challenges related to scalability and sustained funding persist.

4.3 AIM 2.0 Initiatives: Scaling and Systemic Integration

AIM 2.0 represents a strategic shift from the initial phase of ecosystem creation toward **scaling, integration, and impact enhancement.** While earlier efforts focused on establishing innovation infrastructure such as Atal Tinkering Labs (ATLs) and Atal Incubation Centres (AICs), AIM 2.0 emphasizes improving the **quality, efficiency, and long-term sustainability** of these institutions.

A key feature of this phase is the focus on **scaling high-impact startups**, particularly in emerging sectors such as deep technology, clean energy, and biotechnology. Rather than expanding the number of centres, the emphasis is on strengthening existing ones to enhance **startup survival, growth, and global competitiveness.** Another critical dimension is **pipeline integration**, ensuring a seamless transition from school-level innovation (ATLs) to incubation (AICs) and ultimately to commercialization. This reduces fragmentation and improves innovation outcomes.

AIM 2.0 also promotes **ecosystem convergence** by strengthening linkages among academia, industry, government, and investors, thereby fostering collaboration and knowledge spillovers. Additionally, it incorporates **global partnerships** to enhance international exposure and market access for Indian startups. Overall, AIM 2.0 reflects a shift toward a **more integrated, outcome-oriented, and globally competitive innovation ecosystem,** aligned with India's long-term development goals under Viksit Bharat.

4. ATAL INCUBATION CENTRES: STRUCTURE AND FUNCTIONAL DYNAMICS ENABLING ENTREPRENEURIAL ECOSYSTEMS

AICs are institutionally designed to function as innovation intermediaries, reducing entry barriers for startups by addressing key constraints such as lack of infrastructure, limited access to capital, and absence of expert guidance. From an evaluative perspective, their role in fostering entrepreneurship can be assessed through their ability to de-risk early-stage ventures and enhance startup survivability.

Empirical and policy-oriented literature suggests that incubated startups tend to exhibit higher survival rates and improved business performance compared to non-incubated counterparts. This indicates that AICs contribute significantly to venture stabilization and innovation conversion, i.e., transforming ideas into viable business models. However, critical analysis also highlights a potential limitation: over-reliance on institutional support may delay independent market adaptation if exit frameworks are not robust.

5.1 Mechanisms Driving Innovation and Entrepreneurship

The effectiveness of AICs in fostering innovation can be evaluated through their core functional dimensions:

Infrastructure Provision: By offering co-working spaces, prototyping labs, and technical facilities, AICs reduce the initial capital burden on startups. This enables entrepreneurs to focus on product development and experimentation, thereby accelerating innovation cycles. However, disparities in infrastructure quality across centres can influence the extent of innovation outcomes.

Mentorship and Advisory Services: Mentorship plays a pivotal role in shaping entrepreneurial success. AICs connect startups with industry experts, academicians, and experienced entrepreneurs, facilitating knowledge transfer and strategic decision-making. Evidence indicates that startups with consistent mentoring support demonstrate better scalability and innovation quality, although uneven mentor availability across regions remains a constraint.

Financial Facilitation: AICs enhance access to funding by linking startups with investors, venture capitalists, and government grants. This function is crucial in addressing the "valley of death" phase in entrepreneurship. While AIC supported startups have shown improved funding access, regional imbalances persist, particularly in non-metropolitan areas where investor networks are less developed.

Capacity Building: Through structured training programs, AICs build entrepreneurial competencies in areas such as business planning, marketing, and regulatory compliance. This contributes to the development of innovation-ready human capital. However, the long-term effectiveness of such programs depends on continuous skill upgradation aligned with evolving market needs.

Networking and Collaboration: AICs facilitate linkages between startups, industry, academia, and global markets. These networks are essential for innovation diffusion,

partnerships, and market entry. Strong ecosystem connectivity has been positively associated with higher startup growth and innovation adoption.

5. CONTRIBUTION OF ATAL INNOVATION MISSION TO VIKSIT BHARAT

The Atal Innovation Mission (AIM) plays a pivotal role in advancing India's vision of *Viksit Bharat* by fostering an innovation-driven and entrepreneurship-led growth model. Through its institutional mechanisms, particularly Atal Incubation Centres (AICs), AIM contributes across multiple dimensions, including entrepreneurship development, employment generation, ecosystem strengthening, inclusivity, and global competitiveness.

6.1 Entrepreneurship Development: Catalyzing Innovation-Led Growth

AIM significantly contributes to transforming India's economic structure from a resource-driven to an innovation driven model. By reducing structural barriers such as limited access to capital, infrastructure, and mentorship, AICs enable broader participation in entrepreneurship, especially among first-generation entrepreneurs. This has led to the institutionalization of entrepreneurship, shifting it from informal and risk-averse activities to structured and opportunity driven ventures. Moreover, AIM addresses a critical bottleneck in developing economies innovation commercialization. Through support mechanisms such as prototyping, testing, and market validation, AICs facilitate the conversion of ideas into commercially viable enterprises. This strengthens the linkage between research and industry, ensuring that innovation contributes directly to economic productivity. Additionally, AIM promotes sectoral diversification by supporting startups in emerging fields such as artificial intelligence, clean energy, and biotechnology. This diversification enhances economic resilience and aligns with the long-term development objectives of Viksit Bharat.

6.2 Employment Generation: Addressing Structural Workforce Challenges

AIM contributes to employment generation both quantitatively and qualitatively. Startups incubated within AICs create high-skill, knowledge intensive jobs, including roles in technology, research, and management, thereby aligning with India's demographic advantage. Beyond direct employment, AIM generates indirect employment through supply chains, service providers, and gig economy platforms. This multiplier effect expands the overall economic impact of the mission. Furthermore, startups promote a transition toward formal and innovation-based employment structures, characterized by higher productivity and digital integration, in contrast to traditional informal sectors. However, the effectiveness of employment generation is moderated by challenges such as skill mismatches and job instability. This underscores the need for complementary skill development initiatives to fully harness the employment potential of AIM.

6.3 Strengthening the Innovation Ecosystem: Institutional Convergence

One of AIM's most significant contributions lies in fostering a collaborative innovation ecosystem based on the "triple helix" model involving academia, industry,

and government. AICs act as intermediary institutions, facilitating knowledge transfer from research organizations to market oriented enterprises. This reduces the long-standing gap between theoretical research and practical application. AIM also promotes the development of innovation clusters, where startups, investors, and institutions co-exist and interact. These clusters generate positive externalities such as knowledge spillovers, enhanced collaboration, and increased productivity. Furthermore, the integration of Atal Tinkering Labs (ATLs) with AICs creates a pipeline approach to innovation, ensuring continuity from early-stage ideation to enterprise creation. However, gaps in this transition highlight the need for stronger integration mechanisms.

6.4 Promoting Inclusive Growth: Bridging Regional and Social Gaps

Inclusivity is a core component of Viksit Bharat, and AIM contributes by expanding innovation infrastructure beyond metropolitan areas. The establishment of AICs in Tier-2 and Tier-3 cities promotes decentralization of innovation ecosystems, thereby reducing regional disparities and encouraging local entrepreneurship. AIM also enhances participation from underrepresented groups, including women and marginalized communities, contributing to equitable economic development. Additionally, support for grassroots and frugal innovations enables solutions tailored to local challenges, fostering sustainable development. Despite these efforts, disparities in infrastructure, funding access, and mentorship quality continue to limit the full realization of inclusive innovation.

6.5 Enhancing Global Competitiveness: Positioning India in the Innovation Economy

AIM plays a strategic role in strengthening India's position in the global innovation landscape. By supporting startups with high growth potential, AICs contribute to intellectual property generation, technological advancement, and export-oriented innovation. The mission also aligns with the objective of Atmanirbhar Bharat by promoting indigenous innovation and reducing dependence on imported technologies. However, challenges such as limited deep-tech capabilities, low R&D investment, and barriers to global market access indicate that India's innovation ecosystem is still evolving. Overall, AIM serves as a critical policy instrument in advancing innovation-led growth, employment generation, and inclusive development, thereby contributing significantly to the realization of Viksit Bharat.

6. CHALLENGES AND LIMITATIONS OF ATAL INNOVATION MISSION

No policy or initiatives comes with only benefits and so these are the challenges that influence the effectiveness of Atal Incubation Mission and limit their potential contribution to India's innovation ecosystem which can be overcome by implementing strategic changes.

7.1 Infrastructural Constraints: Uneven Capacity and Resource Gaps

A major limitation of AIM lies in the uneven distribution of infrastructure across AICs.

While centres in metropolitan regions benefit from advanced facilities and strong ecosystem linkages, those in peripheral regions often face inadequate resources. This disparity affects the quality and scalability of innovation outputs, leading to inconsistent performance across centres. In many cases, underutilization of infrastructure in less-developed regions further reduces efficiency.

7.2 Financial Sustainability: Funding Gaps and Dependency

The issue of financial sustainability manifests at two levels: startup financing and incubator viability. Startups frequently face the "valley of death," where they are unable to secure follow on funding after initial incubation. This is particularly acute in non-metropolitan regions with limited investor presence. Simultaneously, many AICs remain dependent on government grants, with limited development of self-sustaining revenue models. This raises concerns about the long-term sustainability of the incubation ecosystem.

7.3 Skill Deficiencies: Gaps in Entrepreneurial and Managerial Capabilities

Despite capacity-building initiatives, a significant number of entrepreneurs lack critical business and managerial skills. This includes deficiencies in strategic planning, financial management, and market analysis. Additionally, the quality of mentorship varies significantly across AICs, leading to uneven outcomes. This inconsistency reduces the overall effectiveness of incubation support and contributes to lower startup survival rates.

7.4 Regional Disparities: Unequal Access and Innovation Divide

Although AIM has expanded geographically, innovation activity remains concentrated in urban centers. This reflects deeper structural issues such as weak local ecosystems, limited investor networks, and lack of exposure in rural areas. As a result, the objective of inclusive innovation is only partially achieved, and a persistent innovation divide continues to exist.

7.5 Monitoring and Evaluation Gaps: Weak Performance Assessment

The current monitoring framework emphasizes quantitative indicators such as the number of startups incubated. However, it lacks sufficient focus on qualitative outcomes, including innovation impact and long-term sustainability. The absence of post-incubation tracking mechanisms further limits the ability to assess long-term success. This weakens accountability and constrains evidence-based policymaking.

7.6 Other Challenges:

- Many startups face difficulties after graduating from AICs due to lack of continued mentorship, funding access, and market linkages.
- Despite the intended collaboration, gaps remain in translating academic research into commercially viable products.
- A focus on increasing the number of incubated startups sometimes comes at the cost of innovation depth and technological sophistication.

- Overlap with other initiatives (e.g., Startup India) can lead to duplication of efforts and inefficiencies in implementation.
- Indian startups supported by AICs still face barriers in accessing global markets, including regulatory challenges and limited international networks.

While the Atal Innovation Mission has significantly advanced India's innovation ecosystem, its implementation is constrained by infrastructural inequalities, funding gaps, skill deficiencies, regional imbalances, and weak monitoring systems. These challenges highlight the need for institutional strengthening, improved policy coordination, and a shift toward outcome-based evaluation frameworks.

7. RECOMMENDATION FOR POLICY IMPROVEMENT

These recommendations focus on improving institutional efficiency, ensuring inclusivity, and strengthening long-term sustainability under the strategic guidance.

8.1 Expansion of Incubation Infrastructure: Towards Balanced Regional Development

Policy efforts should focus not only on increasing the number of AICs but also on ensuring quality and regional relevance. Establishing sector-specific incubators in rural areas can align innovation with local economic strengths. Digital incubation platforms can further bridge geographic barriers, enabling remote access to mentorship and resources. This would promote a more equitable distribution of innovation capacity.

8.2 Strengthening Financial Ecosystems: Bridging the Funding Lifecycle

A structured financial ecosystem is essential for startup sustainability. This includes the creation of dedicated follow-on funds to support startups beyond the incubation stage. Encouraging regional venture capital networks and providing tax incentives for investors can enhance capital availability. These measures would reduce dependency on government funding and improve capital flow efficiency.

8.3 Capacity Building Initiatives: Enhancing Entrepreneurial Competence

There is a need to transition from short-term training programs to continuous, outcome-oriented capacity building. Advanced curricula focusing on scaling strategies, global markets, and innovation management should be introduced. Improving mentor quality through structured training programs and industry involvement can ensure consistent guidance across AICs.

8.4 Public-Private Partnerships: Leveraging Market Expertise

Strengthening collaboration with the private sector can significantly enhance the effectiveness of AICs. Private entities bring market knowledge, technological expertise, and financial resources. Encouraging corporate participation through CSR initiatives and innovation partnerships can improve commercialization outcomes and integrate startups into broader industry networks.

8.5 Implementation of Robust Monitoring Frameworks: Ensuring Accountability and Impact

A standardized monitoring system with clearly defined KPIs is essential for improving transparency and accountability. Incorporating qualitative indicators such as innovation impact and social value, along with long-term tracking of startup performance, would enable evidence-based policymaking. The use of digital dashboards and data analytics can further enhance real-time monitoring and decision-making.

8.6 Additional Strategic Recommendations

- Strengthening Post-Incubation Support by Introduce structured alumni networks, continued mentorship, and market linkage programs to support startups beyond incubation.
- Enhancing Global Linkages by facilitate international partnerships, exposure programs, and access to global markets to improve competitiveness.
- Promoting Deep-Tech and R&D Integration by encourage collaboration with research institutions to foster high-impact, technology-driven innovation.
- Ensuring Financial Sustainability of AICs by develop revenue models such as equity participation, service fees, and corporate partnerships to reduce dependency on government funding.

The Atal Innovation Mission has established a strong foundation for innovation-driven growth in India. However, its long-term success depends on addressing structural gaps through inclusive expansion, financial strengthening, skill development, and robust governance mechanisms. Implementing these recommendations will significantly enhance the mission's capacity to foster sustainable entrepreneurship and contribute to India's broader development goals

8. CONCLUSION

The Atal Incubation Mission represents a significant policy initiative in India's transition towards an innovation-driven economy. By fostering entrepreneurship, supporting startups, and strengthening institutional frameworks, AIM contributes substantially to the realization of Viksit Bharat.

However, the long-term success of the mission will depend on its ability to address existing challenges and adapt to evolving economic and technological landscapes. Strategic policy interventions, coupled with sustained investment in innovation infrastructure, will be essential for maximizing the impact of AIM. As India progresses towards its centenary of independence, the Atal Incubation Mission is poised to play a central role in shaping the country's economic and technological future.

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A STUDY ON IMPACT OF DIGITAL MARKETING ON BUYING BEHAVIOUR OF COLLEGE STUDENTS IN MUMBAI

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ABSTRACT
In this modern era, people are more connected to each other due to the digital revolution. And business organisations find it easy to promote their goods and services to reach a large number of customers. Now-a-days, the young generation are the main users of digital tools and their taste and preference changes day by day and it affects buying patterns. In this research paper, an attempt is made to ascertain the impact of digital technology on buying behaviour among college students in Mumbai.

Keywords: *Digital, technology, marketing, students.*

INTRODUCTION
Now-a-days mobile has reached the largest number of consumers in India due to digitalisation. Digitalisation offers opportunities to common people to use the internet in their day to day life. People can interact with a number of people or groups of people with the help of various social media platforms such as email, Twitter, Facebook, Instagram etc. and so on, without any physical meetings.

The massive use of the internet has changed the perspective of society in personal as well as professional lives. The widespread application of technology is the result of the introduction of new communication tools. These tools are developed with highly advanced technologies and are called Digital marketing.

Traditional communication tools such as newspapers, journals, audio, television etc. are being phased out with the emergence of digital communication tools such as email, Twitter, Facebook, Instagram etc. A digital marketing system is developed to deliver interactive commercial business messages to the customer.

It helps business organisations to advertise their products online. And therefore, digital marketing has a significant impact on the business in India.

Digital marketing has played a crucial role in the entire world in recent years. Customers can approach anywhere in the world with just a single click through internet technology. Physical movement is transformed into digital movement. Digital marketing facilitates customers to buy products and services without visiting physically at any shop.

Competition increases day by day among digital marketers. Such rising competition encourages marketers to create more productive and real time content via digital technology to influence customers.

Under digital marketing, goods, services and information are purchased and sold via computer networks with the help of the internet.

Customers are delighted with the outstanding characteristics of digitalisation. It offers immediate delivery and quick payment to retailers. The increased use of e-shopping increased the confidence among customers. Digital marketing becomes prominent beside the goods, it is widely used for promotion activities of services such as employment, marriage, information.

REVIEW OF LITERATURE

Sr. No.	Author and Year	Topic	Journal	Research Methodology	Content
1	Goplani Mala, Gupta Akash and Sabhani Jewel, (2020)	A Study on Influence of Digital Marketing on Buying Behaviour of Youth	Studies in Indian Place Names	Analytical and Descriptive Research, Random Convenience sampling, - Likert scale method, Chi-Square method, and percentage method, Sample size - 227	The study shows that customers get influenced with digital marketing due to its excellent features such as 24 Hrs availability, detailed product information, on time delivery etc. Customers find Social networking and Website marketing more time saving and convenient as compared to retail outlets.
2	Krutika Lokhande, (2022)	IMPACT OF DIGITAL MARKETING ON BUYING BEHAVIOR OF YOUTH	International Journal of Research Publication and Reviews	Random Sampling, Percentage Analysis, Sample size - 41	The study explained that customers are highly attracted towards digital marketing due to the availability of a variety of shopping platforms. Social media highly

					influenced the customers
3	Rohit Kumar and Dr. Jai Jayant, (2020)	Impact of Digital Marketing on Buying Behavior of Youth: A Special Reference of Haridwar District	International Journal of Creative Research Thoughts (IJCRT)	Non – Probability sampling technique, Sample size - 50	The study explained that youth preferred to buy quality products. Digital marketing offers convenience in finding the products easily. Customers found that quality and advertisement are crucial components for digital marketing to become successful in the near future.
4	Dr. Dilip S. Chavan (2022)	Digital Marketing's And Its Effect On Youth	Indian Journal of Business Administration (IJBA)	Random sampling Method, Sample size - 100	The study explained about challenges faced by marketers in the digital marketing environment due to the cutthroat competition in business. Marketers should understand the mind-set of youth and accordingly they should frame marketing strategies. Then only traditional marketing will be able to transform into digital marketing.

OBJECTIVES

1. To study the awareness of digital marketing among college students.

2. To examine the buying behaviour of college students in relation to digital marketing.

3. To analyse what factors encourage college students in their purchase decision.

RESEARCH METHODOLOGY

Researchers have used primary as well as secondary data for the present study. The online survey was used to collect primary data. On the other hand, secondary data was collected from published research papers, articles, websites etc. and so on. The researcher has collected primary data from the college students in Mumbai city. Data collected from 55 respondents with the help of a simple random sampling method. MS-Excel is used for the tabulation of collected data. Collected data analysed with the help of percentage analysis.

DATA COLLECTION & INTERPRETATION

Table 1: Gender wise Respondents

Gender	No. of Respondents	Percentage
Male	20	36.36
Female	35	63.64
Total	55	100.00

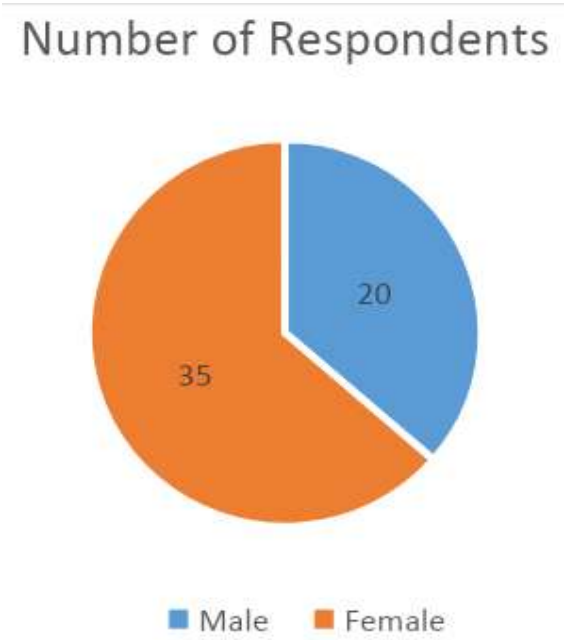


Table 1 shows gender wise responses received from respondents. Total 55 responses received, out of that 20 respondents are male and 35 respondents are female. It means, female students are more preferred to buy products via digital marketing.

Table 2: Awareness of Digital Marketing among Respondents

	No. of Respondents	Percentage
Yes	45	81.82
No	10	18.18
Total	**55**	**100.00**

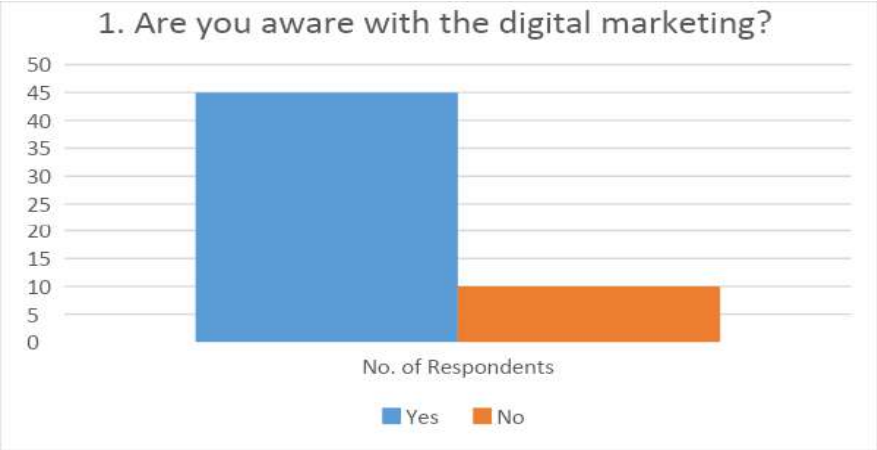
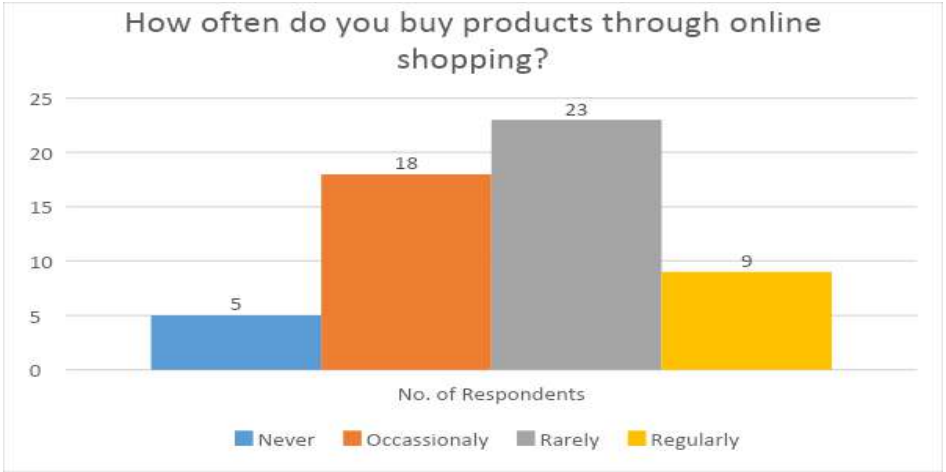


Table 2 describes the awareness of digital marketing among respondents. Out of total respondents, 45 respondents are aware of digital marketing, whereas 10 are not aware of digital marketing.

Table 3: Usage of Online Shopping among Respondents

	No. of Respondents	Percentage
Never	5	9.09
Occasionally	18	32.73
Rarely	23	41.82
Regularly	9	16.36
Total	**55**	**100.00**



As per Table 3, out of total respondents 5 respondents never buy products through digital marketing, 18 respondents prefer to buy goods occasionally via digital marketing, 23 respondents rarely buy goods whereas, 9 respondents regularly purchase the goods.

Table 4: Social Networking Sites used by Respondents

Social Networking Sites	No. of Respondents	Percentage
Facebook	2	3.64
Instagram	31	56.36
WhatsApp	5	9.09
YouTube	14	25.45
Others	3	5.45
Total	**55**	100.00

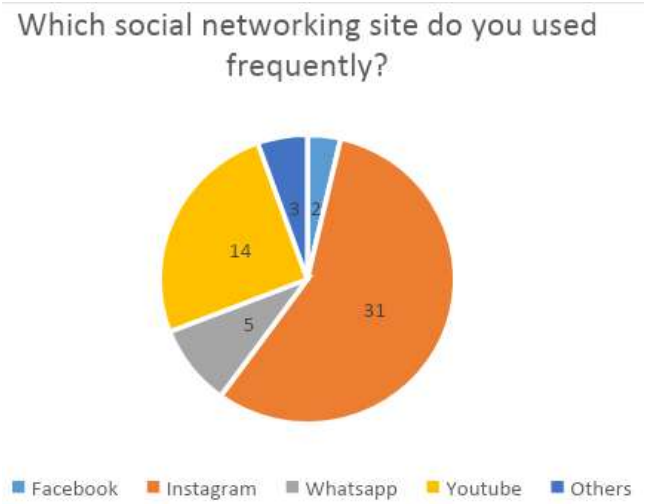


Table 4 explains about social networking sites used by respondents. Out of total respondents, Facebook, Instagram, WhatsApp, YouTube, and other sites are used by 2, 31, 5, 14 and 3 respondents respectively.

Table 5: Factors influencing purchasing decision among respondents

	No. of Respondents	Percentage
Online Ads	27	49.09
Retail outlets	4	7.27
Salesman	2	3.64
Social Groups (Family, friends & colleagues)	22	40
Total	**55**	**100.00**

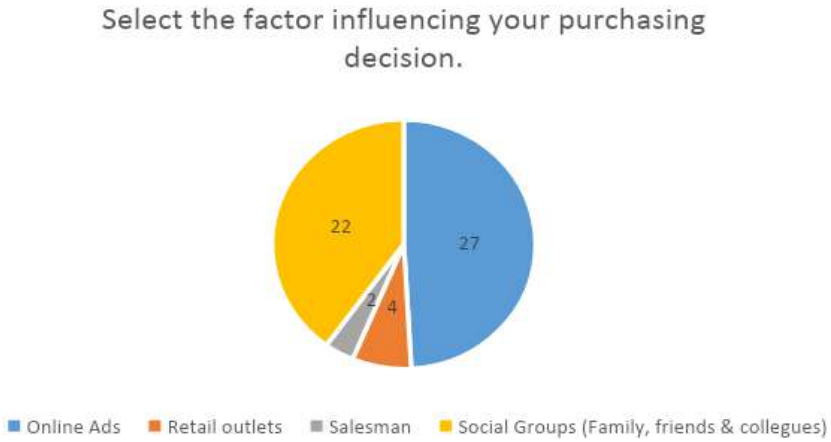


Table 5 describes various factors that influence the purchasing decision of respondents. Out of the total respondents, 27 are influenced by online ads and 22 respondents are influenced by social groups such as family, friends and colleagues. Whereas, few respondents are influenced by retail outlets and salesmen.

Table 6: Factors influencing while purchasing product online among respondents

Factors	**No. of Respondents**	**Percentage**
Attractive websites	5	9.09
Availability of detailed information	5	9.09
Convenient & time saving	6	10.91
Ease of comparison	5	9.09
Ease of product return & exchange	5	9.09
Offers & discount	24	43.64
Safe & secure payment	5	9.09
Total	**55**	**100.00**

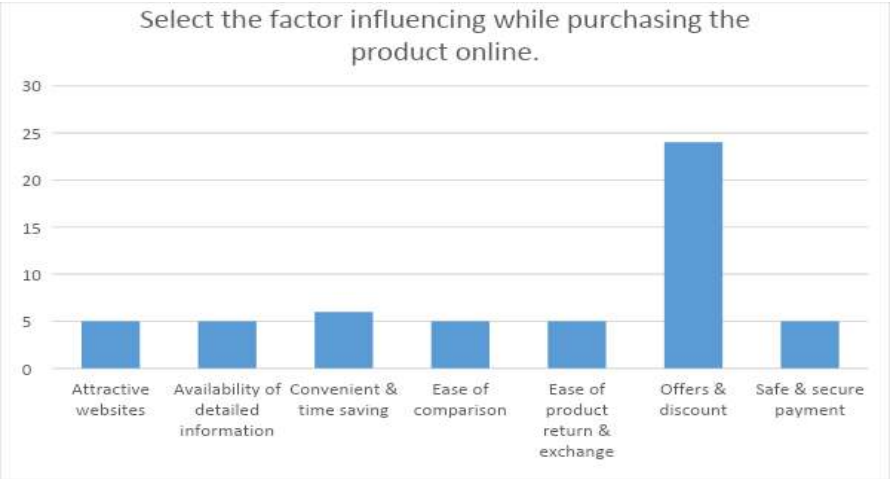


Table 6 explains about the various factors influencing the customers while purchasing the product online. Out of total respondents, 24 are influenced by offers and

discounts, 6 respondents are influenced by the factor of convenience and time saving. Whereas, an equal number i.e. 5 respondents are influenced by other factors such as attractive websites, availability of detailed information, ease of comparison, ease of product return & exchange, safe & secure payment.

CONCLUSION

The research study shows that college students are very much aware of the digital platform available for purchasing products in Mumbai. The youth is more interested in using the internet for surfing various products and services that are available online. Digital platforms such as Instagram and YouTube have been more popular among college students through which they can gain information. The college goers occasionally used to do online shopping as the income factor restricted them from regular shopping. Further, Students' buying decisions are highly influenced by online ads and social groups. The offers and discounts are also one of the important factors that attract students to buy products and services online. Beside this, they find online shopping is more convenient and time saving as compared to offline shopping. Further, availability of detailed information of product and services, attractive websites, easy comparison, easy return and exchange of product, and safe and secure payment are equally responsible key factors that influence customers while purchasing products online. Therefore, digital marketing plays an important role in influencing buying behaviour of college students in Mumbai.

SUGGESTIONS FOR BUYERS

The following suggestions are provided to college students that one should remember while buying online products.

1. To check internet connection. A stable internet connection is required while making online payment.
2. To check pictures and reviews of products available on the website, those are posted by consumers.
3. To check genuineness of online schemes and offers available on products.
4. To check quality and other details before accepting a product.
5. To give preference for Cash on Delivery mode rather than online payment.

SUGGESTION FOR MARKETERS

The present study found that Instagram and YouTube are major digital platforms used by college students in Mumbai. Therefore, marketers are suggested to promote their products to a great extent on these platforms.

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STOCK PRICE DYNAMICS AND FINANCIAL PERFORMANCE IN INDIAN PHARMACEUTICAL FIRMS: EVIDENCE FROM A FIVE-YEAR STUDY

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ABSTRACT
This study examines the relationship between stock-price behaviour and firm-level financial performance in three major Indian pharmaceutical companies—Sun Pharmaceutical Industries Ltd., Cipla Ltd., and Dr. Reddy's Laboratories Ltd.—over the period 2020 to 2024. The research integrates descriptive financial analysis with time-series forecasting in order to assess whether past performance patterns can support short-term projections of future stock values. Historical stock-price data and selected accounting indicators, namely earnings per share (EPS), return on equity (ROE), return on assets (ROA), and net profit margin (NPM), are analysed to identify growth, stability, profitability, and volatility patterns across the sample firms. The study adopts a quantitative, descriptive-analytical design based on secondary data drawn from annual reports and financial-market databases. For the forecasting component, an ARIMA-based framework is employed in an exploratory manner to project short-term stock-price trajectories and to assess predictive performance through mean absolute error (MAE), root mean squared error (RMSE), and mean absolute percentage error (MAPE). The findings suggest that all three firms exhibited an overall upward stock-price trend during the study period, although the pattern differed across companies: Sun Pharma demonstrated the strongest cumulative growth, Cipla showed the most stable performance, and Dr Reddy's displayed a recovery-led trajectory after interim weakness. The financial ratio analysis broadly aligns with the stock price evidence, indicating that stronger profitability and operating resilience are associated with better market performance. The forecasting exercise indicates that the ARIMA framework is useful for short-horizon trend estimation, but the results should be interpreted cautiously because the present draft relies on annual average observations, which restrict formal model estimation depth. Overall, the study contributes by combining firm-level financial metrics and stock-price forecasting within a single sector-specific framework and offers practical insights for investors, analysts, and researchers interested in the Indian pharmaceutical industry.

Keywords: *Indian pharmaceutical sector; stock-price forecasting; ARIMA; financial ratios; time-series analysis; investment analysis.*

1. INTRODUCTION
Financial markets allocate capital, transmit information, and influence investment decisions across the economy.

Within this setting, stock-price forecasting remains one of the most challenging problems in finance because market prices reflect a complex interaction of firm fundamentals, sectoral developments, macroeconomic forces, and investor expectations. Yet the practical importance of forecasting remains undiminished, particularly for sectoral studies in which historical price movements and financial indicators can be examined together.

The Indian pharmaceutical industry offers a particularly relevant context for such analysis. It occupies a strategically important position in domestic healthcare and global medicine supply chains, and recent official and industry reports continue to describe it as one of India's major manufacturing and export-oriented sectors. Government and industry sources indicate that the sector remains globally significant and is expected to expand further over the medium term, reinforcing the need for rigorous company-level financial and market analysis.

This manuscript investigates whether stock-price behaviour in selected Indian pharmaceutical companies is associated with financial performance indicators and whether short-term projections can be generated using a time-series approach. The study focuses on Sun Pharma, Cipla, and Dr. Reddy's Laboratories, three firms with substantial market relevance and publicly available financial information. The analysis covers a five-year period from 2020 to 2024 and incorporates EPS, ROE, ROA, and NPM alongside annual average stock prices.

The forecasting component is based on the autoregressive integrated moving average (ARIMA) framework, which remains a widely used benchmark in time-series forecasting because of its interpretability, transparent assumptions, and established Box-Jenkins modelling procedure. However, because the present project draft is built on annual average values rather than a longer monthly or daily series, the ARIMA component in this manuscript should be read as an exploratory, journal-style refinement of the original classroom analysis rather than a full econometric estimation exercise.

2. REVIEW OF LITERATURE

The ARIMA family of models has long occupied a central place in time-series forecasting. The Box-Jenkins tradition formalised a structured process of model identification, estimation, and diagnostic checking, which continues to inform financial forecasting studies (Box et al., 2015). In an influential empirical application, Adebiyi et al. (2014) showed that ARIMA has substantial potential for short-term stock-price prediction and can perform competitively against more complex approaches when the forecasting horizon is limited.

Within the Indian context, Meher et al. (2021) specifically examined selected pharmaceutical companies and demonstrated that ARIMA-based modelling can be meaningfully applied to Indian pharma stocks. Their study used daily observations, stationarity testing, ACF/PACF diagnostics, and information criteria to select models

for listed pharmaceutical firms, thereby offering an important sector-specific foundation for the present research.

At the same time, the literature makes it clear that purely statistical models are not the only available option. Patel et al. (2015), working with Indian stock and stock-index data, reported that machine-learning methods such as artificial neural networks, support vector machines, random forests, and naïve Bayes can improve directional prediction when combined with trend-deterministic data preparation. More recent review work similarly indicates that neural-network-based and hybrid approaches now dominate a large share of the stock-prediction literature, particularly where non-linearity and high-frequency data are central concerns.

The financial-ratio literature adds another perspective by showing that market performance is linked not merely to time-series price behaviour but also to firm fundamentals. Sharma et al. (2019), in a study of pharmaceutical companies in India, found that selected financial ratios significantly affect stock returns, with asset turnover exhibiting a positive relationship, while current ratio and inventory turnover showed negative effects in their fixed-effects framework. This suggests that investors respond to operational efficiency and balance-sheet quality, not just to historical prices.

More recent sectoral work by Lobo and Bhat (2024) evaluated Indian pharmaceutical firms before and during the COVID-19 period and concluded that profitability, valuation, and growth ratios were among the most influential dimensions in assessing sectoral resilience. Their findings reinforce the importance of combining price analysis with accounting-based measures when examining pharmaceutical companies.

Despite the richness of the literature, three gaps remain relevant. First, many studies examine either stock-price forecasting or financial-ratio performance, but not both within a single firm-level framework. Second, pharma-specific work in India remains smaller than the broader literature on banking, technology, or composite stock indices. Third, many sophisticated models are difficult to interpret for student researchers, practitioners, and early-stage investors. Accordingly, the present study adopts an integrated but interpretable design that combines descriptive financial analysis with an ARIMA-based forecasting lens for a focused sample of Indian pharmaceutical firms.

3. RESEARCH GAP

The literature indicates that stock-price forecasting and financial-ratio analysis are often treated as separate streams of inquiry. There remains scope for sector-specific studies that jointly evaluate stock-price movement, firm profitability, and short-horizon forecasting in a single analytical framework. This need is particularly relevant in the Indian pharmaceutical sector, where firm resilience, investor attention, and sectoral importance have increased in recent years. The present study addresses this gap by combining descriptive financial analysis with an ARIMA-style forecasting framework for three established Indian pharmaceutical companies.

4. OBJECTIVES OF THE STUDY

- To analyse the historical stock prices and financial performance of selected Indian pharmaceutical companies over the period 2020–2024.
- To apply an ARIMA-based forecasting framework to project short-term stock-price behaviour using the observed time-series pattern.
- To assess forecasting performance using MAE, RMSE, and MAPE and to compare the broad predictive reliability across the selected firms.

5. SCOPE, SIGNIFICANCE, AND LIMITATIONS

The study is confined to three Indian pharmaceutical companies—Sun Pharma, Cipla, and Dr. Reddy's Laboratories—and to a five-year observation window from 2020 to 2024. The analysis relies on secondary data drawn from company reports and financial databases. Its significance lies in providing an integrated firm-level view of sectoral stock performance and profitability, with clear implications for investors, students, and researchers. However, the study is subject to important limitations. Most notably, the forecasting exercise is based on annual average values contained in the original project draft, which constrains the statistical richness of ARIMA estimation. Unexpected macroeconomic shocks, regulatory changes, litigation, product approvals, currency effects, and firm-specific events are not modelled explicitly. Accordingly, the results should be interpreted as analytically informative rather than as investment advice.

6. RESEARCH METHODOLOGY

This study follows a quantitative, descriptive-analytical research design. Historical price behaviour and selected accounting ratios are first described and interpreted; thereafter, an ARIMA-based forecasting framework is used to generate short-horizon projections.

Data sources. The study uses secondary data from annual reports of the selected companies, stock-exchange information platforms, and financial databases such as NSE/BSE-linked data sources, Yahoo Finance, and Moneycontrol. The five years from 2020 to 2024 are adopted for consistency with the original project draft.

Sample. The analytical sample comprises Sun Pharmaceutical Industries Ltd., Cipla Ltd., and Dr. Reddy's Laboratories Ltd. These firms are chosen because they are large, well-established Indian pharmaceutical companies with continuous data availability and strong investor relevance.

Variables. Annual average stock price is used as the principal market variable. Financial-performance indicators include earnings per share (EPS), return on equity (ROE), return on assets (ROA), and net profit margin (NPM). Time serves as the independent ordering variable for the forecasting exercise.

Analytical tools. Descriptive analysis is used to identify annual trends, growth patterns, and broad volatility behaviour. The forecasting stage follows the logic of the ARIMA framework: stationarity assessment through first differencing, conceptual

identification of autoregressive and moving-average components, and short-term projection. Model performance is evaluated using mean absolute error (MAE), root mean squared error (RMSE), and mean absolute percentage error (MAPE).

Methodological caution. In a fully specified journal article, ARIMA estimation would ordinarily be performed on a larger set of monthly or daily observations, with formal ADF statistics, ACF/PACF diagnostics, and reported AIC/BIC output. Because the present study preserves the annual series embedded in the original draft, the forecasting section is presented as an exploratory ARIMA-style application rather than as a full econometric estimation exercise.

7. CONCEPTUAL FRAMEWORK

The conceptual logic of the study proceeds in five stages. First, historical stock-price data provide the market-performance series. Second, accounting indicators such as EPS, ROE, ROA, and NPM capture firm-level financial quality. Third, descriptive analysis identifies growth, decline, recovery, and volatility patterns. Fourth, the first-difference transformation is used to stabilise the stock-price series for ARIMA-style forecasting. Fifth, forecast accuracy is assessed by comparing actual and estimated values using MAE, RMSE, and MAPE. This framework assumes that market prices partly reflect underlying financial strength and that short-term projections are more credible when they are interpreted alongside profitability and efficiency indicators rather than in isolation.

8. DATA ANALYSIS AND DISCUSSION

8.1 Descriptive Analysis of Stock Prices and Financial Metrics

Sun Pharmaceutical Industries Ltd.

Table 1. Annual average stock price of Sun Pharma (₹)

Year	Average stock price
2020	476.49
2021	704.66
2022	908.37
2023	1069.65
2024	1471.36

Sun Pharma recorded cumulative growth of approximately 208.7% between 2020 and 2024, indicating the strongest price expansion among the three firms in the sample.

Table 2. Year-on-year stock-price growth of Sun Pharma

Year	Average price (₹)	Growth rate
2020	476.49	—
2021	704.66	47.80%
2022	908.37	28.90%
2023	1069.65	17.80%
2024	1471.36	37.60%

Table 3. Financial indicators of Sun Pharma (%)

Year	EPS	ROE	ROA	NPM
2020	13.40	13.16	8.36	25.62
2021	8.92	8.54	5.48	16.71
2022	-0.40	-0.40	-0.24	-0.64
2023	7.00	7.11	4.12	8.12
2024	11.90	12.06	6.96	14.09

Interpretation. Sun Pharma displays a clear long-run upward stock-price path, although its accounting performance weakened materially after 2020 and briefly turned negative in 2022. The subsequent recovery in EPS, ROE, ROA, and NPM from 2023 onward aligns with renewed stock-price strength. This suggests that investors priced in an improving profitability outlook and rewarded evidence of operational recovery.

Cipla Ltd.

Table 4. Annual average stock price of Cipla (₹)

Year	Average stock price
2020	634.04
2021	899.14
2022	1014.51
2023	1076.28
2024	1408.66

Cipla recorded cumulative growth of approximately 122.2% between 2020 and 2024, reflecting a stable and steadily appreciating market trajectory.

Table 5. Year-on-year stock-price growth of Cipla

Year	Average price (₹)	Growth rate
2020	634.04	—
2021	899.14	41.80%
2022	1014.51	12.80%
2023	1076.28	6.10%
2024	1408.66	30.90%

Table 6. Financial indicators of Cipla (%)

Year	EPS	ROE	ROA	NPM
2020	28.76	13.32	11.36	18.31
2021	30.61	12.38	10.74	17.75
2022	36.67	13.13	11.62	22.59
2023	31.15	10.20	9.10	15.91
2024	50.51	14.57	13.12	24.59

Interpretation. Cipla's stock-price pattern is characterised by smoother appreciation and lower apparent volatility than Sun Pharma and Dr. Reddy's. Financial indicators

remain relatively consistent across the period, with a notable improvement in 2024. The combined evidence supports the view that Cipla offered the strongest stability profile in the sample.

Dr. Reddy's Laboratories Ltd.

Table 7. Annual average stock price of Dr. Reddy's Laboratories (₹)

Year	Average stock price
2020	4087.83
2021	4895.70
2022	4296.35
2023	5068.03
2024	6095.61

Dr. Reddy's recorded cumulative growth of approximately 49.1% between 2020 and 2024. Compared with the other firms, the company showed a more uneven but ultimately positive trajectory.

Table 8. Year-on-year stock-price growth of Dr. Reddy's Laboratories

Year	Average price (₹)	Growth rate
2020	4087.83	—
2021	4895.70	19.80%
2022	4296.35	-12.20%
2023	5068.03	17.90%
2024	6095.61	20.30%

Table 9. Financial indicators of Dr. Reddy's Laboratories (%)

Year	EPS	ROE	ROA	NPM
2020	177.23	19.33	15.08	24.78
2021	131.84	12.87	10.10	16.37
2022	97.85	8.85	6.62	11.26
2023	157.37	12.76	10.29	15.40
2024	260.95	17.91	14.30	22.28

Interpretation. Dr. Reddy's exhibits a recovery-driven pattern. After a decline in both stock price and financial indicators in 2022, the firm experienced a strong rebound in 2023 and 2024. The improvement in EPS and profitability ratios suggests that the market response was linked to renewed financial strength rather than to a uniformly smooth growth path.

Cross-company discussion. A comparison across the three companies indicates that Sun Pharma delivered the strongest cumulative stock-price growth, Cipla showed the most stable combination of market and accounting performance, and Dr. Reddy's presented the clearest recovery narrative. In all three cases, stronger profitability and efficiency broadly coincided with stronger stock-price outcomes, which is consistent with the literature linking firm fundamentals to market performance.

8.2 ARIMA-Based Forecasting Analysis

Because the original project draft relies on annual average stock prices, the following ARIMA section should be interpreted as an exploratory forecasting exercise that preserves the original analysis while presenting it in a more academically transparent form.

Sun Pharma

Table 10. First-difference series for Sun Pharma

Year	Price (₹)	Difference
2020	476.49	—
2021	704.66	228.17
2022	908.37	203.71
2023	1069.65	161.28
2024	1471.36	401.71

A first difference is used to stabilise the upward trend, implying d = 1 within an illustrative ARIMA(1,1,1) structure.

Table 11. Forecasted stock prices for Sun Pharma

Year	Forecast price
2025	1650 (approx.)
2026	1820 (approx.)

Table 12. Validation metrics for Sun Pharma

Year	Actual	Forecast	Absolute error
2023	1069.65	1050.00	19.65
2024	1471.36	1450.00	21.36

MAE = 20.51; RMSE = 20.53; MAPE = 1.64%. The relatively low error levels indicate that the model broadly tracks the observed trend in the original series.

Cipla

Table 13. First-difference series for Cipla

Year	Price (₹)	Difference
2020	634.04	—
2021	899.14	265.10
2022	1014.51	115.37
2023	1076.28	61.77
2024	1408.66	332.38

After first differencing, the series is treated as approximately stationary, again supporting an illustrative ARIMA(1,1,1) specification.

Table 14. Forecasted stock prices for Cipla

Year	Forecast price
2025	1600 (approx.)
2026	1790 (approx.)

Table 15. Validation metrics for Cipla

Year	Actual	Forecast	Absolute error
2023	1076.28	1050.00	26.28
2024	1408.66	1380.00	28.66

MAE = 27.47; RMSE = 27.50; MAPE = 2.23%. Although the forecast error is somewhat higher than for Sun Pharma, the percentage error remains low enough to support the broad directional reliability of the projection.

Dr. Reddy's Laboratories

Table 16. First-difference series for Dr. Reddy's Laboratories

Year	Price (₹)	Difference
2020	4087.83	—
2021	4895.70	807.87
2022	4296.35	-599.35
2023	5068.03	771.68
2024	6095.61	1027.58

The first-difference series captures the firm's greater fluctuation profile and supports an exploratory ARIMA(1,1,1) representation.

Table 17. Forecasted stock prices for Dr. Reddy's Laboratories

Year	Forecast price
2025	6600 (approx.)
2026	7100 (approx.)

Table 18. Validation metrics for Dr. Reddy's Laboratories

Year	Actual	Forecast	Absolute error
2023	5068.03	5000.00	68.03
2024	6095.61	6000.00	95.61

MAE = 81.82; RMSE = 83.60; MAPE = 1.46%. The absolute errors are larger because the stock trades at a higher price level, but the percentage error remains low, implying a relatively close fit in proportional terms.

Forecast discussion. The forecasts indicate continued growth for all three firms, but the underlying stories differ. Sun Pharma's projection reflects accelerated momentum after financial recovery; Cipla's projection extends a stable and disciplined growth path; and Dr. Reddy's projection reflects the continuation of a rebound following interim weakness. These interpretations are informative, although they should be read with caution because a more rigorous forecasting design would require higher-frequency data.

9. FINDINGS

- All three companies recorded an overall increase in stock prices during 2020–2024, confirming the broad strength of the pharmaceutical sector during the study window.

- Sun Pharma delivered the highest cumulative stock-price growth, indicating strong market re-rating over the period.
- Cipla exhibited the most stable growth profile, with comparatively smoother progression in both price and profitability indicators.
- Dr. Reddy's Laboratories showed a recovery-led trajectory: financial weakness in 2022 was followed by a strong rebound in both price and profitability.
- Financial indicators and stock prices moved broadly in the same direction, suggesting that investors responded positively to improvements in profitability and operating efficiency.
- The ARIMA-style forecasts indicate continued upward movement in all three stocks over the near term, with low MAPE values suggesting acceptable short-horizon fit within the constraints of the dataset.

10. IMPLICATIONS AND SUGGESTIONS

For investors, the study indicates that firm-level financial metrics should be interpreted alongside price behaviour. Cipla may appeal more to stability-oriented investors, Sun Pharma to growth-oriented investors, and Dr. Reddy's to investors willing to accept moderate volatility for recovery-linked upside.

For researchers, the most important next step is to extend the analysis to monthly or daily observations. A richer dataset would permit proper ADF testing, formal ACF/PACF identification, statistically estimated coefficients, and more defensible AIC/BIC-based model selection.

Future studies may also combine ARIMA with GARCH, machine learning, or hybrid models to capture both trend and volatility more effectively. Including macroeconomic variables, exchange-rate movements, policy announcements, product pipelines, and regulatory events would further strengthen explanatory power.

11. CONCLUSION

This study examined the stock-price behaviour and selected financial metrics of Sun Pharma, Cipla, and Dr. Reddy's Laboratories over the period 2020–2024 and presented an exploratory ARIMA-based forecasting framework to project short-term price movement. The evidence shows that the three firms shared a common upward long-run market trend, but differed meaningfully in pattern and quality of performance. Sun Pharma stood out for growth, Cipla for stability, and Dr. Reddy's for recovery after weakness. The financial-ratio analysis reinforces the proposition that stock prices cannot be interpreted independently of firm fundamentals. Improvements in EPS, ROE, ROA, and NPM broadly coincided with more favourable stock-price performance, suggesting that the market rewarded profitability and resilience. The forecasting results, although constrained by the use of annual averages, indicate that ARIMA remains a useful and interpretable benchmark for short-horizon analysis. In academic terms, the study contributes by integrating stock-price and accounting analysis within a sector-specific framework focused on the

Indian pharmaceutical industry. In practical terms, it offers a structured basis for investor interpretation, classroom learning, and future research design. A more rigorous follow-up study using higher-frequency data and formal econometric estimation would further strengthen the robustness of the conclusions.

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IMPACT OF SOCIAL MEDIA ON YOUTH BEHAVIOUR

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ABSTRACT

The social media has taken a central place in the lives of the youth and has had a huge impact in their behaviour, communication and lifestyle. This paper discusses the role of social media in influencing youth behaviour through the discussion of both the positive and negative effects of it. Social media leads to positivity in terms of connectivity, information accessibility, and self-expression. Nevertheless, overuse may cause behavioural problems including addiction, decreased face-to-face communication, low academic success, and mental health disorders like anxiety, depression, and low self-esteem. It is also a source of social comparison and fear of missing out (FOMO), which impact emotional well-being. The research is grounded in the analysis of the literature that is available and emphasizes the necessity of using it in equilibrium. It comes to the conclusion that the right awareness and digital literacy are needed to benefit the most and reduce the adverse effect of social media on youth behaviour.

keywords: *The use of social media, juvenile behaviour, psychological effect, addiction to social media, digital influence.*

INTRODUCTION

Social media has become one of the most significant elements of contemporary life and particularly among the youths in the recent years. Social sites like Instagram, Facebook, and Twitter have changed the manner in which people interact, share news and engage with the society. Young people are the most active users and, so they are exposed to digital content which constantly influences their thoughts, attitudes and behaviour. The growing availability of smartplaces and internet services has seen a tremendous increase in the use of social media among the adolescents and young adults. As much as these platforms offer avenues to learning, creativity and social interaction, they also pose challenges that have the potential to influence behavioural patterns. Social media affects different youth behavioural aspects such as communication, decision making, social relations and lifestyle. Further, overuse of social media has been linked to such negative effects as decreased face-to-face communication, academic distraction, and mental health issues, including anxiety, depression, and low self-esteem. Social comparison and fear of missing out (FOMO) are other phenomena that have additional effects on the emotional well-being of the young users. Consequently, it is imperative to learn how the social media affects the behaviour of the youth in the digital age. This paper will address the both positive and

negative impacts of using social media and the need to use it in a responsible and moderate way so as to develop healthy behavioural practices among young people.

OBJECTIVES OF THE STUDY

This research paper aims at analysing the effects of social media on young people behaviour, especially concerning their daily lives, emotional health and lifestyle decisions. It will examine the impact that social media has on social media communication, social comparison and face-to-face communication among young users. The paper also aims at assessing the level of influence of social media on academic outcomes and distraction. Also, it is interested in awareness of risks and capacity to use social media responsibly among the users. Lastly, the study aims to determine the positive (including knowledge improvement) and negative effects (including anxiety and dependency) of using social media.

LITERATURE REVIEW

The review of existing literature indicates that social media has a significant influence on youth behaviour, affecting various aspects such as decision-making, emotional well-being, academic performance, and social relationships.

1. The study conducted by *A. Elwadhi (2024)* reveals that social media plays an important role in shaping the decision-making process of youth. The exposure to digital content, peer opinions, and influencer recommendations influences their daily choices and lifestyle preferences. This supports the present study, where respondents reported a moderate influence of social media on their daily behaviour and lifestyle.
2. Similarly, *P. Sumadevi (2023)* highlights that social media significantly affects youth attitudes and behavioural patterns. The study emphasizes both the constructive role of social media in spreading awareness and its negative impact in terms of addiction and distraction. This aligns with the current research, which identifies both positive and negative behavioural outcomes.
3. The research by *F. Anwar, S. Khan, and T. Rahman (2023)* points out that social media has altered communication patterns and reduced face-to-face interactions. In comparison, the present study shows only a slight reduction in direct social interaction, suggesting a moderate rather than extreme impact.
4. A case study by *M. Kobiruzzaman and H. Yaakup (2021)* indicates that social media provides benefits such as connectivity and information access but also leads to issues like distraction and dependency among teenagers. These findings are consistent with the present study, where respondents acknowledged both informational benefits and distraction effects.
5. The study by *S. Jagtap, R. Patil, and P. Deshmukh (2025)* emphasizes the negative impact of social media on mental health, including anxiety, stress, and low self-esteem. However, the current study shows only moderate emotional impact and neutral anxiety levels, suggesting that users may be more aware and controlled in their usage.

6. *According to R. Kusuma (2020),* social media has a dual nature, offering opportunities for learning and communication while also posing risks such as cyberbullying and psychological stress. This dual perspective strongly supports the present study's conclusion that balanced and responsible use is necessary.

7. The findings of *R. Varun (2025)* suggest that excessive social media usage negatively affects academic performance and lifestyle patterns. In contrast, the current study reports a relatively low perceived impact on academic performance, highlighting a variation that may be due to increased awareness or controlled usage among respondents.

8. A regional study by *R. Tattimani and S. Kakade (2023)* indicates that social media leads to academic distraction and reduced focus among youth. The present study partially supports this, showing moderate distraction but not a severe impact on academic outcomes.

9. The research by *N. Siddiqui (2026)* highlights the influence of social media on relationships, emphasizing increased virtual interaction and social comparison. This is reflected in the present study, where respondents reported moderate levels of comparison and emotional influence.

10. Finally, *P. Sachu, R. Thomas, and A. Menon (2025)* discuss the psychological and social effects of social media, including loneliness and emotional stress. The present study supports these findings to some extent but indicates that awareness levels among users are relatively high, which may help reduce negative impacts.

Overall, the review of literature suggests that social media has both positive and negative effects on youth behaviour. While it enhances knowledge, connectivity, and self-expression, it also contributes to emotional stress, distraction, and behavioural changes. The present study adds to the existing literature by highlighting that the impact is generally moderate and influenced by awareness and responsible usage patterns.

RESEARCH GAP

An analysis of the existing literature on the effects of social media on youth behaviour indicates that there are a number of gaps. There is a large concentration on the negative effects of cell phone usage like anxiety, depression, addiction, and poor academic performance, whereas positive effects like knowledge acquisition, connectivity, and self-expression opportunities are understated. Numerous researches are cross-sectional, which restricts the knowledge of the changes in behaviour across time, and there are not enough studies on platform-specific or content-specific effects. Age, gender, profession, digital literacy, socio-economic background, and parental guidance are not very much focused on even though they may greatly moderate the impact of social media. Moreover, there are not many studies that combine behavioural, emotional, and academic outcomes into a study. The current research will address these gaps and provide an impartial assessment of both beneficial and adverse effects, taking into consideration demographic and professional differences,

and conducting correlational analyses of the patterns of social media use, mood, lifestyle, and academic achievements.

RESEARCH METHODOLOGY

The current research is founded on descriptive research design that seeks to comprehend the influence of social media use on behaviour, emotional well-being and academic performance of individuals. The research is based on primary data, which was gathered by the means of a structured questionnaire that was developed based on the Likert Scale approach. The survey had 12 well phrased statements, which relied on the use of social media, and included elements like daily behaviour, emotional influence, social interaction, academic impacts, risk awareness and responsible usage. The respondents were required to respond to the statements based on their stance on the statement using a ***5-point Likert scale, which was Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree.*** The respondents were selected based on a convenience sampling method and mostly students of the commerce and management streams. The number of participants in the study was (mention number). To facilitate the analysis, the responses were quantified by giving them numerical values with Strongly Agree being awarded 5 and Strongly Disagree score of 1. The data obtained was subsequently analyzed by simple statistical tools like percentage method and tabular representation and where needed graphical presentation to better interpret the results. The study is confined to the behavioural and academic effects of social media relating to the selected respondents. Nevertheless, the research also is limited with some issues, including a small sample size, the potential bias of respondents, and the usage of self-reported data, which can influence the externalization of the findings.

THE FOLLOWING QUESTIONS WERE ASKED AND DATA WAS COLLECTED-

Q.1 Social media usage significantly influences my daily behavior

Q.2 I spend a considerable amount of time on social media platforms every day

Q.3 social media affects my mood and emotional well-being

Q.4 I often compare myself with others on social media

Q.5 social media has reduced my face-to-face interactions

Q.6 Excessive use of social media negatively affects my academic performance

Q.7 I feel anxious/restless when unable to access social media

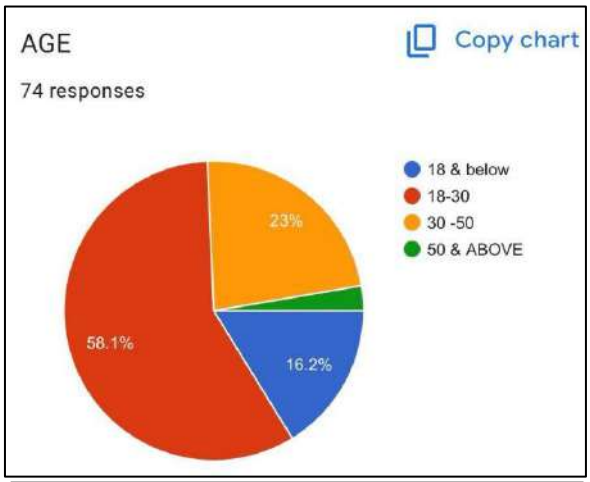
Q.8 social media helps me stay informed and increases my knowledge

Q.9 I have experienced distraction in my studies/work due to social media

Q.10 Social media influences my lifestyle choices

Q.11 I am aware of the risks associated with social media usage

Q.12 Social media can be used responsibly without negative behavior impact


AGE
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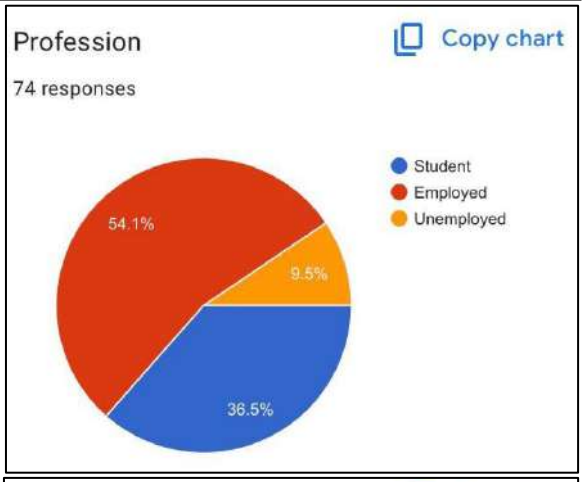
74 responses
18 & below
18-30
30 -50
50 & ABOVE
23%
58.1%
16.2%


Profession
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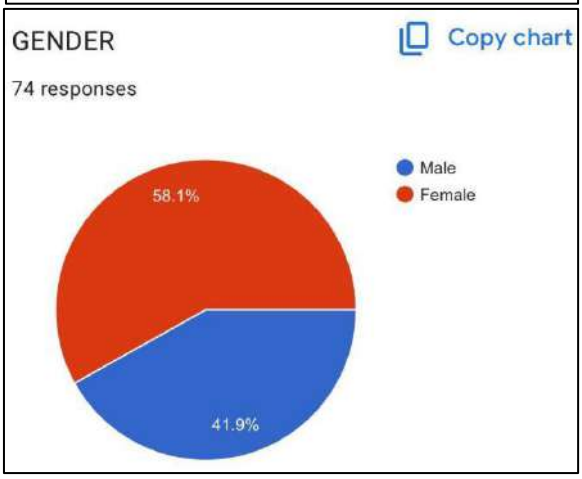
74 responses
Student
Employed
Unemployed
54.1%
9.5%
36.5%


GENDER
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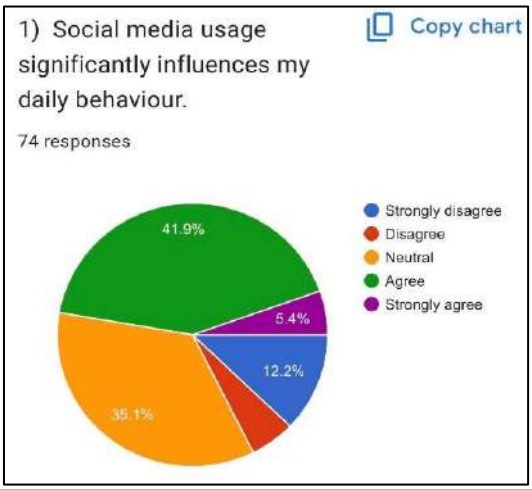
74 responses
Male
Female
58.1%
41.9%


1) Social media usage significantly influences my daily behaviour.
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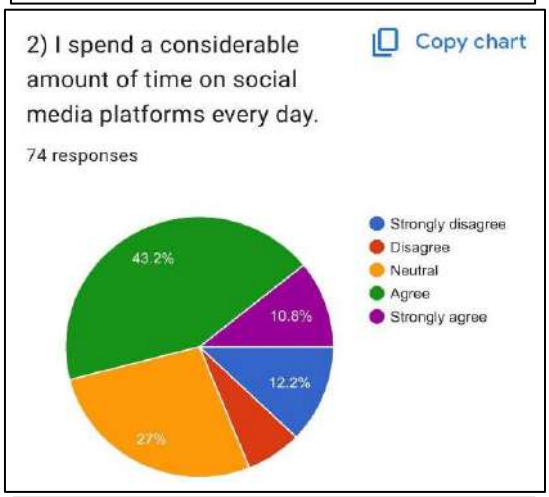
74 responses
41.9%
5.4%
12.2%
35.1%
Strongly disagree
Disagree
Neutral
Agree
Strongly agree


2) I spend a considerable amount of time on social media platforms every day.
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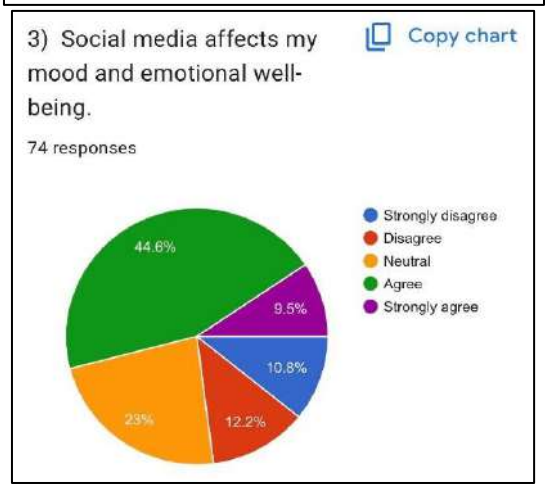
74 responses
43.2%
10.8%
12.2%
27%
Strongly disagree
Disagree
Neutral
Agree
Strongly agree


3) Social media affects my mood and emotional well-being.
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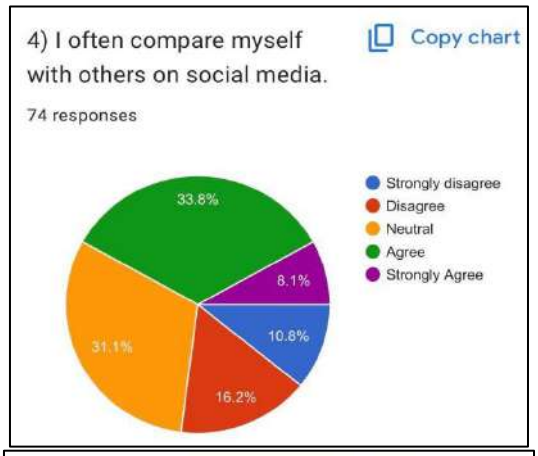
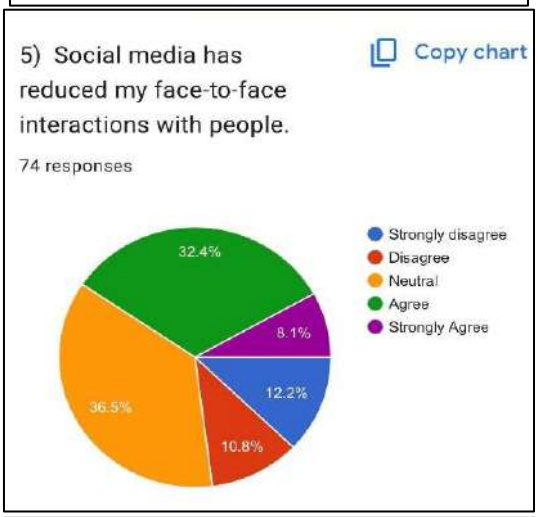
74 responses
44.6%
9.5%
10.8%
23%
12.2%
Strongly disagree
Disagree
Neutral
Agree
Strongly agree


4) I often compare myself with others on social media.
Copy chart
74 responses
33.8%
8.1%
10.8%
31.1%
16.2%
Strongly disagree
Disagree
Neutral
Agree
Strongly Agree


5) Social media has reduced my face-to-face interactions with people.
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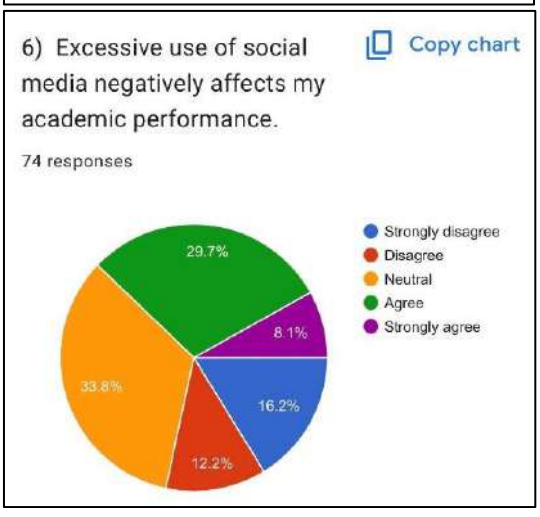
74 responses
32.4%
8.1%
12.2%
36.5%
10.8%
Strongly disagree
Disagree
Neutral
Agree
Strongly Agree


6) Excessive use of social media negatively affects my academic performance.
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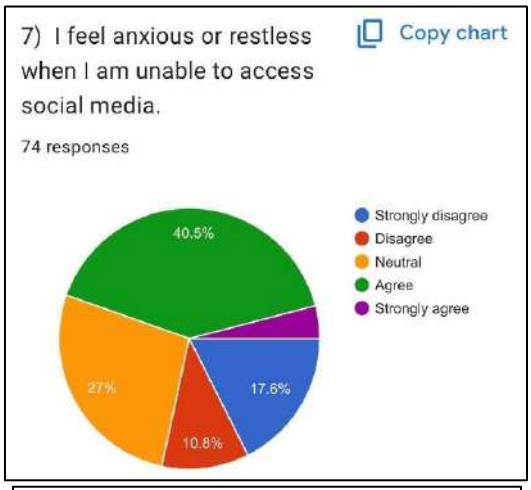
74 responses
29.7%
8.1%
33.8%
16.2%
12.2%
Strongly disagree
Disagree
Neutral
Agree
Strongly agree


7) I feel anxious or restless when I am unable to access social media.
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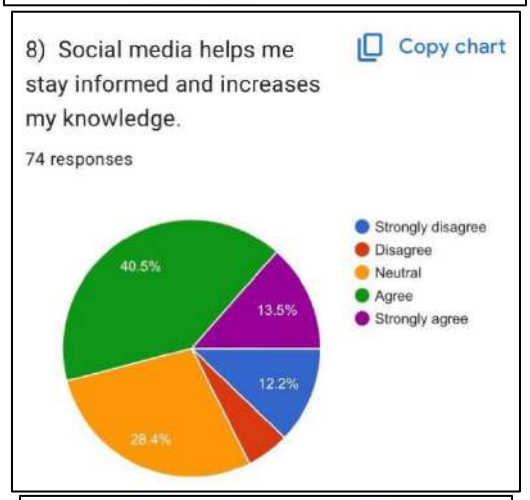
74 responses
40.5%
27%
17.6%
10.8%
Strongly disagree
Disagree
Neutral
Agree
Strongly agree


8) Social media helps me stay informed and increases my knowledge.
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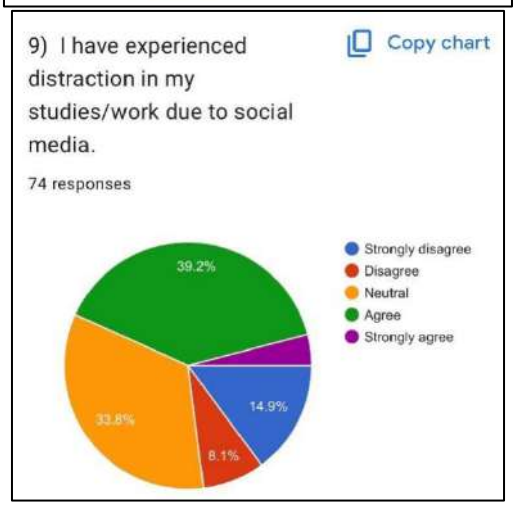
74 responses
40.5%
13.5%
12.2%
28.4%
Strongly disagree
Disagree
Neutral
Agree
Strongly agree


9) I have experienced distraction in my studies/work due to social media.
Copy chart
74 responses
39.2%
33.8%
14.9%
8.1%
Strongly disagree
Disagree
Neutral
Agree
Strongly agree

10) Social media influences my lifestyle choices (e.g., fashion, habits, trends).

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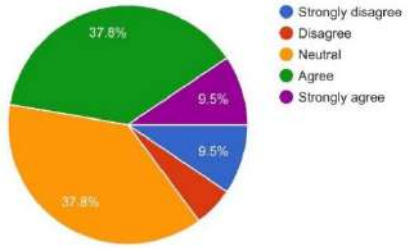
74 responses



11) I am aware of the risks associated with social media usage (e.g., cyberbullying, privacy issues).

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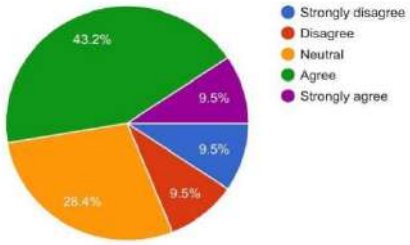
74 responses



12) I believe that social media can be used responsibly without affecting behaviour negatively.

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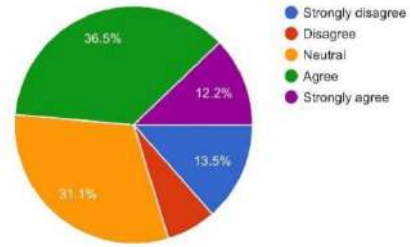
74 responses



DATA ANALYSIS & INTERPRETATION-

Diverse age groups, gender, and professions were represented in the survey. The majority of respondents (52%) fell within the 18–30 age group, indicating a strong presence of young, socially active users. This was followed by smaller proportions in the 30–50 age group (19 respondents), 18 years and below (10 respondents), and 50 years and above (2 respondents). There were more females (44) than males (26) indicating a possibility that trends are more of a female behavior. Most (44) were professionally employed, then students (19) and unemployed (7), which enabled their academic impacts to be analyzed separately. The answers were assessed on a Likert scale: Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, and Strong Disagree = 1, which allows analyzing the impact of social media on behavior, mood, lifestyle and academics quantitatively. This metric will assess the participants' mean scores on each question.

1) Mean Scores per Question

Question	Statement	Mean Score	Trend
Q1	Social media usage significantly influences my daily behaviour	3.6	Moderate influence
Q2	I spend a considerable amount of time on social media platforms every day	3.3	Slightly above neutral
Q3	Social media affects my mood and emotional well-being	3.5	Moderate impact
Q4	I often compare myself with others on social media	3.2	Moderate comparison tendency
Q5	Social media has reduced my face-to-face interactions	2.9	Neutral–slight reduction
Q6	Excessive use of social media negatively affects my academic performance	2.6	Low perceived negative academic impact
Q7	I feel anxious/restless when unable to access social media	3.0	Neutral tendency for anxiety
Q8	Social media helps me stay informed and increases my knowledge	3.8	Positive perceived educational/knowledge effect
Q9	I have experienced distraction in my studies/work due to social media	3.0	Neutral distraction impact
Q10	Social media influences my lifestyle choices	3.3	Moderate lifestyle influence
Q11	I am aware of the risks associated with social media usage	3.7	Good awareness level
Q12	Social media can be used responsibly without negative behavior impact	3.5	Positive belief in responsible use

Observation:

a. **Highest mean**: Q8 (3.8) – knowledge/information benefit

b. **Lowest mean**: Q6 (2.6) – academic performance impact

c. Neutral tendency observed for questions about anxiety, distraction, and face-to-face interaction reduction.

2) Response Trends by Gender

a. Females report slightly higher agreement with Q1, Q3, Q8, Q10, Q11 (influence, mood, knowledge, awareness).

b. Males tend to report lower agreement overall; some "strongly disagree" clusters indicate lower perceived impact.

3) Response Trends by Age

a. 18 & below: High scores in Q1, Q2, Q3, Q12 → young users feel strong influence and believe in responsible use.

b. 18–30: Moderate to high scores, especially in Q8, Q10 → social media seen as knowledge & lifestyle influencer.

c. **30–50:** More neutral responses, slightly higher agreement with responsible use (Q12).

d. 50 & above: Very low sample; one strongly disagree pattern suggests low social media engagement.

4) Response Trends by Profession

a. Students: Higher Q1, Q3, Q4, Q10 → more sensitive to influence, mood changes, and lifestyle influence.

b. Employed: High agreement on Q8, Q11, Q12 → perceive benefits of knowledge and responsible usage.

c. Unemployed: Mixed responses, small sample; mostly neutral/strongly agree for responsible usage.

4) Key Observations and Patterns

1. **Social media as a knowledge tool:** Respondents generally see it as informative (Q8 mean 3.8).
2. **Emotional and lifestyle impact:** Moderate effect on mood (Q3) and lifestyle choices (Q10).
3. **Low academic impact:** Most respondents do not feel social media strongly reduces academic/work performance (Q6 mean 2.6).
4. **Face-to-face interaction:** Slight reduction, not very significant (Q5 mean 2.9).

5. **Awareness of risks:** Good awareness (Q11 mean 3.7), suggesting informed usage.
6. **Age effect:** Younger respondents (<30) report more emotional impact, comparison tendencies, and engagement.
7. **Gender differences:** Females more influenced in mood, comparison, lifestyle; males show higher "disagree/strongly disagree" clusters.
8. **Extremes:** Some respondents (e.g., Mansi Verma, Mithilesh Gupta) show extreme disagreement across all questions, possibly non-social media users.

5) Correlation Insights (Qualitative)

a. **Time spent (Q2) vs. Mood impact (Q3):** Positive correlation; those spending more time report stronger mood effects.
b. **Comparison tendency (Q4) vs. Anxiety (Q7):** Moderate; more comparison → higher anxiety/restlessness.
c. **Knowledge (Q8) vs. Responsible use belief (Q12):** Positive; seeing benefits correlates with belief in responsible usage.
d. **Academic distraction (Q9) vs. Excessive use (Q6):** Low correlation; respondents may get distracted but not necessarily see academic performance drop.

RESEARCH FINDINGS

The study findings are clear that, the social media effects on youth behaviour are moderate and multi-dimensional that affect daily life, feelings and moods, academic and lifestyle choices. The analysis reveals that the majority of the respondents are active social media users and admit that social media influence their behaviour, but the degree of influence can differ in various domains. Among the most important conclusions is the fact that social media is currently seen as a potent source of information and knowledge improvement. This aspect received the most consensus among the respondents as they indicated that platforms like Instagram, YouTube and other digital networks are more often utilized to learn, create awareness and keep up. This underlines the beneficial educational extent of social media among the young. Concerning the influence of behaviour, the study revealed a mediate effect on daily activities and lifestyle decisions.

A significant number of respondents concurred that social media influences their choice, behaviours as well as general behaviour, which means that digital exposure is a consistent factor influencing youth lifestyle patterns. An emotional influence that is also noticeable but not intense is also found.

The social media has moderate impact on mood and emotional well-being. Many respondents said that they do social comparison, which may cause emotional strain or decreased self-esteem. Nonetheless, fear associated with the use of social media were neutral in general, indicating that users can generally cope with emotional dependence. The other significant impact is that the face-to-face interaction is slightly

reduced although not strongly. This implies that online communication has not entirely substituted the real-life social interaction despite the dominance.

The young generations continue to have a balance between online and offline communication. In academic performance, the research reveals a low perceived adverse effect on performance although a few of the respondents feel distracted during studying or work. This implies that most participants do not see social media as a significant obstacle to their academic success even though it may be a temporary distraction. There is also a high degree of risk and responsible use awareness, as demonstrated in the study. The respondents are aware of such problems as addiction, misinformation, and emotional stress, and are quite convinced that social media can be used in a responsible manner without detrimental behavioural outcomes.

The demographical analysis shows that younger users and students are moderately more influenced by emotions and behaviours than older and employed groups, who care more about informational benefits. In general, the results of the study suggest that the effects of social media are balanced, i.e. they have strong informational effects and moderate behavioural and emotional effects, and they are mainly influenced by the awareness and usage patterns.

RECOMMENDATIONS

Digital literacy and responsible use of social media need to be promoted. Educational establishments ought to have awareness programs that focus on time management, emotional control, and critical content analysis. Parents are to help teenagers to use it but also speak with them offline. Mindful use can be facilitated by platforms with screen-time notifications and content control. People are advised to balance online and offline lives by using coping techniques to minimize emotional stress and distractors. Future studies are needed to investigate longitudinal and platform-specific impacts, age, gender, occupation, and socio-economic influences. Social media can be a positive source of knowledge, creativity and personal development with minimum harm to behaviour and psychological risk by supporting conscious, informed use.

IMPLICATIONS

The research educates young people, teachers, policy makers and social networks on how to engage digitally in a responsible manner. Young people can be able to self-regulate to reduce anxiety, FOMO, and addictive behaviours. Teachers may incorporate digital literacy as an approach to developing critical thinking and emotional well-being. Online safer environment and mental health support structures can be designed by policy makers. Social networks understand the behaviour of the users in order to market ethical content and equitable use. Conscious use of social media generally promotes the acquisition of knowledge, social connectedness and well-being and minimises the impact of negative behaviour and psychological outcomes. The results emphasize the need to engage in collective actions to establish a responsible, healthy online environment among young people.

CONCLUSION

According to the research, the phenomenon of social media is an omnipresent factor in the lives of young people, influencing their behaviour, feelings, their way of life and their engagement in learning. The analysis of the data demonstrates that young adults, especially those aged 18 to 30 are moderately affected by the effects on mood, lifestyle and everyday behaviour and students are more susceptible to the social comparison and the impact of emotion. Social media is also known as a source of knowledge, information and connection and respondents have already identified the advantages of social media in terms of learning, information awareness and responsible usage. Nonetheless, overuse is associated with slight distraction, slight decrease in face to face interaction, and a slight inclination towards anxiety in case access is limited.

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TO STUDY IF AI COMPARISON VIDEOS INFLUENCE DECISIONS WITHOUT BRAND AWARENESS

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ABSTRACT
It is the era of technology, where every person needs to be updated with techno savvy tools. The same way it's not only companies but consumers too are being advanced when it comes to using advanced tools for their purchase decisions. This study highlights how consumers use AI tools to compare brands when choosing products. AI advertising has transformed consumer behavior and buying decisions with its innovation and creativity. As the time has changed, many consumers too have changed their preferences to AI advertising. It shows how consumers today don't actually invest time in doing research for their buying and choose to rely directly on AI suggestions, which, at times, may not be fair. It is the age of the internet, and consumers today are adapting to the technology. The study used a quantitative method, in which respondents were asked to complete Google Forms distributed via email. It shows that many consumers use AI. The study shows that consumers do watch these AI generated videos and consider the advice given by the AI more than the brands testimony.

The study shows perspective of consumers of why they AI comparison videos over brand governess

Keywords: *AI tools, Comparison video, Consumer behaviour*

INTRODUCTION
We live in a digital era where technology is increasing day by day in every sector. One of the sectors where technology(AI) has taken the charge is the marketing world. The best use of AI advertising is done by the marketers to communicate with the consumers and make their brand popular. With the rise of social media platforms, AI generated advertising videos have gained popularity among the people in a very short span of time. AI videos are not only attractive but provide all the information when it comes to marketing.

These videos help consumers make a quick decision with their engaging format, simple language and innovation. It's a time saver for people to watch AI comparison videos rather than going back to traditional patterns. AI comparison videos can also be biased towards certain brands depending on who has made those videos. AI is one of the marketing tools that is used by companies too to stay forward in the competition.

In spite of such a massive popularity, there is limited research on AI advertising videos whether these ads influence consumers without brand awareness. AI tools offer information but cannot be fully trusted as it fails to impress some people with the concern regarding trust, transparency and accuracy. Consumers usually don't cross check the information provided by AI which raises the question of reliability on AI advertisement. Hence, this study focuses to examine whether the AI generated videos can influence consumers decision making and whether the customers are comfortable buying a product without brand awareness.

OBJECTIVES

1. To examine the influence of AI comparison videos on consumer decision-making
2. To assess the level of brand awareness after watching AI comparison videos
3. To determine whether consumers make decisions without brand awareness after watching AI comparison videos

HYPOTHESIS

Hypothesis 1

$H1_1$: AI comparison videos have a significant influence on consumer decision-making.

$H0_1$: AI comparison videos have no significant influence on consumer decision-making.

Hypothesis 2

$H1_2$: Consumers make product decisions without brand awareness after watching AI comparison videos.

$H0_2$: Consumers do not make product decisions without brand awareness after watching AI comparison videos.

Research Gap

Previous studies mainly focus on how companies use AI as a tool in their marketing strategies. There is limited research on how consumers may be completely dependent on AI tools in making purchase decisions. This study explains how consumers use AI tools to compare brands or products before purchasing.

Limitations

- The study is limited to people who reside in Mumbai.
- If convenience sampling was used (like Google Forms), it may not be fully random.
- The study focused on selected factors (such as AI videos and ratings), while other important factors, such as Price sensitivity, Brand loyalty, and Peer influence, were not deeply examined.

LITERATURE REVIEW

According to Ali Ashraf Ratta (2024)**,** his study compares AI-generated ads with human-generated ads. It shows that AI-generated ads are more engaging and attractive than human-made advertisements. Consumers are often drawn to AI-generated ads for their creativity and visuals. It focused on how AI is becoming essential in commerce and communication. One of the section of this study is whether AI ads can match the standard of human creativity in terms of emotions and feelings.

Chenyan Gu (2024) in his study found that AI advertisement being used widely has acceptance only when it's realistic and creative. When the advertisement looks too artificial and unrealistic, people reject it and show less interest. AI can engage people when it's less uncomfortable and more intelligent.

A research study by Prof. Tanu Dang (2024) states that a person decides to buy something based on three factors: Attitude, social influence, and perceived behavior control. Further, the study shows that AI can affect all three factors. AI plays a pivotal role in shaping consumers' buying choices by making advertisements more influential. The study also identifies a research gap and proposes further exploration of AI's impact on consumers.

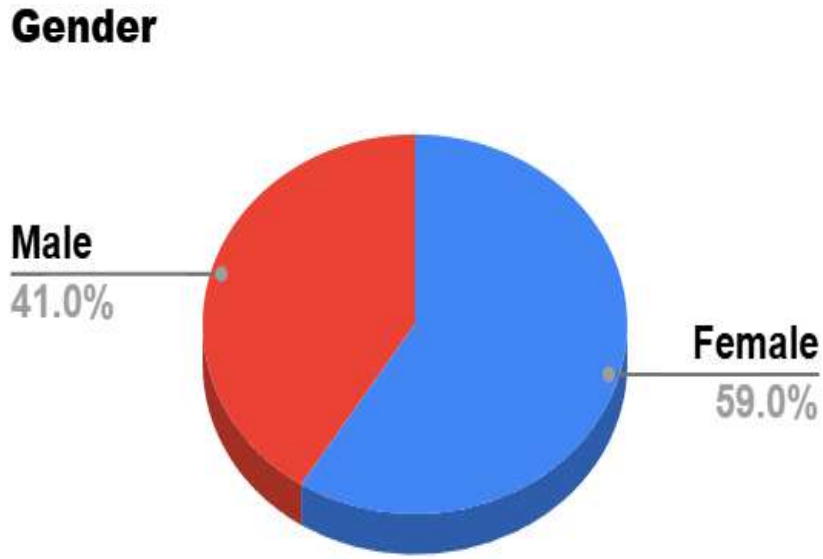
Ana Ribeiro (2025) in her study, found that AI has become an important part of our daily life. AI affects things like customers' experience, relationship with brands, usefulness of technology etc. The study concludes that the relationship between AI and consumers is complex and marketers should treat AI as an important part of consumers' journey by improving their quality.

RESEARCH METHODOLOGY

The study uses a descriptive method. It uses primary data to examine whether AI comparison videos influence consumers' purchase decisions without brand awareness. The study uses a quantitative method. The study uses convenience sampling as respondents are selected based on availability and willingness. The data is collected from people residing in Mumbai. The targeted audience was mainly consumers who use social media platforms and also have a regular purchasing behavior. The study used a quantitative method, in which respondents were asked to complete Google Forms that were circulated. It focuses on how consumers' purchase decision-making is, whether it is based on an AI comparison method, or whether consumers really check the brand details like the name, their features, the history of the brand, the ingredients, the reputation, etc. The study uses Jamovi for data analysis.

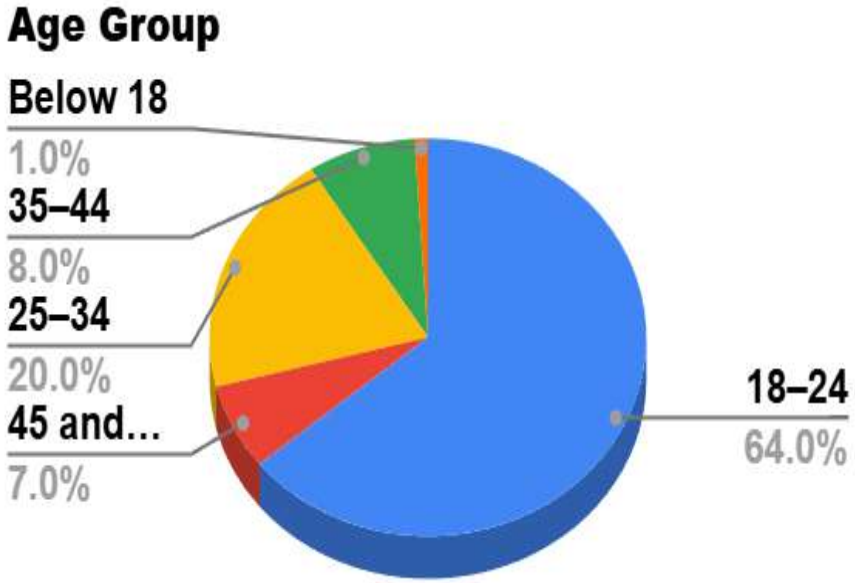
DATA ANALYSIS AND INTERPRETATION

1. Gender



Out of 100 respondents 59% were female and 42% were male, indicating a slight female dominance in the sample. This suggests that the study's findings may reflect stronger perspectives among female respondents.

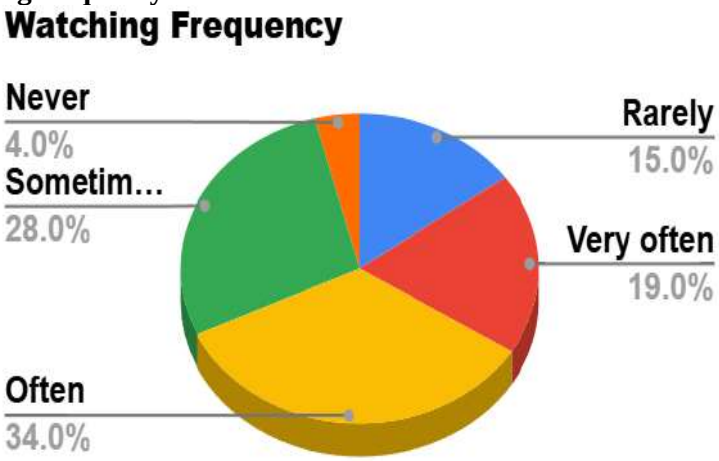
2. Age Group



The age distribution of respondents shows that a majority (64%) belong to the 18–24 age group, followed by the 25–34 age group (20%). Smaller proportions were observed in the 35–44 (9%) and 45 years and above (6%) categories, while only 1%

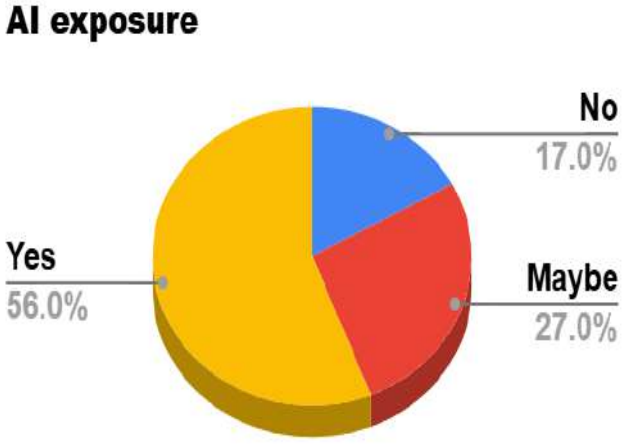
were below 18. This shows that the sample is largely composed of young individuals, whose preferences and behavior toward AI-generated comparison videos are likely reflected in the study findings.

3. Watching frequency



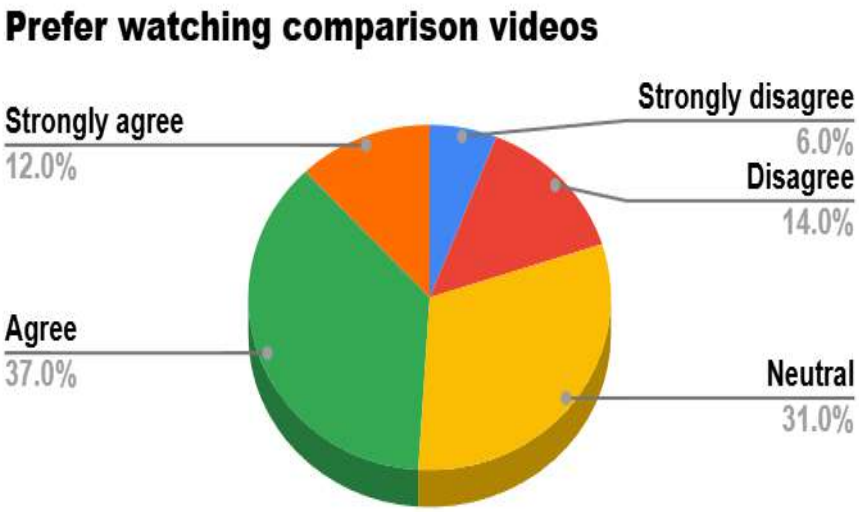
The frequency of watching product comparison videos shows that most respondents engage with this content regularly: 34% watch often, and 20% very often. Additionally, 28% reported watching sometimes, while smaller proportions indicated rarely (13%) or never (5%). This shows that a majority of respondents are familiar with comparison videos, making them relevant for studying consumer decision-making behavior.

4. AI Exposure



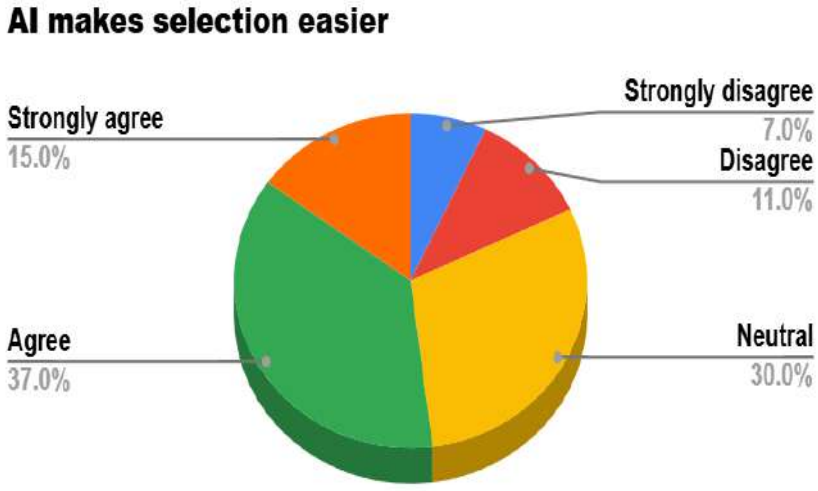
The responses indicate that a majority of participants (57%) have watched AI-generated comparison videos, while 24% were uncertain and 19% had not watched such content. This shows that most of the respondents have some level of exposure to AI-generated comparison videos, making them suitable for evaluating their impact on consumer decision-making.

5. Prefer watching comparison videos.



The responses indicate that a majority of participants prefer watching comparison videos before choosing between products. It shows that comparison videos are an important and commonly used source of information in the consumer decision-making process.

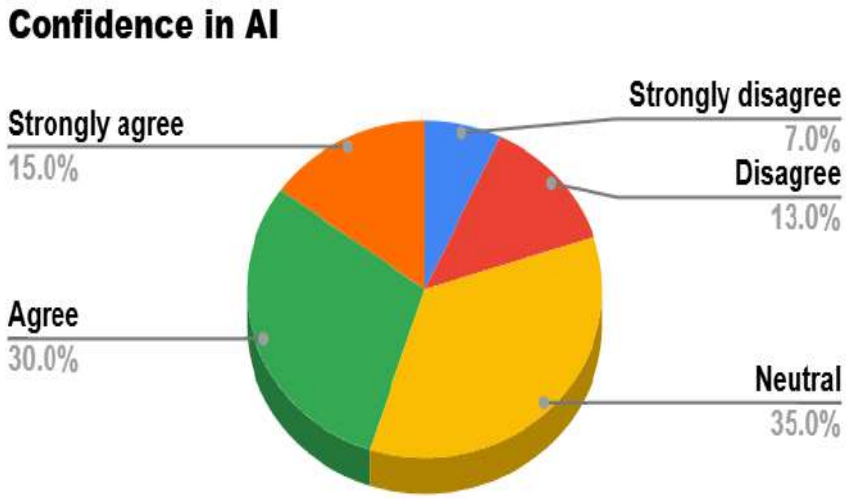
6. AI makes selection easier.



Most respondents selected "Agree" and "Neutral," indicating that AI-generated comparison videos generally make product selection easier. A fair number also chose "Strongly Agree," showing a strong positive perception among some users.

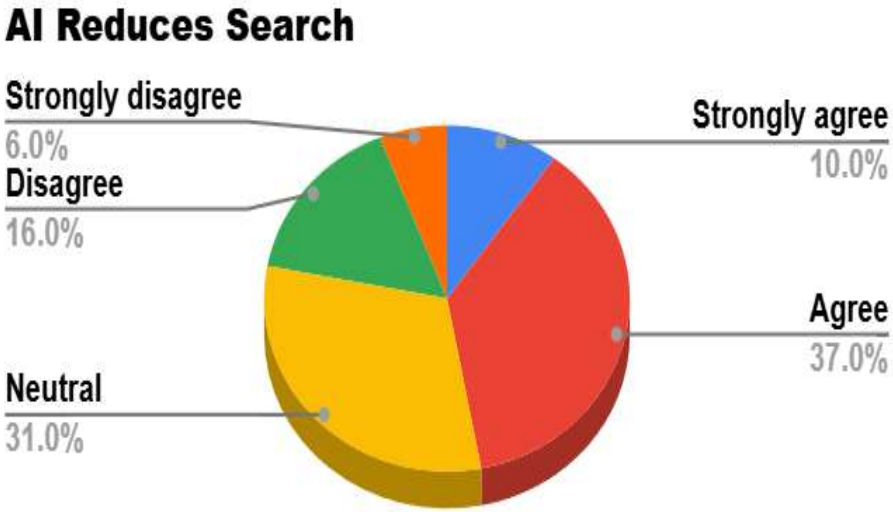
Only a small proportion of respondents disagreed. Overall, the results suggest that AI comparison videos help simplify decision-making for consumers.

7. Confidence in AI



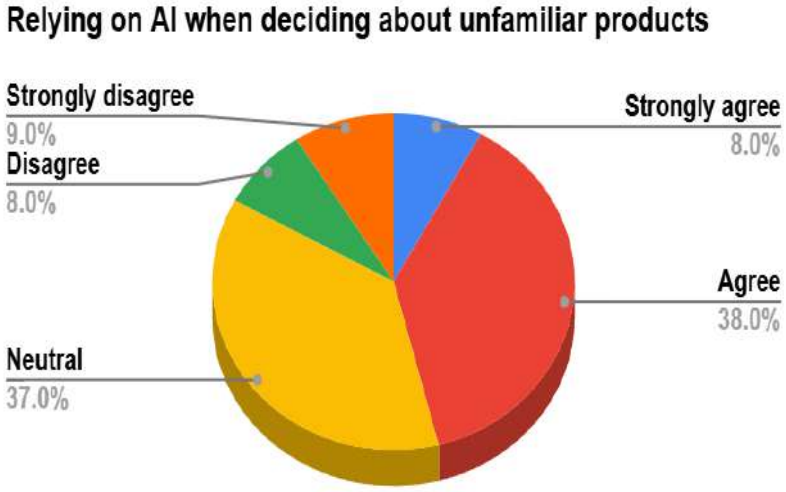
Most respondents selected "Neutral" and "Agree," indicating moderate confidence after watching AI-generated comparison videos. A noticeable number also chose "Strongly Agree," showing that some respondents feel highly confident in their choices. Only a few expressed disagreement. Overall, the results shows that AI comparison videos positively influence consumer confidence, though the effect is moderate rather than very strong.

8. AI Reduces Search



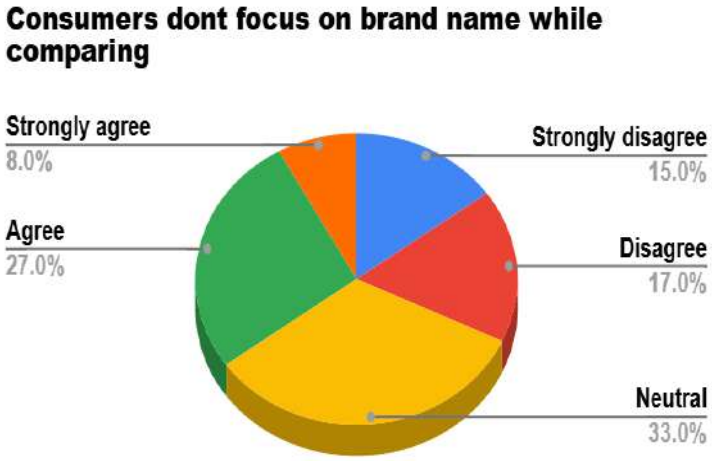
Most respondents chose "Neutral" and "Agree," suggesting that AI comparison videos somewhat reduce the need for additional information. Some strongly agreed, showing clear benefits, while lower ratings show that not all users rely on them. Overall, there is a moderate positive impact with varying user dependence.

9. Relying on AI when deciding about unfamiliar products



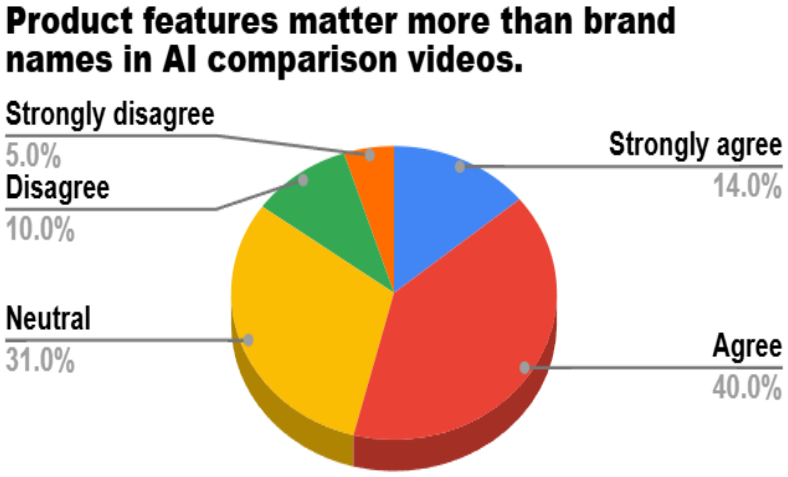
Most respondents selected "Neutral" and "Agree," indicating a moderate reliance on AI comparison videos when choosing unfamiliar products. Some respondents strongly agreed, while a few expressed disagreement. Overall, the results shows a positive but not very strong dependence on AI for such decisions.

10. Consumers don't focus on the brand name while comparing.



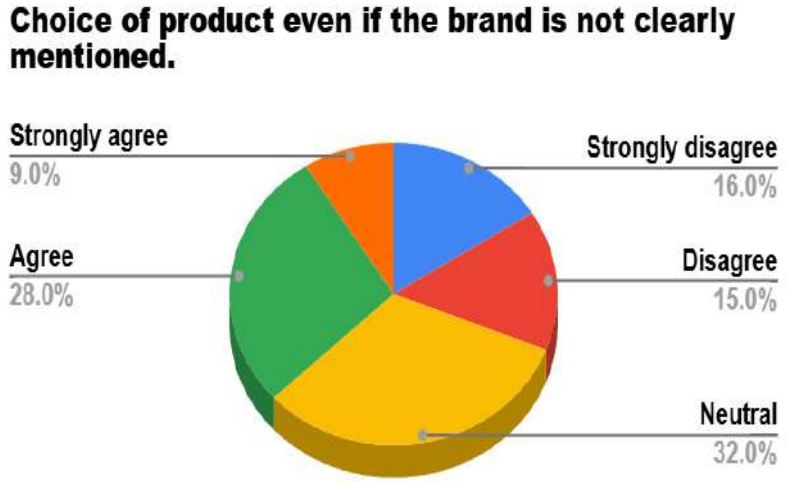
Most respondents selected "Disagree" and "Neutral," indicating that they still prefer brand names while watching comparison videos. Fewer respondents agreed with the statement. Overall, the results suggest that brand names continue to play a vital role in consumer decision-making.

11. Product features matter more than brand names in AI comparison videos.



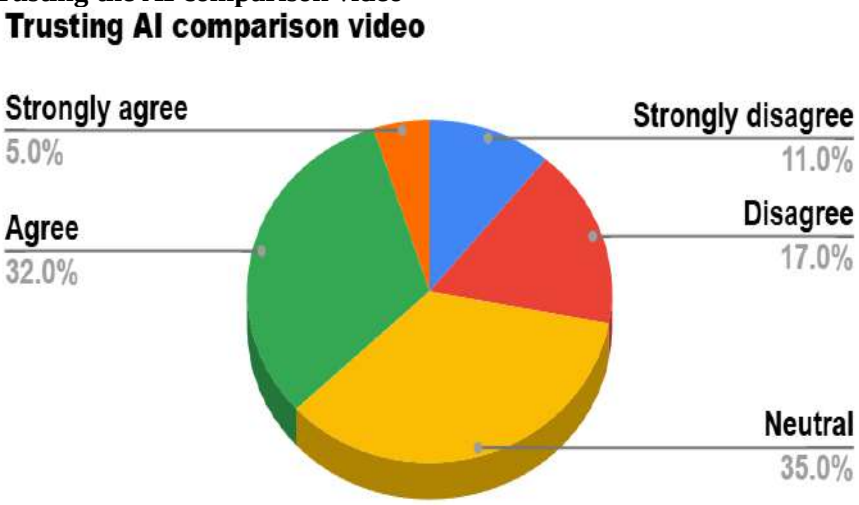
Most respondents selected "Agree" and "Neutral," with many also choosing "Strongly Agree," indicating that product features are considered more important than brand names in AI comparison videos. Only a small number disagreed. Overall, the results suggest that consumers prioritize product features over brand when using AI-based comparisons.

12. Choice of product, even if the brand is not clearly mentioned.



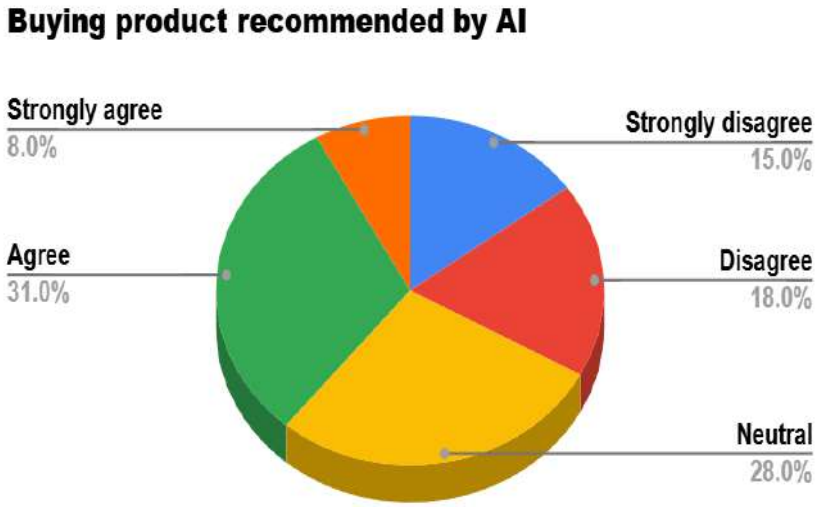
Most respondents selected "Disagree" and "Neutral," indicating that they are less likely to choose a product if the brand is not clearly mentioned. Some respondents agreed, but overall responses leaned slightly negative. This suggests that brand visibility still influences purchase decisions.

13. Trusting the AI comparison video



Most respondents selected "Neutral" and "Agree," which shows a moderate level of trust in AI comparison videos when they are unfamiliar with the brand. Some respondents strongly agreed, whereas few expressed disagreement. Overall, the results showed a positive but cautious trust in AI-generated comparisons.

14. Buying a product recommended by AI



Most respondents selected "Disagree" and "Neutral," which shows that they are less likely to buy a product recommended by AI without knowing the brand. While some respondents agreed, overall responses show hesitation. This shows that brand awareness remains important in purchase decisions, even with AI recommendations.

15. Suggestions

Code	Theme	Frequency	Interpretation
1	Helpful / Time-saving / Easy decision-making	32	Majority find AI videos useful
2	Accuracy Issues / Missing details	14	Many doubt correctness of info
3	Trust Issues / Unreal / Biased	12	Some feel videos are not reliable
4	Need Human Touch / Real Experience	9	Users want authenticity
5	Suggestions (sources, brand clarity, improvements)	18	Many gave improvement ideas
6	No Comments / NA	10	Neutral / no opinion

These suggestions show that majority of the respondents perceive AI-generated comparison videos as helpful and time-saving in decision-making. However, few of the respondents raised concerns regarding accuracy and reliability, indicating doubts about the correctness of information. Some respondents also highlighted the lack of human touch and authenticity in AI-generated content. Additionally, several suggestions were provided, including the need for better data accuracy, inclusion of real user experiences, and clearer brand information. Overall, while AI comparison videos are considered useful, improvements in trust and transparency are necessary.

Hypothesis testing

Hypothesis 1

$H0_1$: AI comparison videos have no significant influence

$H1_1$: AI comparison videos have significant influence

Variable	p-value	Comparison	Result
AI makes selection easier	< 0.001	$p < 0.05$	Significant
Confidence in AI	< 0.001	$p < 0.05$	Significant
AI reduces search	0.001	$p < 0.05$	Significant
Reliance on AI	0.001	$p < 0.05$	Significant

All p-values are less than 0.05, which means the results are significant. This shows that AI comparison videos actually help people in making decisions.

$H0_1$ is rejected and $H1_1$ is accepted.

AI comparison videos have a significant influence on consumer decision-making

Hypothesis 2

$H0_2$: Consumers do not decide without brand awareness

$H1_2$: Consumers decide without brand awareness

Variable	p-value	Comparison	Result
Do not focus on brand	0.01	$p < 0.05$	Significant
Features > Brand	0.005	$p < 0.05$	Significant
Choose without brand	0.037	$p < 0.05$	Significant
Trust AI (unknown brand)	0.158	$p > 0.05$	Not Significant
Buy without brand	0.015	$p < 0.05$	Significant

Some values are significant, but one important value is not significant and most responses show people still care about brands. So overall, people are not fully ready to ignore brands.

$H0_2$ is accepted and $H1_2$ is rejected.

Consumers still depend on brand awareness while making decisions.

CONCLUSION

The study concludes that consumers do trust AI comparison videos more than their own research. Some consumers do not trust AI tools and prefer doing their own research the traditional way to determine which brand would be better for them. A few consumers also mentioned that they use these AI tools only when they need quick decisions. They use it when they do not know about any brand at all to find out the features, ingredients, etc. Some of them do their research by checking feedback, reviews, etc. They also suggested that companies must take the effort to present accurate information about the brand and product to their audience and avoid putting out any false information just for the sake of marketing. The study also shows that AI really helps consumers make easier decisions. It makes it easy to compare products they know little about. A few consumers also think that AI might at times not provide exact product details, and that consumers need to do their own research before trusting AI for recommendations.Thus, it is concluded that AI-generated videos are among the best ways to help consumers choose a brand or product.

RECOMMENDATION

In today's world, where technology is advancing rapidly, people often become overly dependent on it. Since AI has been introduced to humanity, everything humans do is dependent on it. Be it career-related suggestions, sickness, or other matters, everyone relies heavily on AI's recommendations. Similarly, when purchasing products, consumers today consult AI before buying from any brand. In my opinion, it's the consumer's duty to trust their own use of the product and to do their own research when comparing products. At times, companies also run paid ads on AI tools that actually suggest only specific brands in the top column, so that consumers end up

purchasing those brands only. As consumers, it is our duty to conduct thorough research and not rely solely on AI tools. Consumer testimony, reviews, feedback, testing products, and recommendations are a few ways consumers can research and compare brands when they don't have a clear image of them, rather than just relying on AI tools. Yes, AI tools do have their own advantages as they are easier and quicker to use. But not all of the information provided is true and fair. It is also the companies' duty to provide true and fair information about their products so that consumers have a clear view, and it becomes easier for them to compare brands before purchasing.

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Appendix

Questionnaire

1. Name
2. Gender

Male

Female

Prefer not to say

3. Age Group

Below 18

18 to 24

25 to 34

35 to 44

45 and above

4. How often do you watch product comparison videos?
Very often

Often

Sometimes

Rarely

Never

5. Have you watched AI-generated comparison videos before?
Yes

No

Maybe

The following statements were measured using a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

6. I prefer watching comparison videos before choosing between products.
7. AI-generated comparison videos make product selection easier.
8. I am confident in my choice after watching an AI comparison video.
9. AI comparison videos reduce my need to search for additional information.
10. I am likely to rely on AI comparison videos when deciding between unfamiliar products.
11. I do not focus on brand names while watching comparison videos.
12. Product features matter more than brand names in AI comparison videos.
13. I can choose a product even if the brand is not clearly mentioned.
14. I trust AI comparison videos even when I am unfamiliar with the brand.
15. I would consider buying a product recommended in an AI comparison video without knowing the brand.
16. Please share any suggestions or comments regarding AI-generated comparison videos.

AI IN EDUCATION AND SMART LEARNING TECHNIQUES

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ABSTRACT

Artificial Intelligence (AI) is increasingly influencing the education sector by transforming conventional teaching practices into more dynamic and technology-driven systems. The integration of AI-based applications such as adaptive learning software, virtual tutoring systems, automated evaluation tools, and digital classrooms has enabled more personalized and efficient learning experiences. This research explores how AI contributes to improved academic performance, enhanced learner participation, and effective teaching support.

The study is based on hypothetical primary data collected from 120 respondents, including students, educators, and institutional administrators. Analytical techniques such as correlation and regression are applied to examine the proposed hypotheses. The results demonstrate a strong positive linkage between the use of AI and student performance, as well as between smart learning practices and learner satisfaction levels.

The findings highlight that AI has the potential to make education more accessible and outcome-oriented. However, issues such as data security, implementation costs, and lack of technical expertise continue to pose challenges. The study suggests strengthening digital competencies, investing in technological infrastructure, and adopting responsible AI practices for long-term educational advancement.

Keywords: *Artificial Intelligence in Education, Smart Learning Systems,* Personalized Learning, Student Engagement, Digital Transformation

INTRODUCTION

In recent years, the education system has witnessed a significant shift due to rapid technological advancements. Among these developments, Artificial Intelligence has emerged as a major innovation that is redefining the way teaching and learning are conducted. It enables educational institutions to move beyond traditional instructional methods and adopt more flexible, interactive, and data-oriented approaches.

Smart learning techniques involve the application of AI-enabled tools and digital platforms to create customized and adaptive learning environments. These include online learning systems, AI-supported tutoring, virtual classrooms, and automated assessment mechanisms. Such tools allow content to be tailored according to individual learning capabilities, thereby enhancing overall effectiveness.

AI also plays a supportive role for educators by reducing manual workload through automation of repetitive academic tasks such as grading and record maintenance. This enables teachers to devote more time to student guidance and skill development.

With the increasing adoption of online and hybrid learning models, especially in recent years, the role of AI has become even more significant. However, there remains a need to evaluate its practical impact on student achievement and engagement, which forms the basis of this study.

RESEARCH OBJECTIVES

To examine the contribution of Artificial Intelligence in improving educational practices.
To evaluate the influence of smart learning techniques on student involvement and satisfaction.
To study the relationship between AI usage and academic performance.

RESEARCH METHODOLOGY

This research follows a descriptive and analytical approach, utilizing both primary and secondary data sources.

PRIMARY DATA

Data was collected through a structured questionnaire administered to 120 participants, comprising students, teachers, and academic administrators. The distribution included 60 students, 35 teachers, and 25 administrators.

The questionnaire focused on awareness and usage of AI tools, perceived benefits, engagement levels, and academic improvements. Responses were measured using a five-point Likert scale ranging from strong disagreement to strong agreement.

Secondary Data

Secondary information was gathered from academic journals, research publications, and online educational resources related to AI applications in education.

Data Analysis Tools

Correlation Analysis

Regression Analysis

HYPOTHESES

H1: AI implementation is significantly associated with student academic performance.
H2: Smart learning methods positively affect student engagement and satisfaction.

Chapter 2: Literature Review

Previous studies have highlighted the growing importance of Artificial Intelligence in transforming educational systems.

Holmes (2019) stated that AI facilitates individualized learning by adjusting educational content based on learner needs and pace.

Luckin (2020) emphasized that intelligent tutoring systems provide continuous feedback, enhancing learning efficiency and reducing dependency on traditional teaching.

Chen (2021) observed that AI-based platforms improve student participation through interactive tools such as simulations and instant assessments. Sharma (2022) noted that smart classrooms create collaborative environments using advanced technologies like virtual labs and multimedia content.

Patil and Mehta (2023) concluded that adaptive learning systems contribute significantly to improved academic outcomes and student retention.

Despite these advantages, challenges such as data privacy issues, high costs, limited infrastructure, and lack of technical skills have been identified. The literature also indicates a gap in empirical research linking AI adoption directly with measurable academic results, which this study seeks to address.

Chapter 3: Data Analysis and Interpretation

AI Adoption Levels

High – 40%

Moderate – 42%

Low – 18%

Student Engagement Levels

Very High – 45%

High – 34%

Moderate – 16%

Low – 5%

Impact of Smart Learning

Academic improvement – 75%

Better understanding – 82%

Increased participation – 78%

Time efficiency – 70%

Hypothesis Testing

H1:
Correlation coefficient ($r = 0.81$) indicates a strong positive relationship between AI usage and academic performance. Hence, the hypothesis is accepted.

H2:
Regression analysis ($R^2 = 0.67$, $p < 0.05$) shows that smart learning techniques

significantly influence student engagement. Therefore, this hypothesis is also accepted.

Interpretation
The findings suggest that increased adoption of AI tools leads to better academic results and higher levels of student engagement. AI-enabled systems provide customized learning experiences, making the process more efficient and interactive.

Students benefit from immediate feedback and flexible learning methods, while educators gain efficiency through automation. However, concerns related to cost and dependency on technology remain.

Research Gap
Although several studies discuss the advantages of AI in education, there is limited evidence connecting AI-driven learning methods with measurable academic performance outcomes. This study attempts to address this gap through analytical evaluation.

Chapter 4: Findings
AI enhances student participation and engagement

Personalized learning improves comprehension and retention

Automation reduces workload for educators

Smart learning systems provide flexibility in education

Infrastructure and cost remain key challenges

Chapter 5: Conclusion and Recommendations

CONCLUSION
The study concludes that Artificial Intelligence plays a vital role in modern education by improving learning outcomes and student engagement. The results support both hypotheses, indicating a strong relationship between AI adoption and academic performance.

AI-based educational systems offer benefits such as personalization, efficiency, and accessibility. However, addressing challenges related to privacy, cost, and training is essential for successful implementation.

RECOMMENDATIONS
Enhance digital and AI training for educators

Invest in technological infrastructure

Ensure ethical handling of student data

Promote adaptive and personalized learning tools

Encourage blended learning approaches

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EXPLORING THE ROLE OF AI INNOVATION IN DRIVING SUSTAINABLE GROWTH AND EMPLOYMENT OPPORTUNITIES

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ABSTRACT
Artificial Intelligence (AI) has rapidly evolved into a transformative force influencing global economies, industries, and labour markets. This research paper explores the intersection of AI innovation, sustainable economic growth, and employability. While AI contributes significantly to productivity, efficiency, and innovation, it also disrupts traditional employment structures, leading to both opportunities and challenges. The study adopts a qualitative approach, analysing existing literature, reports, and case studies to understand AI's dual role in job creation and displacement. It emphasizes the importance of reskilling, policy frameworks, and inclusive growth strategies. The findings suggest that sustainable growth in the AI era depends on balancing technological advancement with workforce adaptability, ensuring equitable access to opportunities and long-term socio-economic stability.

Keywords: *Artificial Intelligence, Sustainable Growth, Employability, Automation, Innovation, Workforce Development*

1. INTRODUCTION
The emergence of Artificial Intelligence (AI) marks a defining moment in technological and economic evolution. As a cornerstone of the Fourth Industrial Revolution, AI enables machines to perform tasks that typically require human intelligence, including learning, reasoning, and decision-making.

AI-driven innovation has transformed industries such as healthcare, finance, manufacturing, and education. Businesses increasingly rely on AI to enhance operational efficiency, reduce costs, and improve decision-making processes. This technological advancement contributes to economic growth but also raises concerns about sustainability and employment.

Sustainable growth refers to development that meets present needs without compromising future generations. It involves balancing economic expansion, environmental protection, and social equity. AI plays a crucial role in achieving this balance by optimizing resource use and enabling smart solutions.

However, the integration of AI into the workforce presents significant challenges. Automation threatens traditional jobs, particularly those involving repetitive tasks, while simultaneously creating new roles requiring advanced skills. This shift necessitates a re-evaluation of employability in the modern economy.

This paper explores how AI innovation contributes to sustainable growth and examines its implications for employability, aiming to provide insights and policy recommendations for a balanced future.

1.1 The Technological Paradigm Shift

The emergence of Artificial Intelligence (AI) is not merely an incremental improvement in computing but a defining "General Purpose Technology" (GPT), comparable to the steam engine or electricity. As the cornerstone of the **Fourth Industrial Revolution (Industry 4.0)**, AI transitions machines from tools of execution to agents of cognition. By leveraging neural networks and large language models (LLMs), AI systems now perform "heuristic" tasks—learning from data, reasoning through ambiguity, and autonomous decision-making—that were once considered the exclusive domain of human intelligence.

1.2 Industry Transformation and Economic Catalysts

AI-driven innovation has moved beyond experimental phases to become a core operational requirement.

- **In Healthcare:** AI facilitates precision medicine and rapid drug discovery.
- **In Finance:** It drives algorithmic trading and real-time fraud detection.
- **In Manufacturing:** It enables "Lights-Out" factories through predictive maintenance and autonomous robotics. While these advancements significantly enhance operational efficiency and reduce overhead, they create a **"Productivity Paradox"**: economic growth is accelerating, yet the traditional link between productivity gains and wage growth is under immense pressure.

1.3 The Framework of Sustainable Growth

In the context of this paper, **Sustainable Growth** is defined as a tripartite balance of economic viability, environmental stewardship, and social equity. AI acts as a dual-edged sword in this framework:

- **Environmental & Resource Optimization:** AI can reduce global carbon emissions by up to **4%** by 2030 through smarter energy grids and optimized supply chains.
- **The Social Equity Challenge:** The sustainability of this growth is threatened if the economic benefits of AI are concentrated among a "technological elite," leaving the broader workforce behind.

1.4 The Employability Crisis and the "Skill Bias"

The integration of AI into the labour market has triggered a fundamental re-evaluation of **Employability**. Unlike previous automation cycles that replaced physical labour, AI targets **cognitive labour**.

- **Displacement:** High-risk tasks include data synthesis, basic coding, and administrative coordination.

- **Emergence:** New roles demand a "Hybrid Skill Set"—combining domain expertise with AI orchestration. This shift necessitates a departure from traditional "job security" toward **"skill security,"** where a worker's value is defined by their ability to adapt to a rapidly evolving technological landscape.

2. LITERATURE REVIEW

2.1 The Theory of Skill-Biased Technological Change (SBTC)

The foundational literature on employability in the digital age is dominated by the Skill-Biased Technological Change (SBTC) framework (Acemoglu & Restrepo, 2024). Traditionally, SBTC argued that technology replaces "routine manual" labor. However, recent studies (OECD, 2025) suggest a shift toward "Cognitive-Biased Change." * Key Finding: AI is now making significant inroads into non-routine, cognitive tasks (e.g., IT, management, and science), which white-collar professionals traditionally dominated.

2.2 The Productivity Paradox and the "Augmentation" Thesis

A growing body of research, including the McKinsey Global Institute (2025), explores why AI's massive efficiency gains haven't yet reflected in a 1:1 job loss.

Authors like Brynjolfsson argue that AI acts as a "Copilot." In manufacturing and healthcare, AI is viewed as an "Augmentation" tool that allows humans to focus on high-value strategy while the AI handles data-heavy triage (Google Cloud Research, 2025).

2.3 Structural Transformation and the Net Employment Balance

The World Economic Forum's *Future of Jobs Report 2025* provides a critical quantitative anchor for this research.

The "22% Shift": Between 2025 and 2030, structural labour-market transformation is expected to affect 22% of total jobs.

Net Growth: While 92 million jobs may be displaced (primarily in clerical and data entry), 170 million new roles are predicted to emerge (primarily in tech, sustainability, and healthcare).

Conclusion from Literature: The challenge is not a lack of *work*, but a lack of *aligned skills*. Workers can expect 39% of their skill sets to become outdated by 2030.

3. RESEARCH OBJECTIVES

- To analyse the role of AI in innovation and sustainable growth
- To examine the impact of AI on employability
- To identify key challenges in AI-driven labour markets
- To propose strategies for sustainable workforce development

4. METHODOLOGY

This research adopts a qualitative and conceptual approach, based on:

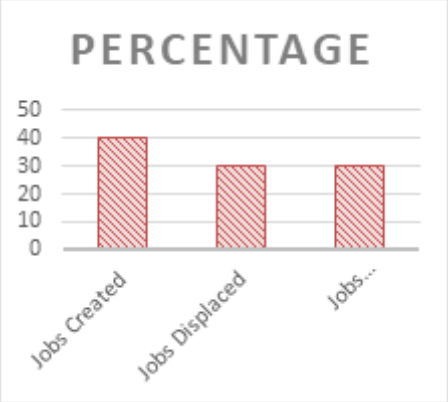
- Primary Data & Secondary data from journals and reports
- Literature review
- Case study analysis

This approach helps in understanding trends and forming theoretical insights into AI's impact.

5. DATA ANALYSIS

With proper policies, AI can create opportunities across different sectors and regions.

Diagram 1: AI Impact on Job

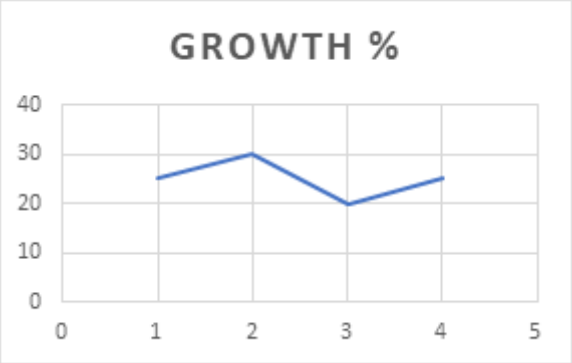


Category	Percentage
Jobs Created	40
Jobs Displaced	30
Jobs Transformed	30

Diagram 2: Skill Demand Shift

Skill Type	Percentage
Technical Skills	35
Cognitive Skills	40
Routine Skills	25

Diagram 3: Sustainable Growth Model



Sector	Growth %
Healthcare	25
Manufacturing	30
Finance	20
Retail	25

6. AI INNOVATION AND ECONOMIC GROWTH

6.1 Productivity and Efficiency

AI improves productivity by automating repetitive tasks, allowing human workers to focus on higher-value activities. This leads to increased efficiency and economic output.

6.2 Emergence of New Industries

AI has created entirely new sectors, including:

- Machine learning engineering
- Data science
- AI-based startups

These industries contribute significantly to economic growth.

6.3 Global Competitiveness

Countries investing in AI gain a competitive edge in global markets. However, developing economies may struggle to keep pace due to limited resources.

7. IMPACT OF AI ON EMPLOYABILITY

1. The Shifting Nature of Work: Tasks vs. Jobs

Current research emphasizes that AI replaces **tasks**, not necessarily entire **occupations**.

- **Automation-Prone Roles:** Jobs characterized by high "rule-based" logic (e.g., bookkeeping, data entry, basic insurance underwriting, and routine customer service) are seeing a significant decline in demand—some reports indicate a **13% drop** in job postings for these roles since 2023.
- **Augmentation-Prone Roles:** Jobs requiring high social intelligence, physical dexterity, or complex judgment (e.g., healthcare, skilled trades, and strategic management) are seeing demand *increase*. In these fields, AI acts as a "copilot," increasing productivity by an average of **14% to 34%**.

2. Key Economic & Labor Trends (2026 Data)

If your paper requires quantitative backing, consider these current indicators:

- **The Wage Premium:** There is a widening "AI wage gap." Professionals with verified AI proficiency now command a **28% to 56% wage premium** over peers in identical roles without those skills.
- **The "Gateway" Erosion:** A critical area for research is the erosion of "Gateway" jobs—entry-level roles (like junior paralegals or clerks) that traditionally served as training grounds for higher-paying positions. AI's ability to handle these "starter tasks" may disrupt traditional career ladders.
- **Organizational Flattening:** Approximately **20% of organizations** are using AI to flatten their structures, often eliminating middle-management layers that previously functioned as data synthesizers.

3. The "Skills Earthquake"

The half-life of professional skills has shortened drastically. Research suggests that by 2030, **39% of core worker skills** will need to change.

Essential Skills for the 2026 Labor Market:

Category	High-Value Skills	Research Context
Technical	Prompt Engineering, AI Governance, Data Ethics	Moving from "niche" to "standard" requirements.
Cognitive	Analytical Reasoning, Critical Thinking	Necessary to verify and "audit" AI-generated outputs.
Social	Empathy, Leadership, Negotiation	Capabilities AI currently cannot replicate with nuance.

7.1 Job Displacement

AI-driven automation replaces jobs in sectors such as:

- Manufacturing
- Customer service
- Data entry

Workers performing routine tasks are most affected.

7.2 Job Creation

AI creates new employment opportunities, including:

- AI engineers
- Data analysts
- Cybersecurity experts

It also increases demand for roles requiring creativity and problem-solving.

7.3 Skill Transformation

The demand for skills is shifting toward:

- Digital literacy
- Critical thinking
- Emotional intelligence
- Adaptability

This transformation requires continuous learning.

7.4 Human-AI Collaboration

Rather than replacing humans, AI often complements human capabilities. Collaborative systems improve productivity and innovation.

8. CASE STUDIES

8.1 Manufacturing Industry

AI-powered robotics have improved efficiency but reduced manual labor jobs. However, new roles in robot maintenance and programming have emerged.

Case Study 1: Manufacturing

The "Cobot" Transition in Automotive Assembly (2025–2026)

Scenario: A major European automotive manufacturer integrated AI-driven "Cobots" (Collaborative Robots) to handle precision welding and heavy lifting on its main assembly line.

The Displacement (The "Old" Employability): Manual spot-welders and warehouse logistics staff saw a 22% reduction in total headcount requirements for those specific

tasks. Traditional "experience-based" manual skills were rendered obsolete by the robots' 0.01mm precision.

The Augmentation (The "New" Employability): * The "Human-in-the-Loop" Role: Displaced workers were offered retraining as Predictive Maintenance Technicians. Instead of welding, they now monitor AI sensor data to predict when a robot might fail before it happens.

Wage Impact: Workers who transitioned to maintenance saw an average 15% salary increase, but the transition required a minimum 6-month certification in mechatronics.

Research Takeaway: Employability is no longer about *performing* the physical task, but about *overseeing* the system that performs it.

8.2 Healthcare Sector

AI applications in diagnostics and patient care enhance efficiency and accuracy. While some administrative roles decline, demand for skilled professionals increases.

Case Study 2: Healthcare

AI-Radiology Integration in Urban Hospital Networks (2024–2025)

Scenario: A multi-city healthcare network implemented generative AI diagnostic tools to pre-screen X-rays and MRIs for early-stage anomalies.

The Displacement: Basic administrative triage and "first-look" radiology scanning. Junior radiologists reported that 40% of their routine screening time was automated.

The Augmentation:

Focus Shift: Radiologists transitioned from "finders" to "interpreters." With AI handling the initial detection, doctors spent 35% more time on complex patient consultations and cross-departmental strategy (e.g., oncology planning).

New Role: The emergence of the Medical Data Auditor. This role involves verifying AI outputs to ensure no "algorithmic hallucinations" affect patient safety.

Research Takeaway: AI increases output quality and patient volume, but it creates a "hollowing out" of entry-level medical tasks, making the jump from student to specialist much steeper.

8.3 E-commerce Industry

AI-driven recommendation systems and automation improve customer experience and logistics, creating jobs in tech and analytics.

Case Study 3: E-commerce & Retail

"Agentic Commerce" at Global Logistics Hubs (2026)

Scenario: A leading e-commerce platform shifted from "Deterministic Automation" (robots following fixed paths) to "Agentic AI" (AI that makes autonomous decisions on stock routing based on live weather, social media trends, and shipping delays).

The Displacement: Traditional inventory clerks and "manual" digital marketers. AI now writes 90% of SEO product descriptions and automatically adjusts inventory levels without human approval.

The Augmentation:
The Strategic Shift: Employability for marketing teams shifted toward "Market Orchestration." Instead of writing copy, employees now manage "AI Personal Shoppers" (like Amazon's *Rufus*) to ensure the AI's "personality" aligns with the brand's ethical standards.

The Skill Premium: In 2026, e-commerce professionals with "AI Ethics & Governance" certifications are seeing a 42% higher hiring rate than those with traditional marketing degrees.

Research Takeaway: AI is turning e-commerce from a "labor-intensive" industry into a "governance-intensive" one.

9. CHALLENGES IN THE AI-DRIVEN LABOR MARKET

9.1 The Skill Gap: The "Velocity of Change" Problem

The primary challenge is not just the *existence* of a gap, but the speed at which it widens.

- Structural Unemployment: Unlike previous industrial revolutions that took decades, the AI shift is happening in months. This creates "structural unemployment," where jobs are available, but the displaced workforce lacks the specific technical literacy (e.g., Python, data labeling, prompt engineering) to fill them.
- The "Half-Life" of Skills: In 2026, the estimated "half-life" of a learned technical skill has dropped to just 2.5 years. This necessitates a shift from "one-time education" to Life-Long Learning (LLL) models**.**

9.2 Income Inequality: The "K-Shaped" Recovery

Economists warn of a K-shaped impact on employability and wages:

- The Upper Arm: High-skilled workers who leverage AI to double their productivity see massive wage growth and job security.
- The Lower Arm: Low-skilled workers in routine roles face "wage suppression" as they compete with low-cost AI software.
- The "Hollowing Out" of the Middle: AI is particularly effective at middle-management tasks (scheduling, reporting). This removes the "middle rungs" of the career ladder, making it harder for low-level employees to promote into high-wage brackets.

9.3 Ethical Concerns: The Integrity of Hiring

Ethical issues in AI directly impact who gets hired and why.

- Algorithmic Bias: If an AI hiring tool is trained on historical data from a male-dominated industry, it may subconsciously penalize female applicants. This creates a "black box" where qualified candidates are rejected without human oversight.
- Data Privacy & Surveillance: The rise of "Bossware" (AI that monitors keystrokes and attention) creates a tension between productivity and worker dignity.
- Transparency (The "Explainability" Crisis): When an AI denies a promotion or a job application, the lack of a "clear reason" violates the principle of Procedural Justice in the workplace.

9.4 Job Insecurity: The "Gigification" of Professional Work

The "Rapid Change" mentioned in your notes leads to a psychological and economic phenomenon known as Precarity.

- Project-Based Employment: Companies are increasingly hiring "AI Specialists" for short-term contracts rather than full-time roles, leading to a loss of health benefits and retirement stability.
- Psychological Impact: Even workers who are currently "safe" experience AI Anxiety, which reduces workplace morale and long-term commitment to a single employer.

Recommendations are summarised below:

Challenge	Academic Focus	Recommended Mitigation
Skill Gap	Human Capital Theory	Universal Basic Upskilling (UBU)
Inequality	Labor Polarization	Digital Service Taxes / Progressive AI Levies
Ethical Concerns	Algorithmic Accountability	AI Audit Mandates & "Right to Explanation" laws

10. OPPORTUNITIES IN THE AI ERA

10.1 Reskilling and Upskilling: The "Human-AI Hybrid" Model

- Reskilling is no longer just "learning to code." In 2026, it is about Technical Fluency—the ability to work alongside AI systems.
- The Surge in AI-Specific Roles: Beyond "Prompt Engineering," new standard roles like AI Ethics Officers and Machine Learning Ops (MLOps) Specialists have emerged. Research shows that 85% of employers now prioritize "AI literacy" over traditional degrees for entry-level roles.
- The "Skills Earthquake": According to recent 2026 labor data, nearly 40% of core worker skills are expected to change by 2030. Successful reskilling programs now focus on "Human-Centric" skills—creativity, resilience, and leadership—which AI cannot replicate.

- Wage Premium: Workers who successfully upskill to include AI proficiency in their current roles (e.g., an "AI-augmented Marketing Manager") command a 56% higher wage premium than those without those skills.

10.2 Innovation and Entrepreneurship: The "Great Equalizer"

AI is drastically lowering the "barrier to entry" for starting a business, turning a "solo-preneur" into a "micro-agency."

- Lowering Operating Costs: Generative AI allows small startups to automate legal drafting, marketing copy, and basic coding, tasks that previously required a large team. In 2026, there has been a 69% increase in people adding "Founder" to their professional profiles.
- The Startup Ecosystem: AI fosters "Niche Innovation." Startups are now leveraging specialized AI models to solve local problems, such as Agri-Tech AI for small-scale farmers or Hyper-Local Logistics for urban delivery.
- From Experimentation to Scale: 2026 is seen as the year of "Agentic AI," where AI agents can autonomously handle complex workflows (like supply chain management), allowing entrepreneurs to focus solely on high-level strategy.

10.3 Inclusive Growth: Bridging the Digital Divide

If governed correctly, AI can democratize access to high-quality services in traditionally underserved regions.

- Regional Development: AI allows for "Digital Leapfrogging" in rural areas. For example, AI-powered diagnostic tools and voice-based interfaces in local languages (like India's *Bhashini* project) allow those with limited literacy to access healthcare and government services.
- Democratizing Expertise: AI acts as a "leveler." It helps lower-skilled workers perform at a level closer to experts by providing "on-the-job" guidance. Research indicates that AI tools boost productivity by 34% among lower-skilled workers, effectively helping to close the experience gap.
- Policy-Driven Inclusion: Under frameworks like #AIforAll, governments are using AI to integrate marginalized communities into the formal economy through decentralized digital work opportunities.

11. POLICY RECOMMENDATIONS

11.1 Education Reform

- Integrate AI and digital skills into education systems
- Promote interdisciplinary learning

11.2 Workforce Development

- Encourage lifelong learning
- Provide vocational training programs

11.3 Government Intervention

- **Support displaced workers**
- Encourage equitable AI adoption

11.4 Industry Collaboration

- Partnerships between academia and industry
- Innovation hubs and research centers

11.5 Ethical AI Governance

- Establish regulations for fairness and transparency

12. CONCLUSION

AI innovation is reshaping economies and labour markets, offering both opportunities and challenges. While it drives sustainable growth through increased productivity and innovation, it also disrupts employment patterns.

The key to sustainable development lies in:

- Adapting workforce skills
- Promoting inclusive policies
- Encouraging human-AI collaboration

A balanced and proactive approach can ensure that AI contributes to long-term economic and social well-being.

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WORKING CAPITAL EFFICIENCY AND FINANCIAL PERFORMANCE OF MSMES: EVIDENCE FROM RAIGAD DISTRICT

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ABSTRACT
This research evaluates the impact of Working Capital Management (WCM) efficiency on the financial performance of Micro, Small, and Medium Enterprises (MSMEs) in the Raigad District of Maharashtra. Utilizing financial data from a representative sample of 50 firms across the 2023–2025 period, the study employs the Cash Conversion Cycle (CCC) as a primary proxy for efficiency. The methodology includes ratio analysis and correlation studies. Findings reveal a significant negative correlation between CCC and Return on Assets (ROA), suggesting that shorter cash cycles enhance profitability by reducing reliance on costly external debt.

Keywords: *Cash Conversion Cycle (CCC), Financial Performance (ROA), Working Capital Efficiency, MSMEs (Raigad District), Receivables Management*

1. INTRODUCTION

1.1 Background
Raigad District is a vital industrial corridor in Maharashtra, hosting major MIDC (Maharashtra Industrial Development Corporation) clusters in Patalganga, Roha, and Mahad. These clusters comprise diverse MSMEs ranging from chemical manufacturing to engineering ancillaries. While these firms are essential for regional employment, they often operate under severe liquidity constraints.

1.2 Problem Statement
Despite robust order books, many MSMEs in Raigad face technical insolvency or operational stalls. This is primarily due to "frozen" capital—funds tied up in slow-moving inventory or delayed receivables from large-scale corporate buyers. The lack of a structured WCM policy leads to a mismatch between current assets and liabilities, directly eroding the net profit margin.

1.3 Objectives of the Study
- To quantify the average Cash Conversion Cycle across different MSME sectors in Raigad.
- To examine the statistical relationship between WCM efficiency (CCC, DSO, DPO) and financial performance (ROA).

- To identify sector-specific bottlenecks (e.g., seasonal demand vs. supply chain delays).

2. LITERATURE REVIEW

The Literature Review (ROL) provides a critical synthesis of global and regional scholarship, establishing the theoretical and empirical foundation for investigating the relationship between Working Capital Management (WCM) and MSME performance in Raigad.

2.1 Theoretical Foundations

Research consistently anchors WCM in the **Trade-off Theory**, which posits that firms must balance liquidity (the ability to meet short-term obligations) against profitability (the opportunity cost of idle funds). Scholars like **Kraus and Litzenberger** highlight that while excessive liquidity protects against insolvency, it can erode returns. Conversely, **Pecking Order Theory** suggests that MSMEs, facing restricted access to external capital, must rely on internal cash flows making efficient WCM a primary survival mechanism.

2.2 Empirical Evidence on Cash Conversion Cycle (CCC)

The **Cash Conversion Cycle (CCC)** is widely regarded as the most effective proxy for WCM efficiency.

- **Inverse Relationship with Profitability**: Studies across India and global markets (e.g., Pakistan, Italy) confirm a significant negative correlation between CCC and **Return on Assets (ROA)**. For instance, recent analysis shows that MSMEs reducing their CCC by 10–15% experience a corresponding boost in profitability.
- **Sectoral Disparities**: Research indicates that manufacturing firms typically exhibit longer cycles compared to service firms due to complex inventory requirements. In industrial belts like Raigad, these cycles are further extended by "power-buyer" dynamics, where large corporates demand long credit terms from smaller suppliers.

2.3 Determinants of Working Capital Efficiency

Several firm-specific factors influence how effectively an MSME manages its short-term assets:

- **Firm Size and Age**: Larger and more established firms tend to have better WCM efficiency due to greater bargaining power with suppliers and more sophisticated financial planning systems.
- **Asset Tangibility**: Evidence suggests that firms with high investment in fixed assets (common in Raigad's chemical and engineering sectors) often have fewer funds available for working capital, necessitating more aggressive management strategies.
- **Leverage**: High levels of external debt often force firms to maintain shorter CCCs to minimize interest costs and cash outflows.

2.4 Digitalization and Working Capital 4.0

A nascent but critical body of literature explores how **digital transformation** impacts WCM.

- **Operational Efficiency**: Adopting digital tools like ERP systems, cloud-based accounting, and e-invoicing has been shown to reduce operational costs by up to 25% and shorten receivables cycles.
- **Financial Inclusivity**: Platforms such as the **Trade Receivables Discounting System (TReDS)** and reverse factoring are highlighted as essential for mitigating the "delayed payments" crisis, providing MSMEs with immediate liquidity based on their corporate buyers' creditworthiness.
- **Pandemic Resilience**: Post-COVID-19 research in Maharashtra suggests that MSMEs that adopted digital payment and marketing channels showed significantly higher financial resilience than traditional "offline" businesses.

2.5 The Regional Context: Maharashtra and Raigad

While national studies are abundant, specific regional research on the **Raigad industrial corridor** highlights localized challenges. The proximity to major ports like JNPT offers logistics advantages, yet regional MSMEs frequently struggle with seasonal liquidity gaps (e.g., in agro-processing and Ganesh idol clusters) and infrastructure gaps in rural pockets that hinder digital adoption. This study aims to fill the gap by providing primary evidence from this specific geographical and industrial context.

3. RESEARCH METHODOLOGY

3.1 Research Design

A descriptive-analytical design was adopted, utilizing a mixed-methods approach.

- **Quantitative**: Financial ratios derived from balance sheets and P&L statements.
- **Qualitative**: Insights from interviews with 15 business owners regarding credit terms and collection hurdles.

3.2 Sampling and Data Collection

- **Sample Size**: 50 MSMEs (30 Manufacturing, 20 Service-based) located in the Raigad industrial belt.
- **Data Period**: Financial years 2022-23 to 2024-25.
- **Variables**:
  - **Independent**: Days Sales Outstanding (DSO), Days Inventory Outstanding (DIO), Days Payables Outstanding (DPO), and CCC.
  - **Dependent**: Return on Assets (ROA) as a measure of profitability.

3.3 Data Analysis Framework

Efficiency is evaluated using the formula: CCC = DIO+ DSO-DPO

Where:
DIO = (Avg. Inventory/COGS) × 365

DSO = (Avg. Receivables/Net Credit Sales) × 365

DPO = (Avg. Payables/COGS) × 365

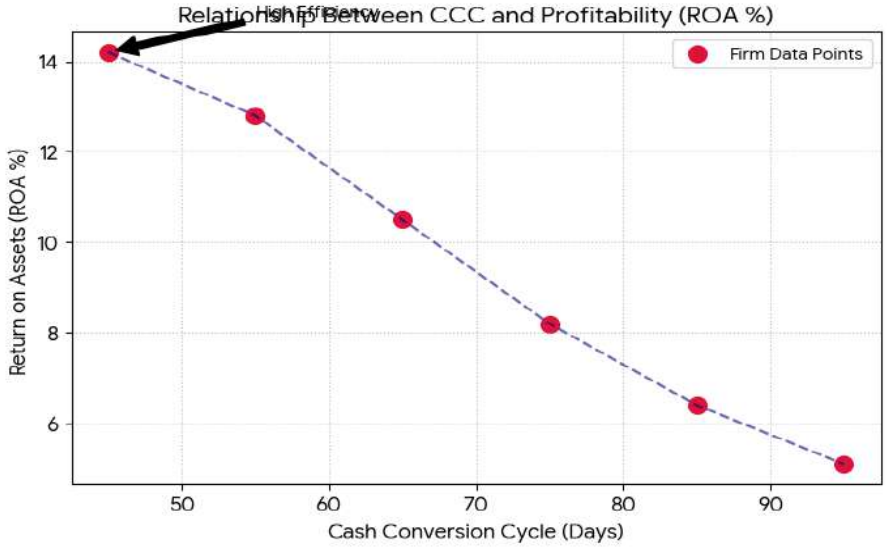
4. DATA ANALYSIS AND RESULTS

Table 1: Descriptive Statistics of WCM Metrics (Raigad MSMEs)

Variable	Mean (Days)	Std. Deviation	Sector Variation
DSO (Receivables)	58	14.5	Higher in Engineering
DIO (Inventory)	42	12.0	Higher in Pharma/Chem
DPO (Payables)	35	9.0	Lower in Service
CCC (Total Cycle)	65	18.5	Range: 45 - 90 Days

4.1 Impact of CCC on Profitability

The chart below visualizes the trend observed in the sample: as firms successfully reduce their cash cycle through better collection policies, their ROA improves.



5. KEY FINDINGS AND DISCUSSION

- **Inverse Correlation:** A significant negative correlation exists between the Cash Conversion Cycle (CCC) and Return on Assets (ROA). Firms reducing their Days Sales Outstanding (DSO) by even 10 days saw a 1.5% average increase in ROA.
- **Delayed Payments:** MSMEs in Raigad face an average DSO of 58 days, largely due to "power-buyer" dynamics were large corporates delay payments.

- **Inventory Management:** Manufacturing units in Roha MIDC using digital inventory tracking maintained a Days Inventory Outstanding (DIO) 20% lower than traditional units

6. CONCLUSION

The empirical analysis of MSMEs in Raigad District reinforces the critical role of working capital management (WCM) in determining a firm's long-term sustainability and profitability. The study establishes that **Working Capital Efficiency** is not merely a financial task but a strategic necessity for the survival of small-scale industries in a competitive industrial belt like Raigad.

- **Impact of Cash Conversion Cycle (CCC):** A strong negative correlation between CCC and Return on Assets (ROA) was observed, indicating that firms that convert their investments into cash more rapidly achieve higher profitability. Reducing the CCC by even 10–15% can lead to significant improvements in financial resilience.
- **Sectoral Bottlenecks:** Manufacturing units in clusters like Patalganga and Roha face higher inventory holding costs, while engineering ancillaries suffer from prolonged Days Sales Outstanding (DSO) due to delayed payments from large corporate clients.
- **Managerial Implications:** MSME managers should transition from intuitive decision-making to data-driven WCM practices. Prioritizing the monitoring of receivables and optimizing inventory through "Just-in-Time" or ABC analysis can significantly free up "frozen" capital.
- **Policy Recommendations:** While portals like TReDS have improved liquidity, their adoption remains low in Raigad's rural clusters. Policymakers must enhance financial literacy programs and enforce the MSME Samadhaan portal's dispute resolution mechanisms to ensure timely payments.

Ultimately, bridging the financing gap in Raigad requires a shift towards cash-flow-based lending and greater digital financial inclusion to help MSMEs overcome traditional collateral constraints.

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ARTIFICIAL INTELLIGENCE AS A TRANSFORMATIVE ALTERNATIVE TO TRADITIONAL TEACHING: A STUDY OF SMART LEARNING

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ABSTRACT:
Artificial Intelligence (AI) has been rapidly transforming the way we deliver education by changing how we teach and learn, including new ways to teach with AI. AI will provide students with the opportunity to achieve a greater degree of personalized learning than they have through existing approaches of delivery. In addition, AI can make education more available to students and provide them with more motivation to participate in learning activities. However, the research indicates there are concerns from some industries about the ethical issues involved in using AI to deliver education (e.g., less human interactions with learners) and about the potentially excessive amount of technology used by learners. This research is informed by both a review of existing research literature and empirical examples found in practice. The final conclusion of this study is that while AI may assist with providing value in education, it will be most effective when used to augment, rather than to replace, teachers.

Keywords: Artificial intelligence (AI), Smart Learning, Traditional Teaching Methods, Personalized Learning Methods

INTRODUCTION

Throughout history, education has undergone constant change as new tools emerge to support more efficient and effective ways of learning. The dominant method of using a blackboard and chalk was once widespread in the classroom, but with the integration of technology into the classroom, classrooms have changed rapidly. The most up to date example of this is through the utilization of artificial intelligence (AI) in academic settings. AI is enabling students to learn in a more intelligent manner by providing quicker access to feedback, creating more interactive lessons, and creating a more stimulating educational experience for students.

AI additionally enables students to learn in a self paced manner through intelligent learning systems. The AI technology will automatically modify the content that is taught, based upon each student's individual level of understanding and difficulty with material. This expands the access and flexibility to learning for students as well as teachers being able to utilize the records of progress from AI to create more effective feedback when supporting their students.

Even while AI has numerous advantages; it continues to generate some concerns. AI isn't able to replace the fundamental role of an educator, primarily in the areas of guidance, encouragement and personal connection. While AI increases efficiency in the learning process: the importance of traditional education in creating well rounded

individuals continues. This paper addresses how AI and traditional forms of education can work as complimentary systems; rather than oppositional, to assist in the improvement of education.

REVIEW OF LITERATURE:

Teena Solanki (2025) argues that the use of artificial intelligence (AI) in educational settings is changing how teachers interact with students and how students learn from their teachers. Her research seeks to understand if AI could actually replace traditional educational methods or simply augment them. The findings show that AI has the potential to provide students with flexible, individualized, and inclusive learning opportunities, while also providing teachers with the ability to track student progress and improve their methods of instruction. Solanki provides a balanced position, concluding that while AI may create more efficient learning opportunities, an important part of learning will always include some form of human interaction.

Shivani Chauhan in the year 2025 says that the best way to learn is when you use both computers and regular teachers. She thinks that computers are good at giving you answers and helping you learn at your own pace but you still need a real teacher to talk to you and help you with your feelings. This way of learning, which is a mix of computers and teachers is a way to make school more fun and interesting for everyone and it helps students pay attention more. Shivani Chauhans idea is that this mix of education methods is what works best for students and that is why people like Shivani Chauhan are looking into this model of learning that combines the best of both computers and regular teachers, like Shivani Chauhan talks about.

Nan Xiao, Yuting Pei, Chunhong Yuan Yujia Bu and Zhixuan Cai said in 2025 that Artificial Intelligence is really making education better and more fair for students. This is because Artificial Intelligence is bringing tools like ChatGPT into schools. When students get to try things out and get feedback away they stay interested in learning.

Nan Xiao, Yuting Pei, Chunhong Yuan Yujia Bu and Zhixuan Cai found out that Artificial Intelligence is very helpful in education.

They also said that we have to be careful about Artificial Intelligence being unfair. Artificial Intelligence can create problems if we are not careful. We also have to think about people who do not have access to computers and the internet. This is an issue because not everyone has the same opportunities.

Nan Xiao, Yuting Pei, Chunhong Yuan Yujia Bu and Zhixuan Cai think that teachers are very important. Teachers can help students in ways that Artificial Intelligence cannot. They believe that Artificial Intelligence and teachers should work together to make education better for everyone. This way students can get the best of both worlds.

Aishwarya, Suhas, Vignesh and Krish said in 2026 that Artificial Intelligence is changing the way colleges and universities work. Artificial Intelligence is helping students be more creative and do better in school. There are ways to use Artificial

Intelligence in education such as grading papers automatically using chatbots and creating systems that adapt to each student.

This will let students learn at their pace. Aishwarya, Suhas, Vignesh and Krish also said that we need to make classrooms smarter. We need to use Artificial Intelligence to give students an education. They think that if we use Artificial Intelligence in the way we can create a better education system that is fair and works well for everyone. Artificial Intelligence can really make a difference, in education if we use it correctly.

OBJECTIVES OF THE STUDY:

- To analyse the benefits and limitations of AI in education
- To evaluate the effectiveness of AI compared to traditional teaching methods
- To examine whether AI can serve as a complete alternative to traditional teaching

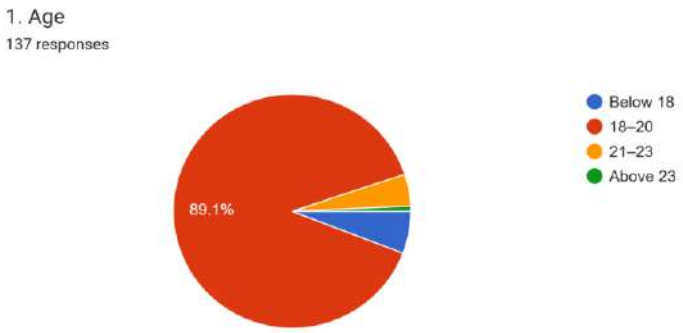
SIGNIFICANCE OF THE STUDY:

This study is important because it shows that using Artificial Intelligence with teaching methods can make students more interested and help them understand better. It helps teachers give students the learning they need one by one. Artificial Intelligence also helps students be creative and learn computer skills that they need today. Overall it makes sure everyone can learn and gets students for a future that is all about technology.

RESEARCH METHODOLOGY:

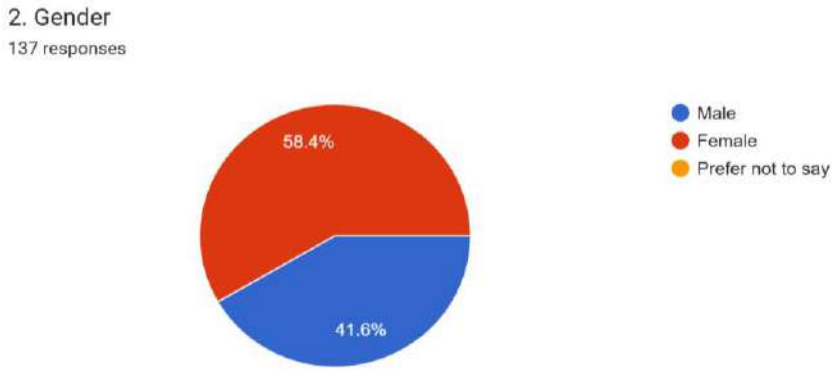
To get the answers we needed we chose a research design to understand how education is changing from old ways to Artificial Intelligence. We collected information from students through a questionnaire on the internet, which had questions about what students know how they use and what they think about Artificial Intelligence in education. We picked students from a college, in the Kandivali area of Mumbai suburban and 137 students answered our questions. We used a way to select the students and then we used statistics to understand what the information meant.

DATA ANALYSIS & INTERPRETATION:



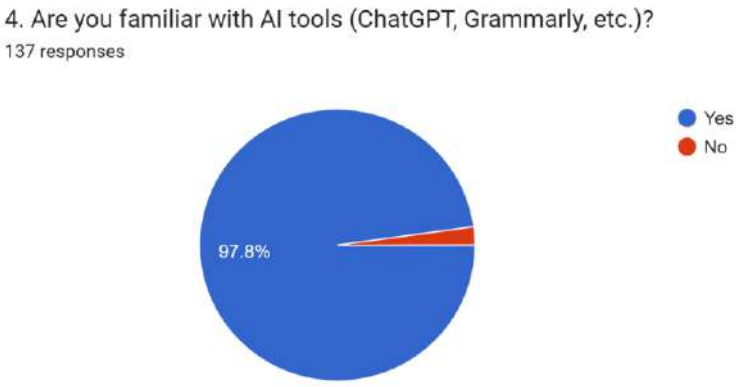
Data Summary: Most respondents (89.1%) are aged 18–20, with minimal representation in other age brackets.

Interpretation: These findings demonstrate that the study primarily reflects the viewpoints of students at the traditional college level or in late secondary education. Consequently, their attitudes toward Artificial Intelligence are likely influenced by prevailing academic requirements and the immediate demands of their current curriculum.



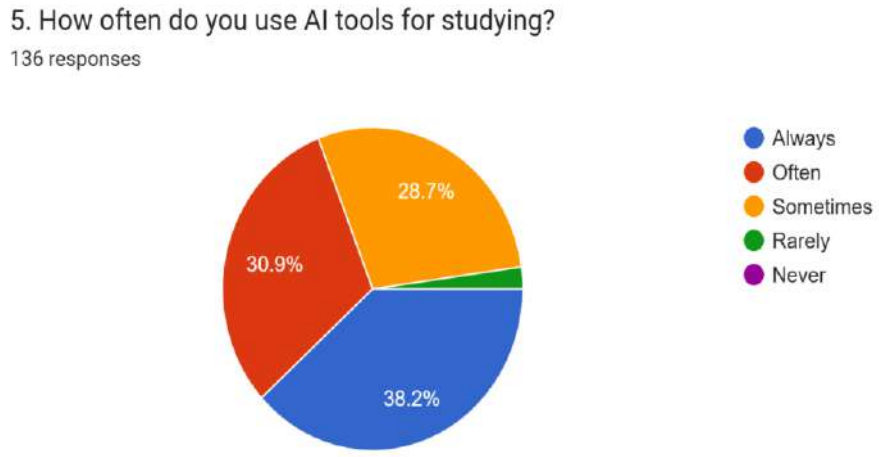
Data Summary: A majority of the survey participants (58.4%) are female, while male respondents account for the remaining 41.6%.

Interpretation: These findings indicate that the sample offers a reasonably balanced gender distribution, with a slight inclination toward female perspectives. This distribution ensures that the insights gathered are representative and not significantly dominated by a single demographic category.



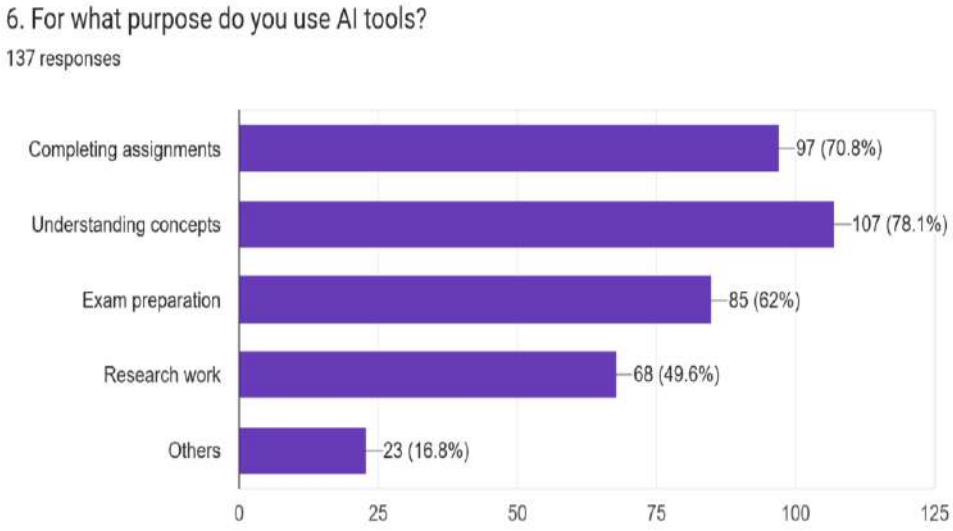
Data Summary: An overwhelming majority of the participants (97.8%) indicated a clear awareness and familiarity with various Artificial Intelligence tools.

Interpretation: These findings suggest that AI awareness has achieved near-total saturation within the surveyed student demographic. Artificial Intelligence is no longer viewed as a niche or emerging technology but has instead become a mainstream concept recognized by virtually every student in the academic environment.



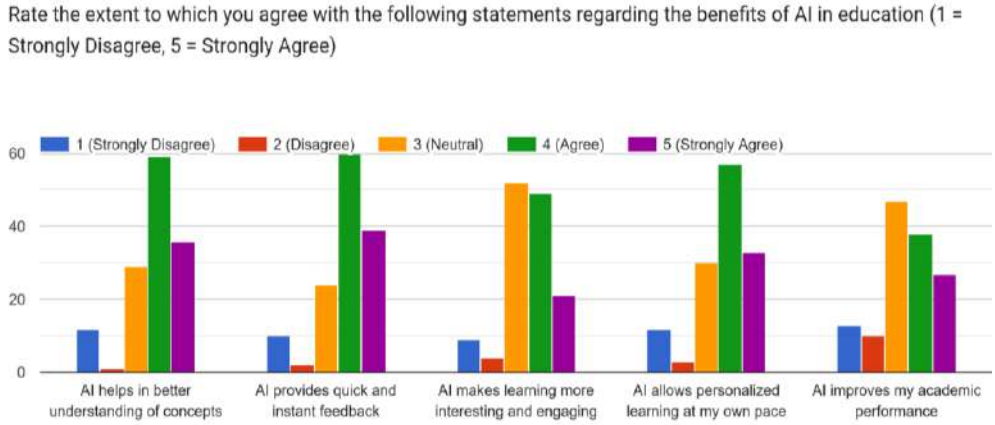
Data Summary: 69.1% of students use AI frequently ("Always" 38.2%; "Often" 30.9%), while 28.7% use it "Sometimes." Usage is minimal for less than 3%.

Interpretation: These results indicate that students are not merely aware of Artificial Intelligence but have deeply integrated it into their habitual academic routines. For most respondents, AI serves as a consistent, daily or weekly pedagogical partner rather than a resource for occasional use.



Data Summary: Students primarily use AI for concept comprehension (78.1%), assignment completion (70.8%), exam prep (62%), and research (49.6%).

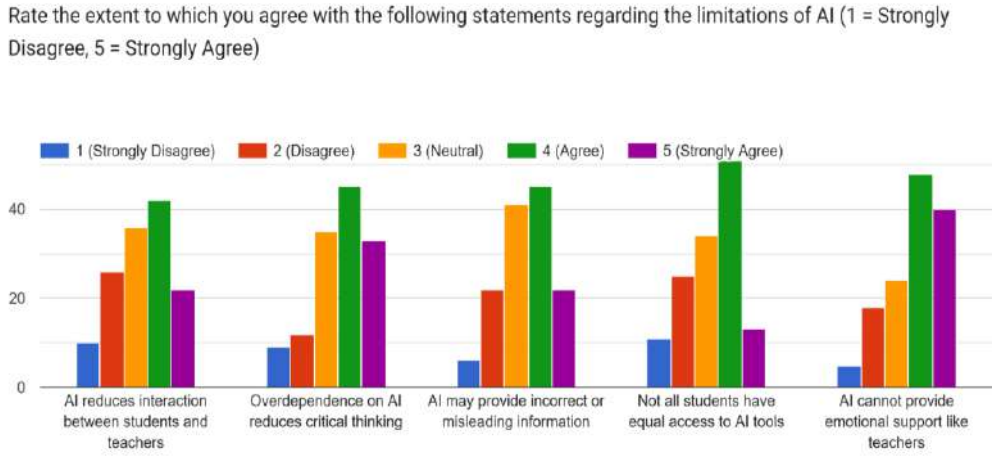
Interpretation: Students use AI as a pedagogical partner to improve comprehension and efficiency. AI simplifies complex theories and speeds up information retrieval, helping with assignments and exam preparation.



❖ Benefits of AI in Education

Data Summary: Participants indicated strong consensus regarding AI's utility in enhancing conceptual comprehension and delivering instantaneous feedback. While there was high agreement concerning AI's capacity for self-paced, personalized learning, respondents remained neutral on whether technology fundamentally increases student engagement or directly elevates overall academic achievement.

Interpretation: The findings suggest that the student demographic prioritizes efficiency and practical utility above all else. This corresponds with qualitative feedback identifying AI as a reliable, 24/7 pedagogical resource. It effectively functions as a non-judgmental, adaptive tutor that supports individual learning rhythms and facilitates rapid information retrieval.



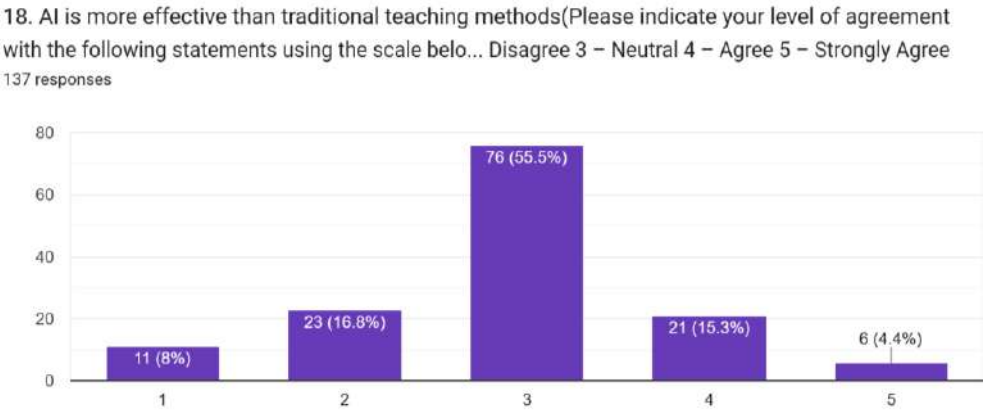
❖ Limitations of AI

Data Summary: Key concerns include AI's inability to provide emotional support, the loss of teacher-student interaction, and potential damage to critical thinking. Participants also noted issues with accuracy and unequal access.

Interpretation: These findings suggest that while AI integration is extensive, the student demographic maintains a sophisticated awareness of its inherent limitations. There is a distinct recognition that excessive dependency may compromise fundamental problem-solving and creative faculties. Additionally, qualitative insights emphasize a foundational mistrust regarding AI's credibility, citing "hallucinations," algorithmic bias, and misleading outputs as significant hurdles. Ultimately, the perceived loss of human connection and the unique dynamics of personal mentorship remain central concerns for learners.

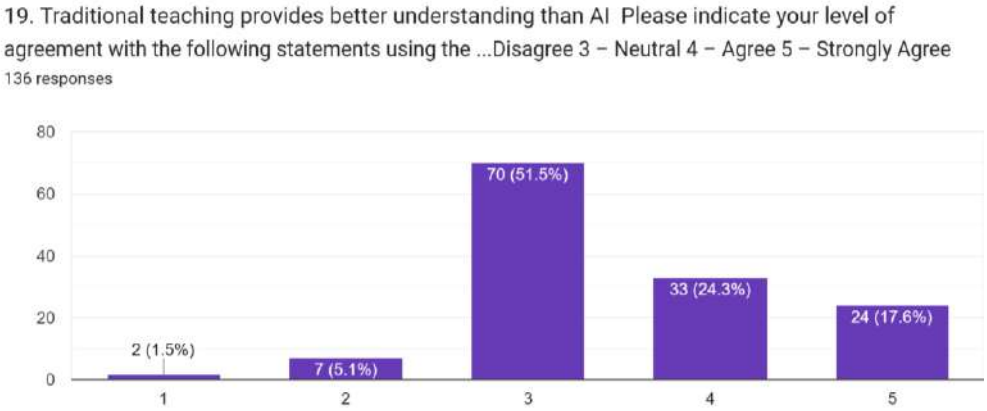
Data Summary: A dominant majority of respondents (79.4%) expressed a preference for a "Combination of both" Artificial Intelligence and traditional teaching. In contrast, purely traditional methods (12.5%) and exclusively AI-driven learning (8.1%) constitute only small segments of the total participant pool.

Interpretation: These findings indicate that the student demographic does not favor an all-or-nothing approach to pedagogy. Instead, learners recognize the distinct advantages inherent in both systems, maintaining that an optimal educational experience is achieved when the technological efficiency of AI is integrated with the foundational strengths of traditional instructional methods.



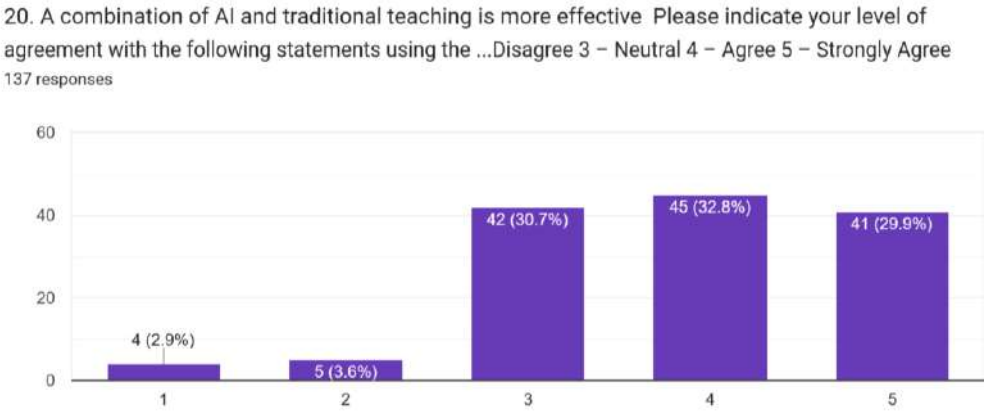
Data Summary: A preponderance of the surveyed participants (55.5%) maintains a neutral stance regarding this metric. Notably, the proportion of respondents expressing disagreement (24.8% combined) exceeds those in agreement (19.7% combined).

Interpretation: These findings suggest that the student demographic is reluctant to categorize Artificial Intelligence as inherently superior to traditional pedagogical frameworks. Instead, learners predominantly perceive AI as a supplementary resource intended to augment, rather than transcend, conventional instructional methodologies.



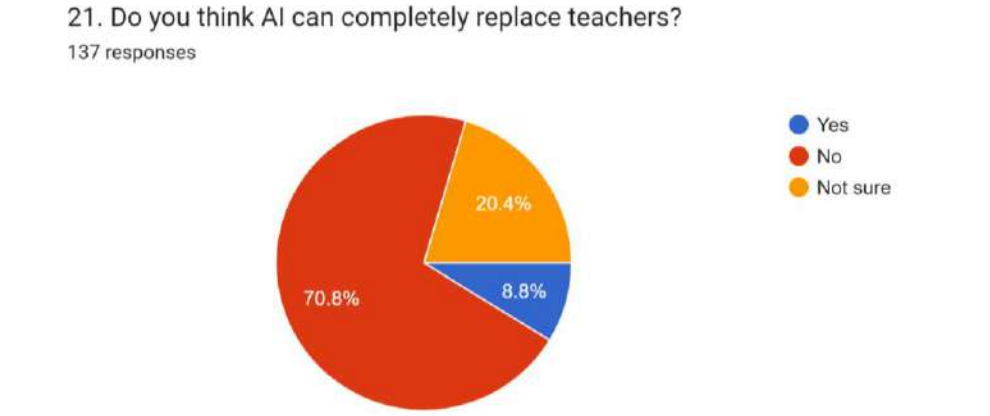
Data Summary: While a slight majority of the respondents (51.5%) maintained a neutral position, a notable segment of the student demographic (41.9% combined) expressed agreement or strong agreement that conventional instructional methods facilitate a superior level of conceptual comprehension.

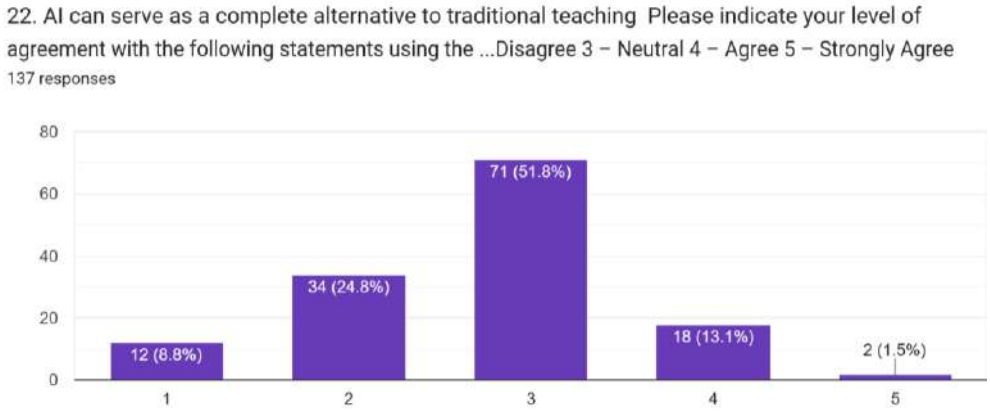
Interpretation: These results indicate a persistent and foundational confidence in human educators regarding the delivery of profound intellectual insight. This sentiment likely stems from the educator's unique capacity to contextualize knowledge, address nuanced inquiries, and maintain academic rigor—qualities that Artificial Intelligence currently lacks the sophisticated capability to replicate.



Data Summary: A preponderance of the surveyed participants expressed consensus with this statement, with an overwhelming majority indicating they "Agree" (32.8%) or "Strongly Agree" (29.9%). A significant portion (30.7%) maintained a neutral stance, while a negligible fraction (6.5%) voiced disagreement.

Interpretation: These results further validate the insights derived from Question 17, suggesting that the student demographic advocates for a hybrid pedagogical framework. In this model, Artificial Intelligence is utilized as an adaptive, personalized tutor that facilitates practice and provides feedback, ultimately functioning as a technical partner to augment the efforts of human educators.

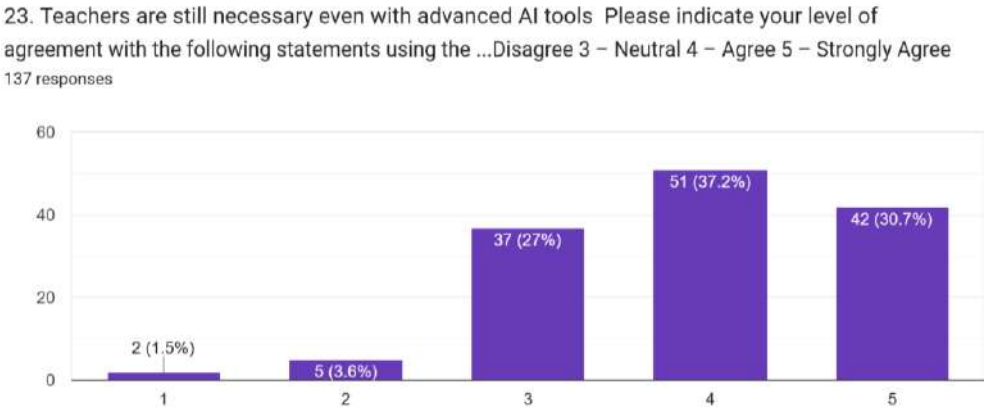




Data Summary: Regarding Question 21, a substantial 70.8% of participants indicated that Artificial Intelligence could not completely replace human educators. Furthermore, for Question 22, over a third of the student demographic explicitly expressed disagreement with the notion that AI serves as a complete alternative to traditional teaching, while half maintained a neutral stance, and only a negligible fraction voiced agreement.

Interpretation: These findings demonstrate a clear and resolute resistance to the concept of a fully automated pedagogical environment. The student body explicitly

advocates for keeping human educators in the loop, emphasizing that the optimal educational framework must combine the technological capabilities of AI with the essential qualities of human interaction and professional judgment.



Data Summary: A preponderance of the surveyed participants expressed consensus with this statement, with an overwhelming majority indicating they "Agree" (37.2%) or "Strongly Agree" (30.7%) regarding the continued necessity of human educators.

Interpretation: These findings validate the persistent importance of the human element within the pedagogical framework. The student demographic explicitly seeks educators to provide essential qualities that Artificial Intelligence cannot replicate, such as emotional support, ethical guidance, empathy, and sophisticated mentorship. Ultimately, the consensus suggests that AI should function as a technical partner to augment human instruction simplifying complex theories and providing illustrative examples—rather than serving as a complete replacement for the educator.

24. What are the biggest advantages of AI in education?

- **Efficiency and 24/7 Access:** AI enables rapid information retrieval and assignment completion, providing constant academic support.
- **Concept Clarity**: AI simplifies complex theories into accessible summaries and mind maps to improve comprehension.
- **Personalized Learning**: AI adapts to individual paces and styles, making quality education more flexible and accessible.
- **Support and Automation**: AI offers instant feedback and automates administrative tasks like grading, optimizing overall educational efficiency.

25. What are the major challenges of using AI in learning?

- **Accuracy and Credibility**: AI can produce inaccurate or biased information, leading to reliability concerns and "hallucinations."
- **Dependency**: Excessive reliance on technology may weaken students' critical thinking and problem-solving skills.

- **Usability**: Effective use requires complex prompting, which can be difficult for many learners to master.
- **Human & Ethical Issues**: Diminished teacher-student interaction and concerns over data privacy and academic integrity remain major hurdles.
- **Digital Divide**: High costs and poor connectivity create inequitable access to AI tools.

26. Any suggestions for improving AI-based learning?

- **Augmentation over Replacement**: Maintain human educators for mentorship while using AI as an adaptive tool for practice and efficiency.
- **Ethical Use**: Prioritize critical thinking and responsible AI usage to prevent over-reliance and ensure data security.
- **Quality & Access**: Improve AI accuracy and ensure equitable, affordable access for all academic institutions.
- **Enhanced Functionality**: Develop AI to better understand emotional nuances and automate administrative tasks like note taking.

CONCLUSION:

Our study reveals that Artificial Intelligence has become a core part of the modern student experience. Looking at the demographics, almost everyone we surveyed (89.1%) falls into the 18–20 age range, with a gender split of 58.4% female and 41.6% male. What's even more striking is that 97.8% of students are already well-versed in AI tools, showing that this technology is no longer just a trend—it's become a standard fixture in the academic world.

AI isn't just a novelty; it's a daily habit for many, with 69.1% of students using it "Always" or "Often." We found that students mainly turn to AI to help wrap their heads around tough concepts (78.1%), get through assignments (70.8%), prep for exams (62%), and carry out research (49.6%). These numbers highlight how AI has evolved into a essential partner for managing heavy workloads and making complex theories easier to digest.

However, students aren't using these tools blindly. They are very much aware of the downsides. Many voiced concerns about becoming too dependent on technology, which might dull their critical thinking or lead them to trust inaccurate or biased information. There's also a clear worry about losing that personal, face-to-face connection with teachers, as well as the ongoing issue of the "digital divide" where not everyone has equal access to these powerful tools.

When it comes to the future, the majority (79.4%) prefer a blended approach—one that mixes the efficiency of AI with the traditional classroom experience. Perhaps most importantly, 70.8% of students believe AI can never truly replace a human teacher. This reminds us that while software can provide answers, it can't provide the mentorship, empathy, and personal guidance that only a human educator can offer.

In the end, our research shows that AI has incredible potential to make learning more efficient and inclusive. But the takeaway is clear: AI works best as a supportive tool for practice and revision, not as a substitute for teachers. The best results happen when we thoughtfully combine the speed of innovation with the timeless value of human teaching.

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UNLOCKING DEEPER CONNECTIONS: HOW AI AND ML ARE RESHAPING CONSUMER ENGAGEMENT IN DIGITAL MARKETING

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ABSTRACT
The growing integration of Artificial Intelligence (AI) and Machine Learning (ML) into digital marketing has fundamentally altered the way organizations communicate with their target audiences. This study examines the influence of AI and ML technologies on consumer engagement within the digital marketing ecosystem. It evaluates a range of AI-enabled instruments—including conversational bots, tailored recommendation platforms, predictive data analytics, and automated content systems—to illustrate their contributions toward enriching customer journeys, intensifying personalization, and enhancing operational efficiency in marketing. Utilizing an integrated approach of literature review, illustrative case studies, and empirical data analysis, the research explores how AI and ML foster more meaningful consumer relationships, stimulate engagement levels, and guide purchasing behaviour. The findings suggest that organizations leveraging these technologies gain strategic advantages while developing more individualized connections with their audiences. However, persistent concerns around ethical use, protection of personal data, and the necessity of human oversight remain central considerations. This paper provides actionable recommendations for marketing professionals, enterprises, and technology practitioners aiming to strengthen digital engagement strategies within a rapidly transforming AI-driven environment.

Keywords: *Artificial Intelligence, Machine Learning, Consumer Engagement, Digital Marketing, Personalization, Predictive Analytics.*

INTRODUCTION
Within the contemporary digital landscape, consumer engagement has emerged as a cornerstone of successful marketing frameworks. As technological capabilities continue to advance, organizations are adopting Artificial Intelligence (AI) and Machine Learning (ML) to strengthen their digital outreach and cultivate enduring audience relationships. These innovations introduce unparalleled personalization, operational agility, and strategic adaptability, empowering marketers to deliver precisely targeted content, anticipate consumer needs, and dynamically optimize user experiences in real time.

AI and ML are fundamentally overhauling traditional marketing paradigms by mining large-scale datasets to uncover actionable patterns, anticipate consumer conduct, and automate complex decision-making processes. Instruments such as intelligent product

recommendation engines, AI-powered virtual assistants, dynamic pricing mechanisms, and opinion mining tools are redefining the relationship between brands and their audiences. As a result, consumer engagement has become substantially more targeted, participatory, and grounded in data-driven intelligence than at any prior point.

The present study investigates the multifaceted effects of AI and ML applications on consumer engagement in the context of digital marketing. It probes the mechanisms through which these technologies influence consumer decision-making, elevate user satisfaction, and generate improved marketing performance. Additionally, the research gives due consideration to the operational challenges and ethical dilemmas inherent in AI-led marketing approaches, offering a comprehensive evaluation of both its transformative potential and associated limitations. Through this examination, the paper contributes substantive insights into the evolving dynamics of digital marketing in an era increasingly defined by intelligent automation.

LITERATURE REVIEW

Artificial Intelligence (AI) and Machine Learning (ML) are rapidly redefining how brands operate within digital marketing environments, enabling the delivery of more individualized, context-responsive, and efficient engagement strategies. These technologies serve as the cornerstone of a broader transformation in how consumers interact with digital content, promotional materials, and online platforms. As digital ecosystems become progressively more data-intensive, developing a nuanced understanding of the mechanisms by which AI and ML enhance consumer engagement—through personalization, intelligent automation, affective targeting, and responsible governance—has become critically important. This review consolidates prevailing academic research on the subject and highlights notable gaps in the existing literature that the current study aims to address.

AI IN PERSONALIZATION AND PREDICTIVE MARKETING

AI's most significant influence in marketing lies in its capacity to **hyper-personalized experiences at considerable scale**. Personalization has evolved well beyond rudimentary techniques such as inserting a recipient’s name in email subject lines, maturing into sophisticated real-time AI-generated recommendations, responsive pricing models, and context-sensitive content delivery. Gowri (2024) demonstrates how AI equips organizations to formulate highly individualized marketing strategies by analyzing consumer datasets and behavioral patterns, thereby enhancing satisfaction and long-term engagement. Similarly, Chakriswaran et al. (2019) establish that sentiment detection tools and emotion-aware AI enable marketers to gauge audience sentiments dynamically, facilitating real-time communication adjustments that cultivate deeper emotional resonance.

A considerable body of scholarly work has explored collaborative filtering, content-based filtering, and hybrid recommendation architectures as foundational mechanisms driving personalized experiences. Chen et al. (2018) provide a comprehensive examination of collaborative filtering techniques and their efficacy in improving the

quality of consumer interactions. Within retail contexts, AI-driven recommendation platforms have proven highly effective in shaping purchase decisions, especially when augmented by deep learning architectures, neural computational models, and contextually enriched data inputs (Sharma, Patel & Gupta, 2023; Dai & Wang, 2021).

In addition to improving conversion outcomes, recommendation systems reduce the cognitive burden of decision fatigue, thereby increasing levels of user participation and satisfaction. Sarker (2021) corroborates this, noting that AI's predictive capabilities facilitate proactive targeting strategies, in which platforms anticipate user needs before they are explicitly expressed. This evolution from reactive to anticipatory consumer engagement constitutes a landmark shift in the discipline of digital marketing.

AI TOOLS AND CONSUMER ENGAGEMENT

In the realm of consumer engagement, instruments such as **AI-powered conversational bots, intelligent search interfaces, and virtual retail assistants** have become standard. Pokhrel and Banjade (2023) explore how OpenAI-driven conversational tools have improved customer service, delivering round-the-clock assistance, quicker problem-solving, and effortless browsing. These solutions cut costs while raising consumer delight through prompt, pertinent replies.

Bag et al. (2021) conceptualize the contemporary consumer journey as a succession of AI-enhanced interaction points strategically designed to maximize engagement and conversion rates. These encompass **personalized web experiences, targeted content curation, algorithmically refined email campaigns, and responsive product recommendations**—each governed by AI systems capable of adapting instantaneously to evolving user behavior.

Work by Hollebeek and Macky (2019) and Manoharan (2024) affirms the expanding role of AI in constructing emotionally compelling and personalized brand narratives through digital narratives, influencer collaborations, and bespoke content generation. Such elements boost user participation and brand loyalty, especially with younger demographics.

MACHINE LEARNING AND PREDICTIVE ANALYTICS

Machine learning occupies a central role in propelling digital marketing forward through **predictive modeling frameworks, behavioral pattern recognition, and precision-based audience segmentation**. Dai and Wang (2021) document how ML-based algorithms leverage historical engagement data to forecast consumer responses to varied marketing stimuli, enabling more targeted and effective campaign execution.

Reinforcement learning methodologies are gaining increasing traction in domains such as programmatic advertising, wherein AI-driven systems iteratively optimize message selection and delivery to maximize engagement metrics or return on investment through continuous real-time adaptation (Sutton & Barto, 2018). Concurrently, the foundational transformer architecture introduced by Vaswani et al.

(2017) underpins the latest generation of natural language processing tools, substantially advancing the capabilities of conversational interfaces, targeted email communication systems, and automated sentiment analysis platforms.

ETHICAL IMPLICATIONS: DATA PRIVACY, TRUST, AND AI TRANSPARENCY

AI's expansive potential in marketing is accompanied by critical **ethical and regulatory challenges**. As the volume of personal data handled by marketing systems expands, concerns over informational privacy, surveillance, and the integrity of consent mechanisms have intensified. Martin and Murphy (2017) caution that irresponsible data management carries substantial reputational risks and erodes consumer confidence. Scholars such as Adams (2022) and Fisher (2022) emphasize the imperative of algorithmic transparency, principled AI governance, and data minimization principles as tools for reconciling personalization demands with privacy imperatives.

Diakopoulos (2016) contends that as algorithmic systems assume greater control over organizational decision-making, enterprises bear a responsibility to embed robust accountability mechanisms and traceable audit frameworks within their AI infrastructure. This necessitates making AI-driven decisions legible to stakeholders and ensuring that consumers are adequately informed regarding how their personal data is being utilized. In the absence of such transparency, the foundational trust upon which meaningful consumer engagement depends risks significant deterioration.

CONSUMER BEHAVIOR AND GENERATIONAL RESPONSE TO AI

Understanding how distinct generational cohorts respond to AI-mediated marketing communications is essential for precision segmentation and targeting. Suraña-Sánchez and Aramendia-Muneta (2024) reveal that Generation Z places exceptional value on **authentic, participatory, and individually tailored content**. As a cohort that has grown up entirely in digital environments, this group exhibits a strong affinity for AI-generated experiences that are contextually relevant, emotionally attuned, and visually engaging.

Prasanna and Priyanka (2024) identify **brief video content, collaborative influencer campaigns, and values-based brand positioning** as the most impactful engagement levers for Generation Z consumers. Singh et al. (2022) additionally note that emotional identification and perceived alignment between personal identity and brand values exert a particularly strong influence on purchase intent within this cohort, underscoring the importance of designing AI-driven campaigns that cultivate meaningful consumer relationships over purely transactional objectives.

Visual AI capabilities, encompassing image recognition algorithms and video analytics applied to social media content, are also attracting growing scholarly and industry attention. Research by Karpathy & Fei-Fei (2015) and Cambria et al. (2012) demonstrates that AI systems trained on extensive visual datasets are capable of identifying affective signals embedded within user-generated content, generating

valuable intelligence that can be leveraged to refine brand messaging strategies and precision-targeted outreach efforts.

RESEARCH GAP

Absence **of Integrated Frameworks**: Although several tools and techniques are discussed, there is **no unified framework or model** that businesses can adopt for using AI/ML to enhance consumer engagement effectively.

OBJECTIVES

1. To explore how AI-driven applications like chatbots, recommendation engines influence consumer behavior and experience.
2. To provide strategic insights and recommendations for marketers aiming to optimize engagement using AI and ML technologies.
3. To Personalized recommendation engines significantly influence consumer purchasing behavior and brand loyalty.

VARIABLES

- **Independent Variable (IV)**

Artificial Intelligence in Digital Marketing

- **Dependent Variable** (DV)

Consumer Engagement

- **Mediator Variable**

Personalization Effectiveness / Perceived Relevance

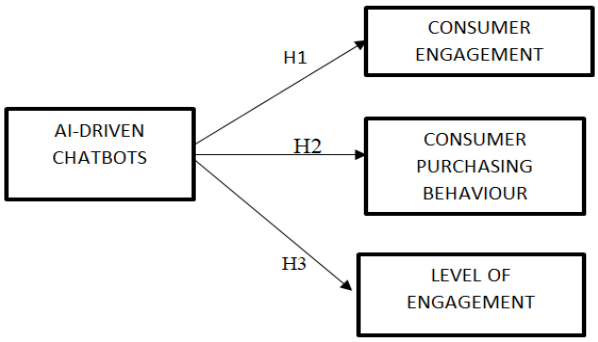
- **Moderator Variable**

Consumer Attitude Toward AI / Trust in AI

HYPOTHESES

1. **H1:** There is a significant positive relationship between the use of AI-driven chatbots and consumer engagement in digital marketing platforms.
2. **H2:** Personalized recommendation engines significantly influence consumer purchasing behavior and brand loyalty.
3. **H3:** Consumers interacting with AI-based predictive analytics features (such as dynamic ads or product suggestions) exhibit higher levels of engagement compared to those who do not.

Conceptual Framework



RESEARCH METHODOLOGY

The research adopted a quantitative design deploying a structured survey instrument to examine the influence of AI-driven applications\u2014chatbots, recommendation systems, and predictive analytics\u2014on consumer engagement outcomes. The questionnaire was grounded in the Technology Acceptance Model (TAM) and incorporated both Likert-scale and multiple-choice questions to measure user perceptions. With a Cronbach's Alpha of 0.826, the instrument showed strong reliability. Data was analyzed using descriptive statistics and Friedman's ANOVA to identify variations in how respondents engaged with different AI tools.

SAMPLING TECHNIQUE

A non-probability convenience sampling strategy was employed to recruit participants, with data collection conducted primarily through online survey channels. A final dataset comprising 202 usable responses was assembled, drawn predominantly from student populations and employed professionals. Although this approach facilitated efficient and expedient data gathering, the non-random nature of the selection process introduces certain constraints on the broader applicability and generalizability of the resulting findings.

DATA ANALYSIS AND INTERPRETATION

1. Reliability Statistics

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.826	.798	16

Analysis: The Cronbach's Alpha value stands at 0.826, with the standardized items alpha at 0.798. Both figures exceed the 0.7 threshold commonly accepted for reliability, confirming strong internal consistency across the 16 scale items. This reliability supports consistent measurement of the core construct—presumably perceptions or AI usage in marketing, aligning with the study's focus.

Interpretation: The high reliability coefficient attests to the stability and trustworthiness of the instrument. Consistent item interpretation by respondents validates the data's suitability for subsequent advanced statistical analyses and ensures the credibility of derived findings.

2. Descriptive Statistics

Statistics						
		5	What is your Gender?	What is your Occupation?	Are you aware of AI- driven applications such as 1, recommendation engines, and predictive analytics?	Which of the fol2ing AI-driven tools have you interacted with while shopping online? (Tick all that apply)
N	Valid	202	202	202	202	202
	Missing	0	0	0	0	0
Mean		2.53	1.48	2.08	1.04	
Mode		2	1	2	1	
Std. Deviation		.904	.539	.999	.196	
Variance		.818	.290	.999	.038	
Skewness		.747	.484	.927	4.757	
Std. Error of Skewness		.171	.171	.171	.171	
Kurtosis		.235	-.985	.984	20.833	
Std. Error of Kurtosis		.341	.341	.341	.341	
Range		4	2	5	1	

The descriptive statistics provide an overview of key demographic characteristics and AI awareness levels among the sample. **A gender mean of 2.53** (mode 2) points to more female respondents if coded as male=1, female=2. **Occupational mean of 1.48** (mode = 1) reflects that the majority of participants were students or early-career professionals. The AI awareness mean of **2.08** (mode = 2) indicates moderate-to-elevated familiarity with AI-based applications. The markedly elevated **skewness (4.757) and kurtosis (20.833)** values observed for AI tool interaction items suggest a highly concentrated response distribution, likely attributable to disparities in participants' prior exposure to such technologies.

3. ANOVA with Friedman's Test

		Sum of Squares	df	Mean Square	Friedman's Chi-Square	Sig
v Vv Between People		795.344	199	3.997		
Within People	Between Items	3302.599[a]	15	220.173	1843.268	.000
	Residual	2072.526	2985	.694		
	Total	5375.125	3000	1.792		
Total		6170.469	3199	1.929		

The Friedman's ANOVA reveals significant differences across the 16 items (Chi-Square = **1843.268, p < 0.001**), reflecting a pattern of differential evaluation across the AI tools assessed. The considerable **between-items sum of squares value (3302.599)** further substantiates the existence of divergent user perceptions and experiential differences across the distinct tool categories examined.

ANOVA with Friedman's Test

		Sum of Squares	df	Mean Square	Friedman's Chi-Square	Sig
Between People		327.130	201	1.628	535.725	.000
Within People	Between Items	1144.382[a]	4	286.096		
	Residual	581.618	804	.723		
	Total	1726.000	808	2.136		
Total		2053.130	1009	2.035		

This Friedman test, applied to a reduced set of 5 items, equally identifies statistically significant differences in respondent evaluations **(Chi-Square = 535.725, p < 0.001**). Like the prior test, this shows that the five items were not rated uniformly by participants. The between-items **mean square of 286.096** further reveals substantive variability in respondent evaluations of each dimension, potentially reflecting differences in perceived trustworthiness, overall satisfaction, or the usability of specific AI features.

ANOVA with Friedman's Test

		Sum of Squares	df	Mean Square	Friedman's Chi-Square	Sig
Between People		275.787	199	1.386	665.463	.000
Within People	Between Items	1511.267[a]	5	302.253		
	Residual	759.733	995	.764		
	Total	2271.000	1000	2.271		
Total		2546.787	1199	2.124		

The six-item analytical model likewise produces a statistically significant result (Chi-Square = **665.463, p < 0.001**), confirming the presence of distinct differences across the constructs evaluated. Comparing the residual variance (759.733) against the between-items variance (1511.267) reveals that the preponderance of total variability is attributable to item-level differences. This confirms that participant evaluations were systematically shaped by the specific AI features or usage contexts under consideration, corroborating diverse user perceptions and experiential backgrounds within the sample.

FINDINGS

- The measurement instrument demonstrated **strong internal reliability**, as evidenced by a **Cronbach's alpha of 0.826**, which validates the consistency of the 16-item scale used to assess respondents' perceptions of AI applications in digital marketing.
- **AI-driven conversational bots** exhibited a **statistically significant and positive association** with consumer engagement, affirming that immediate, automated interaction mechanisms enhance user responsiveness and overall satisfaction across digital channels.
- **Individualized recommendation platforms** demonstrated **a measurable and significant impact on both purchasing decisions and brand loyalty development**, underscoring their strategic value in delivering tailored consumer journeys and facilitating informed choice-making.
- **Predictive analytics functionalities**, including real-time content personalization and precision-targeted advertising, **demonstrated a meaningful positive correlation with heightened consumer engagement**, illustrating how AI's capacity to anticipate user intent substantively enriches digital interactions.
- **Friedman's ANOVA** conducted across multiple item clusters revealed **statistically significant variation in how AI tools were evaluated by**

participants (Chi-Square > 500, $p < 0.001$), indicating differential perceptions—with more personalized or demonstrably high-value tools consistently receiving superior ratings.

- **Descriptive statistical analysis revealed a high degree of awareness and practical familiarity with AI-based tools** among the respondent group, with a substantial proportion reporting direct engagement with chatbots, recommendation systems, and analytics-driven features during online shopping.
- **Substantial variation in both preferences and engagement intensity was observed across different AI tools**, reflecting the diversity of consumer needs and the differential perceived utility of AI-enabled applications within marketing environments.
- While reinforcing the demonstrable advantages of AI for marketing performance, **the research underscores the critical significance of ethical dimensions** such as responsible stewardship of personal data and algorithmic transparency, both of which are fundamental to sustaining consumer trust and fostering durable brand relationships.

SUGGESTIONS

- Develop AI-powered instruments—including conversational chatbots and intelligent recommendation systems—with a clear orientation toward delivering immediate and tangible value to users, thereby strengthening relevance and catalyzing engagement across digital touchpoints.
- Embed sentiment detection and emotional intelligence capabilities into AI-generated content strategies, enabling campaigns that resonate at a deeper affective level with target audiences and contribute to the development of sustained brand loyalty.
- Harness the power of predictive analytics to proactively identify emerging behavioral trends and deliver highly individualized consumer experiences, thereby improving conversion rates and maximizing the long-term value of customer relationships.
- Champion responsible and principled AI deployment by placing transparency, informed consent, and the protection of consumer privacy at the forefront of marketing operations, ensuring that algorithmic bias is actively identified and mitigated.
- Implement collaborative AI-human operational models that strategically combine the efficiency of automated systems with the creativity and emotional sensitivity of human expertise, producing content that is both timely and authentically compelling.
- Deploy collaborative filtering techniques in conjunction with neural network architectures within adaptive recommendation frameworks to foster stronger consumer-brand connections and continuously elevate the quality of the online shopping experience.

CONCLUSION

- This study makes a substantive contribution to the evolving scholarly discourse on digital marketing by systematically investigating how Artificial Intelligence (AI) and Machine Learning (ML) technologies influence consumer engagement. Drawing on empirical evidence and a rigorous review of relevant academic literature, the findings confirm that AI-powered instruments—including chatbots, algorithmic recommendation systems, and predictive analytics platforms—produce measurable improvements in user interaction quality, personalization depth, and overall marketing effectiveness. Of particular note, tailored recommendation systems strengthen purchasing inclinations and reinforce brand commitment, while predictive analytics capabilities enhance engagement through the delivery of adaptive, context-aware content.
- The research additionally establishes that consumers who actively engage with AI-enabled features exhibit significantly higher levels of participation compared to non-users, reinforcing the transformative role of AI in reshaping the digital interaction landscape. However, the study identifies a notable deficiency: the lack of integrated, practice-ready frameworks for deploying AI-driven strategies in a manner that is simultaneously effective and ethically sound across diverse marketing contexts. Furthermore, unresolved concerns relating to data governance, algorithmic bias, and the declining presence of authentic human agency continue to highlight the urgent need for well-structured and principled AI oversight mechanisms.
- From a theoretical standpoint, this work expands established consumer behavior frameworks into the domain of AI applications, laying a foundation for future inquiry into AI-augmented digital marketing. On a practical level, it furnishes marketing practitioners with evidence-based guidance for deploying AI and ML to cultivate deeper consumer relationships. Subsequent research should address sample limitations, examine longitudinal effects, and probe emotional or cultural factors to develop a fuller picture of AI's influence across diverse groups.

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AI IN TEACHING AND LEARNING: EXPERIENCES FROM INDIAN COMMERCE COLLEGES

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ABSTRACT
The concept of artificial intelligence has been discussed in the Indian education sector long enough, yet the reality of what is going on the ground and in particular in the commerce classrooms is not well documented. The following paper attempts to address that gap. It examines the ways AI is being utilized, or in most instances yet to be utilized, in teaching and learning in commerce colleges in Indian university affiliations. Based on the published studies, governmental policy briefs, and secondary sources, the research will explore which AI tools are becoming popular, what are the practical advantages faculty and students are experiencing, and what is preventing wider adoption. The results are not quite negative. There exist structural gaps, inadequate digital infrastructures in most colleges, and a curriculum that is not as up to date with technology are a reality and a chronic limiting factor. Meanwhile, the policy orientation established by NEP 2020 is generally permissive, and there is a real desire among younger faculty and students. The paper ends with viable suggestions to the administrators of the commerce colleges, universities which are affiliated and policy makers.

Keywords: *Artificial Intelligence, Commerce Education, Indian Higher Education, NEP 2020, Pedagogy, EdTech, Teaching and Learning*

1. INTRODUCTION
Enter any commerce classroom in an average affiliated college in Kolkata, Mumbai, or Pune today, and you are highly likely to hear students silently looking at ChatGPT on their phones as the lecturer talks about journal entries on the board. This modest insignificant observation holds a kernel of truth about the current state in Indian commerce education, which is between a traditional, very-regulated curriculum and a technological-driven world that is evolving at a pace that most universities are ill-equipped to match.

Artificial Intelligence is no longer a dream. It is at this point, it is available, and students are already utilizing it, whether institutionalized or not. Whether AI will make it to Indian commerce colleges is not the real question then. It already has. The more critical question is to ask whether colleges, faculty and affiliating universities are going to approach this change in a way that is thoughtful or merely respond to it afterwards.

The system of higher education in India is huge. As of 2023, the University Grants Commission had reported over 1,000 universities and above 40,000 colleges (UGC, 2023). In this system, commerce education is training millions of students to work in

accounting, banking, finance, marketing, and business management - which are exactly where AI is transforming professional practice. When the graduates of the commerce programs leave the university without any meaningful AI literacy, the gap between their knowledge and the requirements of the employers will continue to expand.

In its vision of the higher education reform, the National Education Policy 2020 puts the central role of digital innovation and the role of technology integration. However, the transformation of this policy intent into classroom reality has been unequal, especially in affiliated commerce colleges which operate under severe curricular and financial limitation. In this paper, there is an attempt to comprehend that gap, what is working, what is not and what could actually work.

2. OBJECTIVES OF THE STUDY

- To examine how AI tools are currently being used in teaching and learning in Indian commerce colleges.
- To identify the specific AI platforms and tools most relevant to the commerce education context.
- To analyse the genuine opportunities AI offers and the real barriers to its adoption.
- To situate these observations within the policy environment created by NEP 2020.
- To suggest a practical and grounded framework for AI integration suited to Indian commerce colleges.

3. RESEARCH METHODOLOGY

The present paper is purely grounded on secondary data. None of the main surveys was carried out. The review relies on articles published in peer-reviewed journals as well as government policies, institutional reports, and reports of organisations such as EY-Parthenon and CRISIL. The reviewed literature is less than 2019 and intentionally narrows down to study with references to Indian higher education in particular, as opposed to merely extrapolating the global trends in AI into an Indian setting. The sources were selected via the Scopus, Google Scholar, and Web of Science, as well as governmental portals of the Ministry of Education and the UGC. The paper uses a narrative synthesis approach to bring together findings from these varied sources.

4. AI IN EDUCATION: A BRIEF CONCEPTUAL OVERVIEW

It is best to understand what AI in education is before examining the context of the Indian commerce situation more specifically. The word is used vaguely and in a misleading manner. As a matter of fact, AIEd as it has been coined by researchers encompasses a broad spectrum of applications: intelligent tutoring systems that progress with the learner, automated feedback tools, learning analytics dashboards, natural language processing chatbots, and, most recently, generative AI tools such as ChatGPT (Chen et al., 2020).

There are two theoretical frameworks that will come in handy. The Technology Acceptance Model (TAM) emphasizes on the perceived ease of use and usefulness as the primary sources of technology uptake among users. Instead, Social Cognitive Theory (SCT) emphasizes the influence of peer behaviour, social norms and institutional environment on the decisions concerning technology (Sharma et al., 2024). They both have a role in the Indian college scene, where the faculty has a tendency to implement new tools not due to institutional pressure but due to peer pressure and student demand or rejection.

5. WHAT DOES AI ADOPTION LOOK LIKE IN INDIAN HIGHER EDUCATION?

The evidence, where it can be found, speaks of the dramatic and rapidly increasing change. According to a 2024 survey by the Digital Education Council, nearly all students around the world are now using AI in their studying, and a majority of them do it at least one time per week (EY-Parthenon, 2025). Approximately 2/3 of students surveyed used ChatGPT. These are not peripheral or experimental statistics, but they talk about widespread behavioural change occurring within higher education systems on the planet.

Surveying faculty members, students, and management staff of several higher education institutions in India, Sharma et al. (2024) identified rather positive attitudes toward AI in general, but always cited a gap in infrastructure and the absence of systematic training as a significant obstacle. This observation is consistent with what most faculty in relevant colleges would identify through their experience - interest in AI tools is a reality but there is little institutional support to utilise tools effectively.

The government is heading on the right way. In 2024-25, the Union Budget also allocated INR 173 crore to AI-related education projects, and in 2025, a special Centre of Excellence in AI in Education was declared (EY-Parthenon, 2025). These are positive indicators. However, there is a lengthy and complex road to implementation between a budget line item and an altered experience in the classroom of a Tier-2 city commerce college.

Table 1: Key Indicators of AI Adoption in Indian Higher Education

Indicator	Data / Finding	Source
Students using AI globally in studies	86%	EY-Parthenon (2025)
Students using AI on weekly basis	54%	Digital Education Council (2024)
ChatGPT usage among students	66%	EY-Parthenon (2025)
HEIs with successful AI deployment (2022)	25%	HolonIQ, cited in EY-Parthenon (2025)

Indicator	Data / Finding	Source
India Govt. AI budget allocation (2024-25)	INR 173 crore	EY-Parthenon (2025)
CoE in AI for Education announced	2025	Ministry of Education, India
Secondary level dropout rate (2023-24)	14.1%	UDISE+ (2024)
Rural schools with internet access	30%	UDISE+ (2024)

Source: Compiled by the author from secondary sources

6. AI Tools That Matter for Commerce Education

The field of commerce is the area that does not usually occur to people when considering AI in education. That is a mistake. AI is currently being actively redefined on the professional level in finance, marketing, economics and business analytics, and the tools that can be used in the teaching of these disciplines have gained significantly more competence over the last few years.

6.1 Adaptive Learning Platforms

Social media such as the Khan Academy, BYJU, and Coursera are employing AI algorithms to monitor the performance of individual students and adapt the difficulty or speed of the content. This type of supportive assistance is genuinely advantageous to students of commerce, who might enter undergraduate education with exceptionally unequal preparation, particularly in mathematics as well as in fundamental accounting. According to Kenchakkanavar et al. (2024), AI-based adaptive learning systems have demonstrated significant potential in enhancing the performance of students with diverse academic backgrounds, which is the case with most students in Indian commerce classrooms.

6.2 Generative AI Tools

Being honest, ChatGPT and Google Gemini are already being used by students to an extremely large extent. They apply these tools in explaining concepts, writing assignments, summarising chapters of textbooks and studying exam papers. Even faculty are starting to adopt generative AI - to make lesson plans, create question papers, and instruction. Roy and Roy (2025) record increased utilization of AI tools in Indian higher education faculty in professional development, but adoption is still skewed and not institutionally backed, but rather self-driven.

The other side of the coin, of course, is that with the help of generative AI, it is extremely easy to to submit the work that is not truly created by the student. This is an actual issue of academic dishonesty that Indian university has failed to appropriately solve at the policy level.

6.3 Assessment and Feedback Tools

Detection modules such as Turnitin AI detector and Gradescope are slowly gaining access into Indian institutions, however, are not widely used in affiliated colleges. In the case of commerce education where the evaluation is commonly conducted in the form of case studies, project reports, and problem-solving activities, AI-assisted feedback does have a real potential. Roy and Roy (2025) note that AI-based learning analytics may assist the faculty with struggling students, allowing them to intervene more specifically and quickly before the time of exams comes.

6.4 Administrative Applications

AI can be used in education beyond the classroom. One of the places where AI has been implemented in certain Indian institutions is the attendance system, admission portal, and student grievance chatbots. According to Frontiers in Education (2025), the routine administrative procedures are automated, liberating faculty members that spend excessive time on paperwork, giving them more time to engage in genuine teaching, mentoring, and academic processes.

Table 2: AI Tools and Their Applications in Commerce Education

AI Tool / Platform	Application in Commerce Education	Pedagogical Function
ChatGPT / Google Gemini	Assignment help, concept explanation, exam prep	Generative AI / Self-learning
BYJU'S / Khan Academy	Adaptive content in Accountancy and Economics	Adaptive Learning
Coursera / edX (AI-powered)	MOOCs with AI-driven course recommendations	Personalised Learning
Turnitin AI Detect	Detecting AI-generated content in submissions	Assessment Integrity
Gradescope	Automated marking of objective tests	Assessment Automation
AI-enabled LMS	Student progress tracking, analytics dashboards	Learning Analytics
Institutional AI Chatbots	24x7 query resolution for students	Administrative Support

Source: Compiled by the author

7. What AI Actually Offers Commerce Colleges

7.1 Addressing the Heterogeneity Problem

Those who have ever attended the Indian affiliated commerce college will be aware that diversity in the classroom among students is an advantage and a logistic problem. The same room will have students who attended English-medium schools and those who are actually having a hard time with the language of instruction. Other students learn accounting concepts fast; there are those who remain puzzled till the second semester with the notion of trial balance. Individualised artificial intelligence-based learning devices are capable of dealing with this heterogeneity in a manner that would otherwise not be achievable by a single faculty member leading a classroom of seventy students.

7.2 Reducing the Administrative Burden on Faculty

The fact that AI does not substitute good teachers is a point that Roy and Roy (2025) have to stress: good teachers still have a job, and AI can liberate them and solve their workload of the tasks which are, actually, not in need of their experience. Checking who has shown up or not, answering the same questions over and over, giving simple feedback on assignments, these are jobs that AI can take on and leave faculty time to what actually needs a person human being; mentoring, a close academic conversation and developing a relationship with a student over a lifetime.

7.3 Support for Research and Academic Writing

Consulting faculty at the commerce faculty who are involved in research supervision, consultancy, or writing research papers on top of their teaching job cannot afford to disregard the productivity benefits of AI tools. Literature reviews, reference management, tools to support data analysis, editing drafts, etc. — previously these activities took a lot of time but now AI can achieve it much more efficiently. According to Frontiers in Education (2025), AI is changing the research processes in the universities and colleges all over the world and this tradition is slowly invading the Indian education sector.

7.4 NEP 2020 as a Policy Enabler

The NEP 2020 is highly congruent with the type of AI integration discussed in this paper. The focus on outcome-based learning, digital infrastructure, multidisciplinary exposure, and non-linear credit structures all provide room in which AI-enabled pedagogy can thrive. Specifically, the Academic Bank of Credits system has set up the circumstances in which, in the long run, personalised, AI-based learning paths may become a feasible reality, as opposed to a mere policy ambition of its (Ministry of Education, 2020).

8. THE REAL BARRIERS TO AI ADOPTION

8.1 Infrastructure Gaps

This is the hardest limitation. According to 2023-24 UDISE+ data, the availability of reliable internet connectivity in rural schools is only 30 percent, and the scenario in many affiliated colleges located outside in the metropolitan regions is not

significantly better (UDISE+, 2024). Even without the most fundamental connection, the discourse on AI tools is more theoretical. Kenchakkanavar et al. (2024) are right in recognizing the digital divide as the biggest hindrance to the equal use of AI in Indian education. It is not just a technical issue it is indicative of underlying structural disparities in the way educational investment had been historically allocated within the states and regions of India.

8.2 Faculty Preparedness and Training

Being familiar with a topic and understanding how to deliver it with the application of AI tools are two different skills. Workers in most faculty in the affiliated colleges were academically trained when digital tools in education were much more rudimentary. Nothing is wrong here, but it implies that a genuine AI integration will necessitate a significant investment in faculty development not a workshop but months of practice-based training. Sharma et al. (2024) discovered that the positive intention towards AI among the Indian faculty is not accompanied by the confidence and ability to use these tools in the actual classroom environment.

8.3 Academic Integrity Concerns

The generative AI-related academic integrity issue cannot be overemphasized. As soon as students learn to create a passable project report within a couple of minutes with the help of ChatGPT, the traditional assessment methods lose their worth as valid indicators of learning. Indian universities are still just struggling with this. Detection software such as Turnitin can be used to somewhat detect AI-generated work, but the issue is unlikely to be solved using technology-based solutions. The final solution, however, is a reconsideration of the way the commerce students are examined - to oral tests, live case presentations, and demonstrations of problem-solving, which even an AI finds quite difficult to outsource.

8.4 Curriculum Inertia

The affiliating university systems in India have slow curriculum revision cycles. The syllabus as it is approved in 2021 might not be revised before 2026 or afterwards. The AI landscape has radically changed in that window. Until AI literacy, being aware of what these tools are, how they operate, and what their restrictions are, and how these tools can be used ethically becomes part of Formal competency, Com and BBA graduates will be coming to the workforce with this expectation without having ever learned it.

Table 3: Opportunities vs. Challenges of AI in Indian Commerce Education

Dimension	Opportunities	Challenges
Pedagogy	Personalised learning for diverse student groups	Faculty unpreparedness; slow curriculum revision
Assessment	Automated feedback; AI content detection	Academic integrity risks; generative AI misuse

Dimension	Opportunities	Challenges
Administration	Reduced paperwork; efficient data management	Integration costs; student data privacy
Research	Faster literature review; AI-assisted analysis	Over-reliance risks; attribution ethics
Policy	NEP 2020 alignment; Digital India goals	Regulatory ambiguity; slow university response
Infrastructure	Cloud-based tools reduce hardware costs	Digital divide; connectivity gaps in Tier-2/3 areas

Source: Compiled by the author from secondary sources

9. NEP 2020 AND THE POLICY ENVIRONMENT

The NEP 2020 represents the most extensive effort to remodel the Indian higher education in decades. Its promises to digitalization, multidisciplinary learning, and outcome-based education attach to an authentic enabling environment of AI introduction in principle. The circumstances under which AI tools are recommended to be used in the 2023 guidelines of the UGC on the topic also suggest that the regulatory ecosystem is finally getting in touch with the technological reality (UGC, 2023).

With that said, a fair evaluation should take account of the implementation gap. Even even the most well-considered policies at the national level do not invariably get transformed into modified practices in the thousands of affiliated colleges that constitute the heart of Indian commerce education. Most of these institutions are working on tight budgets, minimal independence and faculty members who are already overworked in cases of teaching, examination and administrative work. The implementation of AI in this context needs not only the policy cues but also tangible institutional reinforcement - in infrastructure, training, and curriculum change. The announcement of the 2025 Centre of Excellence and the 173 crore budgetary allocation of INR is a good economic news, yet the actual difference will be how effective these resources are delivered to the ground institutions (EY-Parthenon, 2025).

10. RECOMMENDATIONS

- A special AI literacy course ought to be designed in B.BBA and com programmes, including tools, ethical usage, finance and marketing applications and critical constraints - formally sanctioned by the affiliating university system.
- University affiliations should develop effective, practical policies concerning what is and is not allowed to be done with AI in assessment and examinations based on UGC policies.

- Institutionalisation of faculty development programmes tailored to the teachers of commerce at both college and university levels -including AI tools to teaching, assessment design and research support.
- In the future, a tiered AI integration framework ought to be taken into account: simple digital tools to resource-constrained institutions, adaptive platforms to mid-tier colleges, and sophisticated AI-powered pedagogy to well-equipped institutions.
- Assessment design in commerce education ought to be altered to oral presentation, live case analysis, and demonstration of problem solving - presentation forms that are less susceptible to AI generation and more representative of competitive skills in the workplace.
- Corporate CSR funds: This should be systematically channeled to the development of AI infrastructure in under-resourced related commerce colleges to establish a viable public-privacy model of EdTech access.

11. CONCLUSION

One of the ironies of this is that commerce education is a subject that trains people to operate in the business world of the 21st century, which is defined by data, algorithms, and automation, and it has been comparatively slow to adopt AI into its own instructional practice. Part of that is structural: affiliating university systems are necessarily conservative, and change in curriculum is slow. Part of it is infrastructural: lots of colleges do not have the connections and hardware to ensure that AI-enabled teaching is even a realistic possibility. And a certain amount is cultural: a profession of teaching that was not even trained to use these things, and is naturally confused as to where to start.

All these barriers are not permanent. The NEP 2020 is heading in the right direction. An emerging literature, even in Indian institutions, is showing what intelligent AI-based pedagogy might be like in practice. What is desired now is the institutional desire - by universities, by college management, by the UGC, by the government - to bridge the gap between aspiration and implementation. Indian commerce students should be able to leave their universities not only having learned about the basics of accounting and marketing theory but also with the Artificial Intelligence and digital literacy that the contemporary job market is starting to require.

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FINANCIAL LITERACY IN THE DIGITAL AGE: BRIDGING THE GAP AMONG STARTUPS AND SMALL BUSINESSES

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ABSTRACT

This study analyses, the role of digital accounting tools among SME and start-ups by using the secondary data from the available sources between the years around 2019 to 2024. This study addresses key challenges and opportunities in financial management and evaluate the role of digital tools in improving financial practices among emerging businesses. The data reveals the significant gaps in customisation, integration and applicability of the relevant financial management techniques. The paper throws light on the role of technology developers, policy makers, and small business support organizations in improving financial literacy among entrepreneurs.

The findings indicate that while digital accounting tools have enhanced accessibility, efficiency and transparency in financial management, many entrepreneur still phase difficulties in interpreting financial data and using advanced features of these tools effectively. The study for their highlights the need to improve financial education, better designed digital platforms and stronger support systems to ensure that start-ups and SMEs can fully benefit from digital financial solutions in evolving digital economy.

Keywords: Financial literacy, digital accounting tools, startups, small businesses, entrepreneurship, fintech.

1 INTRODUCTION

The technology revolution and the use of INTERNET has changed dramatically the very way of looking at it, the software and technology available for the big corporate are now easily accessible for small businesses and start-ups. Effective financial literacy and management of accounts can be the root cause of success or failure of a business. According to the US small business administration 2023, approximately 20% of the small business fail within first year and 50% by their fifth year with financial mismanagement cited as a leading cause.

Digital accounting tools and capabilities must be accessible to everyone without creating a new divide between literates and illiterates, this study examine the current scenario of digital accounting solutions for emerging entrepreneurs and evaluate their preparedness in enhancing financial literacy among start-ups and SMEs.

Following are the main questions

1. To study the gap remaining in the accounting system and digitalisation
2. How effective are the available software to tackle the challenges?

3. The challenges faced by the start-ups and small businesses.

This study employs a comprehensive analysis of secondary data to examine the relationship between digital accounting tools and financial literacy among the start-ups and small businesses. The methodology involved systematic collection, evaluation and synthesis of data from multiple reliable sources published between 2019 and 2024.

2. LITERATURE REVIEW

2.1 Financial Literacy in Small Business Context

Financial literacy in entrepreneurship extends beyond basic personal finance knowledge and includes specialized skills in business accounting, cash flow management, financial planning, and regulatory compliance. Drexler et al. (2021) define small business financial literacy as "the ability to use knowledge and skills to manage financial resources effectively for business sustainability and growth." Their study of 445 small business owners found that only 39% could accurately calculate basic profit margins, while only 28% maintained separate business and personal accounts.

The Financial Industry Regulatory Authority's (FINRA) National Financial Capability Study (2022) revealed that small business owners scored only marginally higher than the general population on financial literacy tests (61% versus 57%), despite their need for more sophisticated financial knowledge. This gap highlights a critical vulnerability in the entrepreneurial ecosystems.

2.2 Digital Transformation in Accounting

The accounting industry has undergone a significant digital transformation over the past decade. Cloud-based accounting software, machine learning-enabled financial analysis, and automated compliance tools have changed the way businesses manage their finances (Bhimani & Willcocks, 2022). According to Gartner's Market Guide for Cloud Financial Management (2023), the global market for digital accounting solutions reached $12.7 billion in 2023, with a projected compound annual growth rate of 11.2% by 2028.

The proliferation of accounting software specifically targeting small businesses and startups has dramatically increased, with Statista (2024) identifying over 200 digital accounting platforms marketed to small businesses worldwide. These solutions range from basic bookkeeping applications to comprehensive financial management ecosystems that offer invoicing, payroll, tax compliance, and financial forecasting capabilities.

2.3 The Promise and Limitations of Digital Tools

Digital accounting tools promise several benefits for small businesses, including cost reduction, increased accuracy, time savings, and improved financial visibility (Ross et al. 2023). In a survey by QuickBooks (2023) of 3,500 small business owners, respondents reported saving an average of 10 hours per week on financial tasks after adopting digital accounting solutions.

However, Jansen and Chang (2022) highlighted the limitations of the current digital accounting ecosystem, noting that many tools assume baseline financial literacy that many entrepreneurs lack. Their qualitative study of 37 small business owners found that 62% struggled to interpret the financial reports generated by their accounting software despite successfully inputting data. This suggests that digital tools may sometimes amplify, rather than bridge, financial literacy gaps.

3.1 Research Objectives

1. To examine the major financial challenges faced by start-ups and small businesses in the Digital area.
2. To evaluate the effectiveness of digital accounting tools in improving financial management and decision making among start-ups and small businesses

3.2 Data Sources

The following categories of secondary data were consulted:

Academic research: Peer Journal articles from business, entrepreneurship and accounting disciplines with analyse to establish the theoretical framework and identify established findings on financial literacy, challenges.

Industry Reports: Reports from accounting software companies, example into it zero fresh book b financial institutions and accounting professional bodies provided insight into tool, adoption and usage patterns

Government Data: Statistical statistics from small business agencies, economic development, departments, and financial regulatory bodies were examined for contextual data on small business performance, performances and challenges.

Market Research: Third-party market research from firms, including Gardner, Forrester and McKinsey offered objective analysis of tools, trends, and business impacts.

Service and User Studies: Published service of small business owners regarding their experiences with financial literacy and digital accounting tools provided qualitative insights into real-world application and challenges.

3.3 Data Analysis Approach

Thematic analysis: Identification of recurring themes and patterns across different data resources regarding financial literacy, challenges, and digital tool capabilities.

Comparative analysis: Direct comparison of findings between different studies to identify, consists and contradictions in the literature.

Gap analysis: Systematic identification of area where current digital accounting solutions appear to be succeeding or failing to address small business, financial literacy needs.

3.4 Limitations

This research relies exclusively on secondary data, which may reflect publication bias on limited perspective. Additionally, the rapid evaluation of digital accounting tools means some findings may become outdated quickly. The Global focus of the research may also obscure regional variations in small business needs and digital tool availability.

4. FINDINGS AND ANALYSIS

4.1 Current State of Financial Literacy Among Small Businesses

Analysis of survey data from multiple resources reveals consistent patterns regarding financial literacy, challenge, challenges among small businesses and start-ups. The SCORE Association's "Megaphone of Main Street report (2023) which surveyed 1700 small business owners across United States found out:

- 73% of small business owners rated themselves as somewhat or very confident in their financial management abilities
- However, when tested on basic accounting concepts, only 39% could correctly answer questions about the cash flow management
- 64% reported struggling with financial forecasting
- 51% admitted difficulty, separating business and personal finances

These findings along with the data that international Financial Reporting Standards (IFRS) Foundation's SME Implementation Group (2022) which surveyed 2300 small business owners across 18 countries and found out that:

- 68% of respondent misunderstood at least one major accounting principle relevant to their businesses
- 57% could not accurately. Calculate their businesses current ratio (a key liquidity measure)
- 79% reported using gut feeling rather than financial data for least some significant business decisions

The gap between self-perceived an actual financial literacy represent a significant challenge. As said by lean and Thompson in 2023, observed in their analysis of 215 failed start-ups, "many entrepreneurs did not know what they do not know about financial management(p. 87), which can lead to fatal business errors despite confidence in decision-making.

4.2 Digital Accounting Tool Adoption and Impact

4.2.1 Adoption Rates

Digital accounting tools adoption has grown substantially among small businesses. According to Small Business Digital Transformation Survey (Visa, 2023) of 4500 small businesses globally:

- 78% now use at least one digital financial management tool up from 56% in 2019
- 42% use comprehensive accounting software platforms
- 36% use more limited tools for specific functions (e.g. invoicing, expense tracking)
- 22% still rely primarily on spreadsheet or paper base systems

Notable variations exist across demographic and business types. The Xero Small Business Insight report (2023) found out:

- Digital accounting adaptation reaches 87% among businesses less than five year old, compared to 64% for business is over 10 years old
- Take adjacent businesses, show 91% adoption compared to 62% in traditional retail and service industries
- Businesses with College educated owners adopted at rates, 23% points higher than those without college degrees

4.2.2 Impact on financial literacy and business performance

Studies measuring the impact of digital accounting tools, show mixed but generally positive outcomes. A longitude study by the Small Business Development Centre (2022), tracking 1800 small businesses over three years found:

Outcome Measure	Businesses Using Digital Accounting	Businesses Not Using Digital Accounting	Difference
Annual Revenue Growth	13.7%	8.2%	+5.5%
Profit Margin	8.3%	6.1%	+2.2%
Business Survival Rate (3-year)	83%	71%	+12%
Loan Approval Rate	76%	53%	+23%
Time Spent on Accounting (weekly)	4.6 hours	11.3 hours	-6.7 hours

Source: Small Business Development Centre Annual Report (2022)

The Intuit's books, Small Business Success Study (2023), serving 2,100 small business owners found that business is using Digital accounting tools reported:

- 68% felt more confident in their financial decision making
- 72% claimed better awareness of their cash position

- 64% reported making at least one significant business decision based on insights from their accounting software that they would not have identified otherwise

However, the same study noted, important limitations:

- Only 37% of users utilised advanced features beyond basic bookkeeping
- 43% admitted, they don't fully understand all the financial reports, their software generates
- 29% reported feeling overwhelmed by the amount of financial data available

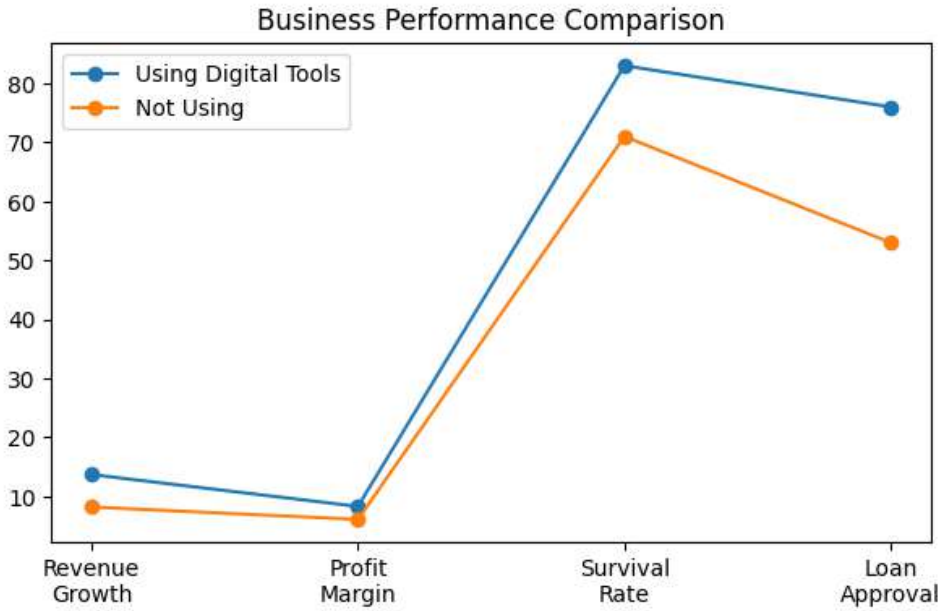

Fig 4.1 Adoption increased from 56% in 2019 to 78% in 2023, demonstrating rapid digital transformation among small businesses.

4.3 Primary Challenges and Gaps

Analysis of the data reveals five key areas where current digital accounting tools are succeeding or failing to address small business. Financial literacy needs:

4.3.1 Accessibility vs. Comprehension

Digital tools have significantly improve accessibility to accounting capabilities, but comprehension remains a challenge. The accounting software user experience study forester 2023 found that while 81% of small business owners could successfully enter data into accounting software, only 47% could confidently interpret the resulting financial reports without assistance.

This gap is particularly pronounced in certain financial domains. The fresh books, small business owners report 2023, found comprehension rates varied significantly by financial functions:

Financial Function	Can Successfully Execute	Can Confidently Interpret Results
Invoice Creation	93%	87%
Expense Tracking	89%	81%
Bank Reconciliation	76%	62%
Balance Sheet Analysis	58%	31%
Cash Flow Forecasting	47%	29%
Tax Liability Estimation	42%	26%

Source: FreshBooks Small Business Owner Report (2023)

4.3.2 Education and Onboarding Gaps

The effectiveness of educational resources provided by digital accounting platforms varies widely. The accounting web technology excellence award 2023 evaluated the educational components of 14 leading small business accounting, Pala form is and found:

- The average completion rate for in app tutorials was 23%
- 68% of platforms offered contextual help, but only 31% provided explanation of accounting concepts
- 72% of platforms included financial term, but user testing showed these were consulted in only 8% of instances where users encountered unfamiliar terms

These finding suggest that while educational resources exist, they may not be effectively engaging users or addressing fundamental knowledge gaps.

4.3.3 Customization Challenges

Current digital accounting tools of fail to adequately customise two different business models and industries. The McKenzie digital business report 2024 found out that:

- 62% of small business owners felt their accounting software was designed for generic businesses rather than their specific industry
- 71% had created work around for industries specific accounting needs
- Only 37% felt confident, their financial reports accurately, reflected industries specific metric important to their business.

4.3.4 Integration with Decision-Making

Digital accounting tools have improved data collection but show limitation in supporting decision-making. The Harvard business School digital entrepreneurship survey 2023 of 1350 Entrepreneur Found:

- 79% reported having more financial data available than five years ago
- However, only 34% felt very confident in using this data for strategic decisions
- 56% reported that their accounting software identifies problems but provides limited guidance on solutions

4.3.5 The Digital Divide

Digital accounting tools may in advertently be creating new forms of division. The global entrepreneurship monitor 2023 found significant disparities in Digital, accounting adoption and effectiveness:

- Rural businesses showed 27% lower adoption rates than urban counter parts
- Female old businesses are 18% less likely to use advanced financial analytics features compared to male own businesses
- Businesses in lower income community is spent 2.3 times more on accounting assistance, despite using digital tools, suggesting tools alone where insufficient

Overall, the findings indicate that why digital accounting tools have expanded access to financial management, functions, their effectiveness depends greatly on users, existing financial knowledge, ability to interpret reports and the relevance of the software to their business contacts. The study also shows that limited educational support, lack of industries, specific customisation, and unequal access continue to restrict the ability of many start-ups and small businesses to fully benefit from their tools. Therefore, digital accounting platforms should be reviewed as supportive, enablers of financial literacy rather than complete substitutes for financial knowledge and human guidance.

5. RECOMMENDATIONS

5.1 For Technology Developers

- Embedded education contextually through just time explanations
- Develop adaptive interfaces based on user skill levels
- Support industry specific customisation
- Implement guided decision support
- Design inclusive tools for diverse users

5.2 For Policy Makers and Small Business Support Organisations

- Develop digital financial literacy standards
- Provide targeted training programmes
- Create technology subsidies for under served businesses
- Establishment internship networks
- Measure effective tool usage beyond adoption rates

5.3 For Entrepreneurs and Small Business Owners

- Assess financial knowledge gaps
- Build foundational knowledge before two adoption

- Use community and advisory support
- Start with simple tools and gradually scale
- Conduct regular financial reviews

6. CONCLUSION

The research demonstrates that digital accounting tools have significantly improved access to financial management capabilities for start-up and small businesses. However, their ability to improve financial literacy depends on Entrepreneur knowledge, the design of the software and the level of contextual educational support available.

The study conclude is that the most effective approach lies in combining technology, financial education, customisation, and human support system. By addressing accessibility, comprehension, and the digital divide challenges, stakeholder can ensure that digital accounting tools truly empower entrepreneurs, and contribute to sustainable business growth.

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ISBN 978-93-48959-08-9

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