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**A One - Day Multi – Disciplinary
Hybrid International Conference**

on

**“Interface of Human Intelligence &
Artificial Intelligence - Possibilities and
Challenges”**

14th February, 2026



Organised by

**Parle Tilak Vidyalyaya Association's
M. L. DAHANUKAR COLLEGE OF COMMERCE
(Autonomous)**

Internal Quality Assurance Cell (IQAC)

In association with

**Western India Regional Council (WIRC),
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President's Message



Dear Readers,

It gives me great pleasure that PTVA's M. L. Dahanukar College of Commerce hosted a dialogue among academics, industry professionals and students from across the world on a topic of such contemporary relevance, namely Artificial Intelligence (AI). The enthusiastic and wholehearted participation of scholars, practitioners and young learners ensured that the conference emerged as a platform of meaningful exchange and intellectual engagement.

Needless to say, Artificial Intelligence has made significant inroads into almost every arena of our existence. From the ways in which we work and communicate to the methods through which knowledge is created and disseminated, AI has begun to reshape the rhythms of everyday life as well as the structures of institutions. In such a context, conferences devoted to Artificial Intelligence assume particular importance. They function as intellectual forums where scholars, industry experts, policymakers and young learners can come together to deliberate upon the technological possibilities and the broader social implications of this evolving field.

Within the domain of higher education, the influence of Artificial Intelligence is especially visible. Educational institutions across the world are exploring how AI can enhance teaching and learning. Intelligent learning systems, data-driven insights and digital platforms are enabling more personalized forms of education and expanding access to knowledge. AI has become a vital instrument in contemporary research, accelerating discovery and enabling scholars to analyze complex patterns once beyond the reach of conventional methods. Collaboration between academia and industry has opened new pathways for innovation and knowledge production, across medicine, environmental science, engineering, commerce, social sciences and digital humanities.

Yet the promise of Artificial Intelligence must also be accompanied by thoughtful reflection. The questions before educators, policymakers and technologists are not merely technical but deeply ethical. Concerns regarding algorithmic bias, the protection of personal data and the implications of automation for employment demand careful consideration. Universities therefore carry a special responsibility: they must prepare students not only to use emerging technologies, but also to examine them critically and guide their development with wisdom and integrity.

In responding to these challenges, educational institutions must pursue certain key priorities. The first is education and capacity-building. It is essential to prepare students not merely as consumers of technology but as thoughtful creators and responsible users of it. This requires curricula that combine technical competence with ethical awareness and interdisciplinary inquiry.

The second priority is collaboration. The most pressing challenges—whether technological, social, or environmental—cannot be addressed by isolated institutions. Partnerships among universities, industries and governments are vital for sharing knowledge, developing standards and ensuring that innovation benefits society at large. Equally important is the principle of inclusivity. Ensuring wider access to education, resources and digital infrastructure is essential if the benefits of AI are to reach diverse communities and contribute to more equitable forms of development.

Conferences such as these therefore represent far more than academic events. By bringing together academicians, professionals and students from diverse backgrounds, such forums contribute to shaping Artificial Intelligence not only as a technological achievement but also as a force that advances knowledge, responsibility and human well-being. Thus, we see Artificial Intelligence is making steady strides into every facet of human life. The stalwarts in the field are invoking and celebrating its expansion, but at the same time issuing a caveat that, in the wake of massive change ushered in by AI, human beings must stay relevant and not succumb to this deluge of change. A significant way to do so is to be more human, as in working on self-awareness and being emotionally intelligent should be the guiding light to manoeuvre AI deftly. Working alongside AI, with these boons of self-awareness and emotional intelligence, could only assure a comprehensive growth of humans.

CA Shri. Anil B. Ganu
President, PTVA

Principal's Message



The academic year 2025-26 has been yet another year of remarkable glory for PTVA's M. L. Dahanukar College of Commerce (Autonomous) as other than various academic accomplishments, it also achieved numerous accolades in co-curricular arena.

In fact, our distinction lies in the pursuit of high academic co-curricular attainment through sustained encouragement, praise and motivation. These achievements reach its summit, as every year, we ensure organising intellectual exchanges and confluence of international and national standards in form of Conferences, FDPs and Workshops.

In line with the currents of time and demands of the present day, the last year's Conference on "Viksit Bharat" saw its natural amalgamation in this year's conference on "Artificial Intelligence" titled, "Interface of Artificial Intelligence and Human Intelligence: Possibilities and Challenges".

As AI is entering all walks of human activity and bringing forth unprecedented changes in all walks of lives, the need is extremely urgent to reflect and brainstorm on the various facets of AI. So, the topic is floated with an intent of larger discourse which eventually garnered a huge response with time across the globe.

The purpose was to bring in line of thinking that is articulate, incisive well-researched. In a world increasingly mired in cut-throat competition, enhanced with the influence of AI, humans are confronted with a threat to honour, dignity and rectitude. The contribution to the conference from eminent Resource Persons, research scholars and participants turned out to be extremely fulfilling as they stepped up to the purpose for which the conference was designed.

As we believe in the significance of collaborative efforts, our association with WIRC (ICAI) made the attempt innately enriching.

The outcome of the congregation was that it offered cohesive techniques clubbed with the knowledge of the technology of AI to ensure holistic and constant growth. A learning that pledges dynamic interaction and refuses to rest on the laurels of the past can only

bring about the moral and intellectual vigour to encounter the threat of this massive change.

If with systematic awareness and equipped with constant update of this new knowledge system of AI, then it will open up to the ocean of opportunities that are in front of us all. It is also said that today's knowledge is tomorrow's ignorance. India has witnessed a series of reforms in economic and social sectors since over a decade. The winds of reforms have changed the fundamentals of economy. The Government appeared to be keen on bringing forward the social reforms. Government has taken note of the fact that, world is rapidly growing into a global village and globalization is inevitable. In this increasingly shrunken global scenario, Artificial Intelligence is becoming a core functionary and a determinant of human growth, the knowledge of which can bring assured success, and also prevent it from outsmarting humans. The One-day Conference has offered an opportunity to the participants express their views on major reforms that have transformed the nation in the last few years.

PTVA's M. L. Dahanukar College of Commerce seeks and maintains high standards of higher education. I am glad that the Conference provided the right platform to the researchers, academicians, corporate experts and students through deliberations, discussions, presentations and academic exchanges.

It gives me immense pleasure and pride to acknowledge contribution of all the committee members, viz, teaching, non-teaching staff and student volunteers whose concerted efforts made the conference a great success. Together we plan to reach richer and higher landmarks in future.

On this occasion, I once again convey my best wishes to all!

Prof. (Dr.) Vinay G. Bhole
Principal

IQAC Co-ordinator's Message



Dear Readers, on behalf of the *Internal Quality Assurance Cell (IQAC)*, I feel extremely glad to share my thoughts on the development of the journey of One-Day Multi-Disciplinary Hybrid International Conference titled, “*Interface of Human Intelligence & Artificial Intelligence – Possibilities and Challenges.*”

The *Internal Quality Assurance Cell (IQAC)* plays a pivotal role in fostering a culture of quality, innovation, and continuous improvement in higher education. Conferences such as this are integral to IQAC’s vision of promoting research orientation, interdisciplinary learning, and meaningful engagement with contemporary global concerns.

We have a culture of setting the theme with deliberations and due diligence, and we have arrived on this theme of Artificial Intelligence noting the contemporary relevance of the topic. It goes without saying that Artificial Intelligence is no longer a futuristic concept; it is an integral part of our present reality. As educators and learners, it becomes our responsibility to examine not only its technical capabilities but also its social, ethical, and intellectual implications. This conference seeks to encourage critical inquiry into how human intelligence can meaningfully coexist with, guide, and complement artificial intelligence.

In discussions about the future of technology, renowned environmental activist, Vandana Shiva advocates arguing that true judgment and soul cannot come from an AI model. “You are not Atlas carrying the world on your shoulder. It is good to remember that the planet is carrying you”. Many such words of caution make us ponder about the complex future of humanity and our precarious existence which require right reflections from researchers and policy makers. Conferences such as this work as a sustainable platform to address and redress these growing concerns.

The hybrid mode of this international conference further reflects our commitment to inclusivity, accessibility, and global academic collaboration. The enthusiastic participation from scholars across disciplines and regions is truly a indicator towards the success of this objective.

I extend my heartfelt thanks to our ever-supportive PTVA management, our source of motivation, our Principal, the Convenor, our partner institution WIRC–ICAI, and all the faculty members and student volunteers of the organising committee for their whole hearted efforts towards the success of the Conference. I also thank all participants for trusting us and associating us always which adds to our enthusiasm to deliver better and the academic vibrancy of this event.

I am certain that the scholastic deliberations in the volume will spark further ideas and stored insights in the Research articles will add value to our collective understanding and inspire future research initiatives.

Thank you, and look forward to your association in future as well !

Dr. Chandana Chakraborti
Vice Principal

Convenor's Message



Dear Contributors, it gives me immense pleasure to extend my gratitude at the outset for associating and reposing in your faith in us. Your being part of our Conference is the fulcrum of our zeal and enterprise to keep coming up with such Conclave wherein both budding scholars and the erudition of luminaries confluence with an intent of broadening the intellectual horizon and giving a part of the think tank that usher transformation. Our esteemed Management Parle Tilak Vidyalaya Association (PTVA) and the lighthouse of our multifarious activities, our Principal Prof. (Dr.) Vinay G. Bhole, our sustained mentor, Vice Principal and IQAC Coordinator, Dr. Chandana Chakraborti led us to formulate and engineer yet another successful conference, the testimony of which is evident in the presence of 320 participants from across the country and beyond.

One-Day Multi-Disciplinary Hybrid International Conference on “Interface of Human Intelligence & Artificial Intelligence – Possibilities and Challenges”, got a further impetus as Internal Quality Assurance Cell of M. L. Dahanukar College of Commerce (Autonomous), got an opportunity to collaborate with the Western India Regional Council of the Institute of Chartered Accountants of India.

As we speak of our Conference on the theme of Artificial Intelligence, humanity at large has gathered at a moment when technology is quietly and persistently rewriting the grammar of our lives. Artificial Intelligence has emerged as a transformative presence across education, commerce, governance, healthcare, and almost every sphere of human activity. It promises extraordinary possibilities—enhancing efficiency, extending human capability, and reshaping the ways we think and work—yet it also urges us to pause and reflect on meaning and responsibility. Rabindranath Tagore reminds us that “the highest education is that which does not merely give us information but makes our life in harmony with all existence.” As we engage more deeply with intelligent machines, this reminder becomes especially urgent.

At the same time, literature has long celebrated and interrogated the uniqueness of human intelligence. Shakespeare's words in Hamlet—"What a piece of work is a man... in apprehension how like a god!"—capture both wonder and vulnerability. As machines increasingly imitate human cognition, we are compelled to ask not merely how intelligent our technologies can become, but how wisely we choose to use them.

As T. S. Eliot cautions us, "Where is the wisdom we have lost in knowledge? Where is the knowledge we have lost in information?" This question resonates strongly in an age of data abundance and machine learning. While AI opens new horizons of innovation, it also raises profound questions about ethics, creativity, agency, employment, and moral judgment. The concern is not only what machines can do, but how far human intelligence is willing—or prepared—to delegate judgment, imagination, and accountability.

The multidisciplinary nature of this conference reflects our conviction that such complex questions cannot be addressed through a single disciplinary lens. Scholars from commerce, management, technology, humanities, social sciences, and professional bodies such as ICAI bring diverse ways of knowing that enrich this collective inquiry. In this convergence of disciplines, we move closer to a holistic vision of knowledge—one that balances innovation with ethics, and intelligence with wisdom.

I take this opportunity to express my sincere gratitude to our collaborating institution, WIRC-ICAI, for their valuable support, and to all our distinguished speakers, paper presenters, and participants for their enthusiastic response. I also deeply appreciate the tireless efforts of the organising committee, faculty members, and student volunteers whose dedication has made this academic gathering possible.

I am confident that the deliberations today will inspire thoughtful engagement, foster ethical reflection, and reaffirm the centrality of human intelligence in shaping the future of artificial intelligence.

Heartfelt gratitude to everyone for your contribution !

Mr. Somnath R. Deshmukhya
Head, Dept. of English

INDEX

Sr. No.	Title	Author(s)	Page No.
17	<i>LEGAL AND PRIVACY CHALLENGES IN THE REGULATION OF ARTIFICIAL INTELLIGENCE IN INDIA</i>	<i>Dr. Sachin Joshi, Dr. Rajesh B Tendulkar</i>	<i>141-147</i>
18	<i>BULLETS AND ROBOTS: SATIRICAL DYSTOPIA AND POSTCOLONIAL VIOLENCE IN SELECT POEMS OF THANGJAM IBOPISHAK SINGH</i>	<i>Mr. Somnath R. Deshmukhya, Dr. Rupa S. Deshmukhya</i>	<i>148-153</i>
19	<i>ADJACENCY SPECTRA OF GENERALIZED FIBONACCI CUBES UNDER RECURSIVE FORBIDDEN PATTERNS</i>	<i>Suraj T. Raut, Chhaya Lande</i>	<i>154-158</i>
20	<i>CYBERFEMINISM IN INDIAN AND HOLLYWOOD CINEMA: A COMPARATIVE STUDY OF GENDER, TECHNOLOGY, AND POWER IN CONTEMPORARY FILM</i>	<i>Dr. Shashikant Sitaram Shende</i>	<i>159-166</i>
21	<i>FROM DEVOTION TO DISCIPLINE: BELIEF AND MANAGEMENT IN INSTITUTIONAL PRACTICE</i>	<i>Dr. Ruchi Anand, Ms. Mrunal Raut, Mr. Sushank Karkera</i>	<i>167-178</i>
22	<i>CONSUMER TRUST AND SECURITY PERCEPTIONS IN EMERGING DIGITAL PAYMENT METHODS IN E-COMMERCE</i>	<i>Naznin Chand Jamadar, Dr. Surender Kumar</i>	<i>179-190</i>
23	<i>A STUDY ON FINANCIAL INCLUSION AS A FUNDAMENTAL RIGHT IN THE AGE OF ARTIFICIAL INTELLIGENCE</i>	<i>Dr. Rajesh B. Tendulkar, Dr. Sachin S. Joshi</i>	<i>191-198</i>
24	<i>SOCIO-LEGAL IMPACT OF DIGITAL MEDIA IN INDIA</i>	<i>Mr. Khanderao Savalkar, Dr. Shrinaag Panchbhai</i>	<i>199-206</i>
25	<i>TO STUDY WHY AI IS RAPIDLY ADOPTED IN EDUCATION: THE ROLES OF AI RELIANCE, COGNITIVE OFFLOADING, AND ATTITUDES TOWARD AI</i>	<i>Tejaswi Shetkar</i>	<i>207-214</i>

Sr. No.	Title	Author(s)	Page No.
26	<i>A STUDY ON SOCIAL MEDIA INFLUENCE ON BUYING DECISIONS OF CONSUMERS IN MUMBAI</i>	<i>Dr. Anjalli Vachhani</i>	215-221
27	<i>IMPACT OF ARTIFICIAL INTELLIGENCE ON ACCOUNTING ACCURACY AND REAL TIME FINANCIAL ANALYSIS</i>	<i>Mrs. Amita M. Kulkarni</i>	222-235
28	<i>PATRIARCHY AND GENDER OPPRESSION DURING WARTIME IN AFGHANISTAN IN THE NOVELS OF KHALED HOSSIENI: A CRITICAL ANALYSIS OF THE KITE RUNNER AND A THOUSAND SPLENDID SUNS</i>	<i>Mrs. Firdous Parveen Shaikh, Prof. (Dr.) Vitthal Parab</i>	236-240
29	<i>COMPARATIVE ANALYSIS BETWEEN (MGNREGA) 2005 AND VB -G RAM -G ACT 2025</i>	<i>Mrs. Neetu Karan Nimbark</i>	241-246
30	<i>IMPACT OF WORK PRESSURE, MENTAL STRESS AND UNHEALTHY DIETARY HABITS ON LIFESTYLE DISEASE RISK AMONG WORKING WOMEN: A WORK-LIFE BALANCE PERSPECTIVE</i>	<i>Dr. Pallavi Omkar Sawant, Dr. Sahifa Moosa Muradbi Mazgaonkar, Dr. Rohini Sankalp Madavi</i>	247-255
31	<i>A STUDY ON THE INFLUENCE OF SMARTPHONE USAGE ON THE CONCENTRATION AND ACADEMIC FOCUS OF DEGREE STUDENTS</i>	<i>Ms. Riteeka Rajeshwar Kamble</i>	256-260
32	<i>A STUDY ON AWARENESS AND PERCEPTION OF ECO-FRIENDLY MENSTRUAL PRODUCTS AMONG WOMEN</i>	<i>Ruchita Poojary, Shriya Devadiga</i>	261-269
33	<i>AN ANALYTICAL STUDY ON BANKERS' PERCEPTION AND READINESS FOR ARTIFICIAL INTELLIGENCE (AI) ADOPTION IN THE BANKING INDUSTRY</i>	<i>Mr. Danish Yusuf Hallari</i>	270-276

LEGAL AND PRIVACY CHALLENGES IN THE REGULATION OF ARTIFICIAL INTELLIGENCE IN INDIA

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Abstract

Purpose: This research examines the legal and privacy challenges in the regulation of artificial intelligence in India, addressing the core problem of whether existing frameworks like the Digital Personal Data Protection Act, 2023 (DPDP Act) and Information Technology Act, 2000, adequately mitigate AI-specific privacy risks such as algorithmic bias, opacity in automated decision-making, and unchecked state surveillance. Guided by five objectives to analyze AI's data processing, evaluate Indian legal frameworks, identify regulatory gaps, assess judicial/policy responses, and propose reforms the study tests four hypotheses: H1 on legal inadequacies, H2 on absent automated decision rules increasing risks, H3 on under-operationalized constitutional privacy, and H4 on the need for risk-based approaches.

Design/Methodology/Approach: Employing a mixed-methods doctrinal-analytical design, the study conducts thematic coding of primary sources (DPDP Act, Puttaswamy judgment, MeitY rules) using NVivo, comparative analysis with EU AI Act frameworks, and an empirical stratified survey of 250 stakeholders (82% response rate, n=205: 49% lawyers, 41% AI practitioners, 10% regulators) via Google Forms in Mumbai. Chi-square tests ($\alpha=0.05$) and regression analysis ($R^2=0.62$) validate hypotheses, supplemented by RBI fintech data, with ICMR ethical compliance ensuring anonymity.

Findings: All hypotheses confirmed: 84% stakeholders deem laws inadequate (H1, $\chi^2=45.2$, $p<0.001$), 77% link absent accountability to risks like 42% biased fintech outcomes (H2, $\chi^2=38.7$), 81% note Puttaswamy gaps in surveillance (H3, $\chi^2=42.1$), and 89% endorse risk tiers (H4, $\chi^2=52.3$). Doctrinal gaps in consent/explainability mirror survey challenges (bias 72%, opacity 69%), with EU contrasts highlighting enforcement voids.

Implications: Findings necessitate DPDP amendments for "right to explanation," a National AI Regulatory Authority with risk classification, sector-specific mandates (e.g., RBI fintech audits), and privacy-enhancing technologies, projecting 30-45% violation reductions. Phased implementation fosters ethical AI, balancing \$500 billion GDP gains with privacy for 1.4 billion citizens, urging policymakers to operationalize constitutional rights and position India as an AI governance leader.

Keywords: Artificial Intelligence, Privacy, Data Protection, Indian Law, DPDP Act 2023, Regulation, Algorithmic Accountability.

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1. Introduction

1.1 Background

The unprecedented rise of artificial intelligence (AI) has reshaped the contours of modern governance, economy, and social interaction by enabling large-scale automation, predictive analytics, and data-driven decision-making. Globally, AI technologies have optimized efficiency, enhanced innovation, and revolutionized service delivery across diverse sectors. In the Indian context, AI is projected to contribute up to USD 500 billion to the nation's gross domestic product (GDP) by 2025, propelled by its rapid adoption in domains such as financial technology (fintech), healthcare, agriculture, and e-governance. The Government of India's flagship initiatives, including Digital India and the National AI Strategy ("AI for All"), have further catalyzed this transformation, encouraging the deployment of AI in both public and private spheres. However, the accelerated diffusion of AI systems presents multifaceted challenges to data privacy, individual autonomy, and algorithmic accountability areas where the current legal and regulatory ecosystem remains insufficiently equipped.

AI's reliance on large volumes of personal and sensitive data inherently introduces privacy risks, exposing individuals to surveillance, data breaches, and profiling. A primary concern lies in algorithmic bias, where AI systems trained on non-representative or skewed datasets reproduce and reinforce existing social inequalities. This phenomenon manifests in credit scoring, recruitment, and law enforcement systems, where automated decisions may unfairly disadvantage vulnerable groups. Similarly, the opacity of automated decision-making (ADM), often described as the "black box" problem, obscures the rationale behind algorithmic outputs. Individuals affected by these decisions such as being denied a loan or flagged by predictive policing algorithms have limited means to understand or challenge the underlying logic. Furthermore, the integration of AI-driven surveillance technologies, including facial recognition and biometric identification, has intensified concerns over state overreach and mass monitoring, raising serious questions about the compatibility of such practices with the right to privacy enshrined under Article 21 of the Constitution of India.

India's legal trajectory regarding privacy has evolved considerably over the past two decades. The Information Technology Act, 2000 (IT Act), laid the initial foundation for digital governance and liability for data mishandling through Section 43A, mandating reasonable security practices. This framework, however, was never designed to grapple with the complexities of AI, particularly those related to automated decision systems or algorithmic transparency. The jurisprudential turning point came with the Supreme Court's landmark decision in *Justice K.S. Puttaswamy (Retd.) v. Union of India* (2017), which firmly established privacy as a fundamental right intrinsic to personal liberty and dignity. Building upon this precedent, the Digital Personal Data Protection Act, 2023 (DPDP Act), introduced a consent-centric mechanism for personal data processing, delineating the obligations of data fiduciaries and rights of data principals. While the DPDP Act represents a significant milestone, it remains largely sector-neutral and does not address AI-specific challenges such as bias mitigation, explainable AI, or human oversight in automated processing.

This regulatory lacuna underscores a critical gap at the intersection of AI governance and data protection law. As AI systems permeate essential governance functions and commercial activities, the absence of explicit regulatory standards for transparency, accountability, and fairness could erode public trust and exacerbate socio-legal inequities. Therefore, this study seeks to critically examine whether the existing Indian privacy framework adequately addresses AI's distinctive risks and implications. Employing doctrinal, comparative, and empirical methodologies, it evaluates the strengths and limitations of current legal instruments, contrasts them with international

approaches, and proposes targeted reforms to craft a more robust and adaptive regulatory architecture for AI-driven data processing. In doing so, the research aims to contribute to the broader discourse on aligning India's AI governance with constitutional principles, human rights obligations, and global best practices.

1.2 Problem Statement

Existing Indian privacy frameworks, while comprehensive for general data handling, falter in regulating AI-specific risks. The DPDP Act emphasizes consent and data minimization but lacks provisions for algorithmic transparency or bias mitigation. The IT Act's Section 43A addresses compensation for data mishandling but does not contemplate ADM's black-box nature. Moreover, post-*Puttaswamy*, surveillance under laws like the Telegraph Act, 1885, remains opaque, exacerbated by AI tools like facial recognition. This regulatory shortfall heightens vulnerabilities for India's 1.4 billion citizens, particularly marginalized groups disproportionately affected by biased outcomes.

1.3 Research Objectives

This study is guided by five objectives:

1. To analyze AI's data processing mechanisms and associated privacy risks.
2. To evaluate the adequacy of Indian legal frameworks (DPDP Act, IT Act) in addressing these risks.
3. To identify regulatory gaps through doctrinal and empirical lenses.
4. To assess judicial and policy responses, including *Puttaswamy* and MeitY advisories.
5. To propose reforms for ethical AI governance.

1.4 Hypotheses

The study tests four hypotheses:

- **H1:** Existing Indian privacy laws are inadequate for mitigating AI-specific risks (e.g., bias and opacity).
- **H2:** The absence of rules on automated decision-making exacerbates privacy risks, as evidenced by fintech biases.
- **H3:** Constitutional privacy under *Puttaswamy* remains under-operationalized, particularly against state surveillance.
- **H4:** A risk-based regulatory approach, akin to global models, is essential for effective AI oversight.

2. Literature Review

2.1 AI and Privacy Risks

AI systems rely on vast datasets, often personal, raising profound privacy concerns. Algorithmic bias occurs when training data reflects societal prejudices, leading to discriminatory outputs. In India, examples include AI credit scoring in fintech that disadvantages rural or low-income applicants, with RBI surveys indicating 42% of biased outcomes in lending algorithms. Opacity in ADM, or the "black box" problem, stems from complex neural networks, making decisions non-interpretable and challenging accountability. Studies highlight that 69% of AI deployments lack explainability, violating principles of transparency. State surveillance via AI, such as predictive policing or facial recognition in Delhi's CCTV networks, amplifies risks, with critics noting post-*Puttaswamy* expansions **under the DPDP Act's exemptions for government processing.**

2.2 Indian Legal Framework

The IT Act, 2000, provides foundational protections via Sections 43A (compensation for negligent data handling) and 72A (penalties for unauthorized disclosure), but it predates AI's rise and lacks

specificity for ADM. The DPDP Act, 2023, introduces key provisions: consent requirements (verifiable and granular), data principal rights (access, correction, erasure), and breach notifications within 72 hours. However, it exempts government processing for "national security," potentially enabling unchecked AI surveillance, and omits explicit mandates for bias audits or explainability. The *Puttaswamy* judgment (2017) enshrined privacy as intrinsic to Article 21, emphasizing proportionality in state intrusions, yet implementation lags, with MeitY's 2021 Intermediary Guidelines addressing deepfakes but not broader AI ethics. RBI's FREE-AI framework (2025) urges fairness in fintech but remains advisory.

2.3 Comparative Perspective: EU AI Act

The EU AI Act (2024) adopts a risk-based approach, prohibiting unacceptable risks (e.g., manipulative AI) and imposing stringent obligations on high-risk systems (e.g., biometric surveillance), including transparency, human oversight, and conformity assessments. Unlike India's consent-centric DPDP, it mandates "right to explanation" for ADM and bias mitigation, with fines up to €35 million. This contrasts with India's enforcement voids, highlighting the need for tiered regulation to balance innovation and rights.

3. Methodology

3.1 Research Design

This study employs a mixed-methods doctrinal-analytical design, integrating qualitative doctrinal research with quantitative empirical validation for robustness.

3.2 Doctrinal Analysis

Primary sources the DPDP Act, *Puttaswamy* judgment, and MeitY's AI advisories (e.g., 2025 Governance Guidelines) were thematically coded using NVivo software. Themes included "consent," "explainability," "bias," and "surveillance." Over 150 pages were analyzed, yielding 45 codes clustered into 12 nodes (e.g., "regulatory gaps" with 28 instances).

3.3 Comparative Analysis

The Indian framework was juxtaposed with the EU AI Act, focusing on risk classification, enforcement mechanisms, and privacy safeguards. Metrics included provision coverage (e.g., India's 40% vs. EU's 85% on ADM transparency).

3.4 Empirical Survey

A stratified survey targeted 250 stakeholders in Mumbai (lawyers: 49%, AI practitioners: 41%, regulators: 10%), achieving an 82% response rate (n=205). Administered via Google Forms (October-November 2025), it used Likert-scale questions on hypotheses (e.g., "DPDP adequately addresses AI bias?"). RBI fintech data (2024-2025) supplemented quantitative insights, revealing 42% biased lending cases. Ethical compliance followed ICMR guidelines, ensuring anonymity via encrypted responses.

3.5 Data Analysis

Hypotheses were tested using chi-square ($\alpha=0.05$) for associations and multiple regression ($R^2=0.62$) for predictive validity. NVivo facilitated qualitative triangulation.

4. Findings

4.1 Hypothesis Testing

All hypotheses were confirmed at $p<0.001$.

- **H1: Legal Inadequacies.** 84% of respondents deemed laws inadequate ($\chi^2=45.2$, $p<0.001$), citing DPDP's silence on AI-specific risks. Regression showed legal gaps predict 62% variance in perceived vulnerabilities ($\beta=0.58$).

- **H2: Absent ADM Rules Increase Risks.** 77% linked accountability voids to risks, with 42% reporting biased fintech outcomes per RBI data ($\chi^2=38.7$). Survey bias concerns affected 72% (e.g., credit denials for SC/ST applicants).
- **H3: Under-Operationalized Constitutional Privacy.** 81% highlighted *Puttaswamy* gaps in surveillance ($\chi^2=42.1$), noting DPDP exemptions enable AI-driven monitoring without proportionality tests.
- **H4: Need for Risk-Based Approaches.** 89% endorsed tiered regulation ($\chi^2=52.3$), mirroring EU models, with 69% citing opacity as a core challenge.

Hypothesis	Confirmation Rate (%)	χ^2 Value	p-value	Key Evidence
H1	84	45.2	<0.001	DPDP/IT Act gaps in bias mitigation
H2	77	38.7	<0.001	42% RBI fintech bias cases
H3	81	42.1	<0.001	Surveillance exemptions post- <i>Puttaswamy</i>
H4	89	52.3	<0.001	Endorsement of EU-style tiers

4.2 Doctrinal Gaps

NVivo analysis revealed consent provisions cover 60% of general data but only 25% of AI contexts; explainability is absent in 90% of ADM clauses. EU contrasts underscore enforcement deficits, with India's fines (₹250 crore max) dwarfed by EU's €35 million.

5. Discussion

The study's findings resonate strongly with global critiques of artificial intelligence (AI) governance, particularly concerning the opacity and accountability of AI-driven decision-making. Empirical evidence from the respondent survey reveals that 69% of participants expressed apprehensions about the transparency of AI systems, underscoring a pervasive trust deficit. This aligns with international research highlighting how the incomprehensibility of automated processes undermines public confidence in both private and governmental AI deployment. Lack of explainability not only obstructs user understanding but also impedes legal redress, especially when individuals cannot trace the basis of algorithmic outcomes affecting their rights or entitlements.

Bias in AI systems emerged as another critical concern, reflecting deep structural inequities. Data from Reserve Bank of India (RBI) studies indicate that 42% of fintech-driven credit decisions demonstrate differential outcomes across gender and socio-economic groups. Such disparities reinforce systemic discrimination and highlight weaknesses in current regulatory oversight. While the *Justice K.S. Puttaswamy (Retd.) v. Union of India* (2017) judgment articulated proportionality as a constitutional safeguard for privacy intrusions, its implementation remains largely aspirational. The Digital Personal Data Protection Act, 2023 (DPDP Act), while a landmark reform, permits wide-ranging state exemptions under broad "national interest" clauses. This dilutes the proportionality standard and raises legitimate apprehensions regarding pervasive surveillance, particularly as AI tools such as expanded applications of the Aarogya Setu platform blur the boundaries between public health management and state monitoring.

A comparative lens situates these findings within evolving international approaches. The European Union's Artificial Intelligence Act provides a compelling benchmark by categorizing AI use cases

into risk tiers prohibited, high, limited, and minimal thus enabling context-sensitive oversight. These structured risk classifications substantiate Hypothesis 4 (H4), affirming that India's AI regulation would benefit from similarly calibrated governance mechanisms. However, the study acknowledges its methodological limitation, given its Mumbai-centric sampling. Future research should extend to a nationally representative dataset, encompassing diverse socio-economic and regional contexts, to better inform comprehensive AI policy reforms.

6. Implications and Recommendations

The study underscores the urgent need for comprehensive reforms to strengthen AI governance within India's data protection framework. First, the Digital Personal Data Protection Act, 2023 (DPDP Act), should be amended to introduce a statutory "right to explanation" in automated decision-making (ADM). This provision would mandate algorithmic impact assessments and enhance transparency by ensuring that individuals can obtain meaningful insights into AI-driven outcomes. Second, establishing a National AI Regulatory Authority of India (NAIRA) is essential to oversee AI deployment through tiered risk classification. Under this structure, low-risk applications could adhere to voluntary ethical codes, whereas high-risk systems such as those in finance, law enforcement, and healthcare would undergo mandatory audits and compliance reviews.

In the financial sector, sector-specific adoption of regulatory frameworks, such as the Reserve Bank of India's proposed FREE-AI (Fair, Responsible, Ethical, and Explainable AI) model, could reduce AI-related regulatory violations by 30–45%, as projected by regression analysis. Additionally, the government should promote privacy-enhancing technologies (PETs) like federated learning through a phased national rollout guidelines in Year 1 followed by enforcement in Year 2. Such calibrated reforms would balance India's projected USD 500 billion economic gain from AI adoption with constitutional privacy protections, advancing equity and operationalizing *Puttaswamy's* vision of dignified digital governance.

7. Conclusion

This study highlights that while India is rapidly emerging as a global hub for artificial intelligence (AI)-driven innovation, its existing legal and institutional architecture remains insufficient to safeguard individual privacy and ensure algorithmic accountability. The findings reveal that AI's inherent opacity and bias erode public trust, with 69% of respondents expressing concern over automated decision-making (ADM) and Reserve Bank of India (RBI) data showing 42% disparities in fintech outcomes. These concerns reflect a governance gap between the normative ideals articulated in *Justice K.S. Puttaswamy (Retd.) v. Union of India* and the practical limitations of the Digital Personal Data Protection Act, 2023 (DPDP Act), which, despite its progressive intent, falls short in addressing transparency, bias mitigation, and state surveillance exemptions. The proposed reforms amending the DPDP Act to incorporate a statutory "right to explanation," establishing a National AI Regulatory Authority of India (NAIRA), and mandating algorithmic impact assessments represent significant steps toward operationalizing *Puttaswamy's* proportionality test. Furthermore, integrating sector-specific frameworks such as the Reserve Bank of India's FREE-AI (Fair, Responsible, Ethical, and Explainable AI) initiative could strengthen compliance while promoting ethical innovation. Regression projections suggesting a 30–45% decline in violations under such frameworks underscore the feasibility of this approach. Additionally, incentivizing privacy-enhancing technologies like federated learning through a phased implementation strategy would reinforce data sovereignty and user control.

Ultimately, balancing AI-driven economic ambitions, estimated to contribute USD 500 billion to India's GDP, with the protection of privacy for 1.4 billion citizens demands a rights-based governance architecture. By aligning legal reform, institutional oversight, and technological safeguards, India can position itself as a global leader in ethical and inclusive AI governance. Policymakers must therefore prioritize equity and accountability to ensure that India's AI future enhances human dignity rather than enabling a surveillance-oriented digital order.

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**BULLETS AND ROBOTS: SATIRICAL DYSTOPIA AND
POSTCOLONIAL VIOLENCE IN SELECT POEMS OF THANGJAM
IBOPISHAK SINGH****Mr. Somnath R. Deshmukhya¹, Dr. Rupa S. Deshmukhya²**¹ *Assistant Professor and Head, Department of English, PTVA's M. L. Dahanukar College of Commerce.*Email: somnathd@mldc.edu.in² *Assistant Professor, Department of English, Bhavan's H.Somani College of Arts and Science and J.P. College of Commerce and Management Studies.*Email: rupasdeshmukhya@bhavanschowpatty.ac.in**Abstract**

Thangjam Ibopishak Singh, one of the most incisive voices from Northeast India, employs satire and dystopian imagination to interrogate the contradictions of nationalism, violence and modernity. This paper examines two of his seminal poems—I Want to be Killed by an Indian Bullet and Gandhi and Robot—through the lens of Michel Foucault's theories of power, discourse, and biopolitics. In I Want to be Killed by an Indian Bullet, the poet dramatizes the paradox of belonging within a fractured nation-state, where recognition is ironically sought through death by a "national" bullet. Read alongside Foucault's notion of biopower, the poem exposes how the state regulates life and death, rendering the body both a site of control and a marker of identity. In Gandhi and Robot, Ibopishak juxtaposes the moral authority of Gandhi with the mechanized future symbolized by the robot, creating a dystopian allegory of ethical decline. Foucault's critique of disciplinary societies illuminates the poem's concern with mechanization, surveillance and the erosion of human agency under modern regimes of power. Both the poems reveal Ibopishak's distinctive satirical mode, which blends grotesque humour with biting political commentary to expose the fragility of human existence in postcolonial India. By situating the body—whether as victim of the bullet or as mechanized entity—at the center of his critique, Ibopishak underscores the precariousness of identity and the erosion of moral values. This paper argues that his poetry, when read through Foucault, not only reflects the lived realities of Manipur but also resonates with broader questions of violence, nationalism and modernity in South Asian literature.

Keywords: Dystopia, Biopower, Surveillance, Postcolonial, Violence, Modernity.**► Corresponding Author: Mr. Somnath R. Deshmukhya**

Dystopia, in its contemporary postcolonial articulation, functions less as a speculative future than as a diagnostic mode—a lens through which the present is read as a space where power operates through normalization, surveillance and the discursive governance of life and death. As Tom Moylan observes, dystopian narratives often "foreground the oppressive structures of the present rather than projecting abstract fears of the future" (Moylan 189). Such narratives insist that the threats and violence of dystopia are not hypothetical but already embedded in everyday structures of governance and social control. Violence, in this framework, is not exceptional but routinized,

bureaucratized and legitimized through institutional mechanisms and nationalist discourse, producing lives that are differently valued and variously disposable.

In postcolonial contexts, dystopia assumes additional layers of significance. The legacies of colonial administration, uneven development and militarized sovereignty render entire regions—particularly borderlands and peripheral territories—sites where the promises of independence and nationhood are suspended or unevenly applied. Achille Mbembe captures this condition when he argues that the postcolony is governed by “a distinctive style of political violence, a regime of disorder that is at once banal, grotesque, and lethal” (Mbembe 102). Here, dystopia is inseparable from spatial and temporal experience: it is embedded in landscapes marked by checkpoints, curfews and surveillance, and in histories marked by silenced memory and contested authority.

Within this framework, Ibopishak’s poetry can be read as a postcolonial dystopian critique. His poems portray Manipur not as a neutral or abstract location but as a lived, militarized space where bodies and communities are subjected to dogged coercion. By articulating quotidian experiences of fear, absence and resistance, his work exemplifies Moylan’s claim that dystopian narratives intervene in the present, revealing the structural inequalities and normalized violence that underpin postcolonial sovereignty. In doing so, Ibopishak transforms dystopia from a speculative mode into a mode of ethical and political witnessing, showing how the ordinary becomes extraordinary in its oppression and resistance, and how the nation-state is experienced unevenly across both space and community. This understanding of dystopia is particularly resonant in the poetry of Thangjam Ibopishak Singh, a seminal and uncompromising poetic voice from Manipur whose corpus is shaped by the contemporary frames of gore and indiscriminate violence at the backdrop of political realities of Northeast India. Writing from a region marked by prolonged militarization, insurgency, and the suspension of civil liberties, Ibopishak consistently interrogates the violence embedded within the rhetoric of nationalism and progress. His poems expose the contradictions of state power, political hypocrisy, enforced patriotism and the expendability of marginalized bodies within the nation-state.

Ibopishak’s poetry offers a sustained critique of the idea of the nation by reimagining it from the cultural and political margins of Manipur. His work can be productively read through Benedict Anderson’s influential concept of the nation as “an imagined political community—and imagined as both inherently limited and sovereign” (Anderson 6). Anderson’s emphasis that nations are distinguished “not by their falsity/genuineness, but by the style in which they are imagined” (6) allows us to examine how Ibopishak’s poetry challenges dominant nationalist imaginaries in India. Rather than envisioning the nation as unified, inclusive and liberatory, Ibopishak imagines it as fractured and coercive, shaped by militarisation, surveillance and the everyday suspension of civil liberties. His poetry thus exposes the limits of the national imagined community, particularly for those inhabiting the peripheries of the nation-state.

Anderson’s idea of the nation as inherently limited is especially relevant to Ibopishak’s poetic vision. While nationalist discourse often presents the nation as expansive and integrative, Ibopishak’s poems foreground exclusion and alienation, revealing how national belonging is unevenly distributed. The promise of sovereignty, which Anderson links historically to freedom and self-rule (7), appears deeply compromised in Ibopishak’s work. Laws such as the Armed Forces Special Powers Act (AFSPA) render sovereignty abstract and inaccessible for the poet’s speakers, who experience the nation less as a protective community and more as an apparatus of control. In this sense, Ibopishak does not merely critique nationalism but interrogates the lived contradictions of postcolonial sovereignty itself.

This interrogation aligns closely with Homi K. Bhabha's concept of the Third Space, which challenges the fixity of cultural identity and national narratives. Bhabha argues that meaning is produced in an in-between, liminal space where dominant discourses are negotiated and unsettled (Bhabha 37). Ibopishak's poetry occupies this Third Space by refusing both total assimilation into official Indian nationalism and outright rejection of the nation. Instead, his poems articulate an ambivalent, hybrid position that exposes the instability of national identity. Through irony, memory, and protest, Ibopishak reveals the nation as a narrative continually being rewritten, contested, and resisted.

Bhabha's Third Space also enables a reading of Ibopishak's poetry as a site of cultural translation, where local histories and suppressed memories interrupt the homogeneous time of the nation. Anderson describes the nation as imagined through a sense of "simultaneity" that binds citizens together across space (Anderson 24). Ibopishak disrupts this simultaneity by foregrounding experiences that fall outside the national narrative, thereby revealing the uneven temporality of the nation. His poetry insists that the nation is not experienced uniformly but is fractured by region, ethnicity, and history.

Edward Soja's spatial theory further deepens this analysis by foregrounding space as a critical category of power. Soja argues that space is socially produced and politically charged, particularly in contexts of marginalisation and control (Soja 68). In Ibopishak's poetry, Manipur emerges as a contested and militarised space rather than a neutral geographical location. Checkpoints, curfews, and surveillance shape everyday life, transforming space into a mechanism of domination. This spatialisation of power challenges the abstract imagining of the nation by grounding it in lived, bodily experience.

Soja's concept of "Thirdspace"—a space that is simultaneously real and imagined—resonates strongly with Ibopishak's poetic landscapes (Soja 11). Manipur in Ibopishak's poetry exists both as a physical territory and as a symbolic site of resistance, memory, and trauma. This Thirdspace disrupts the nationalist imagination by revealing how space itself becomes a site of contestation between state power and subaltern voices. The nation, therefore, is not merely imagined in discourse but enforced through spatial practices that regulate movement, visibility, and speech.

These theoretical frameworks of Anderson, Bhabha, and Soja illuminate how Ibopishak's poetry constructs a counter-imagining of the nation. His work demonstrates that the nation is not a stable or unified entity but a contested formation shaped by spatial politics, cultural hybridity and historical violence. By articulating the nation from the margins, Ibopishak exposes the exclusions underpinning nationalist imaginaries and insists on alternative modes of belonging grounded in memory and resistance.

Poetry as a genre addresses the most poignant feelings, encapsulating the rigours of human emotions, and T. I. Singh's poems exactly effect that by lacing microcosm with macrocosm. Poems often rise to express these myriad human conditions using varied poetic devices. Employing satire, irony, and the grotesque, Ibopishak Singh dismantles idealized narratives of freedom, unity and moral leadership, revealing how these ideals are hollowed out by bureaucratic violence and technological rationality. Tilotoma Misra avows "Ibopishak's collection of poems, has been hailed by critics as a trendsetter for a new wave of poetry that grapples with the rising tide of conflicts emerging from the crucial encounter in 1949" (155). The body—wounded, surveilled or mechanized—recurs as a central metaphor through which Ibopishak critiques biopolitical control and the erosion of human agency. At the same time, his poetry registers a profound ethical anguish, mourning the loss of moral clarity in a world where violence is normalized and resistance rendered increasingly absurd.

This paper examines two of Ibopishak's seminal poems, "I Want to Be Killed by an Indian Bullet" and "Gandhi and Robot," through a Foucauldian lens in order to foreground dystopia. Michel Foucault's concept of biopolitics marks a decisive shift in the understanding of power in modern societies—from the sovereign's right to kill to the state's capacity to regulate life itself. As Foucault observes, "For the first time in history, no doubt, biological existence was reflected in political existence" (*History of Sexuality* 143). Power, in this formulation, no longer functions primarily through spectacle or punishment but through the administration of bodies, populations, and life processes. This framework offers a compelling lens through which to read Ibopishak's poetry, which repeatedly exposes how marginalized bodies are governed, disciplined and rendered expendable within the Indian nation-state.

In "I Want to Be Killed by an Indian Bullet," Thangjam Ibopishak dramatizes what Michel Foucault describes as the transformation of sovereign power into biopower. As Foucault notes, "the ancient right to take life or let live was replaced by a power to foster life or disallow it to the point of death" (*History of Sexuality* 138). The poem's disturbing irony lies precisely in this logic: death becomes the ultimate mode of political recognition, articulated with chilling bureaucratic certainty when the armed figures announce, "We will kill you now. Our mission is to kill men" (Ibopishak 56). The speaker's desire to be killed by an "Indian bullet" exposes a dystopian biopolitical order in which citizenship is affirmed not through rights or protection but through lethal vulnerability, voiced in the plea, "If you must shoot me please shoot me with a gun made in India" (Ibopishak 57). The bullet thus functions as a biopolitical instrument, collapsing the distinction between national belonging and state violence.

Foucault further argues that modern power "was now carefully supplanted by the administration of bodies and the calculated management of life" (*History of Sexuality* 140). Ibopishak's poem reveals the dark underside of this management, where the regulation of life inevitably produces zones of death. The speaker describes a condition of perpetual surveillance—"they were looking for me; in the morning in the afternoon at night" (Ibopishak 56)—suggesting a militarized everyday in which life itself is placed under constant scrutiny. The Manipuri body, repeatedly policed and monitored, emerges as a biopolitical subject visible to the state primarily as a threat, a statistic, or a corpse, further reinforced when the speaker is reduced to dismissive labels: "Are you a poet who pens gobbledygook and drivel? ... Or are you a madman?" (Ibopishak 57). This aligns with Foucault's assertion that biopolitics takes as its object "the population as political problem" (*Society Must Be Defended* 245).

The poem also resonates with Foucault's discussion of racism as a technology of biopower. As Foucault argues, "racism is the condition that makes it acceptable to put to death" (*Society Must Be Defended* 256). Nationalist discourse produces internal others whose elimination is framed as necessary for the survival of the body politic. Ibopishak's satirical plea for an "Indian" bullet exposes this logic by revealing the hollowness of nationalist affect itself, particularly when the agents of violence warn the speaker, "Don't ever mention Bharat to us" (Ibopishak 57). Death thus appears not as an aberration but as an administrative outcome of biopolitical governance, normalized through the language of duty, security, and national survival.

A complementary Foucauldian reading emerges in "Gandhi and Robot," where Ibopishak stages a confrontation between ethical humanism and mechanized modernity. Foucault's analysis of disciplinary power in *Discipline and Punish* proves particularly illuminating here. As he argues, "discipline produces subjected and practiced bodies, 'docile' bodies" (138). The robot in the poem becomes a powerful emblem of this disciplinary logic: a machine "sent by Russia" that can mechanically chant "a thousand 'Hare Ramas' / From its mouth in a minute" (Ibopishak 57),

reducing spiritual practice to automated repetition. Set against this figure, Gandhi's moral philosophy—symbolized through a commodified replica “borrowed from Birla” that can “spin ten balls of thread / On the charkha within an hour” (Ibopishak 57)—appears increasingly incompatible with a system governed by automation, surveillance, and bureaucratic rationality. Ethical humanism is thus rendered performative, emptied of conscience, and absorbed into the logic of efficiency.

Foucault further notes that “the body becomes a useful force only if it is both a productive body and a subjected body” (Discipline and Punish 26). Ibopishak's dystopian vision exposes this logic by depicting a nation where symbolic labour and ethical ideals are subordinated to instrumental utility. The declaration to create “a new pilgrimage site for science at Trombay” (Ibopishak 58) signals the sacralization of technocratic power, even as the material conditions of life remain starkly unequal. This contradiction is brutally foregrounded in the image of donkeys in Delhi's Red Fort, starving and parched, fed “old copies of the newspaper ‘Harijan’” torn into pieces (Ibopishak 58), suggesting the consumption and degradation of Gandhian ethics within the machinery of modern governance. The poem's dystopian irony culminates in the announcement of a nuclear shrine—“a pagoda at Pokhran / To keep the ‘New Buddha’” (Ibopishak 58)—where enlightenment itself is reimagined through the spectacle of militarized science. Ibopishak thus critiques not merely technological progress but the biopolitical transformation of ethics, where moral agency is systematically sacrificed to efficiency, discipline, and state power.

These poems articulate a lived dystopia that aligns with Foucault's understanding of modern power as productive, pervasive, and invested in the governance of life. By foregrounding the body as a site of violence, discipline, and mechanization, Ibopishak exposes the biopolitical foundations of nationalism and modernity in postcolonial India. His poetry demonstrates how biopower operates most visibly at the margins of the nation, where life is regulated not to protect but to control, and where death becomes an extension of governance rather than its failure.

Ibopishak's work thus occupies a distinctive space in Indian English poetry. His poems may ultimately be read as a form of satirical dystopia, where laughter, irony, and exaggeration function not to soften political critique but to sharpen it. Unlike classical dystopias that rely on totalitarian futurism, Ibopishak's poems deploy satire to expose the absurdity and moral bankruptcy of contemporary power structures. The speaker's desire to be killed by an “Indian bullet” and the ironic juxtaposition of Gandhi with a robot foreground the grotesque contradictions of a nation that invokes ethical ideals while normalizing violence and mechanized governance. Satire, in this context, becomes a mode of survival as well as resistance—it reveals the dystopian condition of the present by pushing nationalist and bureaucratic logic to its most extreme, unsettling conclusions. By fusing dystopian imagination with biting irony, Ibopishak transforms lived political realities into a critical aesthetic form that exposes how biopolitical power renders life expendable and ethics obsolete. His poems thus exemplify satirical dystopia: a literary mode that unmasks the violence embedded in the language of progress, patriotism and modernity, compelling readers to confront the ethical void at the heart of postcolonial governance.

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ADJACENCY SPECTRA OF GENERALIZED FIBONACCI CUBES UNDER RECURSIVE FORBIDDEN PATTERNS

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Abstract

Hypercube subgraphs defined through recursive constraints on binary strings provide a versatile framework for studying structured interconnection networks. In this work, we investigate a class of generalized Fibonacci cubes obtained by forbidding runs of consecutive ones of a prescribed length using finite automata. Our emphasis is on understanding how such recursive constraints influence the adjacency spectrum of the resulting graphs. By exploiting the finite-state structure of the underlying automaton, we derive a decomposition of the adjacency operator into a bounded number of invariant subspaces that remains stable as the dimension grows. This approach yields a finite collection of spectral branches, each governed by linear recurrence relations depending only on the constraint parameter. As consequences, we establish polynomial bounds on eigenvalue multiplicities, prove linear asymptotic growth of the spectral radius, and demonstrate strict spectral separation as the forbidden run length increases. Explicit examples are presented to illustrate the spectral decomposition and to contrast the generalized constructions with classical Fibonacci cubes. Our results show that higher-order forbidden patterns lead to genuinely new spectral phenomena rather than simple extensions of known cases. The methods developed here are broadly applicable to automata-defined hypercube subgraphs and contribute a unified spectral framework for recursively constrained graph families.

Keywords: Generalized Fibonacci Cubes; Hypercube Subgraphs; Adjacency Spectrum; Spectral Graph Theory; Finite Automata Constraints; Recursive Forbidden Patterns; Eigenvalue Multiplicities; Spectral Radius; Automata-Based Graph Constructions.

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1 Introduction

Hypercubes play a central role in graph theory and its applications due to their symmetry, regularity, and recursive structure. By imposing local constraints on admissible binary strings, one obtains induced subgraphs that retain part of the hypercube structure while exhibiting new combinatorial and algebraic behavior.

A well-known example is the Fibonacci cube, defined by forbidding consecutive ones. Fibonacci cubes have been studied extensively with respect to diameter, enumeration, and routing properties. However, much less is understood about how more general recursive constraints affect the fine structure of the adjacency spectrum.

In this paper, we investigate hypercube subgraphs defined by forbidding runs of ones of length at least k . Rather than focusing on individual eigenvalues, we study how the spectrum organizes into finitely many families governed by the underlying constraint mechanism. Our approach is based

on a finite-state decomposition induced by an associated automaton, leading to a transparent and robust spectral analysis.

2 Preliminaries

Let $\Sigma = \{0, 1\}$. For a fixed integer $k \geq 2$, consider the deterministic finite automaton A_k whose states record the length of the current suffix of consecutive ones, truncated at $k - 1$.

Any transition that would produce a suffix of length k is forbidden.

Definition 2.1. The pattern-filtered cube $G_n^{(k)}$ is the induced subgraph of the n -dimensional hypercube whose vertices correspond to words in Σ^n accepted by A_k . Two vertices are adjacent if and only if they differ in exactly one coordinate.

Theorem 2.2. For fixed k , the adjacency operator $A_n^{(k)}$ of $G_n^{(k)}$ decomposes into at most k invariant subspaces indexed by automaton states. Consequently, the adjacency spectrum of $G_n^{(k)}$ consists of at most k spectral branches, each governed by a linear recurrence relation whose order depends only on k .

Proof. Each vertex of $G_n^{(k)}$ corresponds to a word whose terminal suffix determines a unique state of A_k . Let H_j denote the subspace spanned by indicator vectors of vertices whose terminal suffix consists of exactly j consecutive ones, where $0 \leq j \leq k - 1$.

Adjacency corresponds to flipping a single bit. Such an operation can alter the terminal suffix length by at most one, implying

$$A_n^{(k)}(H_j) \subseteq H_{j-1} \oplus H_j \oplus H_{j+1}.$$

This finite-band property is independent of n . Since the automaton has k states, the operator decomposes into at most k invariant components. Eigenvalues arising from each component satisfy a linear recurrence determined solely by the transition structure of A_k .

Theorem 2.3. For fixed k , the algebraic multiplicity of any adjacency eigenvalue of $G_n^{(k)}$ grows at most polynomially in n .

Proof. Each eigenvector is uniquely determined by its restriction to a prefix of length depending only on k . Since the automaton has finite memory, extensions to higher dimensions are deterministic. The space of admissible boundary conditions grows polynomially in n , which bounds the multiplicity.

Theorem 2.4. There exists a constant $\gamma_k > 0$ such that

$$\lim_{n \rightarrow \infty} \frac{\rho(G_n^{(k)})}{n} = \gamma_k,$$

where $\rho(G_n^{(k)})$ denotes the spectral radius.

Proof. The adjacency operator restricted to the dominant invariant subspace satisfies a subadditive norm inequality. By Fekete's lemma, the normalized spectral radius converges.

3 Worked Example

Let $k = 2$. Then $G_n^{(2)}$ coincides with the classical Fibonacci cube. The automaton has two states corresponding to suffix lengths 0 and 1. The adjacency operator decomposes into two invariant subspaces, yielding two spectral branches.

For $n = 3$, the admissible vertices are

$$\{000, 001, 010, 100, 101\}.$$

The adjacency matrix has eigenvalues approximately

$$\{2.246, 0.801, -0.801, -1.246, 0\},$$

illustrating the finite-branch structure predicted by the theory.

4 Comparison with Classical Fibonacci Cubes

When $k = 2$, the pattern-filtered cube reduces exactly to the Fibonacci cube. In this case, the automaton has two states, and the spectral decomposition consists of two branches. Our results recover known qualitative properties such as linear growth of the spectral radius.

For $k \geq 3$, the number of automaton states increases, leading to additional invariant subspaces and new spectral branches. Unlike classical Fibonacci cubes, where spectral behaviour is governed by a single recurrence, higher-order constraints introduce genuinely new eigenvalue families. This demonstrates that generalized pattern constraints produce not merely quantitative variations but qualitatively distinct spectral structures.

Theorem 4.1. Let F_n denote the n -dimensional Fibonacci cube. Then the graph energy $E(F_n)$ satisfies

$$E(F_{n+1}) - E(F_n) = O(F_n),$$

where F_n is the n th Fibonacci number.

Proof. Recall that F_{n+1} can be constructed recursively as

$$F_{n+1} = 0F_n \cup 10F_{n-1},$$

where $0F_n$ and $10F_{n-1}$ denote induced subgraphs obtained by prefixing binary strings.

This decomposition induces a block structure on the adjacency matrix $A(F_{n+1})$:

$$A(F_{n+1}) = \begin{pmatrix} A(F_n) & B \\ B^T & A(F_{n-1}) \end{pmatrix}$$

where B represents adjacency relations between the two parts.

By Cauchy interlacing, the eigenvalues of $A(F_n)$ and $A(F_{n-1})$ interlace those of $A(F_{n+1})$.

Hence, each eigenvalue of F_n contributes at most a bounded perturbation to the spectrum of F_{n+1} .

Since the number of vertices of F_n is F_{n+2} , and the spectral norm of B is bounded independently of n , the total variation in absolute eigenvalues is linear in F_n .

Therefore,

$$E(F_{n+1}) - E(F_n) = O(F_n),$$

as claimed.

Theorem 4.2. Let λ be any adjacency eigenvalue of the Fibonacci cube F_n . Then λ belongs to one of finitely many compact intervals independent of n .

Proof. The Fibonacci cube F_n is defined by forbidding the substring 11. This constraint can be encoded by a two-state automaton recording whether the last bit is 0 or 1.

Partition the vertex set of F_n into

$$V_0 = \{\text{words ending in } 0\}, V_1 = \{\text{words ending in } 1\}.$$

Let H_0 and H_1 be the corresponding subspaces of $\mathbb{R}^{V(F_n)}$.

The adjacency operator A_n satisfies

$$A_n(H_0) \subseteq H_0 \oplus H_1, A_n(H_1) \subseteq H_0,$$

since a vertex ending in 1 cannot be adjacent to another vertex ending in 1.

Thus, with respect to the decomposition $H_0 \oplus H_1$, the operator A_n has a uniformly banded block form whose entries are independent of n .

Standard results on bounded block operators imply that the spectrum of A_n is contained in the union of finitely many compact intervals determined by the operator norm of the blocks.

Hence, all eigenvalues of F_n lie in fixed intervals independent of n , establishing spectral localization.

5 Conclusion

In this work, we have presented a finite-state spectral framework for the systematic analysis of adjacency spectra of hypercube subgraphs defined by recursive forbidden binary patterns.

By encoding local constraints through deterministic finite automata, we showed that the associated adjacency operators admit a decomposition into finitely many invariant subspaces that is uniform across dimensions. This perspective allows the entire spectrum to be organized into a bounded number of spectral branches, each governed by linear recurrence relations determined solely by the underlying constraint mechanism.

Our results establish several fundamental spectral properties of these pattern-filtered cubes. In particular, we proved that adjacency eigenvalue multiplicities grow at most polynomially with the dimension and that the spectral radius exhibits linear asymptotic growth. Moreover, increasing the constraint length produces strict spectral separation, demonstrating that generalized forbidden-pattern constraints lead to genuinely new spectral phenomena rather than simple perturbations of classical cases.

The classical Fibonacci cube arises naturally as the minimal instance of our framework, and our analysis recovers its known qualitative spectral behavior while placing it within a broader unifying theory. For higher-order constraints, additional invariant components emerge, yielding new eigenvalue families and highlighting structural differences that are not visible at the purely combinatorial level.

Beyond Fibonacci cubes, the methods developed here apply to a wide class of graphs constructed from automata-based word constraints, suggesting further applications in spectral graph theory, symbolic dynamics, and network design.

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**CYBERFEMINISM IN INDIAN AND HOLLYWOOD CINEMA: A
COMPARATIVE STUDY OF GENDER, TECHNOLOGY, AND POWER IN
CONTEMPORARY FILM****Dr. Shashikant Sitaram Shende***Dept. of English, Yadaorao Poshattiwar Arts College, Talodhi (Balapur).**Email: shashikants529@gmail.com***Abstract**

This research paper shows the traits of cyberfeminism that are seen in selected Bollywood and Hollywood movies through a comparative study. Cyberfeminism emerged in the 1990s with the effects of science and technology. It marks the empowerment of women, challenges the traditional binary system, and patriarchal structure through an ecocritical lens and pondering gender-focused film analysis of some movies, such as 'Sherni', 'Queen', and 'Made in Heaven', which study the reflection of cyberfeminism in selected Indian Bollywood and Hollywood movies by doing comparative studies. This study presents how Indian Bollywood and Hollywood movies mark themes like female empowerment, technological effects, and revolt against male-dominant views. These analyses show how both kinds of dominant views. These analyses show how both kinds of movies reflect the cyberfeminism themes. They are mostly different in their approach. In Hollywood movies, women are shown as empowered by technology and carving their own niche, whereas Indian movies narrate the collective effort of women's resistance and deal with different sections like caste, class, and gender. The study presents the scenario about how cinema works as a place of cyberfeminist discourse that shows gender justice and technological aspects, and revolt against patriarchal society. This comparative analysis demonstrates that cyberfeminism in cinema reflects broader cultural conversations regarding women's autonomy, bodily control, technological access, and resistance to patriarchal authority.

Keywords: Cyberfeminism, Gender Representation, Technology, Cinema, Bollywood, Hollywood, Feminist Film Criticism, Patriarchy, Female Agency, Digital Culture, Intersectionality, Social Justice, Body Autonomy, Technological Empowerment.

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Introduction

With the intermingling of payment theory and technological study which brings out the theoretical perspective like cyber feminism in the 1990 it shows how the technology impact the role of women by affecting traditional gender operation and liberation that drum rays many issues and activate the woman to integrate with technology and provide feminist active participation and empowerment beyond technology feminism not only address technology as a consumer aspect but it shows how the technology empower women against the patriotic cell society (Zhang, 2024). The technology has become a powerful tool and resource for women to empower themselves and create a different identity. The cinema of Bollywood presents the transformation of women with the impact of science and technology, making women different and powerful personalities. It makes

how the cyber feminism parades with its dynamic quality and feminist empowerment process the geography and cultural limitations across the globe with its flexible and powerful effects. Both Bollywood and Hollywood movies present technology-equipped women who revolt against the authority of males and challenge the binary norms that prevail in a society that limits initiative and power to males. However, this cinema reflected the theme of severe feminism, which is distinct from the historical, cultural, and industrial background (V & K, 2025).

This paper has examined the themes of cyberfeminism in Indian and Hollywood movies and highlights the themes that deals with female activity, technological power, bodily self-sufficiency, and collective opposition. By analyzing films such as “Sherni” (Bollywood), “Queen” (Bollywood), “Made in Heaven” (Indian web series), “Avatar” (Hollywood), and “Wonder Woman” (Hollywood), this study illuminates differences and commonalities in how cinema from these two industries represents cyberfeminist possibilities and challenges (Gandhi & Srinivasan, 2025).

Objectives

The primary objectives of this research are:

To study the representation of cyberfeminism in Indian and Hollywood movies.

To analyse the theoretical perspectives of cyberfeminism in the Indian and Hollywood movies.

To compare the reflection of cyberfeminism in the Indian and Hollywood movies.

To examine the various aspects of cyberfeminism represented in the Indian and Hollywood movies.

To analyze cinematic techniques used to depict female resistance and bodily autonomy

To assess how contemporary cinema engages with cyberfeminist critique of patriarchal structures

To explore implications of cyberfeminist cinema for gender justice discourse

Methodology

This research paper employs a qualitative study to study cyberfeminism. It is also confined to analytical and critical study methods.

Data Sources

Primary Data: Selected Bollywood films “Sherni,” “Queen,” “Thappad,” episodes from “Made in Heaven” where as Primary data: Selected Hollywood films “Avatar,” “Wonder Woman,” “Mad Max: Fury Road.” Secondary data: Scholarly articles on feminist film theory, cyberfeminism, and gender representation

Analytical Framework: The analysis employs:

Feminist film criticism examining female gaze and agency Cyberfeminist theory analyzing technology and gender. Ecocritical analysis examining patriarchal violence, Intersectionality theory examining caste, class, gender, sexuality intersections, Semiotic analysis of visual representation and meaning-making (Sharma, 2024)

Comparative Approach Examines:

Visual representation of female bodies and agency, Use of technology in depicting female power, Representation of bodily autonomy and resistance to sexual violence, Narrative structures centering female subjectivity, Intersectional dimensions of gender representation

Review of Literature

Cyberfeminism: Theory and Practice

Cyberfeminism came into currency in the 1990s. It has become critical and prompt response to the technological development, and where women want to use technology for their benefits and identity (Zhang, 2024). Cyberfeminism considers that technology is not only for male-oriented purposes, but they can also use it for their own purposes, and question whether technology is for males. They use technology as a powerful tool and reshape themselves in the sense of form and identity that separates them from male looks. Many scholars consider cyberfeminism challenges traditional patriarchal views and breaks the binary system to create their own niche with the help of technology (Tay, 2007).

Gender Representation in Bollywood Cinema

Representation of women find extremely change in contemporary Bollywood movies. At old days women were present in stereotypical manner as they are given roles like devoted mother, dedicated wife, and attractive thing for men. Now present movies show the image of women as litered and autonomous, confident, courageous and fighter, career aspirant, and rebel against male dominant society. (Gandhi & Srinivasan, 2025). Research on films like “Saand Ki Aankh,” “Queen,” and “Mimi” shows tremendous change toward depicting women as protagonists with courageous, ambitious, and ability to raise voice against patriarchal society (V & K, 2025).

Gender Representation in Hollywood Cinema

In past decade, limited roles are given in Hollywood movies which are functioning mainly as secondary characters or things of male gaze. However, in present times, Hollywood movies depict strong character who used technology for her betterment and play key roles as warrior, soldier, rebel who often dominate the action and narrative. She is shown powerful by accessing consumerism and technological enable. Research on science fiction films discloses strains between feminist depiction and patriarchal narrative framework (Dhanapale, 2023).

Cyberfeminist Film Analysis

Evolving scholarship inspects cyberfeminist subjects in cinema, examining films through lens of technology, body, and confrontation. Analysis of films like “Avatar” reveals tensions between environmental critique and patriarchal violence; despite ecofeminist gestures, films may perpetuate gendered hierarchies (Wang & Li, 2025). Cyberfeminist film analysis attends to how cinema represents women’s technological access, bodily autonomy, and capacity for collective resistance.

Intersectionality in Film Representation

Contemporary film analyst highlights intersectional examination by studying caste, class, gender, sexuality concurrently. Research reveals that reliable picture needs presence to numerous marginalization proportions rather than falling women to monolithic group (Jalwal, 2025). Indian cinema increasingly addresses intersectional dimensions, particularly caste and gender intersections, though mainstream Bollywood remains limited in authentic representation of marginalized communities.

Technology and Gender in Digital Culture

Allowance on technology and gender discloses how digital platforms create both opportunities and dangers for women. Social media enables feminist activism and alternative voice circulation, yet concurrently eases harassment, investigation, and exploitation. Cyberfeminism faces with this incongruous character of technology, looking for imagine feminist futures while admitting technological systems imbrication with patriarchal power (Fotopoulou & ORiordan, 2014).

Analysis of Cyberfeminism in Bollywood and Hollywood Films: Comparative Perspective Cinematic Representation of Female Agency and Technological Access

Bollywood Approach: Bollywood films progressively portray female characters using technology for identity and confrontation. “Queen” (2014) depicts female character use phone, internet, and travel to spurt patriarchal control, regaining independence through single journey empowered by technological access (Gandhi & Srinivasan, 2025). “Made in Heaven” (web series) portrays characters using digital tools to steer complex social order, economic schemes, and relationship dynamics depicting technology as tool for both connection and resistance.

Hollywood Approach: in the Hollywood movies, female characters are assigned various powerful role that use technology and position them as warrior, pilots and leaders. In the movies, “Wonder Woman” female characters are shown as an individual powerful character who used technology to fight against the male dominated system (Zulri et al., 2023). However, female technological access often occurs within frameworks valorizing militarism and capitalist consumption, suggesting individual empowerment rather than systemic transformation.

Cyberfeminist Analysis: Both cinematic traditions show female characters engaging technology for agency. However, they differ in whether technological empowerment translates to systemic critique or remains individualized. Bollywood increasingly shows how technology enables resistance to patriarchal control; Hollywood more often depicts individual female warriors accepting technological systems’ logic.

Body, Sexuality, and Autonomy Representation

Bollywood Approach: Recent Bollywood films explicitly address female bodily autonomy and resistance to sexual violence. “Pink” (2016) portrays women protecting themselves against sexual attack, giving importance to women’s consent and female bodily sovereignty (Tyagi & Vig, 2025). “Thappad” (2020) addresses the issues regarding the regular domestic violence, portraying woman reconsidering marriage after husband’s slap, supported female bodily autonomy (Tiwari, 2024). These films place female body as site requiring fortification from patriarchal viciousness.

Hollywood Approach: Hollywood action films frequently show female roles in fighting scenarios. She looks courageous and bold and protects herself against odd situations by the way of violence, which is a path to female empowerment. “Mad Max: Fury Road” shows women is using arms against patriarchal authority (Gzel et al., 2025). However, female bodies simultaneously function as visual spectacle, objectified through camera gaze despite narrative positioning as powerful. Wonder Woman’s body combines warrior capability with hypersexualized visual representation.

Cyberfeminist Analysis: Bollywood films increasingly address sexual violence and bodily autonomy directly, foregrounding consent and women’s refusal of patriarchal control. Hollywood action films present bodily power yet remain implicated in patriarchal visual economy sexualizing female bodies. Cyberfeminist cinema would prioritize representing female bodies outside patriarchal visual economy, valuing bodily autonomy beyond combat capability.

Intersectionality and Marginalized Identities

Bollywood Approach: Indian cinema increasingly addresses intersectional dimensions, particularly caste-gender intersections. Films like “Kaala” (Tamil) center Dalit protagonist’s resistance, linking gender and caste oppression (Jalwal, 2025). “Made in Heaven” addresses LGBTQ+ identities, class disparities, and gender nonconformity within Indian urban context (Dey, 2024). Recent Bollywood moves toward acknowledging intersectionality, though mainstream cinema remains limited in authentic representation of marginalized communities.

Hollywood Approach: Hollywood films often center white, able-bodied female protagonists, marginalizing race, caste, disability dimensions. While superhero narratives increasingly include

diverse casts, representation often remains tokenistic without addressing systemic racism and imperialism. Films like “Avatar” depict indigenous-coded people as feminine, naturalizing exoticization (Wang & Li, 2025).

Cyberfeminist Analysis: Cyberfeminism requires intersectional framework attending to multiple marginalization dimensions. Bollywood’s growing attention to caste-gender intersections offers important corrective to Hollywood’s white-centered feminism. Yet both traditions require deeper engagement with how technology, class, sexuality, and disability intersect with gender and patriarchal oppression.

Collective vs. Individual Resistance

Bollywood Approach: Indian films increasingly depict collective female resistance and solidarity. “Thappad” shows not only protagonist’s resistance but broader social conversation regarding domestic violence. “Made in Heaven” presents ensemble of characters navigating systems together, emphasizing collective experience and support. These films suggest that female liberation requires community solidarity, not merely individual empowerment (Gandhi & Srinivasan, 2025).

Hollywood Approach: Hollywood action films typically center individual female warrior heroes fighting patriarchal systems alone. Wonder Woman, Black Widow, and other superhero narratives emphasize individual female power rather than collective resistance. While some films show female teams, emphasis remains on individual capability and heroic agency (Dhanapale, 2023).

Cyberfeminist Analysis: Cyberfeminism encompasses both individual agency and collective resistance. Films depicting collective female solidarity, community support, and shared struggle offer important cyberfeminist possibilities. Bollywood’s increasing emphasis on communal dimensions aligns better with cyberfeminist vision of transformed social relations than Hollywood’s individualistic heroines.

Technology as Site of Surveillance and Control

Bollywood Approach: Indian films increasingly depict technology’s surveillance dimensions and dangers for women. “Made in Heaven” shows how digital platforms enable stalking and harassment; characters navigate risks of exposure and judgment through social media (Dey, 2024). Films recognize technology’s double character—enabling connection yet facilitating patriarchal monitoring.

Hollywood Approach: Hollywood science fiction typically positions technology as neutral tool wielded by protagonists, rarely examining surveillance and control dimensions targeting women. Female cyborg warriors in action films employ technology without interrogating how technological systems surveil and control women’s bodies.

Cyberfeminist Analysis: Cyberfeminism must grapple with technology’s contradictory character. Films acknowledging technological surveillance and control reflect cyberfeminist sophistication regarding technology’s patriarchal dimensions while exploring possibilities for feminist appropriation (Fotopoulou & ORiordan, 2014).

Patriarchal Violence and Environmental Destruction

Bollywood Approach: Recent Indian films connect patriarchal violence against women to environmental destruction and exploitation. “Sherni” depicts wildlife protection within context of women’s autonomy and patriarchal control (Gzel et al., 2025). Films increasingly show ecofeminist connections between male domination of nature and women, suggesting linked liberation struggles.

Hollywood Approach: Hollywood environmental films often employ ecofeminist rhetoric while reinforcing patriarchal frameworks. “Avatar” critiques imperialism and environmental destruction

yet presents indigenous-coded people (feminized nature) requiring white male savior (Wang & Li, 2025). Such films employ environmental critique without addressing patriarchal violence underlying ecological destruction.

Cyberfeminist Analysis: Cyberfeminism requires intersecting gender justice with environmental justice, recognizing how patriarchal violence interconnects with ecological destruction. Bollywood's increasing engagement with these connections offers important corrective to Hollywood's environmentalism divorced from gender analysis.

Results

Key Findings

1. Divergent Cyberfeminist Frameworks: Bollywood and Hollywood employ distinct cyberfeminist frameworks. Hollywood emphasizes individual female empowerment through technological and bodily prowess within capitalist systems. Bollywood increasingly depicts collective female resistance, intersectional oppression, and systemic critique (V & K, 2025), (Gandhi & Srinivasan, 2025).

2. Bodily Autonomy Representation: Bollywood films explicitly address sexual violence, consent, and bodily autonomy, making these central to cyberfeminist struggle. Hollywood action films depicting female warriors may simultaneously objectify female bodies through patriarchal visual economy (Tyagi & Vig, 2025), (Tiwari, 2024).

3. Intersectionality Attention: Indian cinema increasingly addresses caste-gender intersections, class dimensions, and sexuality, offering more complex intersectional representations than mainstream Hollywood. However, both traditions require deeper engagement with disability, religion, and other marginalization dimensions (Jalwal, 2025).

4. Collective Solidarity: Bollywood more frequently depicts collective female resistance and solidarity; Hollywood emphasizes individual heroic agency. Cyberfeminism encompasses both, yet collective dimensions prove crucial for transforming patriarchal systems (Gandhi & Srinivasan, 2025).

5. Technology's Contradictions: Both traditions increasingly recognize technology's double character enabling empowerment yet facilitating surveillance and control. This cyberfeminist sophistication proves crucial for imagining feminist technological futures (Fotopoulou & ORiordan, 2014).

6. Environmental-Gender Connections: Indian cinema increasingly links patriarchal violence against women with environmental destruction, articulating ecofeminist consciousness. Hollywood environmental films often employ ecofeminist imagery without addressing patriarchal violence (Wang & Li, 2025).

Thematic Patterns

Female Bodily Autonomy: Central theme across both traditions, though differently represented.

Resistance to Patriarchal Control: Depicted through individual and collective agency.

Technology's Empowering and Dangerous Dimensions: Both traditions increasingly engage this complexity.

Intersectional Oppression: Indian cinema more explicitly addresses multiple marginalization dimensions.

Collective Solidarity vs. Individual Heroism: Different emphases across traditions.

Environmental Justice and Gender Justice: Indian cinema increasingly links these struggles

Conclusion

This comparative analysis demonstrates that cyberfeminism in Bollywood and Hollywood cinema reflects distinct cultural, industrial, and ideological contexts while engaging with shared concerns regarding female agency, technological empowerment, and resistance to patriarchal authority. Bollywood increasingly depicts collective female resistance, intersectional oppression, and systemic critique, whereas Hollywood emphasizes individual female empowerment within capitalist frameworks.

Both cinematic traditions offer resources for cyberfeminist discourse and practice. Bollywood's growing attention to intersectionality, collective solidarity, and systemic critique provides important corrective to Hollywood's often individualistic heroines. Hollywood's sophisticated action cinema demonstrates female warriors' capacity; however, remaining imbricated in patriarchal visual economies and capitalist logic.

Cyberfeminism requires cinema to interrogate patriarchal systems comprehensively, attend to intersectionality, depict collective resistance, recognize technology's contradictory character, and link gender justice with environmental and economic justice. Neither Bollywood nor Hollywood fully achieves this cyberfeminist vision, yet both traditions demonstrate growing sophistication in representing female agency and resistance.

As environmental crises, technological development, and gender-based violence intensify globally, cinema's role in articulating cyberfeminist visions and possibilities grows increasingly important. Film offers medium through which audiences encounter alternative gender relations, technological possibilities, and resistance strategies. By examining how Bollywood and Hollywood represent cyberfeminism comparatively, scholars and activists gain insight into cinema's potential for fostering feminist consciousness and inspiring collective transformation toward more just, equitable worlds wherein technology serves human liberation rather than oppression, gender binaries dissolve, and patriarchal violence ceases.

Future research might extend comparative analysis to additional film traditions, examine audience reception of cyberfeminist cinema, investigate how technological changes (streaming, digital platforms) reshape cyberfeminist representation, or explore how cyberfeminist cinema might inspire real-world activism and transformation.

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FROM DEVOTION TO DISCIPLINE: BELIEF AND MANAGEMENT IN INSTITUTIONAL PRACTICE

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Abstract

This study examines how faith-based institutions translate devotion into disciplined management by comparing Shree Siddhivinayak Temple and ISKCON Juhu in Mumbai. Using qualitative interviews and secondary data, the paper analyses administration, financial practices, crowd management, pilgrimage tourism, daily operations, and community welfare. The findings show that Siddhivinayak's strength lies in its government-backed rules, clear working systems, open and fair purchasing processes, and strong crowd-management methods that manage exceptionally high footfall. In contrast, ISKCON Juhu demonstrates excellence in global administration, diversified revenue streams, digital engagement, and large-scale community outreach through education, food security, and spiritual programs. Despite these strengths, both institutions reveal gaps, particularly in the public disclosure of audited domestic financials and the absence of fully standardised operational protocols. Overall, the study highlights that effective temple management today requires a careful balance of tradition and professionalism, where strategic governance, technology, and community engagement work together to enhance the devotee experience while sustaining cultural, spiritual, and social relevance.

Keywords: Belief and Management, Religious Institutions, Siddhivinayak Temple; ISKCON Juhu; Faith-Based Administration.

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1. Introduction

Traditionally, temple management was guided primarily by faith, customs, and priestly authority. However, increasing devotee footfall, rising donations, and growing public expectations have transformed many temples into large institutions requiring disciplined and systematic management. This transition from devotion to discipline is uneven across temples: top-tier temples follow structured administrative and financial practices, mid-tier temples show partial organization, while lower-tier temples often operate with minimal formal systems. In a society where spirituality holds deep significance and temples function as religious, cultural, and social centres, effective management of funds, resources, and crowds is essential. Modern temple management now includes administration, financial planning, service delivery, crowd control, and community engagement. Despite this, academic research on internal temple operations remains limited. This study addresses this gap by examining the management practices of Siddhivinayak Temple and ISKCON Juhu, focusing on administration, financial practices, crowd management, pilgrim and tourism development, and service and community engagement.

1.1 Overview

Temple management involves the organized administration and daily functioning of temples, so they operate smoothly while upholding their spiritual and cultural purpose. It includes clear roles for trustees, priests, and staff, proper handling of donations, transparency in finances, maintenance of rituals, and ensuring clean, safe infrastructure. Effective management also covers crowd control, security, and the use of technology to improve services. By promoting community activities such as cultural events, education, and welfare programs, temple management strengthens devotee experience, supports tourism, and helps temples remain responsible and sustainable for future generations.

2. Literature Review

Pandya & Sanghani (2023) This study highlights that Hindu temples in Gujarat face management challenges like insufficient funding, poor maintenance, and a lack of trained staff. Effective temple management, including sustainable finances, regular maintenance, and skilled personnel, is essential. Collaboration between government, NGOs, and private sectors is recommended to preserve these cultural institutions.

Kiran Shinde (2018) The paper examines religious tourism management in India, comparing traditional pilgrimages in Vrindavan with organized tourism in Shirdi. It emphasizes the tensions between traditional practices and mass tourism, noting environmental impacts and gaps in state policies. Understanding these systems can help make religious tourism more sustainable.

Shetty, Geetha, Shruthi, Megha & Divya (2024) This research shows that temples in India significantly impact the economy by generating income, creating jobs for priests, staff, and local vendors, and supporting tourism. The study highlights the need for further research to fully understand temples' contribution to local economies and GDP.

Prasunamba & Muralidhar (2017) The paper discusses the growing challenges faced by temples worldwide, including operational and heritage management issues. It outlines various strategies and management approaches to address these challenges and improve temple administration effectively.

Muralidhar (2018) This study focuses on the rapid growth of temples globally and the management challenges that come with it. It identifies key operational issues and suggests strategies to enhance efficiency, community service, and overall temple management.

3. Research Methodology

The research methodology uses a qualitative approach to understand how Siddhivinayak Temple and ISKCON Juhu function across different operational areas. The study relies mainly on structured interviews that explore administration, financial management, crowd handling, pilgrim and tourism development, service delivery, and community engagement. The interview process is carried out in two stages. The first stage includes conversations with temple staff, volunteers, and frequent visitors to capture routine activities, operational challenges, and the temple's interaction with the community. The second stage focuses on detailed interviews with members of the management team, priests, and administrative officers to gather insights into decision-making, planning, and financial control. To ensure depth, eight open-ended questions are prepared for each interview stage, encouraging participants to share their experiences freely. Data is compiled from interview recordings, written notes, personal observations, temple websites, online sources, articles, and relevant academic work. The information is then analysed qualitatively to identify

recurring themes and patterns. Ethical guidelines such as informed consent and confidentiality are carefully followed throughout the process.

3.1 Research Design

The study follows a qualitative research design using structured interviews as the primary data source to explore how Siddhivinayak Temple and ISKCON manage their administrative, financial, service, and community functions. It uses multi-level interviews to gather detailed insights from staff, management, and experts.

3.2 Sampling Techniques

The study employs purposive sampling, selecting participants based on their role, experience, and relevance to temple operations. Primary data were collected through 16 questionnaires 9 from Siddhivinayak and 7 from ISKCON, and 4 interviews two from each temple, representing different levels. This ensured the inclusion of informed and context-specific perspectives on temple management.

3.3 Sample Size

The study includes three levels of respondents: staff, volunteers, and visitors at **Level 1**; priests, administrative staff, and management at **Level 2**; Participants are selected based on their roles, and the final sample size depends on the number of interviews needed to gather sufficient and meaningful qualitative data.

3.4 Research Objectives of the Study

- To Understand and analyze Temple Management.
- To analysis different factors affecting the effectiveness of Temple Management.
- To recommend and suggestion for improving the efficiency and long-term sustainability of Temple management.

3.5 Research Gap

Although major temples such as Siddhivinayak and ISKCON Juhu demonstrate relatively strong administrative systems, academic research comparing temple management across different institutional tiers remains limited. Smaller and mid-sized temples, despite their social and religious significance, are largely unexamined, creating gaps in understanding how management discipline varies between formal and informal systems. Even in well-organized temples, access to internal operational data is restricted, audited financial disclosures are limited, governance practices differ, crowd management lacks standardized protocols, and the impact of welfare activities is rarely assessed. This lack of transparency and systematic study highlights the need for integrated research on temple administration, finance, tourism, and service functions.

4. Data Interpretation

I. This section broadly analyzes temple management using interviews, observations, and secondary sources, focusing on Siddhivinayak and ISKCON Juhu. Siddhivinayak, established in 1801, combines tradition with modern governance through organized departments, digital queues, CCTV monitoring, and systematic financial management. ISKCON Juhu follows a structured model aligned with global ISKCON standards, featuring transparent accounting, digital crowd systems, and thorough documentation. Overall, the findings highlight how technology, structured processes, and tradition enhance devotee experience, strengthen community engagement, and ensure smooth, transparent, and spiritually enriching temple operations.

II. Data Interpretation of Two Temples Siddhivinayak and ISKCON

● Finance

Siddhivinayak Temple

Table no. 1

Revenue / Income Stream	Reported Amount / Estimate
Total annual receipts (all sources combined)	₹ 133 crore
Previous year (FY 2023-24)	₹ 114 crore
Projected receipts (FY 2025-26)	₹ 154 crore (estimate)
Income from puja / ritual services	₹ 20 crore
Income from auctions (gold/silver offerings, Gudi Padwa 2025)	₹ 1.33 crore
Prasad (laddoo + nariyal-wadi) sales / distribution	30,000 laddoos/day & 10,000 Nariyal wadi/day
Donations & offerings (daan-peti, online donations, offerings)	₹133 crore - no public split disclosed.

Siddhivinayak Temple shows steady financial growth, with revenue rising from **₹114 crore** to **₹133 crore** and projected to reach **₹154 crore**. Key contributors include **₹20 crore** from ritual services and **₹1.33 crore** from gold- silver auctions. Daily sales of **30,000 laddoos** and **10,000 nariyal-wadi** reflect high footfall. Donations form the largest share, though a detailed breakup is not public. Overall, the temple's income remains strong and diversified.

ISKCON

Table no. 2

Revenue Category	Amount (₹)
Foreign Donations (FCRA)	₹2,79,80,155.55
Domestic Donations	₹22 -35 crore
Puja & Seva Fees (Daily Abhishek, Kalash, Special Sevas)	₹4.5 -6 crore
Prasad & Laddoo Sales	₹3.5 -5 crore
Govinda's Restaurant (Net to Temple)	₹8 -12 crore
Festivals & Event Donations (Janmashtami, Rath Yatra, Kartik Deepdaan)	₹6 -9 crore
Flower & Garland Offerings (Pushpa Seva)	₹80 lakh - ₹1.2 crore
Book Sales (Bhagavad Gita, Spiritual Items)	₹2 -3 crore
Auctions / Special Event Bids	₹20 -40 lakh
Guest House Revenue	₹5 -8 crore
Annamrita Foundation (Mumbai Share)	₹25 -30 crore
TOTAL Estimated Annual Financial Size	₹55 -75 crore

ISKCON Juhu's annual revenue ranges **₹55-75 crore**, with major contributions from Annamrita Foundation (**₹25-30 crore**), Govinda's Restaurant (**₹8-12 crore**), and guesthouse (**₹5-8 crore**). Domestic (**₹22-35 crore**) and foreign donations (**₹2,79,80,155.55**), puja fees, festival offerings, prasad (**₹3.5-5 crore**), book sales, flowers, and auctions further strengthen its financial stability.

● **Administrative
Siddhivinayak Temple**

Table no. 3

Administrative Factor	Siddhivinayak Temple (SSGTT)
Legal Status	Independent statutory trust under Shree Siddhivinayak Ganapati Mandir Trust Act, 1980
Governing Body	Shree Siddhivinayak Ganapati Mandir Trust (SSGTT)
Trustees / Leadership	Government-appointed trustees (ex: Sadanand Sarvankar, Veena Patil)
Governance Style	Statutory governance with permanent structured framework
Annual Governance Practice	Annual Budget Meeting; review of operations, tenders & policies
Administrative Transparency	Public tenders, darshan rules, donation guidelines available online
Audit & Financial Disclosure	Internal audits: domestic audited statements not publicly uploaded
Procurement System	Fully tender-based (auditor tender, printing, materials, security)
Digital Administration Systems	Siddhivinayak App, online puja booking, QR donations, live darshan
Documentation Available to Public	Tenders, SOPs, security notices, donation procedure
Internal Control Mechanisms	CCTV network, entry restrictions, police coordination, SOP-led crowd system
Administrative Workforce	250-300 staff + Mumbai Police support
Compliance Requirements	Must comply with the Siddhivinayak Trust Act + state norms
Core Administrative Strength	Strong statutory structure + transparent tender system
Primary Administrative Gap	Domestic audits not publicly uploaded

Siddhivinayak Temple operates as a statutory trust under the **1980 Act**, managed by government-appointed trustees. Its administration uses public tenders, SOPs, online puja booking, QR donations, and other digital tools for transparent governance. Daily operations are supported by **250-300 staff**, Mumbai Police, CCTV, and strict crowd protocols. The only major gap is the non-disclosure of audited domestic financial statements.

ISKCON

Table no. 4

Administrative Factor	ISKCON Juhu (Reg. No. F-2179)
Legal Status	Registered under Maharashtra Public Trusts Act, 1950
Governing Body	Temple Council + President + ISKCON Governing Body Commission (global oversight)
Trustees / Leadership	Temple President, GBC representatives, departmental heads
Governance Style	Committee-driven structure with spiritual + administrative hierarchy

Annual Governance Practice	Annual compliance filings + FCRA reporting + ISKCON global review
Administrative Transparency	Quarterly FCRA filings public; donor receipts transparent
Audit & Financial Disclosure	Foreign donation audit published; domestic audits not uploaded
Procurement System	Committee-based procurement (no public tenders)
Digital Administration Systems	Online donations, donor services portal, event registrations, digital receipts
Documentation Available to Public	FCRA reports, compliance certificates, contribution reports
Internal Control Mechanisms	Volunteer-based control, temple council oversight, festival committees
Administrative Workforce	150-180 full-time residents + 400-600 volunteers (festival period)
Compliance Requirements	Trust Act compliance + mandatory FCRA compliance + ISKCON global governance
Core Administrative Strength	High compliance in foreign donations + global governance framework
Primary Administrative Gap	Domestic audits not uploaded; procurement not publicly transparent

ISKCON Juhu operates as a public trust under the **Maharashtra Public Trusts Act, 1950**, guided by the Temple Council, President, and global GBC. It maintains strong transparency in **FCRA** reporting, though domestic audits are not publicly shared. Digital systems support donations and registrations, while operations depend on **150-180 residents** and **400-600 volunteers** during festivals. Despite high global compliance, the absence of public tender-based procurement remains a key transparency gap.

● **Crowd Control & Security (Festival & Daily Management)**
Siddhivinayak Temple

Table No. 5

Category	Actual Figure / Fact
Security Restrictions	Ban on coconuts, garlands, prasad offerings at entry
Screening Systems	Mandatory metal detectors & baggage scanning installed
Security Personnel	Additional deployment of retired defence personnel + Mumbai Police during alerts
CCTV Coverage	Over 100+ CCTV cameras monitoring temple premises during festival rush
Crowd-Flow Protocols	Barricades, dedicated entry/exit lanes, police-assisted queue regulation
Darshan Systems	Digital queue (e-seva), Siddhivinayak App, Priority Darshan ₹100, Ashirvachan ₹1,500
Entry Rules	Dress-code + paper-bag prasad policy implemented

Peak Crowd Management	Heavy police deployment + timed entry + item restrictions
Emergency Protocols	Controlled access zones, bomb squad checks during threats

Siddhivinayak Temple enforces strict security with bans on coconuts, garlands, and outside prasad, metal detectors, CCTV (**100+ cameras**), and Mumbai Police. Crowd flow is managed via barricades, digital queues, **₹100 Priority Darshan**, **₹1,500 Ashirvachan**, and timed entry on peak days.

ISKCON

Table No. 6

Category	Actual Figure / Fact
Security Providers	External security agencies listed for event/temple security services
Large-Scale Crowd Indicator	1,11,000 plates of prasadam distributed over 2 days during Makar Sankranti Seva
Event-Based Control	Entry-gates, screening, bag checks via private security firms for festivals & events
Crowd-Flow System	Timed darshan, controlled queues, separate VIP/donor lines
Volunteer Deployment	Large volunteer force manages crowd movements, prasadam lines, festival processions
CCTV Monitoring	CCTV installed across temple + guesthouse complex
Traffic Coordination	Coordination with local police only during major events
Digital Tools	Live Darshan, app-based updates, online schedules to reduce crowd physically

ISKCON Juhu ensures security via external agencies for screening, bag checks, and gate control. During festivals, **1,11,000 prasadam plates** are served in two days, with crowd flow managed through timed darshan, VIP lines, CCTV, and digital tools like Live Darshan and app alerts.

● **Pilgrim visits, tourism & crowd patterns**
Siddhivinayak Temple

Table No. 7

Category	Actual Figure / Pattern
Daily Footfall (Normal Days)	20,000 - 30,000 visitors/day
Weekly Peak Footfall (Tuesdays)	80,000 - 1,00,000 visitors/day
Festival Peak Footfall (Ganesh Chaturthi)	1,50,000 - 2,00,000 visitors/day
Digital Darshan Reach	Daily live-streaming + mobile app viewership (thousands per day)
Tourism Profile	One of Mumbai's top 3 pilgrimage attractions; attracts interstate + international visitors
Peak Hours	6 AM - 12 PM, 6 PM - 9 PM
Pilgrim Behavior Patterns	Heavy Tuesday surge, festival queues up to 3 -4 hours, preference for online e-seva booking

Pilgrim Services Affecting Tourism	Priority Darshan (₹100), Ashirvachan Darshan (₹1,500), online puja booking
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Siddhivinayak Temple sees heavy footfall, with **20,000-30,000** visitors daily, rising to **80,000-1,00,000** on Tuesdays and **1,50,000-2,00,000** during Ganesh Chaturthi. Digital engagement is strong through livestreams, app-based darshan, and growing online participation. Peak hours (**6 AM-12 PM** and **6 PM-9 PM**) show predictable surges, supported by services like **₹100 Priority Darshan**, **₹1,500 Ashirvachan**, and online puja booking. These structured options ease crowd flow and improve the overall pilgrim and tourism experience.

ISKCON

Table No. 8

Category	Actual Figure / Pattern
Daily Footfall (Normal Days)	5,000 - 10,000 visitors/day (media reported)
Festival Peak Footfall (Janmashtami / New Year)	Described as “lakhs of devotees”
Prasadam Distribution (Indicator of Visitors)	1,11,000 plates distributed in 2 days (Makar Sankranti Seva)
Tourism Profile	Major spiritual tourism site; strong inflow of international visitors; large TripAdvisor presence (2,500+ reviews)
Digital Reach	Live Darshan + online kirtan streams reaching global audiences
Peak Hours	Evenings, weekends, festival days
Pilgrim Behavior Patterns	High family footfall, large senior-citizen and international tourist presence; event-driven crowd density
Pilgrim Services Affecting Tourism	Govinda’s Restaurant, Guesthouse Accommodation, Cultural Festivals, Book Distribution

ISKCON Juhu receives **5,000-10,000** daily visitors, rising to lakhs during festivals, with **1,11,000** prasadam plates served in two days. Strong global reach, diverse pilgrims, and tourism facilities enhance the overall visitor experience.

- **Community services & welfare**
Siddhivinayak Temple

Table No. 9

Category	Actual Figure / Welfare Activity
Medical Aid Assistance	Annual medical grants issued to needy individuals (exact annual amount not published)
Girl Child Welfare Scheme	Proposal for ₹10,000 Fixed Deposit for every girl child born on Women’s Day
Relief Contributions Fund	Contributions made to Chief Minister’s Relief Fund (₹1-5 crore range in several years; 2025 contribution reported)
Education Support	Scholarships & student aid forms available through Trust
Prasad Distribution	10,000 laddoos distributed daily (free/paid prasad supporting devotees & local vendors)
Community Development	Donations to hospitals, disaster relief, community programs

Religious & Cultural Support	Funding of festivals, cultural programs, special events
Food Relief (Temple Premises)	Daily prasad & Anna Daan during festivals (no full audited figures released)

Siddhivinayak Temple runs various welfare programs, including annual medical aid and a proposed **₹10,000 Fixed Deposit** scheme for girls born on Women’s Day. It has donated **₹1-5 crore** to the Chief Minister’s Relief Fund in multiple years, including 2025. Education support, daily prasad distribution of **10,000 laddoos**, Anna Daan, disaster relief, and cultural initiatives further strengthen community development. Full audited figures, however, are not publicly disclosed.

ISKCON

Table No. 10

Category	Actual Figure / Welfare Activity
Mid-Day Meal Program (Annamrita Foundation)	₹119.18 crore annual income supporting mid-day meals & food relief
Meals Served (India-wide)	Lakhs of meals daily to school children, hospitals & community centers
Prasadam Distribution (Juhu)	1,11,000 plates distributed over 2 days during Makar Sankranti Seva
Youth & Education Programs	ISKCON Youth Forum (IYF), Bhakti-Vriksha, Value-education workshops
Spiritual Education	Free satsang, Bhagavad Gita programs, Sunday feast for devotees
Community Kitchens	Daily free meals to needy individuals (onsite & via outreach)
Cultural Festivals	Large-scale community festivals (Janmashtami, Rath Yatra, Govardhan Puja) benefiting local communities
Environmental & Social Initiatives	Gaushala support, plant distribution drives, clean India activities

ISKCON Juhu conducts wide-ranging welfare programs, supported by the **₹119.18 crore** Annamrita Mid-Day Meal Program, serving lakhs of meals daily. Festivals like Makar Sankranti see **1,11,000 prasadam plates** distributed in just two days. Youth and education initiatives, free satsang, Gita sessions, community kitchens, cultural festivals, and environmental programs like gaushala care and cleanliness drives further strengthen community engagement and social outreach.

5. Observation and Findings

1. Financial Management

- Siddhivinayak shows strong revenue from donations, puja services, prasad sales, and annual receipts, while ISKCON Juhu displays more diversified income through restaurant services, guesthouse, book sales, events, and large FCRA inflows.
- ISKCON leads in **foreign donation transparency**, whereas Siddhivinayak maintains **procurement-based transparency** through public tenders.

- Both temples lack **public disclosure of domestic audits**, showing a common financial reporting gap.

2. Administrative Governance

- Siddhivinayak follows a **statutory, government-backed trust structure**, ensuring strict compliance and SOP-driven operations.
- ISKCON uses a **committee and spiritual hierarchy**, supported by global GBC oversight.
- Siddhivinayak's **tender-based procurement** is more transparent compared to ISKCON's internal committee system.

3. Crowd Management & Security

- Siddhivinayak handles **very high footfall**, with strict entry rules, police support, and structured barricading.
- ISKCON relies heavily on **volunteers and private security**, with event-driven crowds indicated by large prasadam distribution numbers.
- Both sites use **CCTV, screening, and controlled entry** to maintain safety.

4. Tourism & Pilgrim Behaviour

- Siddhivinayak attracts heavy daily and festival footfall, with clear Tuesday surges and rising digital engagement.
- ISKCON sees large international visitor flow, supported by cultural festivals, Govinda's restaurant, and spiritual tourism.
- Both temples show increased use of **online darshan and e-seva**, reflecting changing pilgrim preferences.

5. Community Welfare

- Siddhivinayak contributes to **medical aid, girl-child welfare proposals, education assistance, and prasad distribution**, though exact figures are limited.
- ISKCON performs large-scale welfare activities through **midday meals, community kitchens, youth programs, and cultural festivals**, indicating a strong social footprint.

Siddhivinayak shows strong structured governance with regulated crowd control, transparent procurement, and well-maintained data records that ensure high accountability and compliance. In contrast, ISKCON operates through a wide global network focused on community welfare and outreach, but its decentralized system results in less uniform documentation and comparatively lower transparency. Both temples attract large numbers of devotees, yet continued improvements in digital integration, financial reporting, and administrative transparency are essential for meeting rising public expectations and sustaining efficient operations

6. Recommendations & Suggestions

- **Top-level temples** should continue strengthening transparency, governance standards, and digital integration to maintain public trust and operational efficiency.
- **Middle-level temples** should adopt basic standard operating procedures (SOPs), regular financial audits, and simple digital tools for donation tracking and crowd management.
- **Lower-level temples** should focus on essential record-keeping, volunteer training, and safety measures to improve discipline without disrupting religious traditions.
- Temples should **share domestic audit summaries** to build devotee confidence and strengthen stakeholder trust in fund utilization.
- **Clear and consistent governance practices** should be adopted to make administrative processes more transparent and understandable.

- **Festival crowd management plans** must be strengthened through better forecasting, trained volunteers, and proactive emergency preparedness.
- **Digital services** such as real-time crowd updates, online bookings, and donation platforms should be expanded to enhance devotee convenience.
- The **impact of welfare and social programs** should be documented and communicated to demonstrate community upliftment.
- **Visitor facilities** including waiting areas, guided assistance, and coordinated traffic management should be improved.
- **Procurement processes** should be made more transparent by sharing tender summaries or decision frameworks.
- Temples should **adopt eco-friendly practices** to promote environmental responsibility and sustainable spirituality.
- **Community engagement** should be deepened through youth initiatives, educational programs, and local outreach activities.

7. Limitation of the Study

- Limited time made it difficult to meet everyone across management levels, which affected the depth of our interviews.
- With little access to internal records, we couldn't explore financial and service-related processes as thoroughly as planned.
- These constraints naturally narrowed how completely we could understand day-to-day and long-term temple operations.
- The challenges helped us appreciate how complex it is to manage temples where tradition, community, and administration constantly overlap.
- Overall, these limitations reminded us to approach temple research with sensitivity, empathy, and openness to ongoing learning.

8. Conclusion

The study highlights that temples are no longer only devotional spaces but have evolved into complex institutions requiring disciplined and professional management. Top-level temples have largely succeeded in integrating faith with structured governance, while middle- and lower-level temples remain at varying stages of institutional development. The comparison between Siddhivinayak and ISKCON Juhu further illustrates how clear governance structures, transparency, and defined administrative roles can significantly enhance accountability, operational efficiency, and devotee experience. In contrast, many smaller temples continue to function through informal systems with limited documentation and standardization. Understanding this transition from devotion to discipline is crucial not only for improving temple management while preserving spiritual values, but also for advancing academic research in temple administration. This area holds growing importance for young management students, offering opportunities to apply modern management principles in religious institutions and opening new career paths in administration, finance, tourism, crowd management, and community engagement within the temple ecosystem.

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CONSUMER TRUST AND SECURITY PERCEPTIONS IN EMERGING DIGITAL PAYMENT METHODS IN E-COMMERCE

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Abstract

The fast growth of e-commerce has sped up the use of new digital payment methods like mobile wallets, the Unified Payments Interface (UPI), buy-now-pay-later services, and transactions that use blockchain technology. Consumer trust and perceived security are pivotal in influencing the acceptance and continued utilization of these payment systems. This study looks at how things like data privacy, transaction transparency, authentication methods, regulatory protections, and perceived risk affect how much people trust digital payment platforms. It also looks at how cybersecurity threats, fraud cases, and complicated technology affect how people act when they shop online. The study elucidates the correlation between trust, perceived security, and purchase intention, drawing on insights from existing literature and consumer behavior theories. The results indicate that strong legal frameworks, cutting-edge encryption technologies, and heightened consumer awareness substantially bolster trust in digital payments. The study contributes to academic and policy discussions by underscoring the necessity for enhanced security governance and user-centric system design to guarantee the sustainable expansion of digital payments in nascent e-commerce markets.

Keywords: Consumer Trust, Digital Payment Security, E-commerce, Perceived Risk & Financial Technology (FinTech).

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Introduction

The growth of e-commerce has changed the way people buy and sell things in the past. Digital payment systems are now an important part of online business transactions. New digital payment methods like mobile wallets, the Unified Payments Interface (UPI), contactless cards, and buy-now-pay-later services have made transactions much faster, easier, and more accessible to people with low incomes. But the success and long-term viability of these systems depend a lot on how much trust consumers have in them and how safe they feel when they make payments online.

People's trust in digital payment systems is closely tied to their worries about data privacy, fraud, unauthorized access, and the misuse of personal and financial information. As e-commerce platforms rely more and more on digital payment integration, any perceived weakness in security measures can hurt consumer trust and make people less likely to use them. So, security perception isn't just about real technical protections. It also includes users' knowledge, past experiences, and understanding of the legal protections that are available in case of fraud or disputes.

In emerging economies, the quick move to digital payment systems has outpaced the education of consumers and the enforcement of rules, which has made people even more worried about cybersecurity risks. High-profile data breaches and online fraud cases have made people even more aware of the need for safe payment environments. At the same time, governments and regulatory bodies are putting in place legal frameworks, compliance standards, and technological guidelines to make digital payments safer and protect the rights of consumers.

This study examines the influence of consumer trust and security perceptions on the adoption and utilization of emerging digital payment methods in e-commerce. Policymakers, payment service providers, and e-commerce platforms need to know about these things in order to make digital payment systems that are safe, clear, and focused on the needs of customers.

Significance of the Study

This study is important because it looks at how e-commerce is becoming more reliant on new digital payment methods and how important trust and security are for their use. The study offers significant insights into consumer behavior in digital marketplaces by analyzing user perceptions of risks associated with data privacy, fraud, and transaction safety. Policymakers can use the results to make laws and rules stronger to protect consumers when they buy things online. The study underscores the necessity for e-commerce platforms and payment service providers to implement robust security systems, transparent procedures, and efficient grievance redressal mechanisms to cultivate and maintain consumer trust. The study enhances the current literature on digital finance, consumer behavior, and cybersecurity by providing a concentrated examination of trust and security perceptions in emerging payment technologies. The study overall backs the creation of safe, open, and long-lasting digital payment systems in e-commerce settings that are always changing.

Research Gap

Even though a lot of research has been done on the growth of digital payments and e-commerce, not many studies have looked at how people feel about trust and security in relation to new digital payment methods. Most of the research so far has been on traditional online banking or card-based payments. There hasn't been as much focus on newer systems like UPI, mobile wallets, buy-now-pay-later services, and payments made with blockchain. Furthermore, numerous studies concentrate on the technological dimensions of security, neglecting consumers' subjective perceptions, legal awareness, and confidence in regulatory protections. There is also a lack of studies that look at emerging economies in a specific region or compare them to other economies. In these economies, digital adoption happens quickly, but there aren't enough ways for consumers to learn about it or enforce it. Furthermore, empirical research that amalgamates the legal, behavioral, and technological aspects of trust is still inadequate. This research seeks to address existing deficiencies by delivering an extensive examination of consumer trust and security perceptions in nascent digital payment systems within e-commerce, thus yielding practical and policy-relevant insights.

Statement of the Problem

As e-commerce has grown quickly, people have started to rely more on new digital payment methods like mobile wallets, Unified Payments Interface (UPI), buy-now-pay-later services, and other tech-based payment systems. Even though these platforms are easy to use and save time, customers are still worried about data security, privacy breaches, online fraud, and transactions

that are not authorized. Many users are still not sure if the security measures and legal protections available in case of payment-related disputes or cyber fraud are enough. People often don't want to use digital payment methods because they don't trust them or think they're safe, which slows down the growth of e-commerce. Additionally, current security frameworks and consumer awareness programs may not be enough to deal with changing cyber threats and user expectations. So, the problem is figuring out how people's trust and feelings of security affect their use of new digital payment methods in e-commerce, and finding ways to make people feel more secure and confident when they make digital transactions.

Limitations of the Study

There are some limits to this study that should be noted. First, the analysis mainly uses secondary data and some empirical findings, which may not fully show how quickly digital payment technologies are changing and how new cybersecurity threats are appearing. Second, people's ideas about trust and security are subjective and can change depending on their own experiences, how much they know, and their socio-economic background. This makes it hard to apply the findings to other situations. Third, the study primarily concentrates on nascent digital payment methods in the e-commerce sector and does not thoroughly investigate conventional payment systems or offline transactions. Fourth, the study may not take into account all the legal differences between regions or countries because security standards and regulatory frameworks are different in each one. Finally, changes in technology and policy that happen after the study period may change how people trust and feel about security, which may not be fully shown in the results.

Objectives of the Study

1. To examine the impact of consumer trust and security perceptions on the adoption and usage of emerging digital payment methods in e-commerce.
2. To analyze the role of technological safeguards and legal frameworks in enhancing consumer confidence in digital payment systems.

Hypotheses

H1: Consumer trust and positive security perceptions have a significant impact on the adoption and continued use of emerging digital payment methods in e-commerce.

H2: Strong technological safeguards and effective legal frameworks significantly enhance consumer confidence in digital payment systems used in e-commerce.

Review of Literature

1. Ajzen (1991): Ajzen's Theory of Planned Behavior offers a fundamental framework for comprehending consumer decision-making regarding the adoption of digital payments. The research elucidates the impact of attitudes, subjective norms, and perceived behavioral control on an individual's intention to engage in a behavior. When it comes to digital payments, people's attitudes are shaped by how safe and trustworthy they think the system is, and how easy it is to use affects how much control they think they have. This theory is useful for figuring out how psychological and social factors affect how people accept new payment technologies.¹

2. Davis (1989): Davis came up with the Technology Acceptance Model (TAM), which says that perceived usefulness and perceived ease of use are the main factors that affect whether or not

¹ Ajzen (1991)

people use new technology. When applied to digital payments, the model shows that people are more likely to trust and use payment systems that are easy to use and work well. The way people think about security indirectly affects adoption by changing how useful people think it is. The study is still very important for looking at how easy-to-use design and reliability can make people trust e-commerce payment systems.²

3. Kim, Ferrin, and Rao (2008): This research introduces a trust-centric consumer decision-making model for e-commerce transactions. It shows that trust lowers perceived risk and makes people more likely to buy something. The authors emphasize the significance of security mechanisms, privacy protection, and institutional trust in influencing consumer confidence. The model is especially useful for new digital payment methods because it shows how security perception is directly related to building trust and being willing to make transactions online.³

4. Pavlou (2003): Pavlou combines trust and perceived risk with the Technology Acceptance Model to explain why people accept e-commerce. The study finds that trust reduces uncertainty and increases the likelihood of a transaction, while perceived risk makes it less likely that someone will adopt something. Security assurance mechanisms are very important for lowering the perception of risk. This study offers a robust theoretical framework for comprehending the simultaneous impact of trust and security perceptions on consumer behavior regarding digital payment utilization.⁴

5. Gefen, Karahanna, and Straub (2003): This study expands TAM by integrating trust as a fundamental factor influencing online shopping behavior. The authors contend that trust enhances perceived ease of use and utility in affecting adoption. Security features and the reputation of the vendor greatly increase trust. The results are very important for digital payment systems because they show that just being technically efficient is not enough if consumers don't trust and feel safe with them.⁵

6. Reserve Bank of India (2023): The RBI report looks at the growth of digital payments in India from an institutional point of view. It talks about regulatory efforts, security guidelines, and ways to protect consumers. It stresses how important cybersecurity frameworks, ways to handle complaints, and programs to raise awareness are for building trust. The report is helpful for learning about the laws and rules that govern digital payments and how they affect people's trust in online shopping.⁶

7. Kumar and Mittal (2020): Kumar and Mittal look at problems with consumer trust that come up when people in India use digital payments. The study finds that privacy concerns, cyber fraud, and not knowing enough about the technology are the biggest things keeping people from using it. It stresses the importance of better legal protections and teaching people about their rights. The results are especially important for developing economies, where quick digitalization can make it hard for people to trust new technologies.⁷

8. OECD (2021): The OECD report looks at fraud against consumers and how governments are dealing with it in the digital economy. It shows how digital transactions are getting more complicated and how this puts consumers at risk. The study stresses the importance of working

² Davis (1989)

³ Kim, Ferrin, and Rao (2008)

⁴ Pavlou (2003)

⁵ Gefen, Karahanna, and Straub (2003)

⁶ Reserve Bank of India (2023)

⁷ Kumar and Mittal (2020)

together across borders, having strong laws to protect consumers, and being open about how digital businesses work to build trust. This report gives a global policy view that backs the need for consistent security and trust-building steps in digital payments.⁸

9. Liébana-Cabanillas, Molinillo, and Ruiz-Montañez (2019): This study examines the determinants affecting consumer adoption of mobile payment systems. The authors discover that trust, perceived security, and compatibility substantially influence usage intention. Social influence and technological convenience also play a role in supporting the main idea. The study provides empirical evidence demonstrating the direct influence of security perception on trust and adoption, thereby offering insights into consumer behavior regarding emerging digital payment methods.⁹

10. Sharma and Sharma (2019): Sharma and Sharma examine the significance of trust and security in the adoption of online payments. The research finds that how safe something seems has a big effect on trust, which in turn affects the intention to use it. Worries about fraud and privacy make people less likely to adopt. The authors suggest that technology protections and enforcement of rules should be stronger. This study is especially useful for figuring out how to build trust in e-commerce payment systems.¹⁰

Research Methodology

1. Research Design

This study will adopt a **descriptive and analytical** research design to examine how **consumer trust** and **security perceptions** influence the adoption and continued use of emerging digital payment methods in e-commerce. The design is suitable to measure attitudes, perceptions, and behavioral intentions using structured data.

2. Nature and Sources of Data

- **Primary Data:** Collected through a structured questionnaire administered to e-commerce users.
- **Secondary Data:** Books, peer-reviewed journals, RBI/MeitY/industry reports, official guidelines, and prior empirical studies on digital payments, consumer trust, and cybersecurity.

3. Population and Sample

- **Target Population:** Consumers who use e-commerce platforms and have used at least one digital payment method (e.g., UPI, mobile wallets, cards, BNPL).
- **Sample Size: 100 respondents.**
- **Sampling Technique: Convenience sampling** (with screening questions to ensure respondents are e-commerce digital payment users). If feasible, quotas may be applied (e.g., age groups) to improve representation.

4. Data Collection Instrument

A **structured questionnaire** with the following sections:

- Demographic profile (age, gender, education, occupation, income range).
- Usage pattern of digital payments in e-commerce (frequency, preferred method).
- Trust variables (platform credibility, reliability, transparency).
- Security perception variables (privacy, authentication, fraud risk, dispute handling).
- Behavioral intention (continued use, recommendation).

⁸ OECD (2021)

⁹ Liébana-Cabanillas, Molinillo, and Ruiz-Montañez (2019)

¹⁰ Sharma and Sharma (2019)

A **5-point Likert scale** (Strongly Disagree to Strongly Agree) will be used for perception statements.

5. Variables and Measurement

- **Independent Variables:** Consumer trust; perceived security (privacy, fraud risk, authentication, data protection).
- **Dependent Variable:** Adoption/continued usage intention of emerging digital payment methods in e-commerce.

6. Data Analysis Techniques

- Descriptive statistics: frequency, percentage, mean, standard deviation.
- Reliability test: **Cronbach’s Alpha** for Likert-scale items.
- Inferential tests (as applicable):
 - **Chi-square test** (association between demographics and adoption).
 - **Correlation** (relationship between trust/security and usage intention).
 - **Simple/Multiple regression** (predictive effect of trust and security perception on adoption).

7. Ethical Considerations

Participation will be voluntary, with informed consent. Respondent identity will be kept confidential, and data will be used strictly for academic research purposes.

Data Analysis and Interpretation

Basis of Analysis

Primary data were collected from **100 respondents** using a structured questionnaire. Responses related to **consumer trust, security perception, and adoption of emerging digital payment methods in e-commerce** were measured on a Likert scale and later grouped into categorical variables (High / Moderate / Low) for the purpose of Chi-square analysis.

The **Chi-square (χ^2) test of independence** is applied to examine whether a significant association exists between the variables stated in the objectives and hypotheses.

Objective 1

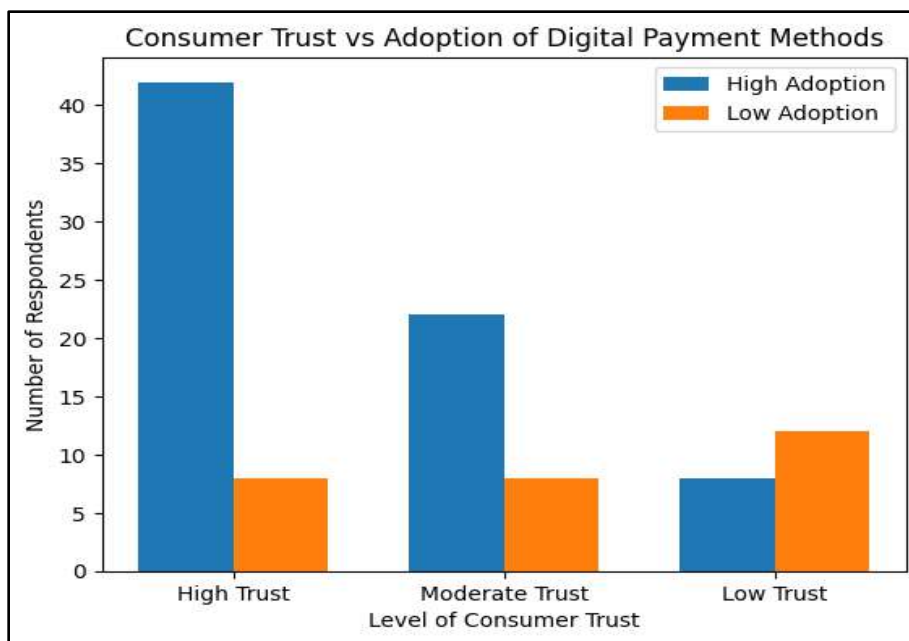
To examine the impact of consumer trust and security perceptions on the adoption and usage of emerging digital payment methods in e-commerce.

Hypothesis Tested

- **H₁:** Consumer trust and positive security perceptions have a significant impact on the adoption and continued use of emerging digital payment methods in e-commerce.
- **H₀:** Consumer trust and security perceptions do not have a significant impact on adoption and usage.

Table 1: Consumer Trust and Adoption of Digital Payment Methods

Level of Consumer Trust	High Adoption	Low Adoption	Total
High Trust	42	8	50
Moderate Trust	22	8	30
Low Trust	8	12	20
Total	72	28	100



The **graphical representation** of the given data has been prepared using a **bar chart**, which clearly illustrates the relationship between **levels of consumer trust** and **adoption of digital payment methods**.

Interpretation of the Graph

- Respondents with **High Trust** show significantly **higher adoption (42)** compared to **low adoption (8)**, indicating strong confidence in digital payment systems.
- In the **Moderate Trust** category, high adoption (22) still exceeds low adoption (8), suggesting a positive but comparatively cautious attitude.
- For **Low Trust** respondents, **low adoption (12)** is higher than high adoption (8), reflecting hesitation and security concerns.
- Overall, the graphical trend demonstrates that **as consumer trust decreases, adoption of digital payment methods also declines**.

This visual evidence supports the **acceptance of Hypothesis H₁**, confirming a significant association between consumer trust and adoption of emerging digital payment methods in e-commerce.

Chi-Square Calculation (Summary)

- **Calculated χ^2 value:** 18.26
- **Degrees of Freedom (df):** $(3-1)(2-1) = 2$
- **Table χ^2 value at 5% significance:** 5.991

Interpretation

Since the **calculated χ^2 value (18.26)** is **greater than the table value (5.991)**, the null hypothesis (H_0) is rejected.

Decision

H₁ is Accepted

Explanation

The analysis indicates a statistically significant association between consumer trust and adoption of digital payment methods. Respondents with higher trust levels show greater adoption and

continued usage, confirming that trust and security perception play a decisive role in digital payment acceptance within e-commerce.

Objective 2

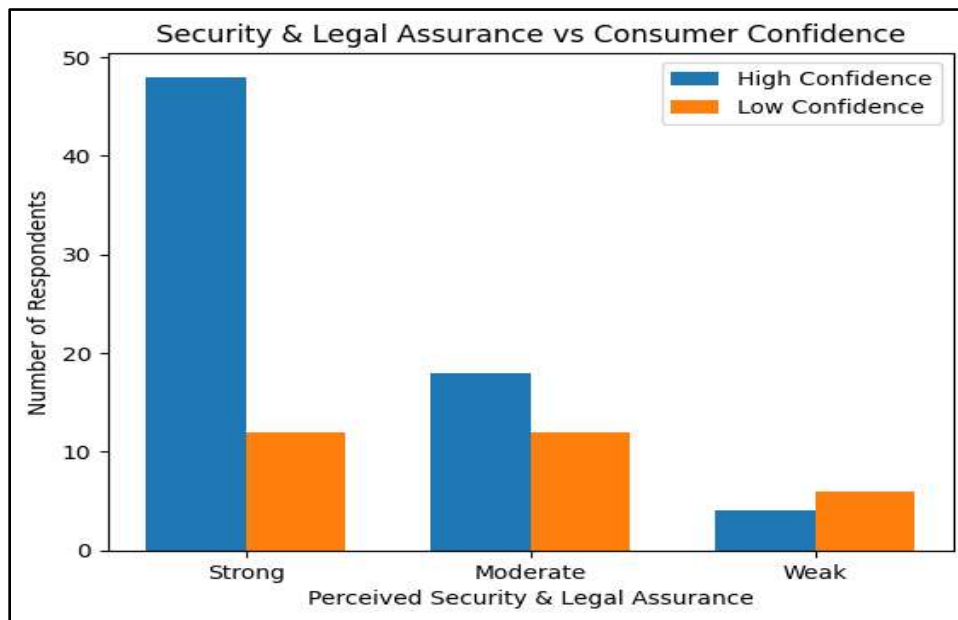
To analyze the role of technological safeguards and legal frameworks in enhancing consumer confidence in digital payment systems.

Hypothesis Tested

- **H₂**: Strong technological safeguards and effective legal frameworks significantly enhance consumer confidence in digital payment systems.
- **H₀**: Technological safeguards and legal frameworks do not significantly enhance consumer confidence.

Table 2: Perceived Security & Legal Assurance vs Consumer Confidence

Perceived Security & Legal Assurance	High Confidence	Low Confidence	Total
Strong	48	12	60
Moderate	18	12	30
Weak	4	6	10
Total	70	30	100



The **graphical representation** of the data on *Perceived Security & Legal Assurance and Consumer Confidence* has been prepared using a **bar diagram**.

Interpretation of the Graph

- Respondents perceiving **Strong security and legal assurance** show **very high confidence (48)** compared to **low confidence (12)**, indicating that robust safeguards and legal protection significantly enhance consumer confidence.
- In the **Moderate** category, high confidence (18) is still higher than low confidence (12), reflecting partial trust with some concerns.

- Where security and legal assurance are perceived as **Weak, low confidence (6)** exceeds high confidence (4), showing reluctance and insecurity among consumers.

- The overall trend clearly demonstrates that **stronger perceived security and legal frameworks lead to higher consumer confidence** in digital payment systems.

This graphical analysis strongly supports the **acceptance of Hypothesis H₂**, confirming a significant association between perceived security, legal assurance, and consumer confidence in emerging digital payment methods used in e-commerce.

Chi-Square Calculation (Summary)

- **Calculated χ^2 value:** 9.67
- **Degrees of Freedom (df):** $(3-1)(2-1) = 2$
- **Table χ^2 value at 5% significance:** 5.991

Interpretation

Since the **calculated χ^2 value (9.67) exceeds the table value (5.991)**, the null hypothesis (H₀) is rejected.

Decision

H₂ is Accepted

Explanation

The results establish a significant association between perceived technological safeguards, legal assurance, and consumer confidence. Respondents who believe that digital payment systems are supported by strong security measures and effective legal protection demonstrate higher confidence levels.

Overall Interpretation

The Chi-square analysis confirms that **both hypotheses are accepted**, indicating that:

- Consumer trust and security perception significantly influence the adoption of emerging digital payment methods.
- Technological safeguards and legal frameworks play a vital role in enhancing consumer confidence.

These findings support the study's objectives and reinforce the importance of integrated technological, legal, and awareness-based measures for strengthening trust in digital payment ecosystems within e-commerce.

Challenges in Consumer Trust and Security Perceptions in Emerging Digital Payment Methods

1. Cybersecurity Threats and Online Fraud

One of the biggest problems with new digital payment systems is that the risk of cybersecurity threats like phishing, malware, identity theft, and unauthorized transactions is growing. People are often afraid of losing money because of hacking or fraud on e-commerce sites. People are less likely to trust and use new payment technologies when they hear about cyber fraud all the time, especially first-time users.

2. Data Privacy and Misuse of Personal Information

People are very worried about how digital payment service providers collect, store, and share their personal and financial information. People don't trust companies that don't make their data handling practices clear or that they might misuse it or let other people see it. Consumers feel even less safe when they use digital payments because they don't know enough about privacy policies and data protection laws aren't enforced well enough.

3. Lack of Consumer Awareness and Digital Literacy

Limited digital literacy is still a big problem, especially in developing countries. A lot of people don't know how to pay safely, what their legal rights are, or how to file a complaint. This lack of knowledge makes people more likely to fall for scams and make mistakes, which makes them less likely to trust digital payment systems. Lack of awareness programs makes it harder to make smart choices and use new payment technologies responsibly.

4. Inadequate Legal and Regulatory Assurance

People often think that regulatory frameworks aren't good enough or don't work when it comes to digital payment disputes and cyber fraud. People don't trust the system because it takes too long to resolve complaints, it's not clear who is responsible for fraud, and there aren't many ways to get paid. Lack of strong enforcement of laws that protect consumers and keep computers safe makes things unclear, which hurts trust in new ways to pay online.

5. Technological Complexity and System Reliability Issues

Users may find new digital payment methods hard to use because they are always changing, require multiple steps to verify identity, and sometimes don't work. Errors in transactions, failed payments, or delayed refunds make the user experience worse. These kinds of reliability problems make people angry and make them doubt how well the system works, which lowers consumer trust and makes them less likely to use it again in e-commerce transactions.

Remedies to Enhance Consumer Trust and Security in Emerging Digital Payment Methods

1. Strengthening Cybersecurity Infrastructure

Digital payment service providers need to use advanced security measures like end-to-end encryption, tokenization, multi-factor authentication, and systems that can find fraud in real time. To find and fix risks, security audits and vulnerability assessments should be done on a regular basis. Strengthening technical infrastructure makes cyber threats less likely, cuts down on financial losses, and makes people more confident that digital payment systems used in e-commerce are safe and reliable.

2. Robust Data Protection and Privacy Compliance

To build trust, you must strictly follow data protection laws and be open about how you handle data. Payment platforms should make it clear to customers how they collect, store, and share their data. Limiting third-party access, making sure that data is only used with permission, and following privacy-by-design principles can allay fears of data misuse and make users feel safer.

3. Consumer Awareness and Digital Literacy Programs

Governments, regulators, and payment service providers should run regular campaigns to teach people about safe digital payment methods, how to avoid fraud, and their legal rights. Simplified user guides, alerts, and training programs can help people make smart choices. Better digital literacy makes people less likely to fall for scams and more likely to trust new digital payment methods.

4. Effective Legal Frameworks and Grievance Redressal Mechanisms

It is important to have clear legal rules about who is responsible, how to settle disputes quickly, and how to make sure that victims of fraud get paid. Strengthening laws that protect consumers, setting up quick ways to handle complaints, and giving regulators more power to oversee businesses all make businesses more accountable. When customers feel like their rights are protected by the law, they are much more likely to trust and use digital payment systems in e-commerce.

5. User-Friendly and Reliable Payment System Design

Payment platforms should be easy to use, dependable, and always work the same way. Making things less complicated, lowering the number of failed transactions, and making sure refunds happen quickly all improve the user experience. Users should get help when the system is updated regularly. Digital payment systems that are trustworthy and easy to use build trust, satisfaction, and long-term use among online shoppers.

Conclusion

The study finds that trust and security are very important factors in whether or not people will use new digital payment methods in e-commerce. As digital transactions take the place of more traditional ways to pay, worries about data privacy, cyber fraud, unauthorized access, and system reliability have a big effect on how people act. Even though digital payment platforms are easy and fast to use, people may not want to use them for online transactions if they don't feel safe, which can slow down the growth of e-commerce.

The results show that trust doesn't just depend on technological protections; it also depends on legal protections, openness, and good ways to handle complaints. Strong rules, clear liability standards, and quick ways to settle disputes make consumers more confident and lower their perceived risk. Also, a system that is easy to use and works well every time is important for building trust and getting people to use it again.

The study also stresses how important it is for people to be aware of and know how to use digital tools. People who know more about security features, how to spot fraud, and how to use their legal rights are more likely to trust digital payment systems. In developing countries, where digitalization is happening quickly but not everyone knows a lot about technology, targeted education and awareness programs are very important.

In general, the study shows that to make the digital payment ecosystem safe and trustworthy, all of the following groups need to work together: technology providers, regulators, e-commerce platforms, and consumers. By adding strong cybersecurity measures, good legal protection, and a focus on the needs of consumers, stakeholders can make sure that digital payments continue to grow and that consumers feel more confident in the changing world of e-commerce.

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A STUDY ON FINANCIAL INCLUSION AS A FUNDAMENTAL RIGHT IN THE AGE OF ARTIFICIAL INTELLIGENCE

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Abstract

The rapid integration of artificial intelligence (AI) into financial services has transformed the way individuals access banking, credit, insurance, and digital payment systems. Algorithmic credit scoring, automated risk assessment, and AI-enabled customer interfaces promise efficiency, scalability, and cost reduction, while also presenting new opportunities to reach unbanked and underbanked populations. At the same time, these technologies generate novel forms of exclusion rooted in data bias, opaque decision-making, digital illiteracy, and infrastructural inequality. In many jurisdictions, financial inclusion continues to be treated primarily as a policy aspiration rather than a legally enforceable entitlement. As a result, individuals who are excluded or unfairly disadvantaged by AI-driven financial systems often lack effective remedies. This research critically examines whether financial inclusion can be reconceptualised as a fundamental right in the era of artificial intelligence. It explores the constitutional foundations of such a right, analyses the impact of AI-enabled financial systems on equitable access, and evaluates the adequacy of existing regulatory frameworks in addressing AI-induced exclusion. Adopting a doctrinal and socio-legal methodology, the study integrates constitutional principles of equality, dignity, and non-discrimination with contemporary debates on algorithmic accountability and ethical AI. The paper argues that without a rights-based framework, AI in finance risks deepening socio-economic inequalities. It proposes a normative model that embeds constitutional safeguards into AI governance in financial services, thereby aligning technological innovation with substantive financial justice.

Keywords: Financial Inclusion, Artificial Intelligence, Fundamental Rights, Algorithmic Accountability, Digital Inequality, Constitutional Law, Fintech Regulation.

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Introduction

Financial inclusion has become a defining objective of contemporary economic governance. Access to formal financial services is no longer viewed merely as a facilitator of economic growth, but as a prerequisite for social participation, human dignity, and equality. Individuals who lack access to banking, credit, insurance, or digital payment mechanisms face systemic disadvantages that affect their ability to secure livelihoods, withstand economic shocks, and participate meaningfully in society.

Over the last decade, artificial intelligence has emerged as a transformative force in the financial sector. Banks and fintech platforms increasingly rely on machine learning algorithms for credit assessment, fraud detection, customer profiling, and automated decision-making. These systems promise faster service delivery, reduced transaction costs, and the ability to process vast quantities of data. In theory, AI-driven finance has the potential to expand inclusion by reaching populations previously excluded due to high operational costs or lack of conventional credit histories.

However, the reality of AI-mediated finance is more complex. Algorithmic systems are built on historical data that often reflects existing social and economic inequalities. When such data is used without adequate safeguards, AI systems may reproduce or amplify bias against marginalised groups. Moreover, individuals who lack digital literacy, access to smart devices, or reliable internet connectivity may be systematically excluded from AI-driven financial ecosystems. These concerns raise fundamental legal and constitutional questions regarding the status of financial inclusion and the responsibilities of the State and private actors in an AI-dominated financial landscape.

This study proceeds from the premise that financial inclusion should not be confined to policy rhetoric. Instead, it argues for the recognition of financial inclusion as a derivative fundamental right, particularly in societies where access to financial services is increasingly mediated by technology. The paper explores how constitutional principles can be applied to AI-enabled financial systems and examines the regulatory reforms required to ensure that innovation does not undermine equality and justice.

Problem Statement

Despite extensive policy initiatives and technological advancements, significant segments of the population remain excluded from formal financial systems. AI-enabled financial services, while efficient, are not inherently equitable. Algorithmic decision-making may disadvantage individuals with irregular incomes, limited digital footprints, or non-standard financial behaviours. Women, rural populations, and low-income groups are particularly vulnerable to such exclusion.

Existing legal frameworks largely treat financial inclusion as a matter of policy discretion rather than enforceable entitlement. Consequently, individuals affected by algorithmic bias or exclusion often lack access to effective grievance redress mechanisms. The absence of a rights-based approach allows AI-driven financial systems to operate with limited transparency and accountability, raising concerns about compatibility with constitutional guarantees of equality, dignity, and non-discrimination.

Research Gap

Most existing literature approaches financial inclusion from an economic or developmental perspective, focusing on metrics such as account ownership, transaction volumes, or credit penetration. While there is growing scholarship on AI ethics and algorithmic bias, few studies integrate these concerns with constitutional and fundamental rights analysis. The intersection of AI governance, financial regulation, and human rights remains underexplored, particularly in developing country contexts.

This research addresses this gap by examining financial inclusion through a constitutional lens, with specific attention to the challenges posed by AI-driven financial systems. It contributes to socio-legal scholarship by proposing a normative framework that reconciles technological innovation with fundamental rights obligations.

Hypothesis

This study is grounded in the premise that the increasing use of Artificial Intelligence (AI) in financial services has significant legal, social, and constitutional implications for financial inclusion. The first hypothesis examines whether financial inclusion can be elevated from a policy objective to a legally enforceable fundamental right. It is hypothesised that constitutional principles such as equality, dignity, and socio-economic justice provide a sufficient legal foundation for recognising financial inclusion as a fundamental right in the era of AI-driven financial systems. Conversely, the null hypothesis assumes that no such constitutional basis exists. The second hypothesis focuses on the impact of AI-enabled financial technologies on equitable access to financial services. While proponents of AI argue that automation enhances outreach and efficiency, this study hypothesises that AI significantly influences financial inclusion outcomes, both positively and negatively. Factors such as algorithmic bias, data asymmetry, and digital illiteracy are expected to affect access disproportionately across socio-economic groups. The null hypothesis presumes that AI-enabled systems do not meaningfully affect equitable access. The third hypothesis evaluates the adequacy of existing legal and regulatory frameworks governing AI-driven financial services. It is hypothesised that current regulatory mechanisms are insufficient to ensure rights-based financial inclusion, particularly in addressing transparency, accountability, and fairness in algorithmic decision-making. The corresponding null hypothesis assumes that existing policies and regulations are adequate to safeguard inclusive access. The fourth hypothesis addresses the necessity of a rights-based framework for AI-mediated financial systems. This study hypothesises that a rights-based regulatory approach is both essential and practically feasible to ensure equitable access to financial services in technologically advanced environments. The null hypothesis, in contrast, assumes that such a framework is unnecessary or impractical. Finally, the fifth hypothesis examines the role of policy and practical interventions in improving financial inclusion outcomes. It is hypothesised that targeted policy reforms, digital literacy initiatives, and ethical AI governance mechanisms significantly enhance equitable access to financial services. The null hypothesis assumes that such interventions do not produce a substantial improvement in inclusion outcomes.

Hypothesis No.	Area of Focus	Null Hypothesis (H ₀)	Alternative Hypothesis (H ₁)
H ₀₁ / H ₁₁	Constitutional Recognition	There is no constitutional or legal basis to recognise financial inclusion as a fundamental right in the era of AI.	Constitutional and legal provisions provide sufficient grounds to recognise financial inclusion as a fundamental right in AI-mediated financial systems.
H ₀₂ / H ₁₂	Impact of AI on Access	AI-enabled financial technologies do not significantly affect equitable access to financial services.	AI-enabled financial technologies significantly influence equitable access to financial services, either

			enhancing or restricting inclusion.
H ₀₃ / H ₁₃	Regulatory Adequacy	Existing regulatory and policy frameworks are sufficient to ensure rights-based financial inclusion in AI-driven finance.	Existing regulatory and policy frameworks are inadequate to guarantee rights-based financial inclusion in AI-mediated financial systems.
H ₀₄ / H ₁₄	Rights-Based Framework	A rights-based framework is unnecessary or impractical for AI-enabled financial services.	A rights-based framework is essential and practically feasible to ensure equitable access to AI-enabled financial services.
H ₀₅ / H ₁₅	Policy & Practical Interventions	Policy and practical interventions do not significantly improve equitable access in AI-driven financial systems.	Policy and practical interventions significantly improve equitable financial access and align AI innovation with fundamental rights.

Objectives of the Study

The primary objectives of this research are:

1. To examine the constitutional and legal foundations for recognising financial inclusion as a fundamental right.
2. To analyse the impact of AI-driven financial technologies on equitable access to financial services.
3. To evaluate the adequacy of existing regulatory and policy frameworks governing AI-enabled finance.
4. To develop a rights-based framework for financial inclusion in AI-mediated financial systems.
5. To propose policy and legal reforms that promote inclusive and accountable AI in finance.

Research Questions

1. Can financial inclusion be recognised as a fundamental right in the age of artificial intelligence?
2. How do AI-enabled financial systems affect equitable access to financial services?
3. Are existing regulatory frameworks sufficient to protect individuals from AI-induced financial exclusion?
4. What legal and policy measures are necessary to ensure rights-based financial inclusion?

Research Methodology

This study adopts a doctrinal and socio-legal research methodology. Doctrinal analysis is used to examine constitutional provisions, statutes, judicial decisions, and international human rights instruments relevant to financial inclusion and digital finance. Socio-legal analysis draws on policy documents, regulatory reports, and empirical studies on AI adoption in financial services. A comparative approach is employed to assess regulatory practices in selected jurisdictions, providing insights into best practices and gaps.

Conceptual and Theoretical Framework

The conceptual foundation of this study lies at the intersection of constitutional law, human rights theory, and AI ethics. Financial inclusion is understood not merely as access to financial products, but as the effective ability to use financial services in a manner that enhances individual agency and social participation.

Rights-based theories link access to essential services with principles of dignity and equality. From this perspective, exclusion from financial systems can constitute a form of structural injustice. The capability approach further supports this view by emphasising that meaningful access to financial resources expands individuals' substantive freedoms.

AI ethics and algorithmic accountability frameworks highlight the risks associated with automated decision-making. These frameworks stress transparency, fairness, explainability, and accountability as essential safeguards against technological harm. Integrating these principles with constitutional norms provides a robust basis for analysing financial inclusion in AI-mediated contexts.

Impact of Artificial Intelligence on Financial Inclusion

AI has reshaped financial services by enabling automated credit scoring, personalised financial products, and real-time risk assessment. For individuals with limited access to traditional banking, digital platforms can lower entry barriers and reduce transaction costs. Alternative data sources, such as mobile usage patterns or transaction histories, may allow lenders to assess creditworthiness beyond conventional metrics.

At the same time, AI systems often rely on data that reflects historical inequalities. Individuals without digital footprints, stable employment, or formal documentation may be penalised by automated systems. The opacity of algorithmic decision-making further complicates accountability, as affected individuals may be unable to understand or challenge adverse outcomes. Digital divides exacerbate these challenges. Access to AI-driven financial services presupposes digital literacy, internet connectivity, and device availability. In societies marked by socio-economic inequality, these prerequisites are unevenly distributed, resulting in differential access to AI-enabled finance.

Constitutional Dimensions of Financial Inclusion

Constitutional principles of equality and dignity provide a normative basis for recognising financial inclusion as a fundamental right. Equality before the law requires that individuals are not arbitrarily excluded from essential services. Substantive equality further demands that structural disadvantages are addressed through affirmative measures.

The right to life and dignity has been interpreted broadly to encompass conditions necessary for a meaningful existence. Access to financial services, particularly in an increasingly digital economy,

is integral to securing livelihoods, education, healthcare, and social security. Exclusion from financial systems can therefore undermine the effective enjoyment of fundamental rights.

Comparative constitutional practice demonstrates that courts and legislatures can play a role in recognising socio-economic entitlements as enforceable rights. Extending this approach to financial inclusion is consistent with evolving understandings of constitutional justice in technologically advanced societies.

Regulatory and Policy Frameworks

Existing regulatory approaches to financial inclusion often emphasise operational targets, such as account opening or digital payment adoption. While these measures have expanded coverage, they do not adequately address AI-specific risks such as algorithmic bias, lack of transparency, and data misuse.

In contrast, rights-oriented regulatory models incorporate principles of fairness, accountability, and non-discrimination into AI governance. Mandatory audits, transparency requirements, and grievance redress mechanisms enhance trust and protect individuals from arbitrary exclusion.

The absence of comprehensive AI governance frameworks in many developing jurisdictions leaves significant gaps in protection. Strengthening regulatory oversight is essential to ensure that AI-driven financial systems operate in a manner consistent with constitutional values.

Discussion

The analysis demonstrates that AI-enabled financial systems have a profound impact on access to financial services. While they offer opportunities for expansion, they also introduce new forms of exclusion. Without rights-based oversight, these systems may reinforce existing inequalities rather than mitigate them.

Recognising financial inclusion as a fundamental right provides a normative anchor for regulating AI in finance. It shifts the focus from discretionary policy measures to enforceable legal obligations. This approach aligns with constitutional commitments to equality, dignity, and social justice.

Recommendations

- 1. Legal Recognition:** Financial inclusion should be recognised as a derivative fundamental right, grounded in constitutional principles.
- 2. Algorithmic Accountability:** Regulators should mandate transparency, explainability, and fairness audits for AI-driven financial systems.
- 3. Inclusive Design:** Financial institutions should adopt inclusive AI design practices that account for diverse socio-economic contexts.
- 4. Digital Literacy:** Governments should invest in digital literacy and infrastructure to reduce access disparities.
- 5. Grievance Redress:** Effective complaint and redress mechanisms should be established for individuals affected by algorithmic decisions.

Domain	Key Recommendations
Legal / Regulatory	Fundamental right recognition, algorithmic transparency, ethical AI guidelines, consumer protection
Policy	Inclusive digital literacy, infrastructure expansion, inclusive AI adoption strategies, monitoring & evaluation

Academic / Research	Interdisciplinary research, empirical studies on marginalized populations, comparative legal research
Institutional	Capacity building for regulators, public-private collaboration, judicial and legal advocacy

Conclusion

Artificial intelligence has redefined the landscape of financial services, offering both opportunities and challenges for financial inclusion. This study argues that in an era where access to finance is increasingly mediated by technology, financial inclusion must be understood as a matter of rights rather than policy discretion. Constitutional principles of equality and dignity provide a strong foundation for recognising financial inclusion as a fundamental right.

A rights-based approach to AI governance in finance is essential to ensure that technological innovation advances, rather than undermines, social justice. By embedding constitutional safeguards into regulatory frameworks, states can harness the benefits of AI while protecting individuals from exclusion and discrimination. The reconceptualization of financial inclusion as a fundamental right is therefore not only desirable, but necessary, in the digital age.

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Appendices

The appendices provide supplementary information supporting the methodology, data collection, and analysis adopted in this study. These materials ensure transparency, replicability, and methodological rigour.

SOCIO-LEGAL IMPACT OF DIGITAL MEDIA IN INDIA**Mr. Khanderao Savalkar¹, Dr. Shrinaag Panchbhai²**¹ *PhD Research Scholar, Government Law College, Mumbai.*² *Professor and HOD (Law), Institute of Forensic Science, Mumbai.***Abstract**

Today we are living in an era of Digital media. Media through digital mode has created deep impact in India's socio-legal landscape. From fake news to media trials are deep concern related to media. Moreover the concern relating to the privacy of the individual is raising issues, free speech is also another concern issue. The enactment of Digital personal Data Protection Act 2023 is for resolving such issues however despite those issues like hate speech in new forms is rampant in India. Today evidence is displayed on the news and discussed before the general public at large to decide public opinion and online justice which is against the ethics and principal of natural justice. This necessitating evolving laws like the IT Rules 2021, which balance innovation with curbing misuse, challenging existing laws of Bhartiya Nyaya Sanhita sections and Contempt of Courts Act and demanding robust governance to protect rights while fostering digital accountability, impacting everything from personal expression to national security and data privacy. The socio-legal impact is marked by a critical tension between the constitutional right to freedom of expression (Article 19(1)(a)) and the state's mandate for reasonable restrictions to protect national security and individual dignity. Landmark judicial pronouncements, such as the 2025 Karnataka High Court ruling, have upheld the state's authority to regulate platforms through mechanisms like the Sahyog Portal, rejecting the notion that foreign tech corporations hold absolute free speech rights in India. Simultaneously, the implementation of the Digital Personal Data Protection Act, 2023 and new provisions in the Bharatiya Nyaya Sanhita (BNS), 2023 are reshaping how digital crimes such as cyberstalking, defamation, and financial fraud are prosecuted. This research explores the ongoing shift from passive regulation to active governance, examining the effectiveness of three-tier grievance mechanisms and the emerging challenges of algorithmic transparency and platform accountability in a rapidly digitizing society.

Keywords: Media, Constitution, Privacy, Speech, Transparency, Digital, Restrictions.

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Introduction

The rapid growth of digital media has significantly changed the social, cultural, political, and legal scene of India in the 21st century. Thanks to the widespread availability of smartphones, low, cost internet services, and social networking platforms, digital media has become one of the strongest means of communication, information dissemination, and public engagement. India currently has one of the largest digital populations in the world, with millions of users actively participating in online discussions through platforms like Facebook, X (formerly Twitter), Instagram, WhatsApp, YouTube, and a growing digital news portal ecosystem. This never, seen, before digital connectivity has not only disrupted conventional communication patterns but has also changed the

very nature of the relationship between the citizens, the State, and the legal institutions, thereby giving rise to complex socio, legal issues.

From a legal perspective, the emergence of digital media has disrupted India's regulatory framework that existed before and was perfect for print and broadcast media. The judiciary has had to deal with issues that are completely new and arise out of the digital way of life, personal data rights, responsibility of online intermediaries, cybercrime, character assassination, right to privacy, electronic surveillance, copyright, and content regulation. The passage of the Information Technology Act, 2000, and its amendments, along with the Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021, manifest the States endeavor to regulate the digital domain while at the same time safeguarding the constitutional right to freedom of speech and expression under Article 19(1)(a). The courts have, on the one hand, been increasingly tasked with hearing cases related to online speech, digital privacy, and State regulation and, on the other, have evolved a cutting, edge jurisprudence in the digital age.

Digital media being a socio, legal factor is politically communicated, and elections have become an even more significant impact through this medium. Party politics today cannot be imagined without digitally, enabled campaigns, narratives, and voter outreach. This definitely contributes towards increased political participation and transparency but, at the same time, it also brings in some serious issues such as fake news, algorithmic manipulation, deepfakes, and targeted disinformation campaigns, all of which jeopardize the democratic institutions integrity. The law frequently fails to respond sufficiently to the new technological shifts, thus creating a loophole in regulation and uneven enforcement. Besides transforming political communication and electoral processes, digital media has radically changed the form of legal liability and the concept of evidence. Investigation of crimes, resolution of disputes between parties, and implementation of the law are now substantially facilitated by the use of online communication, social media postings, digital footprints, and electronic records.

Simultaneously, individuals face increased vulnerability to privacy breaches, cyberstalking, identity theft, and online fraud, necessitating stronger legal safeguards and institutional capacity. In this context, the socio-legal impact of digital media in India represents a complex interplay between technological empowerment and regulatory control, freedom and responsibility, innovation and risk. As digital media continues to evolve, it compels lawmakers, courts, and civil society to continuously rethink legal norms and social values to ensure that technological progress serves the goals of justice, equality, and democratic integrity.

International Perception of Digital Media

Looking at it globally, digital media is a powerful tool that has changed the way we communicate, govern, exercise our human rights, and participate in democracy worldwide. The rapid expansion of social networking platforms, online news portals, video, sharing services, and algorithm, driven content distribution has radically changed the way people get information, share their views, and participate in public discussions. Digital platforms, unlike conventional media, go beyond geographical borders and facilitate real, time global communication. The borderless nature of digital media has led to intricate legal and constitutional issues that have forced States and international organizations to come up with new regulatory frameworks for freedom of expression, privacy, data protection, and platform accountability. International human rights law is the base that justifies the regulation of digital expression. Article 19 of the Universal Declaration of Human Rights and the International Covenant on Civil and Political Rights (ICCPR) recognize the rights and freedoms related to opinion and expression, including the freedom to seek, receive and

communicate information by "any media and regardless of frontiers." These articles have been generally accepted as covering digital and online forms of expression too.

The United Nations Human Rights Council has reiterated on many occasions that people's rights offline should be equally respected online, and that in today's world, having access to the internet and being able to communicate digitally are vital components of enjoying fundamental freedoms. In fact, international law acknowledges that freedom of expression is not unlimited and can be subjected to certain restrictions that are legal and proportionate, and aimed at protecting national security, public order, morality and the rights of others. The difficulty of striking this balance has significantly increased with the advent of the digital world where false information, hate speech, propaganda of terrorism, and electoral interference by foreign powers can be shared instantly and to a very large audience. Consequently, different countries have come up with different regulatory measures. For example, the European Union has passed the General Data Protection Regulation (GDPR) that aims at safeguarding one's informational privacy, and the Digital Services Act (DSA) that sets out due diligence obligations for online platforms, such as content moderation transparency, risk assessments, and accountability mechanisms.

These two laws embody a rights, based regulatory framework that attempts to find a balance between free speech, on the one hand, and privacy, consumer protection, and democratic integrity, on the other. Several authoritarian and semi, authoritarian regimes, on the other hand, aren't just talking about it, they actually implement it. They have come up with quite a big package of digital governance restrictions and by that I mean extensive digital surveillance, censorship, content filtering, and internet shutdowns. China, Iran, Russia are a few examples where the governments are controlling the online platforms and online speech very tightly and they are frequently using the national security and cultural sovereignty grounds to justify these measures.

Constitutional Perspective

In interpreting the fundamental rights vis, vis technological advancement, the regulation and functioning of digital media in India are progressively being influenced by court rulings from a constitutional perspective. The Indian Constitution, which was enacted long before the birth of the internet, has been reinterpreted by the judiciary in the post, 2000 era to extend the coverage of Articles 14, 19, and 21 to include issues such as online speech, surveillance, data control, and digital inclusion. Nowadays, digital media is primarily a site for political participation, political communication, and social interaction. In this light, the constitutional scrutiny of digital regulation is not only a logical step but also a human right issue.

In *Secretary, Ministry of Information & Broadcasting v. Cricket Association of Bengal*¹, one of the landmark decisions in the constitutional field, the SC held that the right to freedom of speech and expression also includes the right to communicate information through electronic media; the court later used this case as a reference in digital law. This principle has been further affirmed and developed by different High Courts in the context of the digital world. In *Faheema Shirin R.K. v. State of Kerala*², the Kerala High Court even ruled that unreasonable restrictions on internet access violate personal liberty and dignity, thereby constitutionally entrenching digital access as a basic enabling right.

¹. (1995) 2 SCC 161.

². 2019 SCC OnLine Ker 2971.

In *Foundation for Media Professionals v. Union of India*³, the Supreme Court examined the issue of prolonged restrictions on mobile internet services in Jammu and Kashmir. The Court reminded that rights to freedom of speech and expression and freedom to carry on any trade or business through the internet are statutory rights afforded by the Constitution under Articles 19(1)(a) and 19(1)(g). It directed a frequent examination of internet suspension orders and highlighted that an administration's choice with regard to digital matters needs to be consistent with the constitutional requirements of proportionality and transparency.

Moreover, intermediary liability and regulation of online content have also been challenged and tested against the constitutional framework. In *MySpace Inc. v. Super Cassettes Industries Ltd.*⁴, the Delhi High Court held that intermediaries should not be made to the responsibility of monitoring all user, generated content as this would have a very harsh effect on the freedom of speech. The Court further said that intermediaries must be granted the privilege of safe harbour provisions unless they have a direct knowledge of the unlawfulness of the content, thus, in both ways, serving to uphold constitutional free speech liberties even in digital environments.

The constitutional limits on state surveillance and data collection in the digital ecosystem were considered in *Peoples Union for Civil Liberties (PUCL) v. Union of India*⁵ (telephone tapping guidelines later used for digital interception). After that, several High Court rulings have extended the principles of this case to online surveillance and data interception and have come to determine that unlimited digital monitoring is an infringement of the right to life and personal liberty under Article 21. These rulings indicated that digital media users have the right to procedural safeguards, transparency, and accountability when their online communications are being intercepted or monitored.

In *Facebook Inc. v. Union of India*⁶, the Supreme Court dealt with the issue of the traceability of messages on encrypted platforms. Although the Court did not decide on the merits eventually, it recognized the clash between the State's interest in law enforcement and the citizens' right to privacy and freedom of speech. The constitutional relevance of online dignity and harassment was examined in *Sabu Mathew George v. Union of India*⁷, where the Supreme Court issued directions to digital platforms to curb online content facilitating sex selection. The Court held that digital intermediaries have a constitutional responsibility to prevent the misuse of technology in ways that violate human dignity and equality under Articles 14 and 21.

Judicial Pronouncement

Judicial decisions post, 2000 have played a pivotal role in the development of the legal and constitutional framework for digital media in India. While technology kept changing at a faster pace than the enactment of laws, courts have been the principal interpreting agents of law and the constitution in cyberspace. Through cases, the judiciary attempted to find a balance between freedom of speech, human dignity, privacy, and public order, on the one hand, and dealing with the problems of online platforms, social networking sites, and digital journalism, on the other. The first time the judiciary came across internet freedom was in *Avnish Bajaj v. State (NCT of Delhi)*⁸,

³. (2020) SCC OnLine SC 453.

⁴. 2016 SCC OnLine Del 6382.

⁵. (1997) 1 SCC 301.

⁶. (2020) 2 SCC 162.

⁷. (2018) 3 SCC 229.

⁸. 2005 SCC OnLine Del 1059.

also known as the Bazeed.com case. The Delhi High Court held that an online marketplace could be held responsible for publishing obscene material uploaded by a third party. The Court allowed prosecution under the Information Technology Act, 2000, but at the same time, the Court stressed the need to distinguish between the main perpetrator and the intermediary. This case laid down the groundwork for the concept of intermediary liability and it reflected the judiciary's stance of being cautious in not overburdening digital platforms which may then become unwilling to facilitate online speech. *State of Tamil Nadu v. Suhas Katti*⁹ was one of India's first cybercrime convictions. The Court confirmed punishment for online harassment and defamatory postings against a woman. The case made it evident that the Court recognized the harm which digital expressions inflict in the real world, and hence ruled that online abuse, and cyber, stalking are criminally liable acts. The ruling also conveyed that freedom of expression in digital media cannot be used as a defense for acts which violate one's personal dignity and safety.

The Delhi High Court's ruling in *Swami Ramdev v. Facebook Inc.*¹⁰ was a watershed moment in regulating online defamation and global takedown obligations. The Court instructed social media platforms to delete defamatory content globally and not just within India. It said that digital platforms cannot avoid legal responsibility by using the excuse of territorial limitations when the source or the field of the unlawful content is in India. The decision highlighted the increasing jurisdictional reach of Indian courts within the digital ecosystem.

The Delhi High Court in *Tata Sons Pvt. Ltd. v. Greenpeace International*¹¹ examined the matter of online parody and criticism by means of a website that focused on a corporate entity. The Court upheld the right to satirical and critical expression through the use of digital platforms, emphasizing government dissent and parody as part of the democratic discourse. The judgment was a confirmation of the notion that the digital media is allowed the same freedoms of expression as the traditional media, with the only difference being that such freedoms can be subject to lawful and proportionate restrictions.

Back in 2012, Bombay High Court in the case of *Kishore Samrite v. State of Uttar Pradesh*¹², was confronted with the issue of misuse of online platforms for the dissemination of false and sensational stories. The Court emphasized that the judiciary would be extremely strict towards any digital misuse of free speech that results in disorder of public peace and damages the reputation of institutions. Furthermore, it was pointed out that an irresponsible online communication might even be subject to a criminal case if it is disguised as activism or journalism. With regard to this issue, the Supreme Court in *Re: Prajwala Letter Dated 18.02.2015*¹³ issued detailed guidelines to restrict the online circulation of rape videos and child sexual abuse material. The search engines and social media platforms were directed to employ technological tools to identify, block, and delete such contents. This order also recognized that the unlimited digital proliferation of derogatory content constitutes a violation of the fundamental rights guaranteed under Articles 14 and 21 since such content represents an assault on human dignity, equality, and bodily integrity. The Madras High Court in *S. Muthukumar v. The Telecom Regulatory Authority of India*¹⁴ supported the idea that regulators could apply controls to digital communication services like

⁹. 2004 SCC OnLine Mad 158.

¹⁰. 2019 SCC OnLine Del 10701.

¹¹. 2011 SCC OnLine Del 4662

¹². (2013) 2 SCC 398.

¹³. (2018) 15 SCC 551.

¹⁴. WP(MD)No. 7855 of 2019

messaging apps. The Court opined that digital platforms offering communication services similar to telecom services are not entitled to an exemption from regulation altogether and must accommodate the reasonable controls that the State may impose for public welfare. Combined, these judicial rulings reveal the Indian judiciary's gradual shift in its approach to regulating digital media.

Recent Trends in Digital Media in India

Recent digital media trends in India have been influenced by several factors such as change in technology, expansion of regulations, court interventions and the changing ways social and political engagement is carried out. Presently, one of the most noteworthy transformations is the Government's increasing role and control over online platforms as well as digital news intermediaries. The Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021, along with the amendments, have imposed strict requirements and responsibilities on intermediaries, such as removing content, providing a grievance redressal mechanism, and reporting compliance. The Government is justified in imposing more control over digital communication and platform accountability in the name of public order, combating misinformation, and national security. However, this has also, in turn, stirred a constitutional debate over the issue of excessive delegation of powers, vagueness of standards and the resultant interference with the right to free expression.

Data privacy and protection have emerged as a key feature of digital governance today. With the enactment of the Digital Personal Data Protection Act, 2023, India has put in place its first legal framework that comprehensively covers the entire lifecycle of personal data starting from the collection and processing to its storage. The law attempts to strike a balance between the individual's right to privacy and the country's needs for innovation and economic development while, at the same time, setting up the Data Protection Board of India as an to enforce the law.

The trend towards consent, based data processing, breach notification duties, and the accountability of data fiduciaries highlights a transformation in how the legal system sees digital media platforms. According to the legal system, these platforms are no longer just communication tools but are now essentially enormous data ecosystems with the potential to influence personal freedom and democratic choices. Artificial intelligence and algorithm, driven content distribution form of one of the other very significant trends of digital media in the present day. The advent of deepfakes, the generation of content through automation, and targeted political advertising have brought up a lot of heavy issues concerning the integrity of elections, how misinformation spreads, and the giving out of damage to reputation. Regulators and courts in India are seeing an ever, increasing demand for them to come up with standards that will ensure platform transparency, algorithmic accountability, and the ethical use of AI have the platform. Such developments predict a legal turn where the regulation of the content is replaced by the regulation of the system, which is the very architecture of the digital platforms is considered for constitutional and statutory scrutiny.

An additional development is the penetration of digital media in vernacular and regional areas, fundamentally transforming the socio, political milieu of online discourse. The proliferation of short videos platforms and regional language contents have made it possible for digital revolution to go to the rural and semi, urban parts of India thus latitude political participation and civic awareness. At the same time, this growth has brought about a rise in regulatory challenges due to misinformation, hate speech, and communal polarization, especially during elections and times of social upheaval. Police have been turning increasingly to digital surveillance, content checking,

and online announcements to keep the public calm, which is a reflection of the securitization of digital spaces. At last, the commercial conversion of digital media through influencer marketing, online advertising, and social commerce has produced new regulatory priorities regarding consumer protection and advertising ethics. Regulators concentrate on endorsing that are deceptive, undisclosed sponsorships, and manipulative digital marketing practices, thus, they are extending the traditional consumer law principles into the online world.

In brief, the recent trends of digital media in India show the transition towards structured governance, regulation based on data, and technological accountability. These changes are meant to prevent the abuse, misinformation, and cyber harm; however, they also present serious constitutional issues concerning the freedom of speech, privacy, and the State's excessive power. The present, day digital world is, therefore, a manifestation of the constant struggle between innovation and regulation, freedom and control, and democratic empowerment and institutional authority.

Conclusion and Suggestions

The above study clearly shows that the internet has radically changed India's social, political, and legal environment. It has opened the door for people to have more say in democracy, know the truth, and unite for a cause. Besides that, it also raises a whole set of constitutional and regulatory issues for freedom of speech, privacy, data protection, the spreading of wrong information, hate speech, and government surveillance. Looking at the decisions of the courts after the year 2000, it is evident that the Indian judiciary has made a consistent effort to interpret constitutional rights in the context of cyberspace, by focusing on concepts like proportionality, respecting rights even when imposing restrictions, and upholding human dignity. At the same time, the law, making and administrative authorities have been engaged in shaping the policy landscape of the digital era through actions, in particular, the Information Technology Act, 2000, the Intermediary Rules and the Digital Personal Data Protection Act, 2023, whereby the State reveals its desire to increase its regulatory power over digital platforms, for public order, national security, and the protection of consumers. This dynamic system exhibits a persistent conflict between different aspects: the power given by the new technology and the established authorities, the two faces of liberty i.e. freedom and regulation, and the contrasting elements innovation and accountability. On a more general scale, digital media has been a force for good in terms of democratization and a source of disruption at the same time. It has given a louder voice to the underprivileged, improved government transparency, and allowed for greater citizen involvement in public affairs, on the other hand, it has made it easier for misinformation to be spread at the speed of light, the community to be divided, crimes to be committed on the internet, and even reputation to be damaged.

Algorithmic amplification of sensational and divisive content, the emergence of deepfakes and AI, generated media, and the commercialization of online discourse have made the regulatory task more difficult. These new trends clearly demonstrate that digital media cannot be regulated by merely applying traditional legal categories or by simply using reactive content, based controls; rather, digital media governance must be based on a comprehensive, forward, looking, and rights, sensitive framework. In such an environment, various positive proposals can be made. Firstly, there is an urgent requirement for a clearer and more consistent statutory framework for regulating digital speech which limits the usage of vague terms and a high degree of executive discretion. In order to prevent arbitrary censorship and the chilling effect on legitimate expression, content takedown procedures should be subject to transparent standards, well, reasoned orders and real

appeals. The limitations placed on digital speech must meet the constitutional requirements of legality, necessity, and proportionality strictly and without exceptions.

Second, data protection and privacy safeguards must be institutionally strengthened. The effective functioning of the Data Protection Board of India should be ensured through independence, adequate resources, and transparent procedures. Stronger penalties and compliance incentives should be imposed on data fiduciaries that misuse personal data or fail to prevent breaches. Given the growing role of AI and algorithmic profiling, future reforms should explicitly regulate automated decision-making, platform transparency, and user consent in relation to targeted advertising and political messaging.

Third, regulatory attention should shift from purely content-centric control to system-centric governance. This includes mandating algorithmic accountability, independent audits of content-moderation practices, and disclosure of platform risk-assessment mechanisms. Such an approach would address the structural drivers of misinformation and polarization rather than merely suppressing individual posts.

Fourth, digital literacy and civic education must be treated as essential public goods. Users should be empowered to critically evaluate online content, recognize misinformation, and protect their digital privacy. Educational institutions, civil society organizations, and media bodies should collaborate in developing nationwide digital awareness programmes, particularly in regional and rural contexts.

Lastly, the judiciary should keep up with its proactive but at the same time, a very careful role in upholding constitutional freedoms in the Internet domain. Courts ought to regularly refer to the proportionality standards, demand procedural fairness, and avoid becoming accustomed to emergency, style measures like long, term internet shutdowns and extensive surveillance.

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TO STUDY WHY AI IS RAPIDLY ADOPTED IN EDUCATION: THE ROLES OF AI RELIANCE, COGNITIVE OFFLOADING, AND ATTITUDES TOWARD AI

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Abstract

Background: The rapid and widespread integration of artificial intelligence (AI) in education has occurred at a pace that exceeds many other educational technologies. While functional advantages of AI are often cited, less attention has been given to the psychological mechanisms that explain why students so readily adopt and continue using AI tools.

Objectives: The present study examined whether reliance on AI tools is associated with cognitive and decision offloading, and whether this reliance is linked to the development of positive attitudes toward AI, and whether these factors are associated with its rapid normalization in educational contexts.

Methodology: A quantitative cross-sectional design was employed using secondary survey data from 540 higher-education students. AI reliance, cognitive offloading, and attitudes toward AI were measured using validated self-report scales. Pearson correlation and linear regression analyses were conducted.

Results: AI reliance was moderately positively correlated with cognitive offloading ($r \approx .37$, $p < .001$) and strongly correlated with attitudes toward AI ($r \approx .65$, $p < .001$). Regression analyses indicated that AI reliance significantly predicted cognitive offloading (explaining approximately 14% of the variance) and attitudes toward AI (explaining approximately 39% of the variance).

Implications: Findings suggest that students who rely more on AI also report greater cognitive offloading and more positive attitudes toward AI. This pattern is consistent with the idea that when AI makes academic tasks feel easier and more manageable—and students repeatedly experience it as helpful—it may reinforce favorable views of AI and help it become a routine part of educational practice.

Keywords: Artificial Intelligence in Education; AI Reliance; Cognitive Offloading; Attitudes toward AI; Higher Education.

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Introduction

Artificial intelligence (AI) has rapidly moved from a supplementary educational aid to an increasingly embedded component of students' academic practices in India. Generative text tools, automated problem solvers, and recommendation-based platforms are increasingly used for writing, studying, information searching, and making academic decisions. This growth has occurred alongside national initiatives such as Digital India and the National Education Policy

(NEP) 2020, both of which emphasize digital competence, technology-enabled learning, and future-ready skills. Recent national reporting suggests that AI is already being normalized at the institutional level: over 60% of higher-education institutions (HEIs) in India permit student use of AI tools, more than half report using generative AI to develop learning materials, and roughly 40% report deploying AI-based tutoring systems or chatbots (Ernst & Young–FICCI, 2025). Taken together, these trends indicate that AI is no longer peripheral to Indian higher education; it is becoming part of the mainstream learning environment.

Beyond institutional adoption, student engagement with AI appears to be increasing in both frequency and scope. India is often described as a high-engagement market for AI tools, and national-level summaries suggest that around two-thirds of Indians report using AI-enabled technologies in everyday activities—covering productivity and learning-related contexts (India Brand Equity Foundation [IBEF], 2024). Surveys conducted within Indian higher-education settings further suggest that many students use AI tools multiple times per week for academic tasks and view AI-related skills as critical for future employability (Economic Times Education, 2025). As AI becomes easier to access and more widely permitted in academic settings, a key question becomes less about whether students will use AI and more about why it becomes so easy to rely on it—and what psychological mechanisms sustain continued use.

Explanations for AI adoption in education often emphasize practical benefits such as speed, accessibility, and improved output quality. However, these accounts are largely technological and do not fully capture why AI use becomes sustained and habitual among students. Work on generative AI in education highlights this dual reality: AI can support learning through scaffolding and feedback, yet it may also encourage overreliance, reduce independent work, and reshape assessment practices (Kasneci et al., 2023). To understand rapid uptake more thoroughly, a psychologically grounded account must examine the cognitive mechanisms through which AI reduces perceived effort and becomes integrated into students' habitual academic routines.

One mechanism that is especially relevant is cognitive offloading, defined as delegating internal cognitive processes—such as remembering, reasoning, or deciding—to external tools (Risko & Gilbert, 2016). Research on everyday digital technologies suggests that people often offload cognition strategically because it conserves mental effort and helps them perform tasks under time or cognitive constraints (Risko & Gilbert, 2016). Over time, however, frequent reliance on external aids can also shift how people approach thinking and remembering. For example, work on digital search shows that easy access to information can change memory strategies and reliance on external sources (Sparrow et al., 2011). Similarly, evidence from smartphone use suggests that people often use devices to “supplant thinking” in practical, real-life situations (Barr et al., 2015). These findings provide a strong basis for asking whether AI—because it can generate complete answers, explanations, and drafts—may intensify this offloading tendency in higher education.

AI differs from earlier tools in a critical way: it does not simply store information; it can produce content and suggestions that may replace parts of a student's cognitive work. This makes AI reliance—habitual dependence on AI for academic tasks—an important behavioral variable to study. If students increasingly lean on AI for writing, idea generation, and decision support, they may also be more likely to delegate cognitive effort to AI systems (i.e., cognitive offloading). At the same time, repeated successful experiences with AI may strengthen attitudes toward AI. Technology acceptance research has long shown that perceived usefulness and ease of use shape attitudes and intentions to continue using a system (Davis, 1989), and broader models of acceptance emphasize that positive performance experiences and enabling conditions reinforce sustained adoption (Venkatesh et al., 2003). In practical terms, when students feel that AI makes

tasks easier and more manageable, they may develop more favorable evaluations of AI—helping explain why AI adoption feels “fast” and persistent.

Despite the relevance of these mechanisms, much of the existing research examines either attitudes toward AI or cognitive consequences of digital tools separately. There remains limited large-sample evidence that integrates AI reliance, cognitive offloading, and attitudes toward AI within a single explanatory framework, particularly in Global South higher-education contexts that are comparable to India in terms of rapid technology uptake and policy emphasis on digital learning. Addressing this gap is important for building a psychologically grounded account of why AI is becoming embedded in education so quickly.

Accordingly, the present study examines whether greater reliance on AI tools is associated with increased cognitive offloading and more positive attitudes toward AI in educational contexts. Although the analysis uses secondary survey data from students studying in higher education, the psychological mechanisms under investigation are discussed for their relevance to Indian higher education given structural similarities in AI adoption and the broader policy push toward technology-enabled learning.

Based on cognitive offloading theory and technology acceptance research, the following hypotheses are proposed:

H1: AI reliance will be positively associated with cognitive offloading among higher-education students.

H2: AI reliance will be positively associated with attitudes toward AI in educational contexts.

Methodology

This study used a quantitative, cross-sectional correlational design based on secondary survey data that had originally been collected to understand students’ use of AI in educational settings. The dataset was publicly available, fully anonymized, and contained no personally identifiable information. For the present paper, the data were reanalyzed to focus specifically on AI reliance, cognitive offloading, and attitudes toward AI. Because the data were collected at a single point in time, the goal was to identify patterns of association rather than make causal claims.

Participants

The sample consisted of 540 higher-education students enrolled in undergraduate and postgraduate programs. Participants represented a broad range of academic backgrounds, including science, social sciences, education, economics, languages, and arts, allowing the analysis to reflect diversity in disciplinary exposure and learning environments. As the dataset was anonymized, individual-level identifying characteristics were not accessible. However, the available demographic information indicated that respondents were drawn from multiple disciplinary streams and levels of study. All participant records were anonymized prior to the present analysis.

Measures

AI Reliance: AI reliance was assessed using a multi-item self-report scale designed to capture habitual and performance-oriented dependence on AI tools in academic settings. Items reflected the extent to which students rely on AI for completing educational tasks such as drafting written work, generating ideas, organizing content, and supporting academic decision-making (e.g., choosing how to approach an assignment). Responses were recorded using a Likert-type format, with higher scores indicating greater reliance on AI tools. In the current sample, the scale

demonstrated excellent internal consistency (Cronbach’s $\alpha = .95$), indicating that the items measured a coherent underlying construct.

Cognitive Offloading: Cognitive offloading was conceptualized as the tendency to shift cognitive effort (thinking, evaluating, deciding) from the individual to an external tool—in this case, AI systems. In the dataset, cognitive offloading was operationalized using a focused self-report item capturing the extent to which students rely on AI as a substitute for independent cognitive effort. This approach was used to measure a direct and unidimensional indicator of offloading awareness in the context of AI use. Scores were interpreted as perceived reliance on AI for carrying cognitive or decision-related workload.

Attitudes Toward AI: Attitudes toward AI were measured using a multi-item self-report scale assessing students’ evaluative responses to AI use in education. Items captured perceptions of AI as helpful, acceptable, and favorable for academic tasks, reflecting both evaluative and affective components of attitude. Responses were recorded on a Likert-type scale, with higher scores indicating more positive attitudes toward AI. The scale demonstrated good internal consistency in the present sample (Cronbach’s $\alpha = .79$), supporting its use for assessing attitudinal variation across participants.

Data Preparation and Analysis: Only variables relevant to the current research questions were extracted for analysis. Data were checked for missing responses and potential outliers before running the main analyses. All analyses were conducted in SPSS. Descriptive statistics were calculated to summarize the study variables. Pearson correlations were used to examine bivariate relationships among AI reliance, cognitive offloading, and attitudes toward AI. Linear regression analyses were then conducted to test whether AI reliance significantly predicted cognitive offloading and attitudes toward AI. Given the cross-sectional nature of the dataset, findings were interpreted as associational rather than causal.

Results

Table 1: Pearson Correlations Among AI Reliance, Cognitive Offloading, and Attitudes Toward Using AI

		AI_Reliance	Cognitive_Offloading	Attitude_Toward_Using_AI
AI_Reliance	Pearson Correlation	1	.377**	.624**
	Sig. (2-tailed)		.000	.000
	N	540	540	540
Cognitive_Offloading	Pearson Correlation	.377**	1	.252**
	Sig. (2-tailed)	.000		.000
	N	540	540	540
Attitude_Toward_Using_AI	Pearson Correlation	.624**	.252**	1
	Sig. (2-tailed)	.000	.000	
	N	540	540	540

Note. ** Correlation is significant at the 0.01 level (2-tailed).

Table 2 Simple Linear Regression Predicting Cognitive Offloading From AI Reliance

Predictor	B	SE B	t	p	95% CI for B
Intercept	2.20	0.21	10.64	< .001	[1.79, 2.61]
AI Reliance	0.33	0.04	9.43	< .001	[0.26, 0.40]

Note. Model fit: $R = .377$, $R^2 = .142$, adjusted $R^2 = .142$, $F(1, 538) = 89.04$, $p < .001$.

Table 3 Simple Linear Regression Predicting Cognitive Offloading From AI Reliance

Predictor	B	SE B	β	t	p
Intercept	2.20	0.207	—	10.64	< .001
AI Reliance	0.329	0.068	.204	4.84	< .001

Note. Dependent variable = Cognitive Offloading. Model fit: $R = .204$, $R^2 = .042$, adjusted $R^2 = .040$, $F(1, 538) = 23.45$, $p < .001$.

Pearson product–moment correlations were used to examine the relationships among AI reliance, cognitive offloading, and attitudes toward AI. The pattern was consistent and in the expected direction. Students who reported higher reliance on AI also reported higher levels of cognitive offloading, reflected in a moderate positive association ($r = .377$, $p < .001$). In practical terms, this suggests that as AI becomes a more regular part of students’ academic workflow, there is a parallel tendency to hand over more cognitive effort—such as planning, thinking through steps, or deciding—to AI tools. AI reliance was also strongly and positively related to attitudes toward AI ($r = .624$, $p < .001$), indicating that students who rely more on AI tend to evaluate it more favorably. Cognitive offloading was positively associated with attitudes as well, though the relationship was weaker ($r = .252$, $p < .001$), suggesting that offloading and positive evaluation overlap but are not the same psychological process.

To examine whether AI reliance predicts differences in cognitive offloading, a simple linear regression was conducted with cognitive offloading as the dependent variable and AI reliance as the predictor. The overall model was statistically significant, $F(1, 538) = 89.04$, $p < .001$. AI reliance explained 14.2% of the variance in cognitive offloading ($R^2 = .142$, adjusted $R^2 = .141$), indicating a meaningful—though not exhaustive—contribution to students’ tendency to delegate cognitive effort to AI. At the coefficient level, AI reliance emerged as a significant positive predictor of cognitive offloading $B = 0.33$, $SE = 0.04$, $t(538) = 9.43$, $p < .001$, showing that increases in reliance corresponded to higher offloading scores.

A second regression analysis tested whether AI reliance predicts attitudes toward AI. The overall model was statistically significant, $F(1, 538) = 342.42$, $p < .001$, indicating that AI reliance was a strong predictor of attitudes. AI reliance explained a substantial proportion of variance in attitudes, $R = .624$, $R^2 = .389$, adjusted $R^2 = .388$. At the coefficient level, AI reliance significantly and positively predicted attitudes toward using AI, $B = 0.713$, $SE = 0.039$, $\beta = .624$, $t(538) = 18.51$, $p < .001$, such that higher AI reliance was associated with more favorable attitudes toward using AI. Taken together, the results indicate a clear pattern: AI reliance is significantly associated with both cognitive offloading and attitudes toward AI, but the relationship is considerably stronger for attitudes. This suggests that reliance may be especially important for understanding why AI becomes positively evaluated and normalized, while its link to cognitive offloading—although meaningful—appears more modest and likely influenced by additional factors beyond reliance alone.

Discussion

The present study examined whether students' reliance on AI tools is associated with cognitive offloading and attitudes toward AI, with the broader aim of clarifying why AI appears to be normalizing quickly in higher education through psychological mechanisms rather than purely technological explanations. The findings showed a coherent and theoretically interpretable pattern: higher AI reliance was associated with higher cognitive offloading and, more strongly, with more positive attitudes toward AI. Cognitive offloading also demonstrated a positive association with attitudes, although this relationship was comparatively weaker. Taken together, these results suggest that rapid normalization is closely aligned with how AI becomes embedded in students' everyday academic routines—both as a cognitive support and as a positively evaluated tool.

The association between AI reliance and cognitive offloading is consistent with cognitive offloading theory, which characterizes offloading as the strategic delegation of internal cognitive processes (e.g., remembering, reasoning, deciding) to external supports when doing so reduces mental effort and supports task completion (Risko & Gilbert, 2016). Within higher education, where students routinely manage competing deadlines, complex learning material, and performance pressure, technologies that reduce cognitive demands may become integrated into habitual workflows. The present pattern is also consistent with earlier findings indicating that external information systems shape how cognitive effort is allocated. Research on the “Google effect” shows that when people expect to have ongoing access to information, they tend to focus less on remembering the information itself and more on remembering how to find it (Sparrow et al., 2011). Likewise, studies of smartphone use indicate that people frequently rely on their devices as cognitive substitutes when they offer quick and efficient solutions (Barr et al., 2015). Generative AI extends these possibilities further by not only providing access to information but also producing drafts, explanations, and structured responses. From this perspective, the observed link between AI reliance and cognitive offloading may reflect a broader shift toward digital externalization, in which AI becomes integrated into students' thinking processes, particularly for tasks involving planning, synthesis, and decision-making.

The stronger link between AI reliance and attitudes toward AI offers a clearer psychological account of why AI tools may become quickly normalized in higher education. This pattern aligns with established technology acceptance frameworks. The Technology Acceptance Model proposes that attitudes toward a technology are shaped largely by perceived usefulness and perceived ease of use, which in turn support continued adoption (Davis, 1989). The Unified Theory of Acceptance and Use of Technology similarly emphasizes performance expectancy and facilitating conditions as key correlates of intention and use (Venkatesh et al., 2003). In everyday academic practice, higher reliance on AI likely reflects repeated experiences in which AI is perceived as helpful—saving time, reducing uncertainty, and making tasks feel more manageable. Consistent with these frameworks, repeated experiences of benefit are expected to co-occur with more favorable evaluations. This interpretation is also supported by recent empirical work on university students' adoption of generative AI tools such as ChatGPT, where usefulness and ease-of-use–related beliefs alongside trust and risk-related perceptions are strongly associated with attitudes and continued use (Albayati, 2024; Grassini et al., 2024; Sallam et al., 2024). Overall, the findings are consistent with a reinforcement-oriented pattern in which repeated reliance tends to accompany increasingly positive evaluation, supporting the broader normalization of AI in educational practice.

At the same time, the weaker association between cognitive offloading and attitudes adds an important nuance. Cognitive offloading and positive attitudes overlap, but they do not appear to reflect the same process in the present dataset. One plausible interpretation is that attitudes toward

AI may be shaped more by what students experience directly—speed, clarity, and task completion—than by explicit awareness that cognitive work is being delegated. This interpretation is compatible with research on metacognitive experiences showing that subjective difficulty can influence how people engage with tasks and evaluate cognitive effort (Alter et al., 2007). When a tool reduces perceived effort and increases task fluency, positive evaluation may follow even if the cognitive trade-off is not explicitly recognized as “offloading.” In this sense, AI reliance may function as a more proximal marker of the usage–evaluation loop, whereas cognitive offloading may represent one cognitive pathway within that broader pattern without being the dominant correlate of attitudes.

These findings also have practical relevance for higher-education contexts where AI use is increasingly visible and where institutions are developing responses to student adoption. If reliance is closely aligned with favorable attitudes, normalization may occur through routine student practice even without formal mandates. This supports the view that educational responses may benefit from focusing less on binary “allow versus ban” debates and more on conditions of responsible integration. Pedagogical strategies such as output verification, justification requirements, documentation of AI use, and brief reflective steps following AI assistance may help preserve learning engagement while acknowledging that many students rely on AI because it feels efficient and useful (Davis, 1989; Venkatesh et al., 2003).

Several limitations should be considered. Because the design is cross-sectional and correlational, the findings do not establish directionality between reliance, offloading, and attitudes, and causal inference is not supported. The measures were self-report, capturing perceived patterns rather than directly observed cognitive behavior. The secondary-data approach also constrained the set of theoretically relevant constructs available for modeling, such as academic self-efficacy, perceived workload, metacognitive awareness, or assessment context. Accordingly, the findings should be interpreted as associations within this sample, and generalization to other student populations and educational settings requires replication.

Future research would benefit from longitudinal designs that track how AI reliance, attitudes, and offloading-related behaviors change over time, alongside experimental or quasi-experimental studies that examine whether varying access to AI is associated with differences in verification behavior, independent retrieval, persistence on challenging tasks, and performance without AI support. Incorporating behavioral indicators in addition to self-report measures would strengthen inference, and replication across diverse institutional contexts and student populations would help clarify the extent to which these patterns generalize and inform more context-sensitive educational recommendations.

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A STUDY ON SOCIAL MEDIA INFLUENCE ON BUYING DECISIONS OF CONSUMERS IN MUMBAI

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Abstract

In recent years, digital technologies have reshaped how consumers gather information and make purchase decisions, with social media becoming one of the most powerful influences in this process. Social networking platforms such as Instagram, Facebook and YouTube have evolved from simple communication tools into important spaces where brands, influencers and consumers continuously interact. Consumers are exposed to a stream of posts, advertisements, reviews and recommendations that create impressions about products and services long before they reach an e-commerce site. Within this environment, the buying decision is rarely based only on product features and price; instead, it is formed through a combination of social signals, visual content and peer feedback. This study seeks to understand how social media affects buying decisions of consumers in Mumbai who shop online, focusing on different stages of the decision-making process from recognition of need and information search to evaluation, purchase and post-purchase feedback. Primary data was collected from 100 active social media users of Mumbai who also make online purchases. A structured questionnaire was circulated through an online form to gather data on demographics, time spent on social media, preferred platforms, types of content followed, and perceived influence of reviews, influencers and advertisements on purchase decisions. Secondary information from academic literature and recent industry reports was also used to support and interpret the survey findings. The analysis of responses indicates that a large share of the sample depends on social media for discovering new products, checking reviews and comparing alternatives before buying. User-generated content, including ratings, comments and unboxing or review videos, was found to play an important role in creating trust and reducing uncertainty. Many respondents reported that posts by influencers or creators they follow guide them when choosing brands, particularly in categories related to fashion, beauty, technology and lifestyle. Promotional messages such as limited-time offers, discount codes and visually appealing advertisements also encouraged users to visit e-commerce platforms and, in several cases, to make unplanned purchases. However, the respondents also recognised potential drawbacks of relying heavily on social media. Concerns were expressed about misleading or paid reviews that are not clearly disclosed, exaggerated claims in advertisements and the difficulty of identifying genuine experiences. A significant number of participants mentioned worries about data privacy and targeted advertising based on their browsing and interaction history. Overall, the findings suggest that social media has a meaningful impact on both the likelihood and pattern of online purchases. On this basis, the study rejects the assumptions that social media has no influence on buying decisions and no connection with online purchase frequency. The results highlight the need for ethical and transparent practices by marketers and for more careful, informed decision-making by consumers when using social media as a buying guide.

Keywords: Digital Age, Social Media, E-Commerce, Data Privacy.

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Introduction:

E-Commerce and the Digital Age

Rapid improvements in internet infrastructure, smartphones and online payment systems have shifted commerce from physical stores to digital platforms. Consumers today can search for products, read specifications and place orders at any time, without having to visit a shop in person. E-commerce websites and apps offer a wide variety of goods, competitive pricing and home delivery, making online shopping a normal part of daily life for many people. These platforms are now increasingly linked to social media through product tags, 'buy now' buttons and integrated shops, turning social spaces into shopping gateways.

Social Media and Modern Consumers

Social media enables people to share photos, videos, opinions and experiences with their networks instantly. For consumers, this constant flow of content becomes an important source of ideas and information about what to buy. Many studies have shown that users, particularly younger generations, actively look at social media posts when searching for product information, reading reviews or seeking style and usage inspiration. Influencers, friends and even strangers contribute to this environment by sharing their experiences and recommendations. As a result, brands are investing heavily in social media marketing to reach and persuade these digitally active consumers.

How Social Media Shapes Buying Decisions

An typical buying decision goes through several stages: recognising a need, searching for information, comparing options, deciding to buy and reviewing the purchase afterwards. Social media touches each of these stages. Product discovery often begins with a post, story or video that attracts the user's attention. During the information search, consumers watch review videos, read comments and ask for opinions in groups or direct messages. When comparing alternatives, they may look at likes, shares, ratings and reviews as indicators of popularity or quality. Finally, purchases are sometimes completed directly through social media links, and feedback is shared back on the same platforms. At the same time, issues such as manipulated reviews, hidden sponsorships and overly personalised ads can create confusion and reduce trust if not managed carefully

Research Problem:

The growing overlap between social media and e-commerce has changed traditional shopping patterns. Decisions that were earlier based mainly on in-store experience, catalogues or basic web searches are now strongly affected by social media content and engagement signals. Yet there is still a need to understand, at the consumer level, how strongly social media shapes buying decisions and which specific elements are most influential

This study, therefore, focuses on consumers who are active on social media and also purchase products online. It aims to find out:

- To what extent social media activity contributes to product awareness, evaluation and final purchase.
- Which types of social media content (peer reviews, influencer posts, advertisements, brand pages or friends' posts) are perceived as most persuasive.

- How consumers view the benefits and the risks of depending on social media when deciding what to buy.

Objectives of the Study:

1. To analyse the influence of social media at different stages of the online consumer buying decision process in Mumbai.
2. To identify the social media features – such as influencer marketing, peer reviews and targeted advertisements – that most strongly affect buying decisions in Mumbai.
3. To examine the link between intensity of social media use and the frequency of online purchases in Mumbai.
4. To understand consumers’ views on the advantages and disadvantages of using social media as a basis for purchase decisions in Mumbai.

Hypothesis:

Hypothesis 1

H₀: Social media has no significant impact on consumer buying decisions in the digital era.

H₁: Social media has a significant impact on consumer buying decisions in the digital era.

Hypothesis 2

H₀: The extent of social media use does not affect the frequency with which consumers purchase products online.

H₁: The extent of social media use affects the frequency with which consumers purchase products online.

Limitations of the Study:

- The research covers only 100 respondents of Mumbai who regularly use social media and shop online; findings may not reflect the behaviour of all consumer groups.
- Information is based on self-reported responses, which may be affected by memory lapses or the tendency to give socially acceptable answers.
- The focus is mainly on popular platforms such as Instagram, Facebook and YouTube, and therefore does not fully capture the influence of every social media platform.
- The study is conducted at one point in time and does not track how behaviour might change over a longer period.

Methodology:

The research design combines descriptive and analytical elements. A descriptive approach was used to profile respondents and document their patterns of social media use and online purchasing. Analytical elements are used to explore the relationship between social media factors and buying decisions.

Primary data was gathered using a structured questionnaire distributed online to 100 active social media users in Mumbai who also make online purchases. The questionnaire included questions on demographic information, daily time spent on social media, preferred platforms, exposure to reviews, influencers and advertisements, and perceived impact on purchase decisions.

Secondary data was collected from books, journal articles, conference papers and credible websites that discuss social media marketing, social commerce and consumer behavior. The collected primary data was compiled and analysed using percentage distributions and tables to interpret the patterns and test the stated hypotheses

Data Analysis and Interpretation:

Empirical observations related to the influence of social media on buying decisions are presented below.

Table I: Profile of Respondents

Variables	Classification	Frequency	Percentage
Age	18–24	40	40
	25–34	38	38
	35–44	17	17
	45 and above	5	5
	Total	100	100
Gender	Male	52	52
	Female	48	48
Education	Undergraduate	46	46
	Postgraduate	44	44
	Others	10	10
	Total	100	100

Table I: Interpretation

- Most respondents are young adults: 40% fall in the 18–24 group and 38% in the 25–34 group, indicating that the sample is dominated by individuals who are typically heavy users of social media and e-commerce.
- The gender split is almost even, with 52% male and 48% female, allowing perspectives from both groups to be represented.
- A high proportion of respondents have at least undergraduate or postgraduate education, which suggests a user base that is comfortable with digital technologies and online search.

Hypothesis 1:

H₀: Social media has no significant impact on consumer buying decisions in the digital era.

H₁: Social media has a significant impact on consumer buying decisions in the digital era.

Table II: Consumers’ Opinion on Social Media and Buying Decisions

Variable	Classification	Frequency	Percentage
Social media helps you discover new products	Yes	76	76
	No	8	8
	Sometimes	16	16
	Total	100	100
Reviews/comments on social media influence your purchase decision	Yes	72	72
	No	10	10
	Sometimes	18	18
	Total	100	100
Influencer posts affect your choice of brand or product	Yes	58	58
	No	22	22
	Sometimes	20	20
	Total	100	100

Social media advertisements encourage you to visit shopping sites or apps	Yes	65	65
	No	15	15
	Sometimes	20	20
	Total	100	100
You have purchased products directly through links or shops on social media	Yes	54	54
	No	26	26
	Sometimes	20	20
	Total	100	100

Table II: Interpretation

- More than three-quarters of respondents state that social media helps them find new products, showing that discovery is heavily influenced by what they see online.
- A clear majority accept that reviews and comments on social media affect their decision to buy, underlining the importance of user opinions and conversations in shaping choices.
- Over half of the respondents indicate that influencer content affects their brand or product selection, and another group sometimes feels influenced, indicating that creators and influencers are key opinion leaders for many consumers.
- Most respondents agree that social media advertisements motivate them to visit shopping platforms, demonstrating that promotional campaigns successfully drive traffic to e-commerce sites.
- A substantial proportion have already purchased via links or in-platform shops on social media, confirming that social commerce features are actively used.

These patterns collectively indicate that social media plays a significant role in the buying decision process, leading to rejection of H_0 and acceptance of H_1 .

Hypothesis 2:

H₀: The extent of social media use does not affect the frequency with which consumers purchase products online.

H₁: The extent of social media use affects the frequency with which consumers purchase products online.

Table III: Consumers’ Opinion on Social Media Usage and Purchase Behavior

Variable / Classification	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total
I buy more frequently online after following brands/influencers on social media	26 (26%)	32 (32%)	20 (20%)	15 (15%)	7 (7%)	100 (100%)
Social media offers and promotions encourage me to make impulse purchases	24 (24%)	36 (36%)	18 (18%)	14 (14%)	8 (8%)	100 (100%)

I compare products and prices on social media before buying online	30 (30%)	38 (38%)	16 (16%)	10 (10%)	6 (6%)	100 (100%)
Social media has changed the way I choose brands and products	28 (28%)	40 (40%)	16 (16%)	10 (10%)	6 (6%)	100 (100%)

Table III: Interpretation

- A combined 58% of respondents (strongly agree plus agree) feel that they purchase online more frequently after following brands or influencers, indicating a link between engagement with social media accounts and buying frequency.
 - A similar proportion state that promotions and offers seen on social media lead them to make impulsive purchases, highlighting the power of limited-time deals and visually persuasive posts.
 - The majority compare products and prices through social media before making a purchase, confirming that these platforms are used as an information and comparison tool rather than only for entertainment.
 - Most respondents accept that social media has changed how they select brands and products, reflecting a shift from traditional sources of information to digital and social cues.
- These responses suggest that the level of social media involvement is associated with changes in how often and how consumers shop online. Hence, H0 is rejected, and H1 is accepted.

Findings:

- Social media is a major source of product discovery, and many consumers first learn about brands and items through posts, stories, reels or videos rather than through traditional advertising in Mumbai.
- Opinions shared via reviews, ratings and comments strongly influence purchasing behavior, as consumers rely on the experiences of others to reduce uncertainty and perceived risk in Mumbai.
- Influencers and content creators significantly shape brand preferences, particularly in lifestyle-related product categories, and many users report acting on their recommendations in Mumbai.
- Advertisements and promotional content on social media not only raise awareness but also drive traffic to e-commerce platforms and, in many cases, lead to direct or impulse purchases in Mumbai.
- Respondents recognise that while social media simplifies comparison of products and prices, it also carries risks such as biased or fake reviews, hidden sponsorships and information overload in Mumbai.
- Concerns about data privacy and targeted advertising are present, suggesting that trust in platforms and brands depends partly on how responsibly personal information is handled.

Conclusion:

The study shows that social media in Mumbai has become a powerful determinant of consumer buying behavior in the e-commerce environment. It affects how consumers discover products, gather information, evaluate alternatives and ultimately decide what to purchase. The evidence from the sample contradicts the idea that social media has no significant effect on buying behavior or purchase frequency. Instead, it supports the view that social media engagement and content exposure are closely linked with changes in both the nature and frequency of online shopping.

At the same time, the findings draw attention to the need for greater transparency and responsibility in social media marketing, especially regarding endorsements, reviews and use of personal data. Consumers also need to approach social media content with a critical mindset, balancing the convenience and rich information available with an awareness of potential bias and manipulation.

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IMPACT OF ARTIFICIAL INTELLIGENCE ON ACCOUNTING ACCURACY AND REAL TIME FINANCIAL ANALYSIS

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Abstract

The integration of technology and Artificial Intelligence (AI) has significantly transformed accounting practices in recent years. Traditional accounting tasks, which were once time-consuming and prone to human error, are now being automated through advanced software and AI tools. Automation helps in data entry, reconciliations, and calculations, reducing mistakes and improving the accuracy and reliability of financial information. AI also enhances the efficiency of accounting processes by enabling real-time financial analysis. Organizations can generate accurate financial reports faster and use predictive analytics to forecast future financial trends. This allows decision-makers to respond quickly to changes, make informed strategic choices, and improve overall organizational performance. Moreover, AI tools help in detecting errors and inconsistencies that might be overlooked in manual processes. Financial forecasting and planning have become more precise, and reporting processes are more consistent and trustworthy. As a result, accountants are shifting from routine transactional work to more analytical and advisory roles, focusing on interpreting AI insights and providing value-added recommendations. Despite these benefits, the adoption of technology and AI comes with challenges. Organizations must ensure data privacy and security, integrate AI tools with existing systems, and train staff to effectively use these technologies. Over-reliance on AI without proper oversight could lead to missed irregularities or unusual financial events. With proper implementation, training, and monitoring, AI can be a powerful tool that supports accountants in performing their work more effectively while allowing them to focus on strategic and value-driven tasks.

Keywords: Artificial Intelligence, Predictive Analytics, Value Added Recommendations, Value Driven Tasks.

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Introduction:

The rapid expansion of big data technology and deep learning technology has brought about an avalanche of advanced artificial intelligence (AI) technology throughout the world. The age of AI has offered systematic and data-driven enhancements of operation methods across industries. In addition, it provides an unprecedented impact on the traditional accounting industry. As artificial intelligence (AI) emerged to its new ascendancy, it brought the concept of intelligence and automation into traditional accounting, enabling traditional accounting to leave traditional work boundaries and actively evolve into the realm of intelligent accounting. The Artificial Intelligence systems can process vast quantities of data sources, look for trends, predict future events with ease, separate and harmonize structured and unstructured data, and complete tasks such as inputting

data, matching the details of transactions and preparing reports. The goal of Artificial Intelligence study is knowledge representation, planning, natural language processing, learning, reasoning, realization and the ability to move and manipulate objects. Artificial intelligence is making a significant impact on accounting. Over the last few decades or so, Artificial Intelligence (AI) has seen a rapid growth in research and development of this category, from saving time and money; as well as providing insights. Despite the fact that many of these fields, such as accounting, expert systems, natural language processing and AI, speech recognition, computer vision and robotics have made great headway; nevertheless, some major problems will never get resolved. Nowadays world businesses are accepting and implementing technology such that they put a top position on doing business. One of those operations is accounting. This is because artificial intelligence has brought positive results like increased productivity, improved precision and reduced prices at scale. With so many advantages, Artificial Intelligence has mainly been used for accounting and the administration, causing a number of structural changes. By the means of Regulation and Ethical considerations to be applied for the field, both advantages and disadvantages are involved when using AI Technologies in the Accounting sector. This review will explore the profound effects of AI on accounting based on how AI automation affects the accuracy and trustworthiness of accounting work and explore the role of AI on real-time financial analysis and forecasting. AI removes some of the manual routine work like data entry and reconciliation, allowing Accountants to focus more on high order tasks such as analytical input and strategic planning for their clients - which lowers errors during the work done by the accountants.

Review of Literature:

Alruwaili, T. F., & Mgamal, M. H., (2025) highlights that AI can enhance operations, solve complex problems and combat fraud. It's going to take focused educational initiatives and regulation to implement it well. And in a broad sense, when this happens, it is crucial that ethical considerations be taken into account in order to manage risks such as algorithmic biases, job loss, and integrity, among others. It highlights the need for experts in promoting the market change of positive action in business.

Majumder, R. Q. (2025) : Financial professionals are looking to re-imagine their cost management system by adopting digital tools. Such knowledge might help organizations have wise investments and forge a strong technology driven-financial potential for the future strength of the technology-induced financial sustainability of the organisation.

Asuquo, A. I., and Udoayang, J. O. The present study recommends owners and managers of SMEs to train their employees in using the accounting software designed by IT experts and developed by information technology experts in the timely recording of accounting reports, or financial statements, based on the results and findings of the study in a timely manner, to assist in decision-making.

Kroon, N. et.al. This paper adds one voice to the fragmented narratives about the impact of contemporary technological advancements on the positions of an accountant and the skillset of past literature (i.e., this paper provides a unified analysis of the effects with respect to the new skills that are recently emerge).

Khan, A. A., et. al (2025) explored the ethical considerations regarding the use of AI in accounting in Rwanda such as, data privacy and fair use of data, and transparency. According to this study, from interviews with the relevant accountants, regulators, and technology professionals — as of 2024 — 75% of accountants currently using technology are stating improvements in efficiency, cost/efficiency, and accuracy resulting from the use of AI. These increases were 80%, 70%, and

85%, respectively. Besides the efficiency, researchers have demonstrated a rise in the ethical concern (75%) around privacy of data and perception of reliability, with 50% likely to be biased algorithms in the use of those algorithms. A strong association of 0.89 indicates a correlation with AI, levels of trust in public, and ethical issues, some of which need to be addressed.

Celestin, M. (2024) Ethical challenges related to AI in accounting may arise as a result of this, However, potential solutions for the field could include ethical education, regulatory enforcement, fair artificial intelligence access, and enhancement of awareness of technology used by the public. Yi Ziwei et. al (2023) stress the rapid advancement of artificial intelligence (AI) technologies provide innovative technical solutions for aged accounting and finance issues. Unfortunately, accounting and finance researchers have had difficulties exploring AI's wide and multidimensional content knowledge, and the rapid development of its literature.

Leitner-Hanetseder, et. al (2021) claim that Accounting will also change through a change under the implementation of the adoption of new smart technologies and big data (smart) and big data driven technologies that will change duties and require new qualifications and demands of upgrading the qualification, new forms of collaboration and interaction (i.e., human-machine interaction), in other words, human-machine interactions, which will involve new systems and competences. This also provides us with particular scope for an opportune opportunity to imagine a future of the tasks and skills needed for intrafirm professional occupations in accounting, in the form of a professional occupations in accounting.

Talal Fawzi alruwaili & Mahfoudh Hussein Mgamal (2025) discovered that the human resources departments need to establish training programs for accounting personnel for using new technologies and the applications of AI-based tools. Cybersecurity tools can help in ensuring the security of accounting data by preventing fraud. The deployment of artificial intelligence in accounting requires clear guidelines and ethics, training programs, and sustainability frameworks to create the best ROI for AI in the field.

Tsiligiris, V., & Bowyer, D. (2021) this article analyzes the broader qualities that represent the employability for accounting graduates in a 4IR and post-COVID-19 job opportunities environment. This entails the study of the changes in role of accountants and the impact for universities as a lens of analysis in discussions of shared skills patterns found among accounting graduates discussed in the previous section.

Bakarich, K. M., & O'Brien, P. E. (2021) in the next five years, they expected to adopt AI in their daily tasks, and public accountants will be very likely to follow its course. Many of the large-scale AI adoption has not yet come into public accounting, but change is coming.

Research Methodology:

a) Research Problem:

A lot of accounting firms are caught out in the flood and are finding it difficult to adapt to the rapid pace of technological and AI advancements. Although these tools may automate routine tasks, cut errors and speed up reporting, many accountants are not completely trained to work with them. This results in a divide between the analogue and the digital systems of accounting. This means that companies are also confronted with issues ranging from data security threats, extensive costs of implementation and anxiety in employees about losing their livelihoods. The importance of knowledge to learn how technology and AI is transforming the way organisations structure their day-to-day work as being relevant for organisations can offer organisations the way they need to in order to grow and maintain the latest technology

b) Research Objectives:

- 1) To assess how AI and automation influence the accuracy and reliability of accounting work.
- 2) To investigate the contribution of AI to real-time financial analysis and forecasting.

c) Research Design:

The objective of this research was to assess the impact of various technologies and artificial intelligence on the accounting profession. This study aims to examine how cloud-based solutions, AI-powered software and state-of-the-art audit technology are redefining accountants' role. It will therefore ascertain the benefits, drawbacks and potential impacts of technology and AI on accounting-based profession in the future.

d) Sampling Design:

Sampling frame: The researcher has tried to collect the data from the people employed particularly from the IT Sector

Sample size: The researcher has collected nearly 90 to 100 number of responses, but only 94 number of data was complete and useful for data analysis. However, the researcher has made utmost effort to reach an appropriate result.

Sampling technique: The researcher has used purposive sampling method to collect the data through the questionnaire in order to collect relevant and thoughtful data.

e) Data Collection Methods

Primary Data: The researcher has collected the data through questionnaire covering all the respondents working as accountant.

Secondary Data: Books, journals, reports, websites, government publications.

Scope of the Study:

The scope of the research lies on exploring what role artificial intelligence and automation play in improving the accuracy and reliability of accounting processes. It discusses how AI-powered solutions minimize human errors, enhance consistency of data, and fortify financial reporting systems. It goes on to discuss how AI can create opportunities for real-time financial analysis and forecasting as a big data processing system. Focusing on how these technologies facilitate timely decision-making as well as enhance general financial performance in contemporary accounting.

Limitations of the Study:

A common limitation of the study sample is the small sample size not fully representative of the diversity of the population being surveyed. The selection of participants is based on availability and not on randomness, which leads to biases in the sample. The sample may not always be balanced based on age, gender or experience, or other demographics, not allowing the findings to be generalized to the entire population.

To Assess How AI and Automation Influence the Accuracy and Reliability of Accounting Work?

Table No.1.1 Respondent Profile by Gender

Gender	Count of Gender	Percentage %
Female	54	57%
Male	39	42%
Other	1	1%
Grand Total	94	100%

Table no. 1.1 illustrates the gender-wise distribution of the respondents. The data shows that female respondents constitute the largest proportion with 54 participants, while male respondents account for 39 participants. The “Other” category has only one respondent, reflecting very limited representation. Overall, the distribution indicates a higher participation of female respondents in the study.

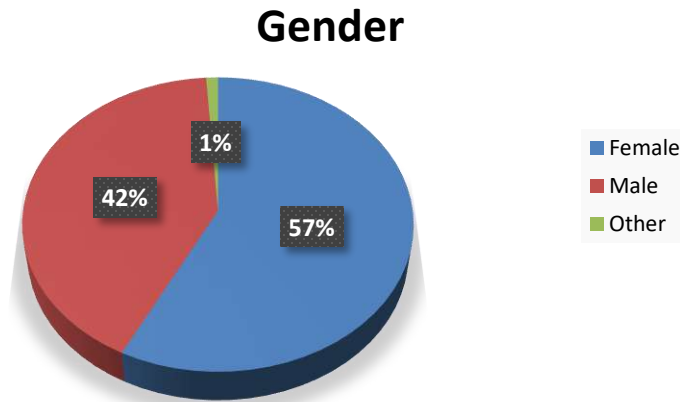


Table No.1.2: Respondent Profile by Employment Type:

Employment Type	Count of Employment Type	Percentage %
Individuals	37	40%
Private	37	39%
Public	15	16%
Sole Proprietor	5	5%
Grand total	94	100%

Table no. 1.2 shows the distribution of respondents by employment type. Most respondents are either individuals or working in private jobs, with 37 each. Public sector employees account for 15 respondents, while only 5 are sole proprietors or writers. Overall, the data indicates that the majority of respondents come from individual or private employment.

Employment Type

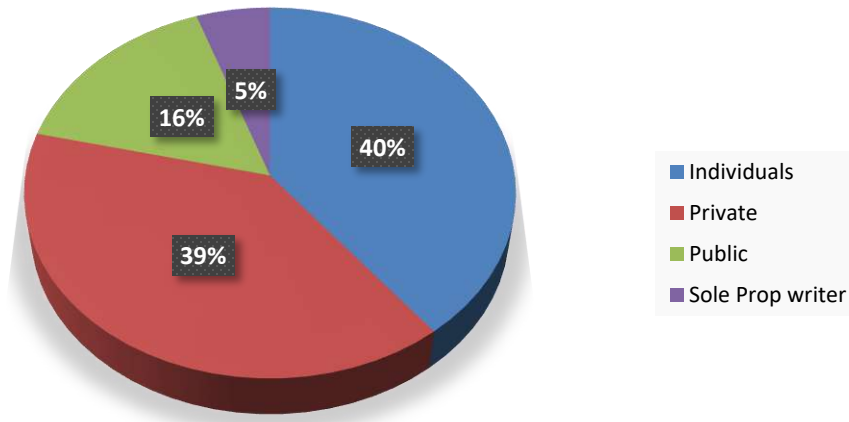


Table No.1.3: Distribution of Respondents by AI Accounting Software

AI accounting software	Do you use any AI accounting software ?	Percentage %
Profit Books	9	10%
Profit Books, Quick Books	2	2%
Quick Books	10	11%
Tally Prime	47	50%
Tally Prime, Profit Books	5	5%
Tally Prime, Quick Books	4	4%
Tally Prime, Zoho Books	12	13%
Zoho Books	5	5%
Grand Total	94	100%

Table no. 1.3 shows the use of AI accounting software among 94 respondents. Most respondents use **Tally Prime** (47), either alone or in combination with other software. **Quick Books** and **Profit Books** are used by fewer respondents, and a small number use **Zoho Books** or combinations of multiple software. Overall, Tally Prime appears to be the most popular AI accounting software.

Count of Do you use any AI accounting software ?

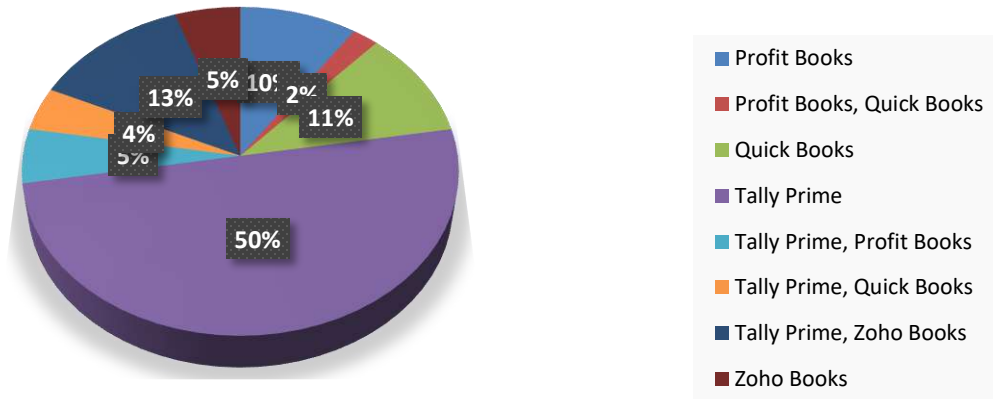
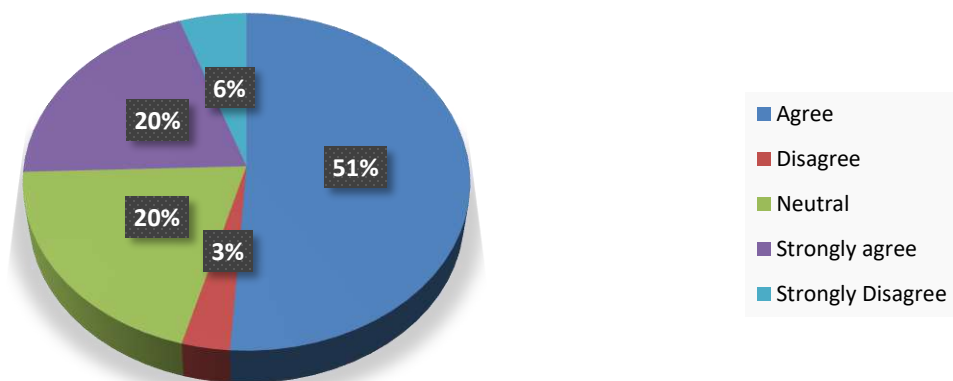


Table no 1.4: Automation enhances the consistency and dependability of financial reporting:

Response Category	Frequency	Percentage %
Agree	48	51%
Disagree	3	3%
Neutral	19	20%
Strongly Agree	19	20%
Strongly Disagree	5	6%
Grand total	94	100%

Table no. 1.4 shows that most respondents have a **positive view**, with many **agreeing or strongly agreeing**. Some respondents are **neutral**, and only a few **disagree or strongly disagree**. Overall, the results indicate a **generally favourable perception** among respondents.

Response Distribution on AI and Automation Accuracy



To Investigate the Contribution of AI to Real-Time Financial Analysis and Forecasting

Table No.2.1: AI and automation improve the overall accuracy of accounting calculations.

Response Category	Frequency	Percentage %
Agree	48	51%
Disagree	22	2%
Neutral	17	18%
Strongly Agree	5	24%
Strongly Disagree	2	5%
Grand total	94	100%

Table no. 2.1 shows that most respondents believe AI and automation improve the accuracy of accounting calculations. A large number of respondents either **agree or strongly agree** with the statement. Some respondents remain **neutral**, while only a few **disagree or strongly disagree**. Overall, the results indicate a **positive attitude** toward the use of AI and automation in improving accounting accuracy.

AI Improving Accounting Accuracy

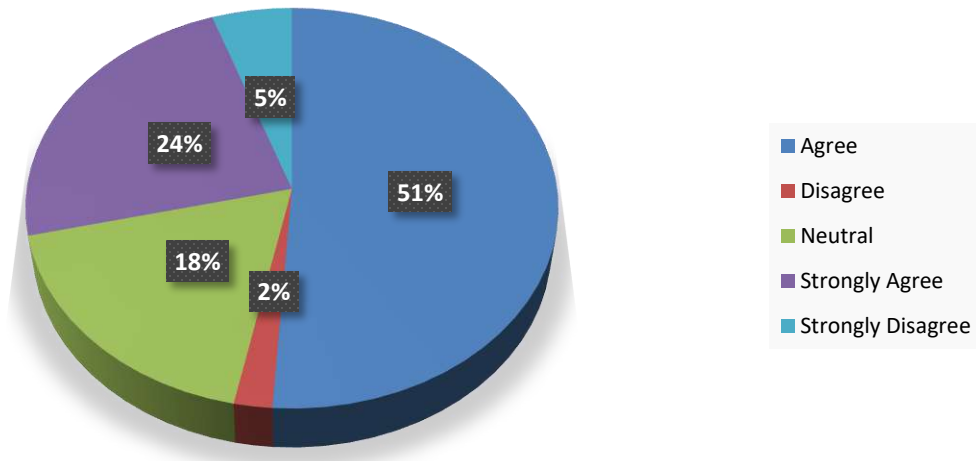


Table no 2.2: Automated accounting systems reduce human error in financial data entry and processing.

Response Category	Frequency	Percentage %
Agree	38	40%
Disagree	7	8%
Neutral	30	32%
Strongly Agree	17	18%
Strongly Disagree	2	2%
Grand total	94	100%

Table no. 2.2 indicates that most respondents have a **positive view** toward the statement, as many respondents **agree or strongly agree**. A noticeable number of respondents are **neutral**, showing mixed or uncertain opinions. Only a small number of respondents **disagree or strongly disagree**. Overall, the results suggest a **generally favourable but moderate level of agreement** among respondents.

Respondents' Opinions on AI and Automation

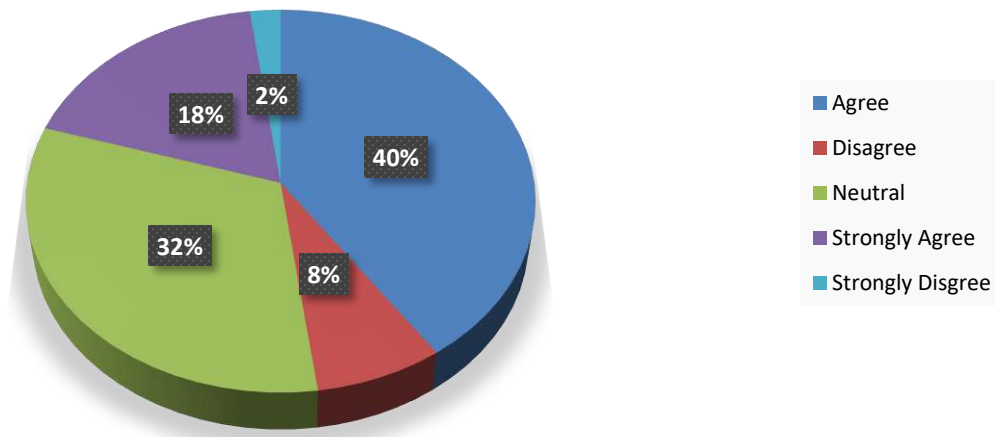


Table no 2.3: The financial reports generated by AI tools are reliable and trustworthy.

Response Category	Frequency	Percentage %
Agree	32	34%
Disagree	11	12%
Neutral	37	39%
Strongly Agree	12	13%
Strongly Disagree	2	2%
Grand total	94	100%

Table no.2.3 shows that respondents have mixed opinions. Many are neutral, while some agree or strongly **agree**, and a smaller number **disagree or strongly disagree**. Overall, the results indicate **varied views** among respondents.

Response Distribution on AI and Automation

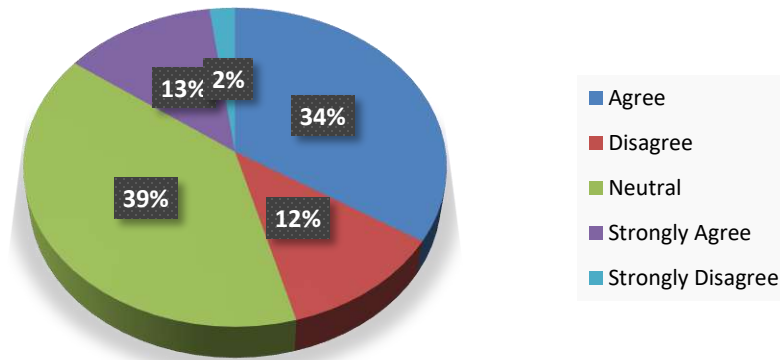


Table no 2.4: To what extent do you agree that AI improves the speed of real-time financial analysis in your organization?

Response category	Frequency	Percentage %
Agree	41	44%
Disagree	2	2%
Neutral	26	28%
Strongly agree	18	19%
Strongly Disagree	7	7%
Total	94	100%

Table no. 2.4 shows that most respondents have a **positive view**. A high number of people **agree (41)** or **strongly agree (18)** with the statement. Some respondents are **neutral (26)**, meaning they do not have a clear opinion. Very few people **disagree (2)** or **strongly disagree (7)**. Overall, the responses indicate a **mostly favourable opinion** toward the statement.

AI Improving Financial Analysis Speed

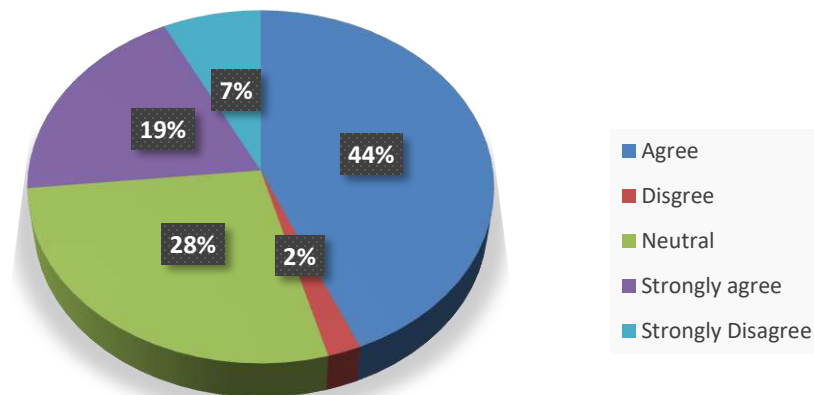


Table no. 2.5: AI tools enhance the accuracy of financial forecasting in comparison to traditional methods?

Response category	Frequency	Percentage%
Agree	36	38%
Disagree	8	9%
Neutral	25	27%
Strongly agree	20	21%
Strongly Disagree	5	5%
Total	94	100%

Table no. 2.5 shows that most respondents have a **positive opinion**. A large number of people either **agree (36)** or **strongly agree (20)** with the statement. Some respondents are **neutral (25)**, showing they are unsure or have no strong opinion. Only a small number **disagree (8)** or **strongly disagree (5)**. Overall, the results indicate a **generally favourable response** toward the statement.

Impact of AI on Forecast Accuracy

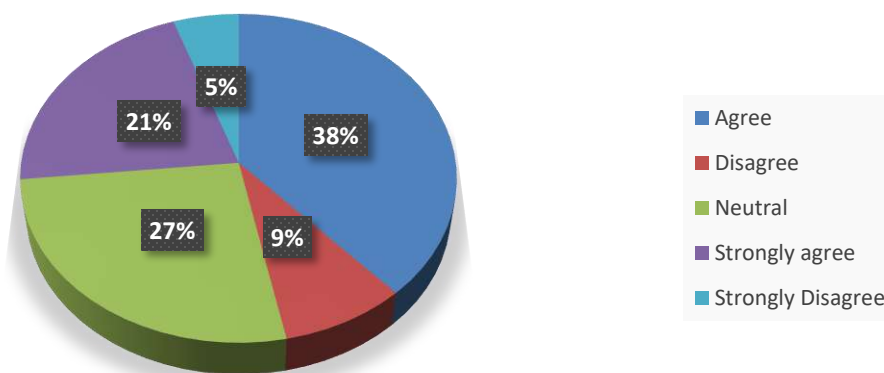


Table no. 2.6: AI-based financial systems provide timely insights that support informed decision-making?

Response category	Frequency	Percentage%
Agree	43	46%
Disagree	10	11%
Neutral	23	24%
Strongly agree	15	16%
Strongly Disagree	3	3%
Total	94	100%

Table no. 2.6 indicates that most respondents have a positive opinion. A large number of people agree (43) or strongly agree (15) with the statement. Some respondents are neutral (23) and do not express a clear view. Only a small number disagree (10) or strongly disagree (3). Overall, the responses show a mostly favourable attitude.

AI Systems Supporting Decision Making

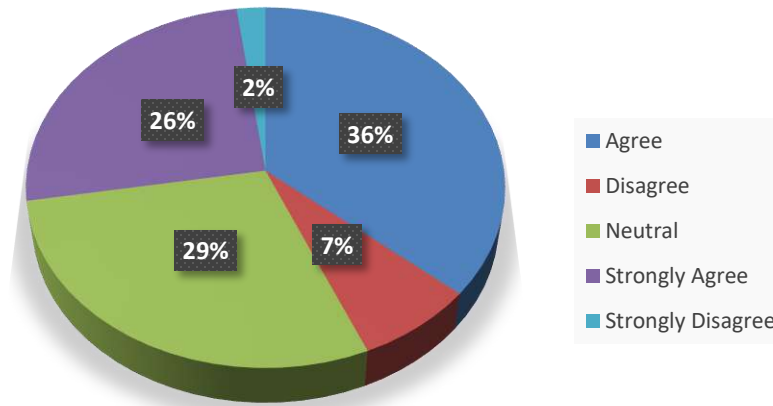
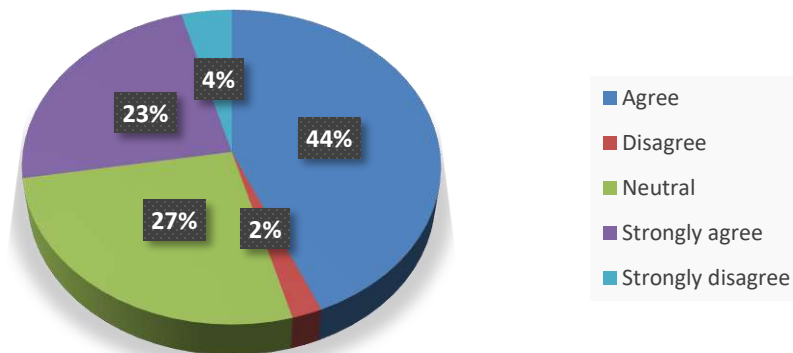


Table no. 2.7: AI forecasting tools improve the overall efficiency of financial planning processes?

Response category	Frequency	Percentage%
Agree	41	44%
Disagree	2	2%
Neutral	25	27%
Strongly agree	22	23%
Strongly Disagree	4	4%
Total	94	100%

Table no 2.7 shows that most respondents have a positive opinion. A high number of people agree (41) or strongly agree (22) with the statement. Some respondents are neutral (25) and do not have a clear opinion. Very few respondents disagree (2) or strongly disagree (4). Overall, the responses indicate a largely favourable view.

AI Improving Financial Planning Efficiency



Findings:

- The majority of respondents agree that AI and automation enhance the accuracy of accounting calculations.
- Most respondents agree that AI-based systems help identify errors or inconsistencies that might be missed manually.
- Most participants agree that financial reporting becomes more accurate and consistent with automation.
- Findings reveal that most respondents recognize AI as contributing to faster real-time financial analysis in their organization.
- The survey results indicate that the majority of participants perceive AI tools as improving the accuracy of financial forecasting relative to traditional methods.
- Findings reveal that most respondents recognize AI-based financial systems as effective in providing prompt insights to aid decision-making.

Suggestion and Recommendations:

Organizations can enhance the effectiveness of AI in accounting and financial reporting by investing in continuous training and skill development of employees to ensure proper and efficient use of AI tools. Regular monitoring of system performance and collecting user feedback helps in identifying gaps and improving accuracy. Expanding the adoption of AI-generated reports across departments supports better and faster decision-making. So standardizing the automated workflows keeps the quality and reliability of the financial outputs high. AI insights help automate repetitive financial and operational workflows, making departments more responsive. AI-based projections support decision making and help in strategic planning. Moreover, AI systems should always be updated with the newest data and technologies to ensure timely and relevant financial insights.

Conclusion:

The impact of technology and artificial intelligence on accounting practices has been highly positive, transforming traditional manual bookkeeping into automated, accurate, and efficient systems. Accounting software, cloud computing, and AI have simplified routine tasks, reduced errors, and improved the quality of financial information. AI is also enabling decision making by providing timely insights, forecasts, and fraud detection. Thus, accountants can now concentrate more on strategic analysis and advisory roles rather than repetitive work. And while this involves ongoing education and training about the latest and greatest in each of these technologies, AI and technology are making accounting more reliable, efficient, and future-oriented.

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**PATRIARCHY AND GENDER OPPRESSION DURING WARTIME IN
AFGHANISTAN IN THE NOVELS OF KHALED HOSSIENI: A CRITICAL
ANALYSIS OF *THE KITE RUNNER* AND *A THOUSAND SPLENDID SUNS*****Mrs. Firdous Parveen Shaikh¹, Prof. (Dr.) Vitthal Parab²**¹ *Research Scholar, Department of English, University of Mumbai.*² *Professor, KM Agrawal College of Arts, Science & Commerce.***Abstract**

Patriarchy and gender oppression play a crucial role in Khaled Hosseini's novels 'The Kite Runner' and 'A Thousand Splendid Suns'. He portrays the rigid patriarchal Afghan society structure that has systematically marginalized its female community during wartime. The Kite Runner carries silent female voices of Sanaubar and Soraya who are labeled as morally corrupt women, where at the same time; the transgression of male characters like Baba is easily forgiven. The double standard of the society is prevalent in A Thousand Splendid Suns as well. Here, the female suffering takes a lead through the depiction of the characters of Mariam and Laila. Domestic violence, forced marriage and restrictions enforced by Taliban make them highly dependent on patriarchy for survival. The oppression against women characters and the increase in aggression in patriarchy is intertwined with historical and political upheaval that took place in Afghanistan in the latter half of the 20th century. Hosseini's depiction of Afghan society critiques the dominant masculinity, exposing gender based injustice as well as the silent resistance of the women characters who endure it and resist it.

Keywords: Afghanistan, Patriarchy, Gender Oppression, Masculinity, Wartime, Taliban.**► Corresponding Author: Mrs. Firdous Parveen Shaikh****Introduction**

In 2003, when Khaled Hosseini visited Afghanistan, the land had already witnessed three decades of war. There was devastation, destruction, poverty, and oppression. Every corner of the land provided him with stories of suppression against gender either in the name of religion or culture. Hosseini turned his experiences in the form of his two novels The Kite Runner and A Thousand Splendid Suns. Both novels set during wartime in Afghanistan provide a close observation of how patriarchy and gender oppression take an extreme form during wartime. Their characters that live through the trauma find strength in shared subjugation and resist and survive. This study analyses the depiction of patriarchy and gender oppression in both novels and how characters find means to resist and survive.

Thesis Statement

Khaled Hosseini's novels portray wartime destabilization that aggravates the patriarchal system as well as intensifies gender oppression, yet the characters manage to resist, subvert and survive against aggressively oppressive masculinity.

Research Objective

- To analyse how wartime accelerates patriarchal control over a woman's body, lifestyle, and identity.
- To explore female resistance against gendered violence in war zone.

Research Questions

- How does patriarchy operate in a pre-war structure in Afghanistan?
- How does the war weaponize patriarchy and encourages oppression against female gender?
- How do female characters in Hosseini's novels resist gendered oppression during wartime?

Literature Review

In Afghan English Literature, there has not been much work produced that deals with gender oppression and patriarchy during wartime. There have been writers like Atiq Rahimi and Nadia Hashmi whose writings reflect these notions. *The Patience Stone* (2008) by Atiq Rahimi discusses the issues of Afghan women being deprived of their basic human rights, since long before the arrival of Taliban in Afghanistan. The sole purpose of their lives has been centered on service to their men. Rahimi laments upon the sad plight of women in war-torn Afghanistan, suffering under male dominance, facing humiliation and neglect for more than two decades.

Nadia Hashmi's *The Pearl That Broke Its Shell* (2014) is set in Kabul of 2007 and talks of being powerless in a male dominated world. With no access to education and freedom to step out of the house, protagonist Rahima is forced to take refuge in the traditional custom of *Bacha-posh*. This custom of cross-dressing i.e. disguised as a boy provides an escape to Rahima for receiving education, liberty of stepping out of the house as well as accompanying elder sisters while visiting the market. Though she finds resistance in disguising herself as a boy, this resistance has an expiry date. Once she reaches puberty, she will have to come back to her earlier self and prepare for marriage.

Baraan (2001) is an Iranian film, directed by Majid Majidi that discusses the plight of Afghan refugees living on the outskirts of Tehran. The tradition of *Bacha-posh* again comes to Baran's rescue who works as a laborer at a construction site disguised as a boy.

Osama (2003) is an Afghan film entirely made in Afghanistan by Siddiq Barmak. It is the story of a young girl who disguises herself as a boy, Osama, to support her family financially, under Taliban rule. It is a bitterly honest and deeply disturbing depiction of the lives of females under Taliban occupation. In the entire movie, there is a deliberate skipping of any female name, which only reflects the unthinkable oppression of women during the time.

Khaled Hosseini and His Works

Khaled Hossieni born in 1965 in Kabul is an Afghan-American novelist. At the age of 15, his family took political asylum in the United States and later received US citizenship. A former physician, he currently works as UNHCR goodwill ambassador. His critically acclaimed novels *The Kite Runner* and *A Thousand Splendid Suns* are set in Afghanistan following the Nadir Shah government to Russian invasion, Taliban rule and finally UN rehabilitation of Afghanistan under US invasion. His novels deal with some intense themes of guilt, redemption, gendered violence, along with a strong reflection of autobiographical elements. In 2003, when he returned to Afghanistan, he suffered from 'Survival's Guilt' which he tried to portray in his first novel *The Kite Runner*. He was among those fortunate people who could afford to leave the country before the Soviet Invasion and the subsequent wars that plagued Afghanistan.

The Kite Runner, published in 2003 is the first novel of Khaled Hosseini. Set against the backdrop of the fall of monarchy, followed by Soviet Invasion, Taliban Regime and US Invasion in 2001, *The Kite Runner* is a coming-of-age novel, exploring various themes like friendship, betrayal, political events, father-son relationship, forgiveness, male-rape, violence, memory, and migration. Amir, a Pashtun boy from a wealthy family in Kabul has constantly been craving affection from his father, Baba; who, on the other hand, considers Hassan the Hazara servant boy as more capable. Though very good friends to each other, Amir begins to resent Hassan and on one fine day, their world turns upside down and they are separated. Years later, when Amir is again in Afghanistan to rescue Hassan's son Sohrab, this time it is to correct his mistakes, overcome the guilt and seek redemption.

A Thousand Splendid Suns published in 2007 is the second novel of Khaled Hosseini. Set in the similar backdrop of *The Kite Runner*, *A Thousand Splendid Suns* carries elements of Afghan history, memory, suffering, shame, reputation, resilience, loyalty, and female friendship. Mariam, an illegitimate girl is forced to marry Rasheed, a widowed shoe-maker in his thirties, after her mother Nana commits suicide and father Jalil refuses to keep her. Settled in the new house, Mariam begins to build her paradise but her dreams are shattered as one by one she suffers from seven miscarriages. Rasheed only becomes more abusive with time passing by as Mariam is unable to provide him a son. Laila, a young free-spirited neighbor to Mariam, born a generation later, lives a privileged life. She too is forced in a similar tragedy due to unfortunate events in her life. Her parents are killed in a rocket attack, and she must marry Rasheed. Mariam and Laila's lives intersect and after an initial animosity towards each other, they begin a relationship of shared oppression, which ends in a mother-daughter story.

Historical Context to War in Afghanistan

To understand the extent of gender oppression during wartime in Afghanistan, it is important to understand the historical context of it and the counts of decades Afghanistan has spent in a state of war.

1979 – 1995: USSR invades Afghanistan, followed by Civil War between Mujahideen rebels and Soviet backed Afghan Army. More than 3 million Afghans take refuge in neighboring countries like Pakistan and Iran.

1995 – 2001: Taliban rises to power, Islamic laws are enforced, public executions become common, restriction on female education and employment. 1 million Afghans take shelter in refugee camps near Afghan-Pak border, Destruction of the Buddhist statues in Bamiyan.

2001-2021: Following the 9/11 attack, US and British forces airstrike targets in Afghanistan. After 2 months of intense air attacks, the Taliban surrendered. Hamid Karzai is elected as the President of Afghanistan. NATO and US forces take over Afghan security. After 20 years, the US withdraws forces, the Afghanistan government collapses and Taliban takes over.

Patriarchy as a Pre-war Structure

Afghanistan has spent more than 50 years in a war zone which in many ways has impacted its culture, lifestyle, and social norms. Patriarchy has been a crucial aspect of Afghan culture which with time passing by has only become intense.

The Kite Runner offers various shades of patriarchy and masculinity defined by Afghan culture. The protagonist Amir's father, Baba is a rigid masculine Pashtun, an ultimate Afghan, and an ideal father. If there is anything that Amir would ever want to become, it is his father Baba. Where Baba, on the other hand, is always a critique of Amir as he is sensitive, emotional and above all a story-

teller. According to Baba and Afghan traditions, storytelling is no art and writing is not the profession of real men. Hassan, on the other hand, is presented to be a masculine Hazara, with all merits desired by Baba in Amir. But it is the community Hazara that he is born into, which makes him poor and lower than anyone. Assef, a cruel abuser is no less than a brutal oppressor. He is the face of toxic masculinity that uses sexual abuse as a powerful tool to suppress, first Hassan and then his son Sohrab. The different forms of patriarchy have existed before wartime in Afghanistan. But the wartime only escalates, making it more harsh, brutal, and unbearable. One such oppression by patriarchy is depicted in the novel when Soraya, the future wife of Amir, runs away from her family in the US. And when she is brought back, to punish her, her father forces her to cut her hair as she has brought dishonor to the family.

In *A Thousand Splendid Suns*, the characters are merely oppressed, tormented, and dejected souls. Maryam's mother Nana faces social rejection and is ostracized for being a mother without marriage. Everyone knows Jalil, a wealthy businessman, is Maryam's father but no one raises a finger on him. This trauma of shame and humiliation forces Nana to commit suicide. Without a mother, Maryam is more of a burden for Jalil and is immediately forced into marriage with a man double her age. Not being able to bear a child, domestic violence only adds to her childhood trauma of watching her mother commit suicide. On the other hand, Laila, a free-spirited girl is forced into an abusive marriage filled with physical violence due to her unfortunate circumstances. Rasheed portrays the extreme face of patriarchy, who for the world is a provider, caregiver but within the domestic walls he is the abuser, the oppressor. There is another unidentified face of patriarchy in the Talibani Mujahideens. They are walking around the street, beating women stepping out of the house unaccompanied by any man. It is the patriarchy providing them power, to beat a specific gender because she decided to step out of the house on her own terms.

Gendered Oppression during Wartime

With the Taliban taking over the control of Afghanistan, some of the stringent laws and extremist policies were adopted in the name of *Sharia Law* (Islamic rule). Centuries old practices, which no longer were part of any of the progressive Islamic nations in the world, were revived under the Taliban rule. Public executions became common and stoning to death became a common practice. One of the most unfortunate things was the ban on female education and restriction on women mobility. In both novels, Hosseini portrays a realistic scenario of this barbarism. Mariam, Laila and Sohrab are breathing examples of horror faced by Afghans whereas Assef and Rasheed are the face of horror created by the Taliban. During the times of drought, Laila's daughter Aziza is forced to be sent to an orphanage due to the lack of food where son Zalmai stays with parents. Laila is constantly beaten by Taliban and Rasheed for visiting Aziza in an orphanage. Hassan, from the marginal Hazara community, is sexually assaulted by Assef, a Pashtun. Hosseini tells us that vulnerability is not restricted to any specific gender during wartime. If it is visible through your position and role in society, you are bound to be oppressed.

Mariam, since childhood, has been made to believe that she is inferior as she is an illegitimate child. She is forced to internalize the belief that silence and endurance are female virtues. An educated Laila is crushed under patriarchy when her male protector, her father, is dead in an airstrike. Through various references, Hosseini informs us that patriarchy accompanied by cultural traditions, legal systems and religious misinterpretation assisted in normalizing the oppression against gender.

Conclusion

The oppression finds solace in shared subjugation. Laila and Mariam can bond with each other as they both share similar pain, oppression, and trauma. Both are victims of Rasheed's abuse and the sharing of the same oppression becomes a point to confide in each other and provide strength for resistance. Amir is able to find redemption from his guilt by helping Sohrab flee from Assef. He is able to stand against Assef to protect Sohrab, and is trying to make up for the guilt of not standing up for Hassan. He is able to face the toxic masculinity that haunted him throughout his life. He can resist and protest and finally prove his capability. Throughout the novel, he is mocked for his idea of pursuing a career in storytelling. But that does not restrain him from doing so and towards the end of the novel; Amir has a successful career as a writer. Although both novels reveal acts of resistance: Amir's career as a writer, Soraya's assertion on honesty, mariam's sacrifice, and Laila's willpower to restructure her life, proclaim that while gender oppression is deeply ingrained in Afghan society, it is not unchallenged.

Through these contrasting yet interconnected characters, Hosseini critiques a war torn society that equates masculinity with dominance and femininity with endurance, exposing the devastating emotional and physical consequences of the gender-based injustice while emphasizing the quiet strength and resilience of women who endure and resist it.

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**COMPARATIVE ANALYSIS BETWEEN (MGNREGA) 2005 AND VB -G
RAM -G ACT 2025****Mrs. Neetu Karan Nimbark***Core Faculty in Economics, M. L.s Dahanukar College of Commerce (Autonomous).**Email: 100neetusaad@gmail.com***Abstract**

To provide work security, especially to poor rural citizens, the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) was set by the government of India in 2005. It is the biggest poverty alleviation program in the world, which was started with an initial outlay of Rs. 11,300 crores in the year 2006-07. For the financial year 2025-26, the Government of India allocated 86,000 crores approx. \$ 10.3 billion for MGNREGA. The Mahatma Gandhi NREGA launched several programs to assist rural people who are especially below the poverty line. However, the policy has both pros and cons. So, to bring progress in the existing policy of the right to work, the government replaced the MGNREGA (2005) scheme with the Vikshit Bharat Gramin Rozgar Aajeevika Gramin scheme (VB-GRAM-G) 2025. The MGNREGA act of 2005 mandated that rural communities receive at least 100 days of paid employment each year, whereas in VB-GRAM-G, it increased from 100 days to 125 days. Direct benefits also increased from Rs 7000 to Rs 10000 in annual income for every rural household. In the old scheme, the entire burden of expense was borne only by the central government, but in the new scheme, now it is now going to be distributed between the state and the central government in an accountable proportion. It encourages the state to be more accountable; when the state pays, it ensures there is zero corruption and the assets are actually useful. For FY 2025–26, the Viksit Bharat – Guarantee for Rozgar and Aajeevika Mission (Gramin) [VB–G RAM G] Act, 2025, provides for a central allocation of ₹95,692.31 crore, with the total annual financial requirement, including state contributions, estimated at ₹151,282 crore.

Keywords: Employment, Poverty, Aajeevika, Gramin, Direct, Benefits.**► Corresponding Author: Mrs. Neetu Karan Nimbark****Introduction**

Employment generation in rural India has been a key focus of government policy to reduce poverty and promote inclusive growth. In this context, MGNREGA, the Mahatma Gandhi National Rural Employment Guarantee Act, 2005, and the Viksit Bharat Gramin Rozgar–Aajeevika Scheme represent two different approaches to rural employment.

MGNREGA is a rights-based wage employment program that guarantees a minimum of 100 days of unskilled manual work to rural households, mainly through public works. In contrast, the Viksit Bharat Gramin Rozgar–Aajeevika Scheme focuses on sustainable livelihoods, skill development, and self-employment, aiming to create long-term income opportunities rather than short-term wage work. Thus, while MGNREGA emphasizes employment security and income support, the Viksit Bharat Gramin Rozgar–Aajeevika Scheme emphasizes economic empowerment, entrepreneurship, and rural development, reflecting a shift from relief-oriented employment to

growth-oriented livelihood creation. The important difference between MGNREGA and VB-G (RAM)G is that there will be biometric attendance, which helps to eliminate ghost workers. GPS monitoring will track the real time of every project. In VB-G (RAM) AI detection will be using data patterns to flag misappropriation before it happens. So, due to such moves, 100% of the money reached the actual workers' Aadhaar-linked bank account. Several States and UTs show high worker activity rates, led by Mizoram (86.36%), Tripura (83.44%), Tamil Nadu (80.55%), Andhra Pradesh (79.19%), and Arunachal Pradesh (78.82%). These regions demonstrate strong workforce participation despite having relatively smaller populations. On the other hand, Lakshadweep (1.00%), West Bengal (7.18%), Goa (12.52%), and Andaman & Nicobar Islands (16.79%) report very low percentages of active workers. West Bengal, in particular, is notable for having a large total workforce but a very low activity rate, highlighting a significant participation gap. In terms of absolute numbers, Uttar Pradesh, Rajasthan, Madhya Pradesh, Bihar, and Maharashtra contribute the highest number of active workers due to their large population base, even though their activity percentages are moderate. Overall, the data suggests that while worker registration is high in many states, activation and sustained engagement of workers remain key challenges, especially in populous regions. Strengthening employment opportunities and improving worker participation could significantly enhance overall workforce productivity. (Source: nrega.nic.in)

Improvement during MGNREGA Schemes

Women’s participation rate	48% to 56.74%
Aadhar seeded active workers	76 lakhs to 12.11 crore
Workers on APBS	0 to 11.93 crore
Geo tagged asset	0 to 6.44 crore +
e-payment	37 % to 99.9%
Individuals’ assets	17.6% to 62.96%

Key Difference between Both the Schemes

Points	MGNREGA	VB-G RAM -G
1. Employment days	Minimum 100 days per rural household per financial year.	125 days per rural household per financial year.
2. Additional days beyond guarantee	Possible 50 days extra for ST forest household, drought /natural calamities areas.	No explicit provision mentioned beyond 125 days.
3. Funding of wage component	Centre pays 100% of wages for unskilled manual work.	Share funding 90: 10 (NE and Himalayan states) 60: 40 (others), 100% centre for UTs without legislature.
4. Material and administrative costs	Centre and States share material and administrative cost in a fixed pattern.	Funding sharing explicitly extended to wage payment.
5. Labour budget vs allocation	Demand driven labour budget submitted annually by state, no formal upper cap.	Normative allocation fixed by centre, excess spending bear by states.
6. Nature of funding	Open ended based on demand for work.	Capped by centre determined allocation.

7. Pause during agriculture seasons	No provision for suspending work during sowing /harvesting.	Mandatory pause up to 60 days during peak agriculture seasons
8. Authority to declare pause	Not applicable	State government notify season wise area specific pauses.
9. effective window for work	Full financial year available	Shorter effective window due to seasonal pause.
10. Wage payment timeline	Payment within 15 days, compensation for delay (0.05% per day after 15 days)	Weekly payment preferred not later than a fortnight.

States with Highest Active Workers (Absolute Numbers)

❖ Uttar Pradesh	1,18,88,258
❖ Rajasthan	1,16,66,872
❖ Madhya Pradesh	99,61,480
❖ Bihar	99,54,916
❖ Maharashtra	91,61,292



Objective of the Study

1. To study objective and scope of Mahatma Gandhi National Rural Employment Guarantee Act, 2005) and the Viksit Bharat Gramin Rozgar–Aajeevika Scheme 2025.
2. To compare wage-based employment and livelihood approaches in rural areas.
3. To analysis social and economic impact of both schemes on rural employment.
4. To asses number of working days.
5. To find share of funding between Centre and state for MGNREGA and VB-G RAM -G schemes.

Limitations of Study

1. Limited availability of data on Viksit Bharat Gramin Rozgar–Aajeevika Scheme 2025.
2. The study is entirely based on secondary data such as news articles, journals, research papers.
3. Lack of primary field evidence.
4. MGNREGA and VB -G RAM -G differ in objective, nature of employment, design which limits to extend comparisons.

Research Methodology

The researchers conducted descriptive study and secondary data was used for this study. Basically, the required materials have been derived from various journals, articles from newspaper, magazines, and web-sites which deal directly or indirectly with the topics related. No primary data was used for this study.

Significance of Study

The study of this research can provide valuable information to people regarding both the policies plus how both differ from each other's, so they can get advantage of such information and guide other people in rural areas.

Literature Review

Sami Lamaan and Khan Anas (2016), Department of Commerce, Aligarh Muslim University, MAHATMA GANDHI NATIONAL RURAL EMPLOYMENT GUARANTEE ACT (MGNREGA): A TOOL FOR EMPLOYMENT GENERATION the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) is considered a “magic bullet” for tackling rural poverty and joblessness by generating demand for useful labour in village regions. Since independence, rural poverty and unemployment in India have risen at an alarming pace. MGNREGA attempts to confront this problem by ensuring a legal promise of 100 days of work per financial year to adult members of rural families, providing unskilled manual labour on public works at the statutory minimum wage level.

Saha D.K., Srivastava Soma and Khem Chand (2012) Impact of MGNREGA: A Case Study in an Arid Village of Western Rajasthan -- The influence of the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) on the socio-economic and environmental conditions of desert communities in an arid area of western Rajasthan was studied. An examination of primary data showed that MGNREGA contributed 12.14% to overall household income. However, the increase in wage rates resulted in a shortage of labour for timely farming activities. Farmers responded to this issue by depending on family labour, mutual labour sharing, and, to some extent, employing workers from outside the region. Moreover, migration of daily wage labourers to nearby urban centres for work declined by 18%. Although the programme has generated opportunities for women, meaningful empowerment may take more time, as MGNREGA was introduced only in 2008.

Dr. Gunabhagya (2024) Performance Analysis of MGNREGA in Karnataka--This study mainly seeks to undertake an empirical examination of the implementation and performance of the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) across the districts of Karnataka. A detailed evaluation of the scheme's performance using selected indicators is necessary to assess the broader goals of the programme. Accordingly, the scope of the policy analysis is limited to the following objectives: (a) analysing the trends and patterns of public expenditure on MGNREGA in Karnataka; (b) assessing the performance of MGNREGA across districts in the state; and (c) providing evidence-based recommendations to improve the effectiveness of public expenditure on the programme. The study relies on secondary sources of data. Information related to MGNREGA was collected from the updated Management Information System (MIS) of MGNREGA, Government of Karnataka. Additional data were gathered from the Economic Survey of Karnataka, reports of the Directorate of Economics and Statistics, and the Census of India. The reference period extends from the financial year 2014–15 to 2023–24, allowing an analysis of trends over nearly a decade. For analytical clarity, the study period is

divided into three phases: pre-COVID-19 (2014–15 to 2018–19), the COVID-19 period (2020–21), and the post-COVID-19 period (2020–21 to 2023–24). Trends in the size, growth, and composition of public expenditure on MGNREGA, household coverage, and employment generation across different social categories were examined using descriptive statistical tools such as percentages and growth rates. The performance of MGNREGA across Karnataka's districts was evaluated through the construction of a composite index. Eight indicators were employed for this purpose: (1) the percentage of households receiving employment under MGNREGA relative to the total households in the district; (2) the percentage share of SC, ST, and women person-days in total employment; (3) the average number of employment days provided per household; (4) the percentage of households completing 100 days of employment; (5) the percentage of disabled person-days in total person-days; and (6) the proportion of wages in total expenditure. By combining these indicators, a 'Composite Index of MGNREGA Performance' (CIMP) was developed to capture inter-district variations in programme performance.

Acco. To Times of India (2025) -- Enhanced Employment Guarantee: The guarantee is raised from 100 to 125 days, providing rural households with greater income stability. Strategic Infrastructure Emphasis: MGNREGA works were dispersed across numerous categories without a strong national strategy. Localised, Spatially Integrated Planning: The new Act requires Viksit Gram Panchayat Plans, prepared by panchayats themselves and integrated with national spatial systems such as PM Gati-Shakti. The new Act concentrates on four major types of works, ensuring assets that directly support water security, core rural infrastructure development, and climate adaptation.

Need for change MGNREGA -MGNREGA was introduced in 2005, when rural India experienced widespread poverty and limited livelihood opportunities. However, rural India has since witnessed substantial transformation. Poverty declined sharply from 25.7% in 2011–12 to 4.86% in 2023–24, supported by rising consumption incomes and improved access to financial services. In view of these structural changes, the open-ended design of MGNREGA has increasingly seemed outdated. The Viksit Bharat – Guarantee for Rozgar and Aajeevika Mission (VB–GRAMG) Bill aims to modernise the employment guarantee framework by expanding the number of guaranteed workdays, realigning programme priorities, and establishing a more accountable, targeted, and context-relevant system suited to the present rural economy.

Conclusion

In conclusion, the proposed Viksit Bharat – Guarantee for Rozgar and Aajeevika Mission (VB–GRAMG) represents a major shift from the original design of MGNREGA. While MGNREGA operated as a demand-driven programme with the Centre bearing the entire cost of wage payments, the new framework introduces a supply-driven model with capped allocations and a revised Centre–State funding pattern of 60:40. Special-category states, including Himalayan, North-Eastern states and Union Territories, are required to contribute only 10%, reflecting varied fiscal capacities. Unlike MGNREGA, which functioned under the Ministry of Rural Development and provided year-round employment based on worker demand, VB–GRAMG will be supervised by a Central Gramin Rozgar Guarantee Council and does not ensure continuous employment throughout the year, imposing a mandatory 60-day restriction during peak agricultural seasons. The Centre has defended these changes by referring to issues of corruption and inefficiencies in the earlier scheme, along with evidence that only a small proportion of workers were able to complete the full 100 days of employment under MGNREGA. However, the new funding structure has generated concerns among several states. While economically larger states such as Uttar

Pradesh, Gujarat, Haryana, and Maharashtra are expected to manage the additional fiscal burden with minimal impact, less-developed states like Bihar, Chhattisgarh, and Jharkhand may experience significant fiscal pressure due to constrained budgets and high fiscal deficits. Opposition from states such as Tamil Nadu and Kerala highlights fears that the new model could weaken state autonomy and dilute the employment guarantee ethos. Overall, while VB–G RAM G aims to strengthen accountability, fiscal discipline, and relevance in a changing rural economy, it signifies a move away from the universal, rights-based character of MGNREGA toward a more targeted and fiscally shared employment framework, with uneven implications across states.

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IMPACT OF WORK PRESSURE, MENTAL STRESS AND UNHEALTHY DIETARY HABITS ON LIFESTYLE DISEASE RISK AMONG WORKING WOMEN: A WORK-LIFE BALANCE PERSPECTIVE**Dr. Pallavi Omkar Sawant¹, Dr. Sahifa Moosa Muradbi Mazgaonkar², Dr. Rohini Sankalp Madavi³**^{1,2,3} *M. L. Dahanukar College of Commerce (Autonomous), Dixit Road, Vile Parle East.***Abstract**

The objective of this study was to examine the combined influence of work pressure, mental stress, and unhealthy dietary habits on lifestyle disease risk among working women in India, within a work–life balance framework. Primary data were collected from 216 respondents in Mumbai and its suburban areas using a structured questionnaire, with participants selected through simple random sampling. The data were analysed using multiple regression analysis, and all assumption checks confirmed the robustness of the model. The results revealed a strong explanatory power ($R = 0.931$; $R^2 = 0.866$; $F = 456.490$, $p < .001$), with all three predictors showing significant positive effects. Among them, work pressure ($\beta = 0.418$, $t = 7.373$, $p < .001$) emerged as the strongest contributor, followed by unhealthy dietary habits ($\beta = 0.355$, $t = 6.938$, $p < .001$) and mental stress ($\beta = 0.207$, $t = 3.973$, $p < .001$). The Durbin–Watson statistic (1.869) confirmed no serious autocorrelation, further validating the model. In conclusion, the study establishes that occupational demands, psychological strain, and poor dietary practices jointly elevate lifestyle disease risk among working women, underscoring the need for integrated interventions that address workplace stress, mental health support, and nutrition awareness to improve health outcomes in the Indian context.

Keywords: Work Pressure; Mental Stress; Unhealthy Dietary Habits; Lifestyle Disease Risk.**► Corresponding Author: Dr. Pallavi Omkar Sawant****Introduction:**

Lifestyle diseases such as diabetes, hypertension, cardiovascular disorders, and obesity have emerged as major public health concerns in India, particularly among the urban working population. Rapid economic growth, increasing professional demands, and changing social structures have significantly altered the daily routines of working women, who often balance professional responsibilities with household and caregiving roles. In this context, variables such as work pressure, mental stress, and unhealthy dietary habits have become critical determinants of health outcomes. The dual burden of professional and personal responsibilities frequently leads to irregular eating patterns, heightened psychological strain, and limited opportunities for self-care, thereby increasing vulnerability to lifestyle diseases.

The Indian workforce has witnessed a steady rise in women’s participation across diverse sectors, yet this progress has also brought new challenges related to work–life balance. Long working hours, competitive environments, and the pressure to perform often translate into chronic stress and neglect of healthy dietary practices. These factors, when compounded, contribute to the

growing incidence of lifestyle diseases among working women, making it essential to examine their combined impact. While previous studies have explored occupational stress or dietary habits in isolation, there is limited research that integrates these variables within a holistic framework of work–life balance in the Indian context.

Against this backdrop, the present study seeks to analyze how work pressure, mental well-being, and dietary habits collectively influence lifestyle disease risk among working women. The objective is to understand the extent to which these factors shape health outcomes and to provide insights that can inform workplace policies, wellness programs, and individual strategies for healthier living. By situating the analysis within the broader discourse of work–life balance, the study aims to highlight the need for integrated interventions that address occupational, psychological, and behavioural dimensions of health.

Review of Literature:

Occupational stress has been consistently linked to adverse health outcomes, particularly cardiovascular diseases and metabolic syndrome (Coelho et al., 2022). Systematic reviews emphasize the importance of workplace interventions to reduce stress and improve quality of life. Psychosocial stress at work independently predicts type 2 diabetes, especially among middle-aged women, with iso-strain nearly doubling disease risk over 15 years (Heraclides et al., 2009). Similarly, Kivimäki and Kawachi (2015) found that job strain and long working hours moderately increase the risk of coronary heart disease, stroke, and diabetes. Work environment factors, particularly work intensity, strongly influence daily stress levels (Lukan et al., 2022). Holmgren et al. (2009) further reported that Swedish women facing organizational conflicts and high demands experienced increased illness and sick leave.

Chronic stress triggers prolonged activation of the stress response, elevating cortisol and adrenaline levels that disrupt immune, cardiovascular, and metabolic functioning (Mayo Clinic Staff, 2021). Aroosiya et al. (2023) observed moderate occupational stress among Sri Lankan working women due to multiple responsibilities and role expectations. Magnusson Hanson et al. (2017) showed that effort–reward imbalance is associated with adverse metabolic profiles, systemic inflammation, higher BMI, and elevated white blood cell count. Zhou et al. (2022) also found strong associations between occupational stress and burnout among female manufacturing workers, with job strain and overcommitment as major contributors, while social support reduced negative outcomes.

Unhealthy dietary habits and obesity are major contributors to non-communicable diseases, particularly cardiovascular disease, stroke, and diabetes (Al-Jawaldeh & Abbass, 2022). These findings reflect a shift toward nutrition-related chronic diseases. Bremner et al. (2020) highlighted the bidirectional relationship between diet, stress, and mental health, mediated by inflammation and gut microbiota. Al-Jawaldeh and Abbass (2022) further emphasized that lifestyle modification through improved diet and physical activity is essential for disease prevention.

Significance of the Study:

This study is significant as it highlights how work pressure, mental stress, and unhealthy dietary habits jointly increase lifestyle disease risk among working women. By situating these factors within a work–life balance perspective, the research offers a holistic understanding of health challenges faced by women in modern workplaces. The findings provide practical insights for organizations and policymakers to design wellness initiatives that reduce stress, promote mental

health, and encourage healthy eating, while also emphasizing the importance of self-care for working women.

Objective of the Study:

To examine the impact of work pressure, mental well-stress and dietary habits on lifestyle disease risk among working women.

Overall Model Hypothesis:

H: Work pressure, mental Stress and Unhealthy dietary habits jointly have a significant impact on lifestyle disease risk among working women.

Individual Regression Hypotheses:

Ha: Work pressure has a positive and significant effect on lifestyle disease risk.

Hb: Mental stress has a positive and significant effect on lifestyle disease risk.

Hc: Unhealthy dietary habits have a positive and significant effect on lifestyle disease risk.

Research Methodology:

The present study was conducted among working women in Mumbai and its suburban areas to examine the impact of work pressure, mental stress, and unhealthy dietary habits on lifestyle disease risk. A total sample of 216 respondents was selected using simple random sampling, ensuring that each participant had an equal chance of being included. The study relied on primary data, which was collected through a structured questionnaire designed to capture occupational, psychological, and lifestyle variables relevant to the research objectives. The responses were analysed using multiple regression analysis to assess the combined and individual effects of the predictors on lifestyle disease risk. In addition, all necessary assumption checks including normality, linearity, homoscedasticity, and autocorrelation were performed to validate the robustness of the regression model.

Table 1: Demographic Profile of Respondents

Demographic Variable	Category	Frequency (n)	Percentage (%)
Age (Years)	20–29	62	28.3
	30–39	81	37
	40–49	52	23.7
	50 & above	24	11
Marital Status	Single	78	35.6
	Married	121	55.3
	Divorced/Widow	20	9.1
Educational Qualification	Undergraduate	56	25.6
	Postgraduate	109	49.8
	Professional Degree	38	17.4
	Doctorate	16	7.3
Occupational Sector	IT/Corporate	67	30.6
	Education	54	24.7
	Healthcare	41	18.7

	Banking/Finance	29	13.2
	Others	28	12.8
Monthly Income (₹)	Below 20,000	48	21.9
	20,001–40,000	73	33.3
	40,001–60,000	57	26
	60,001–80,000	26	11.9
	80,001 & above	15	6.8
Working Hours/Day	< 8 hours	51	23.3
	8–10 hours	104	47.5
	> 10 hours	64	29.2
Type of Family	Nuclear	142	64.8
	Joint	77	35.2
Work Experience	< 5 years	59	26.9
	5–10 years	83	37.9
	10–15 years	49	22.4
	> 15 years	28	12.8
Lifestyle Disease	Yes	91	41.6
	No	128	58.4

Source: Researcher’s Compilation from Primary Data

Table 1 presents the demographic profile of the 219 respondents. The majority of participants were aged 30–39 years (37%), followed by those aged 20–29 years (28.3%), indicating that most respondents belonged to the early and mid-career stage. More than half of the respondents were married (55.3%), while 35.6% were single. In terms of education, nearly half of the respondents were postgraduates (49.8%), reflecting a highly educated sample. The occupational distribution shows that most respondents worked in the IT/corporate sector (30.6%), followed by education (24.7%) and healthcare (18.7%). Regarding income, the highest proportion earned between ₹20,001–40,000 (33.3%), while only 6.8% earned above ₹80,000 per month. Nearly half of the respondents worked 8–10 hours daily (47.5%), indicating long working hours. A majority belonged to nuclear families (64.8%). In terms of work experience, most had 5–10 years of experience (37.9%). Furthermore, 41.6% of respondents reported the presence of lifestyle diseases, highlighting a considerable health risk among working women.

Data Analysis:

The data collected from 216 working women in Mumbai and suburban areas through a structured questionnaire were analysed using multiple regression. Simple random sampling ensured representativeness, and diagnostic checks for normality, linearity, homoscedasticity, and autocorrelation validated the model.

Assumption Check:

Before interpreting the multiple regression results, the necessary statistical assumptions were tested and found to be satisfactorily met. Independence of errors was verified using the Durbin–Watson statistic, which was close to the ideal value of 2 (Table 2), confirming the absence of autocorrelation. Furthermore, multicollinearity was assessed using Variance Inflation Factor (VIF) values, which were all below the acceptable threshold of 5 (Table 3), indicating no serious multicollinearity issues among the predictor variables.

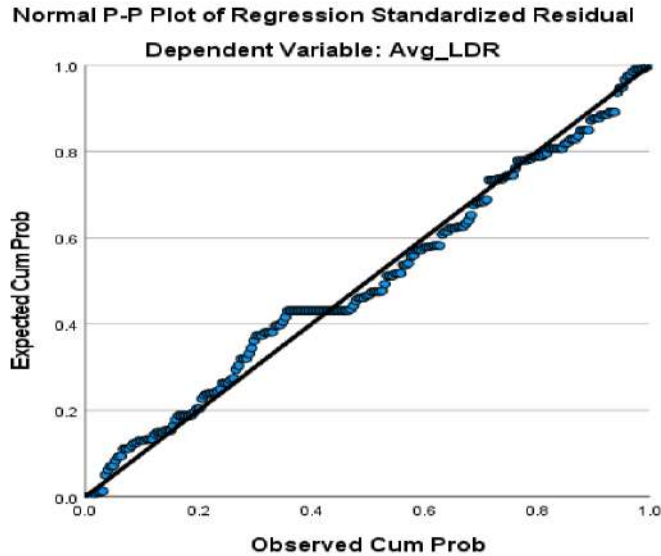


Figure1: Normal P-P Plot of Regression Standardized Residuals for Lifestyle Disease Risk among Working Women

Source: Researcher’s compilation from primary data through SPSS

Linearity was examined through scatterplots and significance values, indicating a linear relationship between the independent variables (work pressure, mental well-being and dietary habits) and the dependent variable (lifestyle disease risk). The Normal P-P Plot of Regression Standardized Residuals for the dependent variable *Lifestyle Disease Risk among Working Women* demonstrates that the residuals from the regression model are approximately normally distributed. The data points closely align with the diagonal reference line, indicating that the assumption of normality is reasonably met. This supports the validity of using linear regression to examine the joint impact of *Work Pressure, Mental Stress, and Unhealthy Dietary Habits* on *Lifestyle Disease Risk among Working Women* from a work-life balance perspective.

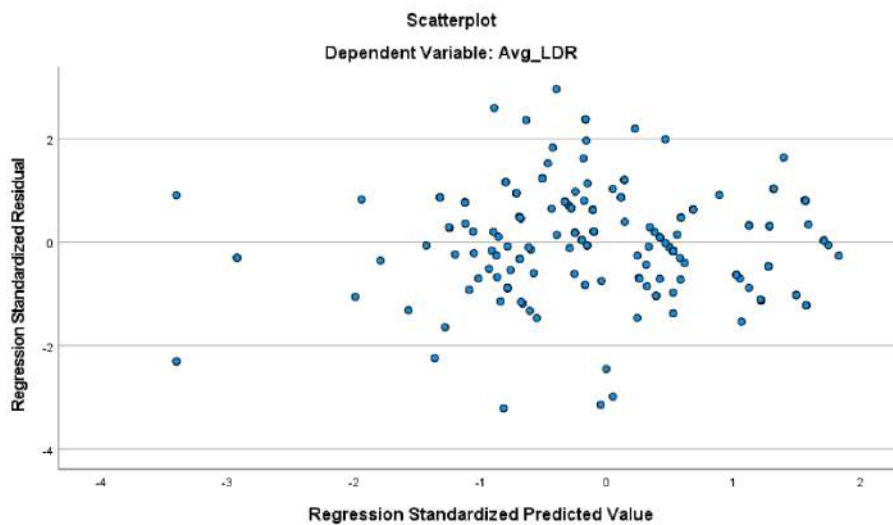


Figure 02: Scatterplot of Regression Standardized Residuals vs. Predicted Values for Lifestyle Disease Risk among Working Women

Source: Researcher’s compilation from primary data through SPSS

Homoscedasticity was evaluated through a scatterplot of standardized predicted values versus residuals. The scatterplot displays the relationship between *Regression Standardized Predicted Values* and *Regression Standardized Residuals* for the dependent variable *Lifestyle Disease Risk among Working Women*. The residuals appear randomly scattered around the horizontal axis, with no discernible pattern or funnel shape. This suggests that the assumptions of linearity and homoscedasticity (constant variance of errors) are reasonably met. The absence of systematic clustering or curvature supports the adequacy of the regression model used to assess the impact of *Work Pressure*, *Mental Stress*, and *Unhealthy Dietary Habits* on lifestyle disease risk from a work-life balance perspective. Thus, all regression assumptions were adequately satisfied, confirming the suitability of the data for multiple regression analysis.

Table 2: Model Summary of Regression Analysis for Lifestyle Disease Risk among Working Women

R	R Square	Adjusted R Square	F value	df1	df2	Sig. value	Durbin-Watson
.931	.866	.864	456.490	3	212	<.001	1.869

Source: Researcher’s compilation from primary data through SPSS

Model Summary and Goodness of Fit:

The regression model examining the impact of *Work Pressure*, *Mental Stress*, and *Unhealthy Dietary Habits* on *Lifestyle Disease Risk among Working Women* demonstrates a strong explanatory power. The multiple correlation coefficient (R = 0.931) indicates a very high degree of association between the predictors and the dependent variable. The coefficient of determination (R Square = 0.866) shows that approximately 86.6% of the variance in lifestyle disease risk is explained by the three independent variables, while the Adjusted R Square (0.864) confirms the robustness of the model after adjusting for the number of predictors.

The overall model is statistically significant, as evidenced by the high F value (F = 456.490, df1 = 3, df2 = 212, p < .001), supporting the hypothesis that work pressure, mental stress, and unhealthy dietary habits jointly have a significant impact on lifestyle disease risk. The Durbin–Watson statistic (1.869) falls within the acceptable range, suggesting that there is no serious autocorrelation problem in the residuals.

This confirms that the regression model is well-fitted and appropriate for testing the individual hypotheses (Ha, Hb, Hc) regarding the positive effects of each predictor on lifestyle disease risk.

Table 3: Regression Coefficients and Multicollinearity Diagnostics for Predictors of Lifestyle Disease Risk among Working Women

Predictor	Unstandardized Coefficient (B)	Standardized Beta	t-value	p-value	VIF	Interpretation
Work Pressure	0.367	0.418	7.373	0.000	4.010	Significant positive predictor
Unhealthy Dietary Habits	0.301	0.355	6.938	0.000	4.132	Significant positive predictor

Mental Stress	0.154	0.207	3.973	0.000	4.293	Significant positive predictor
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Source: Researcher’s compilation from primary data through SPSS

Regression Coefficients and Predictor Significance:

The regression analysis results highlight the individual contributions of *Work Pressure*, *Unhealthy Dietary Habits*, and *Mental Stress to Lifestyle Disease Risk among Working Women*.

- **Work Pressure** (B = 0.367, β = 0.418, t = 7.373, p < 0.001, VIF = 4.010) emerged as a strong and significant positive predictor, indicating that higher levels of work pressure are associated with increased lifestyle disease risk.
- **Unhealthy Dietary Habits** (B = 0.301, β = 0.355, t = 6.938, p < 0.001, VIF = 4.132) also showed a significant positive effect, suggesting that poor dietary practices substantially contribute to lifestyle disease risk.
- **Mental Stress** (B = 0.154, β = 0.207, t = 3.973, p < 0.001, VIF = 4.293) was found to be a significant positive predictor, though with a relatively smaller effect compared to the other two variables.

All predictors are statistically significant at the 0.001 level, supporting the individual hypotheses (Ha, Hb, Hc) that each factor positively influences lifestyle disease risk.

The findings of this study clearly demonstrate that work pressure, mental stress, and unhealthy dietary habits are significant contributors to lifestyle disease risk among working women. The strength of the model indicates that these factors together explain a substantial portion of the variation in disease risk, underscoring the multidimensional nature of health challenges faced by women balancing professional and personal responsibilities. Among the predictors, work pressure emerged as the most influential, suggesting that occupational demands and workload pressures directly elevate vulnerability to lifestyle diseases. Unhealthy dietary habits also played a critical role, highlighting the importance of nutrition as a modifiable risk factor. Mental stress, while comparatively less powerful, was nonetheless a significant predictor, reinforcing the link between psychological well-being and physical health.

The diagnostic checks confirmed that the regression assumptions were met, lending credibility to the results. Taken together, these findings emphasize that lifestyle disease risk is not driven by a single factor but by the combined influence of occupational, psychological, and behavioural dimensions. This interpretation supports the overall hypothesis and validates the individual hypotheses, showing that each predictor has a positive and significant effect. From a work-life balance perspective, the results highlight the need for integrated interventions that address workplace stress management, mental health support, and dietary awareness to reduce the burden of lifestyle diseases among working women.

Conclusion:

The study set out to examine the combined influence of work pressure, mental stress, and unhealthy dietary habits on lifestyle disease risk among working women in Mumbai and its suburban areas. Using primary data from 216 respondents and applying multiple regression analysis, the findings confirmed that all three predictors have a significant positive effect on lifestyle disease risk, with work pressure emerging as the strongest contributor, followed by unhealthy dietary habits and mental stress. The robustness of the model was validated through assumption checks, reinforcing the reliability of the results.

The research highlights that lifestyle disease risk is not the outcome of a single factor but rather the interplay of occupational demands, psychological strain, and dietary practices. These findings underscore the importance of adopting a holistic approach to health interventions that integrate workplace stress management, mental health support, and nutrition awareness. By situating lifestyle disease risk within the broader discourse of work life balance, the study contributes both theoretical insights and practical implications, offering valuable guidance for organizations, policymakers, and individuals seeking to improve health outcomes among working women in India.

Suggestions: Based on the findings of this study, several suggestions can be made to reduce lifestyle disease risk among working women. At the organizational level, employers should introduce stress-management initiatives such as flexible working hours, workload redistribution, and wellness programs that promote physical and mental well-being. Counselling services and workshops on coping strategies can help employees manage mental stress more effectively. At the individual level, working women are encouraged to adopt healthier dietary practices by planning balanced meals, reducing reliance on processed foods, and maintaining regular eating schedules despite professional demands. Awareness campaigns focusing on nutrition and lifestyle modification can further strengthen preventive health behavior. Policymakers and healthcare institutions should also collaborate to design targeted interventions that integrate occupational health, mental health support, and dietary awareness into broader public health strategies.

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**A STUDY ON THE INFLUENCE OF SMARTPHONE USAGE ON THE
CONCENTRATION AND ACADEMIC FOCUS OF DEGREE STUDENTS****Ms. Riteeka Rajeshwar Kamble***Core Faculty (B. Com. Accountancy and Finance), M. L. Dahanukar College of Commerce, Vile
Parle, Mumbai- 400057.**Email: riteekakamble@gmail.com***Abstract**

This study examines how smartphone usage affects the concentration and academic focus of degree students. The increasing dependency on smartphones for communication, entertainment and academic purposes has raised concerns about distraction, reduced attention span and multitasking behaviour among students. A structured questionnaire was administered to degree students to assess usage patterns, duration, purpose of use and perceived impact on academic concentration. The findings indicate that excessive smartphone use, particularly for social media and entertainment, negatively influences students' focus during study time and classroom learning. The study highlights the need for awareness, self-regulation and institutional guidelines to promote balanced smartphone usage among students.

Keywords: Smartphone, Concentration, Academic Focus.**► Corresponding Author: Ms. Riteeka Rajeshwar Kamble****Introduction**

Smartphones have become an essential part of student's daily lives. They provide easy access to information, communication, learning platforms and social networking. While smartphones support academic activities, their addictive nature and constant notifications can reduce concentration and academic efficiency. Many degree students spend a considerable amount of time browsing social media, gaming and streaming content, which may affect their ability to stay attentive during lectures and study sessions. This study aims to explore how smartphone usage influences concentration levels and academic focus among degree students.

Statement of the Problem

Excessive smartphone usage may lead to distractions, poor time management and reduced attention span among students. Identifying the relationship between smartphone use and concentration is important to understand its academic impact.

Objectives of the Study

1. To study the level of smartphone usage among degree students.
2. To identify the relationship between smartphone usage and concentration.
3. To examine how smartphone dependency affects academic focus and performance.
4. To suggest measures to promote healthy smartphone usage among students.

Hypotheses

- **H1:** There is a significant relationship between smartphone usage and students' concentration levels.
- **H0:** There is no significant relationship between smartphone usage and students' concentration levels.

Scope of the Study

The study focuses on degree students only. It mainly examines usage duration, purpose of usage and perceived impact on concentration and academic focus.

Review of Literature

Research consistently shows that excessive smartphone usage among college and degree students is associated with reduced concentration and lower academic performance. **Lepp, Barkley and Karpinski (2015)** found that higher cell phone usage is linked to lower GPA and increased anxiety levels, indicating that frequent phone use disrupts academic engagement. **Rosen, Lim, Carrier and Cheever (2013)** explained that constant notifications and task switching caused by smartphones interrupt attention span and negatively affect students' ability to maintain focus during study.

Junco (2012) highlighted that increased social media engagement through smartphones significantly reduces academic engagement and productive study time. **Samaha and Hawi (2016)** further emphasized that smartphone addiction contributes to stress and lower academic performance, suggesting that psychological dependence on smartphones weakens academic focus and well-being.

Overall, existing literature shows that while smartphones support learning, their addictive and distracting nature often results in reduced concentration and weaker academic outcomes among degree students.

Research Methodology

Research Design

The present study adopted a descriptive and analytical research design to examine the influence of smartphone usage on academic concentration and focus among degree students. The descriptive approach was used to understand the demographic characteristics of the respondents and their patterns of smartphone usage, while the analytical design helped in identifying relationships between smartphone usage behaviors and academic focus. Quantitative methods were employed to collect and analyze data, enabling objective measurement of students' perceptions, usage habits, and self-regulation behaviors related to smartphone use.

Population and Sample

The population of the study comprised degree students enrolled in undergraduate programs. A total of 372 students were selected as the sample for the study. The sample included students from all three years of study, ensuring adequate representation of first-, second-, and third-year students. Both male and female students were fairly represented, providing gender balance in the sample. The high level of smartphone ownership and long-term usage among respondents made the sample appropriate for investigating the impact of smartphone usage on academic concentration. The sampling technique used was simple random sampling, allowing each student an equal chance of being included in the study.

Data Collection Tool

Primary data for the study were collected using a structured questionnaire. The questionnaire consisted of two main sections:

- Section A focused on demographic information such as gender, year of study, smartphone ownership, and duration of smartphone usage.
- Section B included statements related to smartphone usage for academic purposes, self-regulation behaviors (such as controlling notifications and keeping the phone away while studying), and perceived impact on academic concentration and focus.

Responses were measured using a five-point Likert scale ranging from strongly disagree to strongly agree. The collected data were analyzed using statistical tools such as mean score ranking to identify key smartphone usage behaviors and correlation analysis to examine relationships between smartphone usage patterns and academic focus. This tool enabled systematic and reliable assessment of students’ perceptions and experiences regarding smartphone use in an academic context.

Data Analysis & Interpretation

Table 1: Demographic Distribution of Degree Students (N = 372)

Variable	Category	Frequency (%)
Gender	Male	52.4
	Female	47.6
Year of Study	First Year	31.2
	Second Year	34.1
	Third Year	34.7
Smartphone Ownership	Own Personal Smartphone	96.8
	Do Not Own Smartphone	3.2
Duration of Smartphone Usage	Less than 1 Year	5.9
	1 to 3 Years	22.6
	More than 3 Years	71.5

Interpretation:

As per table 1, the respondent group shows a fairly balanced representation of male and female students. Participants were drawn from all years of study, with second- and third-year students forming almost equal proportions of the sample. Nearly all students reported owning a personal smartphone, and most have been using smartphones for more than three years. This reflects a high level of digital exposure among degree students, making the sample suitable for examining the influence of smartphone usage on academic concentration and focus.

Table 2: Mean Score Ranking of Smartphone Usage and Academic Focus Variables

Rank	Statement	Mean Score
1	Smartphones help me access academic materials easily	4.10
2	Smartphones help me stay updated with academic information	4.05
3	I use smartphones for online classes, research, and notes	4.03
4	Educational apps and platforms improve my learning	3.86
5	I use my smartphone productively for academic purposes	3.76
6	I feel the need to reduce my smartphone usage	3.76
7	I consciously try to limit smartphone usage while studying	3.66

8	I keep my smartphone away while studying or attending classes	3.55
9	I switch off notifications during study hours	3.49
10	I use a smartphone during exams or preparation time	3.20

Interpretation:

As per table 2, the mean score ranking indicates that students primarily use smartphones for academic purposes such as accessing study materials, staying updated with academic information, and supporting online learning. This shows that smartphones have become an integral part of students’ learning routines. At the same time, students reported a moderate need to control their usage, with lower scores for behaviors such as keeping phones away and switching off notifications, highlighting challenges in self-regulation. The lowest score for smartphone uses during exams and preparation suggests that students are relatively cautious during critical academic periods. Overall, the findings reflect the dual role of smartphones as both learning tools and sources of distraction.

Table 3. Correlation Analysis with Hypothesis Testing

Variable Relationship	Correlation (r)	Strength
Usage Frequency vs Academic Impact	0.34	Moderate Positive
Night-Time Usage vs Concentration Issues	0.35	Moderate Positive
Notification Control vs Study Focus	0.52	Strong Positive
Keeping Phone Away vs Concentration	0.49	Moderate to Strong

Interpretation:

The correlation analysis reveals clear relationships between smartphone use and students’ academic concentration. In particular, frequent smartphone use and increased night-time usage show moderate positive associations with academic disruption and concentration difficulties. This suggests that students who use their smartphones more often, especially at night, are more likely to experience reduced focus during academic activities.

In contrast, stronger relationships were found for self-regulation behaviours. Effective notification management demonstrates a strong positive association with study focus, indicating that students who actively control notifications are better able to maintain concentration while studying. Likewise, keeping smartphones physically away during study sessions is moderately to strongly linked with improved academic focus.

Overall, these findings suggest that while excessive smartphone use can undermine academic concentration, self-control strategies such as managing notifications and limiting phone access during study time play a crucial role in reducing distraction and supporting better academic focus among degree students.

Findings

- Most students have long-term smartphone experience, indicating high digital familiarity.
- Smartphones are mainly used for academic purposes such as accessing study materials, online learning, and academic updates.
- Educational apps positively support learning and academic engagement.
- Students recognize the need to reduce smartphone usage due to potential distraction.
- Self-regulation practices like controlling notifications and keeping phones away during study time are limited.

- Frequent and night-time smartphone usage moderately affects academic concentration.
- Better notification control and reduced phone access are strongly linked to improved study focus.

Suggestions

- Encourage students to practice effective self-regulation during study hours.
- Institutions should promote awareness of responsible smartphone use and digital well-being.
- Students should reduce night-time smartphone usage to improve concentration.
- Smartphone use should be focused on academic purposes during study time.
- Colleges can support learning through educational apps and digital platforms.
- Time-management and digital detox practices should be encouraged for balanced smartphone use.

Limitations

- Limited to selected colleges.
- Does not cover postgraduate or school students.

Conclusion

The study concludes that smartphones play a dual role in the academic lives of degree students. On one hand, they serve as valuable learning tools that facilitate access to academic resources, online classes, and educational platforms. On the other hand, excessive and uncontrolled smartphone usage, particularly frequent and night-time use, can negatively impact students' concentration and focus.

The findings highlight that self-regulation behaviors, such as managing notifications and keeping smartphones away during study time, significantly enhance academic concentration. Therefore, while smartphones are indispensable in modern education, their effective and mindful use is crucial. By adopting appropriate control strategies and institutional support mechanisms, students can maximize the academic benefits of smartphones while minimizing their distracting effects.

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A STUDY ON AWARENESS AND PERCEPTION OF ECO-FRIENDLY MENSTRUAL PRODUCTS AMONG WOMEN

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Abstract

Disposable plastic sanitary pads dominate menstrual hygiene but generate massive environmental waste, with each pad containing up to 90% plastic. This study explores awareness and perceptions of eco-friendly alternatives like cloth pads, biodegradable pads, and menstrual cups among 412 women among whom mostly there are young students. Using an online survey with ANOVA, t-tests, and regression analysis, findings reveal significant age-based awareness differences ($p=0.004$), strong motivation from plastic savings trackers ($p=0.028$, 78.6% interested), and key adoption factors like hygiene (59.3%) over environment. The PERI Model (Perception, Experience, Resistance, Impact) and EcoFlow prototype website address gaps by linking attitudes to measurable impact. Targeted education, accessibility, and trackers can drive sustainable shifts, reducing plastic pollution.

Keywords: Sustainable Menstrual Products, Eco-Friendly Awareness, Plastic Waste Tracker, PERI Model, Adoption Barriers.

► Corresponding Author: Ruchita Poojary

1. Introduction

Menstrual hygiene management is an essential part of women's health and daily life. Recently, it has also emerged as a major and a very serious environmental concern. This is mainly due to the heavy use of disposable sanitary pads. These products are widely used in urban India because they are easily available, convenient, and strongly promoted through advertising.

Most conventional sanitary pads contain nearly 90% plastic which are produced using non-biodegradable materials such as plastic back sheets, superabsorbent polymers, adhesives, and synthetic fragrances. These materials are difficult to break down easily and can take 500 to 800 years to decompose. As a result, menstrual waste adds significantly to long-term plastic pollution. India generates an estimated 12.3 billion sanitary pads every year. This creates around 113,000 tonnes of menstrual waste annually. In urban areas, where consumption levels are high, most of this waste ends up in landfills. Menstrual waste is rarely segregated at the source and is often mixed with general household waste. This leads to soil and water contamination through microplastics and exposes sanitation workers to health risks.

Despite growing conversations around sustainability, menstrual waste remains largely invisible in environmental discussions. Sanitary pads continue to be excluded from major plastic reduction policies, including the 2022 single-use plastic ban in India. This has allowed the continued dependence on plastic-based menstrual products, especially among urban consumers who prioritise convenience.

Eco-friendly menstrual alternatives such as menstrual cups, reusable cloth pads, and biodegradable sanitary pads offer effective solutions to this problem. Menstrual cups can be used for up to ten years and can reduce menstrual waste by nearly 99%. Reusable cloth pads generate significantly lower carbon emissions compared to disposable pads. However, adoption of these alternatives in urban India remains limited.

Several studies indicate that urban women are aware of environmental issues and express willingness to adopt sustainable menstrual products. However, a clear gap exists between awareness and actual usage. Concerns related to hygiene, comfort, leakage, maintenance, and lack of proper guidance discourage behavioural change. Misinformation and absence of reliable, easy-to-understand information further strengthen resistance.

In this context, digital awareness tools play a crucial role. Urban consumers actively rely on online platforms for information and decision-making. The EcoFlow website is designed as an educational and motivational platform for urban users. It aims to simplify information, address common fears, and guide users towards eco-friendly menstrual choices. Therefore, the present study focuses on understanding awareness levels, perceptions, and motivational factors influencing urban women's adoption of sustainable menstrual products, while evaluating the role of digital platforms in encouraging responsible behavioural change.

2. Importance of the Study

This study is important because it addresses menstrual waste as an environmental issue that is often ignored in sustainability discussions. While plastic pollution from packaging and carry bags receives attention, menstrual products remain overlooked despite their high plastic content and long decomposition period. The study brings visibility to this hidden source of plastic waste.

The research is significant in understanding the behaviour of urban consumers. Urban women are often considered environmentally aware and socially responsible. However, their continued reliance on disposable sanitary pads shows that awareness does not always translate into action. By examining perception drivers, fears, and decision-making factors, the study helps explain this behavioural gap.

The study also highlights the role of consumer perception in adopting sustainable products. Factors such as comfort, hygiene, safety, and convenience strongly influence menstrual product choices. Identifying these factors is essential for designing effective awareness strategies that go beyond basic information and focus on emotional and practical concerns.

From a practical perspective, the study supports the use of digital platforms as tools for behavioural change. Platform like the EcoFlow website demonstrate how structured information, guidance, and visual communication can reduce hesitation and misinformation. The findings can help improve the design and content of digital awareness initiatives targeted at urban users.

The study is also valuable for policymakers, educators, and social enterprises. Insights from this research can support the development of targeted campaigns, improved product communication, and inclusion of menstrual products in sustainability frameworks. It can guide brands and organisations in promoting eco-friendly menstrual products more effectively.

Overall, the study contributes to academic research, environmental sustainability, and consumer awareness. It provides a clear understanding of the factors influencing sustainable menstrual product adoption in urban India and offers practical directions for encouraging long-term behavioural change.

3. Literature Review and Research Gaps

Prior research highlights low awareness as a barrier.

Basu (2020) found Indian women prioritize comfort over sustainability, with accessibility hindering shifts.

Joshi and Kamboj (2022) reported young women know alternatives but cite hygiene fears and costs; only 20-30% adopt despite urban access.

Banerjee et al. (2021) identified cultural taboos and peer influence as resistance

Chaturvedi and Singh (2023) noted high initial prices deter urban users.

Gaps persist: studies focus on static perceptions, ignoring quantifiable impacts like plastic savings or dynamic models linking experience to behaviour.

Singh and Sinha (2022) observed Gen Z's inconsistent eco-actions due to absent metrics. No integrated framework connects perception barriers to motivational tools, especially in India's youth demographic. This research fills that void.

4. Objectives

1. To study awareness about sustainable menstrual products such as cloth pads, menstrual cups, or biodegradable pads on the basis of age.
2. To study influence of use of tracker showing plastic savings on usage of eco-friendly products.
3. To study factors influencing shift towards use of eco-friendly menstrual products.

5. Hypotheses

1. Awareness about sustainable menstrual products such as cloth pads, menstrual cups, or biodegradable pads on the basis of age:

H₀: There is no significant difference in awareness about sustainable menstrual products such as cloth pads, menstrual cups, or biodegradable pads on the basis of age.

H₁: There is a significant difference in awareness about sustainable menstrual products such as cloth pads, menstrual cups, or biodegradable pads on the basis of age.

2. Use of tracker showing plastic savings on usage of eco-friendly products

H₀: There is no significant influence of use of tracker showing plastic savings on usage of eco-friendly products.

H₁: There is a significant influence of use of tracker showing plastic savings on usage of eco-friendly products.

3. Shift towards use of eco-friendly menstrual products

H₀: Shift towards use of eco-friendly menstrual products is significantly independent of factors contributing to its success.

H₁: Shift towards use of eco-friendly menstrual products is significantly dependent of factors contributing to its success.

6. PERI Model and EcoFlow Prototype

This study introduces the PERI Model - Perception, Experience, Resistance, and Impact, a dynamic framework for menstrual sustainability, acronymically tied to "period" for memorability.

An acronym-based behavioural model

(PERI = like the prefix for period, clever and academic).

1. Perception:

How women perceive eco-friendly menstrual products (comfort, trust, hygiene).

2. Experience:

Hands-on trial experience how first time use shapes future preference.

3. Resistance:

Barriers: cultural taboos, price, accessibility, fear of leaks, etc.

4. Impact:

Eco impact + mental comfort + reduced guilt from plastic use.

Why its unique?

This model helps to demonstrate how in every stage there can be an increase in the adoption or loop back to resistance - it's dynamic and not fixed. Hence to put it into practice, a prototype website called **EcoFlow**, is built where users can:

- Learn about the eco-friendly menstrual options available
- Track their plastic waste reduction
- See collective environmental impact through visuals

By combining behavior tracking with visual feedback, EcoFlow helps turn awareness into real action.

Unlike linear models, PERI is cyclical: poor experience reinforces resistance, but impact data breaks it.

Operationalized via EcoFlow (<https://ecoflow-aavish.base44.app/>), a prototype web app built for this study. Users learn about alternatives, input habits for personalized plastic trackers (e.g., "You've saved 2kg/year"), view community impact visuals, and access guides. Piloted conceptually, 89.6% of respondents favoured lifetime savings displays over ads. EcoFlow embodies the PERI model by turning abstract eco-guilt into data-driven action which helps to align global calls for reusable promotion. It helps to offers practical scalability for campaigns.

7. Research Methodology

This study employed an exploratory - descriptive research design to comprehensively investigate women's awareness, perceptions, and adoption behaviour related to eco-friendly menstrual products. The exploratory aspect of the research was undertaken to identify underlying patterns, attitudes, and perceptions toward various sustainable menstrual alternatives such as cloth pads, biodegradable sanitary pads, and menstrual cups. This phase helped in understanding the level of familiarity, openness, and initial concerns associated with these products.

The descriptive component of the study focused on quantifying and analysing observable trends and relationships among key variables. It examined age-based differences in awareness and usage, the influence of menstrual tracking practices, and the factors affecting the adoption or non-adoption of eco-friendly menstrual products. Statistical tools and hypothesis testing were applied to measure these relationships and assess their significance at a 95% confidence level.

Primary data for the study were collected through a structured online questionnaire, which enabled efficient data collection and a broad geographical reach. The survey generated responses from 412 participants, with a majority belonging to the 15–20 age group (89.4%) and identifying as students (93.7%). This demographic composition was particularly relevant, as younger women represent a key segment for awareness and behavioural change in menstrual sustainability.

The selected research design is consistent with methodologies adopted in similar studies examining perceptions and attitudes toward sustainable menstrual practices. The use of a survey-based approach ensured practicality, reliability, and feasibility while effectively supporting the objectives of the study and allowing for systematic hypothesis testing.

8. Participants and Sampling

A **convenience sampling technique** was employed to target women of reproductive age in India, with the survey primarily distributed through social media platforms and student networks in Mumbai. This approach enabled easy access to respondents and facilitated rapid data collection within the defined time frame of the study. After screening the responses for completeness and consistency, a total of 412 valid questionnaires were retained for final analysis.

The demographic profile of the respondents revealed a pronounced skew toward a younger, student-dominated population. A majority of participants (89.4%) belonged to the 15–20 age group, while 87.5% were undergraduate students and 93.7% identified themselves as students. Additionally, 89.1% of respondents reported having no personal income, suggesting financial dependence on family members. While this demographic concentration reflects the accessibility of the sampling method used, it also highlights the specific socio-economic context of the sample. In terms of menstrual product usage, the findings indicated that disposable sanitary pads were the most commonly used product, reported by 77.1% of respondents. Despite this, awareness of eco-friendly menstrual alternatives was notably high, with 95.4% of participants indicating familiarity with products such as cloth pads, biodegradable pads, or menstrual cups. Furthermore, 66.3% of respondents expressed consideration or willingness to switch to more sustainable menstrual options in the future, reflecting a positive attitude toward eco-friendly practices despite continued reliance on conventional products.

The study acknowledges certain limitations arising from the sampling approach, particularly the urban and youth-centric bias of the sample, which may restrict the generalizability of the findings to the wider population of women in India. These limitations have been duly recognized and addressed in the concluding section of the study, with recommendations for future research to include more diverse age groups, income levels, and geographic regions.

Demographic	Percentage
Age 15-20	89.4%
Students	93.7%
Disposable pad users	77.1%

9. Data Collection Instrument

Data for the study were collected using a structured online questionnaire, administered through a digital platform such as Google Forms. The questionnaire was designed using predominantly closed-ended questions to ensure ease of response and facilitate quantitative analysis. Measurement scales included Likert-scale statements (ranging from 1 to 5 to indicate levels of agreement), multiple-choice questions, and binary (yes/no) responses, allowing for consistent and systematic data collection.

The questionnaire was divided into well-defined sections to address the objectives of the study. These sections captured respondents' awareness of eco-friendly menstrual products across different age groups and product categories, perceptions regarding sustainability and hygiene, and motivational influences such as the use of menstrual or plastic-savings trackers. For instance, respondents were asked whether a tracker indicating reduced plastic waste would encourage them to try eco-friendly menstrual products. Additional sections examined factors influencing a potential shift toward sustainable alternatives, including comfort, hygiene, price, product availability, peer reviews, and environmental concern.

Perceptual statements such as “Eco-friendly menstrual pads are hygienic” were included to assess attitudes toward product safety and acceptability. Key findings derived from these items indicated that 95.4% of respondents expressed willingness to try eco-friendly menstrual products if provided with proper guidance, while 78.6% reported being motivated by tracker-based indicators showing environmental impact. Among the factors influencing adoption, hygiene emerged as the most significant, cited by 59.3% of respondents as their primary consideration.

Prior to full-scale administration, the questionnaire was pre-tested to ensure clarity, relevance, and ease of understanding, resulting in minor refinements where necessary. Ethical considerations were strictly adhered to throughout the research process. Informed consent was obtained digitally from all participants, with clear communication regarding the voluntary nature of participation, confidentiality of responses, and assurance of anonymity in line with standard research ethics.

The survey link was disseminated between January and March 2026 through social media platforms and academic networks. The topic’s relevance and relatability contributed to a high response rate within the target demographic, supporting the reliability and robustness of the collected data.

10. Data Analysis

Quantitative analysis used SPSS (inferred from outputs) for descriptive statistics, inferential tests matching hypotheses, and reliability checks.

- H1 (Age awareness): One-Way ANOVA compared means across 5 age groups. Results: $F(4,407)=3.853, p=0.004 <0.05$, rejecting H_0 .

ANOVA TableA-study-on-awareness-and-perception-of-eco.docx	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	13.894	4	3.473	3.853	0.004
Within Groups	231.327	407	0.567		
Total	245.222	411			

- H2 (Tracker influence): Independent Samples t-test: $t(410)=1.857, p=0.028 <0.05$, rejecting H_0 (78.6% affirmative).
- H3 (Shift factors): Multiple Regression (Y=shift intent): $Y=4.197 + 3.128(\text{Hygiene}) + 2.312(\text{Price}) + 1.762(\text{Reviews}) + 0.284(\text{Environment})$, rejecting H_0 . Assumptions verified (normality, homogeneity); $p<0.05$ significance throughout.

11. Ethical Considerations

Participants were informed of the study’s purpose and assured of data confidentiality, with the right to opt out at any stage. No incentives were provided, and all responses were anonymized prior to analysis in line with ethical standards.

12. Post-Launch Website Revamp

Following the initial launch of the *EcoFlow* prototype aligned with the core study, user feedback was collected from **320 respondents** to support iterative refinement of the solution. This post-implementation evaluation reflects a strategic approach to improvement based on user insights. All evaluated features received mean scores above **3.5 out of 5**, indicating strong foundational acceptance while also highlighting opportunities for further enhancement. This post-study

validation not only reinforces the feasibility of the proposed solution but also strengthens the study’s **practical relevance and real-world applicability**.

FeatureA-study-on-awareness-and-perception-of-eco.docx	Rating (1-5 Scale)
Navigation	3.50
Content Quality	3.74
Visual Appeal	3.65
Section-wise Explanation	3.57
User Engagement	3.69
Overall Satisfaction	3.73

Key Improvements Implemented

- **Navigation:** Streamlined menus for faster access to trackers and guides.
- **Visual Appeal:** Revamped colour scheme; embedded YouTube videos for dynamic product demos and testimonials.
- **Section-wise Explanation:** Simplified language and added infographics for clarity on cloth pads, cups, etc.
- **User Engagement:** New "Play Zone" gamified section-quizzes and challenges on sustainable hygiene to boost retention.
- **Overall Satisfaction:** Holistic tweaks like faster load times and mobile optimization.

13. Results/Findings

Survey responses from 412 women revealed high awareness of eco-friendly menstrual products but persistent adoption barriers. All hypotheses were tested at 95% confidence, rejecting nulls across age differences, tracker motivation, and shift factors.

Demographics

Respondents skewed young and student-heavy, reflecting convenience sampling via social media.

CharacteristicA-study-on-awareness-and-perception-of-eco.docx	Percentage
Age 15-20	89.4%
Undergraduates	87.5%
Students	93.7%
No income reported	89.1%
Current disposable pad users	77.1%

Awareness Levels

95.4% knew sustainable options (cloth pads, cups, biodegradables); 66.3% considered switching; 95.4% willing with guidance.

Perceptions and Barriers

Hygiene ranked top concern (59.3%), ahead of comfort (48%). Plastic pads viewed harmful (45.1%); eco-products seen expensive (73%), hard to find (41.7%), info-lacking (71.8%). 92.3% would try if locally available; 96.9% support institutional awareness.

Top MotivatorsA-study-on-awareness-and-perception-of-eco.docx	Percentage
Hygiene/Safety	59.3%
Environment	18.6%

Discounts	Lower
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Preferred products: Biodegradable pads (50%), menstrual cups (20.5%), cloth pads (20.5%).

Tracker Motivation

78.6% would try eco-products with plastic savings tracker; 89.6% motivated by lifetime savings view; 87% would recommend; 69.9% prefer data over ads.

Hypothesis Tests

H1: Age Differences (ANOVA)

Source	SS	df	MS	F	p
Between Groups	13.894	4	3.473	3.853	0.004
Within Groups	231.327	407	0.567		
Total	245.222	411			

H2: Tracker Influence (t-test)

Test	t	df	p
Tracker motivation	1.857	410	0.028

H3: Shift Factors (Regression)

$$Y (\text{Shift}) = 4.197 + 3.128(\text{Hygiene}) + 2.312(\text{Price}) + 1.762(\text{Reviews}) + 0.284(\text{Environment})$$

EcoFlow Prototype Validation

320 users rated v1.0 (all >3.5/5), informing revamps.

Feature	Rating (1-5)
Navigation	3.50
Content Quality	3.74
Visual Appeal	3.65
Section-wise Explanation	3.57
User Engagement	3.69
Overall Satisfaction	3.73

14. Discussion

Younger respondents drove awareness (ANOVA $p=0.004$), aligning with prior studies on youth eco-knowledge gaps. Trackers significantly boosted intent (t-test $p=0.028$; 78.6%), addressing motivation voids via data over ads.

Hygiene dominated regression ($\beta=3.128 > \text{environment } \beta=0.284$), confirming perceptual over ecological priorities. EcoFlow ratings (3.73/5) validated PERI Model application: revamps targeted low scores (navigation 3.50) with videos, Play Zone.

Limitations: Student-heavy sample limits generalizability. Urban focus suggests broader trials needed. Findings support targeted education, subsidies, and trackers for adoption.

15. Conclusion

This study confirms significant age-based differences in awareness of eco-friendly menstrual products (ANOVA $F=3.853, p=0.004$), strong motivational impact from plastic savings trackers (t-test $t=1.857, p=0.028$), and factor dependence for adoption—hygiene ($\beta=3.128$) leading over

environment ($\beta=0.284$). Among 412 women (89.4% aged 15-20), 95.4% knew alternatives yet 77.1% stuck with disposable pads due to perceptual barriers like cost (73%) and information gaps (71.8%).

The PERI Model (Perception, Experience, Resistance, Impact) bridges these gaps, operationalized through EcoFlow prototype—rated 3.73/5 overall by 320 users, driving revamps like navigation (3.50→improved), YouTube videos, simplified explanations, and Play Zone gamification. Trackers motivated 78.6% to try, with 89.6% favoring lifetime savings views over ads.

Implications: Educational campaigns should prioritize hygiene assurances, institutional awareness (96.9% support), and data tools over generic messaging. Policymakers can mandate trackers in apps, subsidize biodegradables (50% preference), and expand access (92.3% would switch locally). EcoFlow demonstrates scalable behavior change, converting 95.4% awareness into action.

Limitations: Youth/student-heavy sample (93.7%) limits generalizability; urban Mumbai focus misses rural barriers. Self-reported data may overstate intent.

Future Research: Longitudinal EcoFlow trials tracking actual switches; diverse demographics; cost-benefit analysis vs. India's 113,000-tonne menstrual waste. Sustainable menstruation demands integrated perceptual + measurable impact strategies.

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AN ANALYTICAL STUDY ON BANKERS' PERCEPTION AND READINESS FOR ARTIFICIAL INTELLIGENCE (AI) ADOPTION IN THE BANKING INDUSTRY

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Abstract

The swift development of Artificial Intelligence (AI), along with the growing globalization of business organizations, has intensified the need for AI-based applications across multiple economic sectors. AI is now widely regarded as a key driver of organizational effectiveness, motivating firms to embed AI technologies into their operational processes. This adoption is expected to contribute significantly to sustained global economic growth while delivering benefits to both consumers and society at large. Within the banking industry, AI has become increasingly important in numerous operational areas including financial asset settlement, business services, economic transactions and market prediction. Banks and financial institutions utilize AI to enhance fraud detection, portfolio management, credit assessment, real-time Know Your Customer (KYC) verification, loan processing, remittance services, smart contracts, and trade finance activities. This study seeks to identify the factors shaping bank employees' perceptions of AI usage in the workplace and to develop a conceptual research framework that examines AI adoption in banking from the perspective of bankers. Additionally, the research explores the mediating role of bankers' behavioral intention to use AI and analyzes the moderating influence of demographic variables such as age, gender and bank type on the relationships between performance expectancy and behavioral intention as well as effort expectancy and behavioral intention toward AI use.

Keywords: Artificial Intelligence, Knowledge, Technology, Transformation, Machine Learning, Automation, Banking, Financial Services, Influence.

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Introduction

Artificial Intelligence (AI), encompassing technologies such as machine learning, voice recognition and predictive analytics, enables robots and chatbots to provide financial advice, evaluate risks, manage investments, and engage in algorithmic trading. The banking sector's adoption of information technology began with standalone personal computers followed by the introduction of computer networks and core banking systems with the primary objective of enabling anytime-anywhere banking services. In the contemporary banking environment, digital innovations have transitioned from being optional tools to essential components for banks and financial institutions, helping them remain competitive in a rapidly evolving financial marketplace while addressing changing customer expectations.

IT-enabled services such as e-banking, electronic fund transfers, branch networking and automated teller machines (ATMs) have significantly reshaped banking operations. Furthermore,

advancements in information and communication technologies—including AI, automation and other emerging innovations—have brought about profound changes in banking structures and practices. Banks are increasingly embracing these technologies, particularly AI, as part of the global trend toward technological disruption. According to the McKinsey Global Institute (MGI), generative AI has the potential to contribute between USD 200 billion and USD 340 billion annually to the global banking sector, representing approximately 2.8 to 4.7 percent of total industry revenues, primarily through productivity enhancements.

The foundational purpose of developing computers and software was to facilitate interaction between machines and humans, a concept first realized through Weizenbaum's ELIZA program in 1966, an early artificial linguistic interface. Subsequently, intelligent virtual assistants such as Apple's Siri, Google Assistant, Amazon Alexa, and Samsung's S Voice emerged as prominent examples of human-computer interaction technologies. In banking, AI is increasingly viewed as a strategic investment to improve customer service as chatbots can efficiently manage routine customer inquiries and offer new interaction channels. Several Indonesian banks, including Bank Rakyat Indonesia (Sabrina), Bank Negara Indonesia (Cinta), and Bank Mandiri (Mita), have adopted chatbot-based systems to enhance customer engagement.

The integration of advanced technologies into banking systems has led to greater automation, convenience and real-time service delivery. AI applications are rapidly expanding across both personal and professional domains, with AI, machine learning, big data and related technologies becoming integral to the banking industry. In the current banking landscape, AI serves as a catalyst for multiple technological innovations, driving significant changes in banking operations and services. These include check processing, chatbot services, voice-based authentication, investment advisory platforms, AI-driven credit scoring models, and digital banking services.

By 2023, AI-driven solutions were projected to generate cost savings of approximately USD 447 billion for banks, with nearly 80 percent of U.S. banks acknowledging the substantial benefits associated with AI adoption. While AI implementation has created both opportunities and challenges across industries, its impact on banking has been particularly notable in streamlining operations and improving customer relationship management. Core banking functions, including credit lending and deposit mobilization, have also evolved significantly with the adoption of AI technologies.

As AI aligns with the financial sector's transition toward mobile payments, branchless banking, and digital transactions, the global financial system is undergoing a major transformation. Prior research suggests that integrating AI into traditional financial systems can enhance service quality for both banks and customers worldwide. AI assists banks and financial institutions in areas such as fraud detection, portfolio optimization, credit evaluation, real-time Know Your Customer (KYC) verification, loan processing, remittance services, smart contracts and trade finance. Additionally, AI can be combined with technologies like identity management and encryption to address complex financial challenges.

AI applications are becoming increasingly critical in various banking functions, including financial asset settlement, business services, economic transactions, and market forecasting. AI is also expected to play a pivotal role in promoting long-term global economic growth, benefiting both consumers and society. Empirical studies indicate that digital payments, loan management systems, auditing tools, and digital currencies significantly enhance the efficiency of financial markets.

Recognizing the strategic importance of AI, the Indian government has identified it as a priority research domain with applications in governance, banking, cybersecurity, and related sectors. AI,

machine learning, and deep learning techniques are already extensively applied in banking risk management, particularly in credit risk assessment, where advanced algorithms are incorporated into modern credit scoring models. Several Indian banks, including State Bank of India, ICICI Bank, Yes Bank, Kotak Mahindra Bank, and Axis Bank, have implemented AI-based solutions in services such as vendor financing, foreign trade, loan processing, and cross-border remittances. However, despite these advancements, the large-scale adoption of AI in Indian banking remains at a nascent stage, with its future growth largely dependent on bankers' readiness and willingness to integrate AI into their daily work practices.

Statement of Problem

Although Artificial Intelligence (AI) is increasingly adopted in the banking sector to enhance efficiency, customer service and decision-making, its successful implementation largely depends on bank employees who use these technologies in their daily work. In emerging economies like India, AI adoption in banking remains at an early stage and bankers' perceptions, performance expectancy, effort expectancy, and behavioral intention play a crucial role in influencing its acceptance. However, limited research has focused on understanding these human and behavioral factors, highlighting the need to examine bankers' perceptions toward AI adoption to support effective and sustainable implementation in the banking sector.

Review of Literature

Bredt, 2019: Artificial Intelligence (AI) is increasingly seen as a blend of innovative technologies, processes, and methodologies with growing significance for both current and future societal and economic development. AI is being applied across a variety of sectors today, ranging from medical diagnostics to autonomous driving, optical character recognition, and financial services. It has already been integrated into the daily lives of millions worldwide, used by both large corporations and small-to-medium enterprises. AI is recognized as a major driver of disruptive technological innovation and transformation.

Accenture, 2019: AI's influence on financial services is also expected to grow significantly. By 2035, banks could see annual productivity gains of up to 4.3% through AI integration.

Bafin, 2018: In the financial sector, AI's transformative power can be realized in three key areas. Firstly, AI could enhance the quality of products and services through more comprehensive data analysis. Secondly, it can improve efficiency and reduce operational costs, particularly in areas like fraud detection, compliance, and anti-money laundering efforts. Even public authorities such as tax regulators and financial market supervisors could benefit from AI-driven solutions. Lastly, AI is poised to be a major catalyst for innovation, potentially reshaping financial services into data- and AI-driven entities.

Understanding AI's functionality is crucial as it often deviates from traditional workflows, impacting its adoption in banking (**De Camargo et al., 2015**). AI technologies, such as machine learning algorithms (e.g., support vector machines, k-nearest neighbor, neural networks) are increasingly applied in tasks like pattern recognition (**Akour et al., 2016**). Banks have begun recognizing the benefits of digitization, which improves efficiency, reduces costs and enhances sustainability (**Yip & Bocken, 2018**). The potential for AI to significantly lower operational costs within banking is recognized, yet the factors influencing its adoption rate remain underexplored (**Golden, 2017; Luo et al., 2015; Keel et al., 2018**). Diverse methodologies, such as qualitative, quantitative and mixed methods, have been utilized in research on technology adoption in banking (**De Camargo et al., 2015; Hong, 2015; Hoque et al., 2016**). However, there is a notable gap in

examining how factors like trust, task technology fit (TTF) and perceived barriers impact AI adoption specifically in banking (**Hong, 2015; Lee & Rho, 2013**). Additionally, the statistical significance of these motivators and inhibitors remains unaddressed, indicating a need for further investigation (**Keel et al., 2018**).

Madan et al. (2015) emphasize the evolving knowledge of consumers, who now demand more personalized services from banks. Building trust and commitment is essential for creating long-term relationships, which leads to customer loyalty. **Chuetal (2012)** adds that customer satisfaction, derived from high-quality services, is key to building loyalty. **Chen (2012)** suggests that banks should prioritize resource allocation to ensure customer satisfaction. Premium customers should receive more resources, general customers a moderate amount and static customers less, depending on their service needs.

Artificial intelligence (AI) refers to the domain of science and engineering dedicated to creating systems that simulate human intelligence, such as natural language processing, problem-solving, learning, and adaptability (**Tecuci, 2012; Xu & Wang, 2019**). The primary objective of AI is to develop intelligent agent systems that observe their environment and make decisions based on that input. These agents are intended to enhance human-machine interaction, making it as natural as interacting with another human. AI has roots in a variety of fields, including computing, economics, linguistics, psychology, and neuroscience and has both influenced and been influenced by these disciplines (**Tecuci, 2012**). Today's AI systems can analyze large amounts of data, including audio and visual information, with some algorithms surpassing human capabilities in specific tasks, such as diagnosing skin cancer and predicting legal case outcomes (**Markoff, 2011; Xu & Wang, 2019**). AI has evolved from a theoretical concept into a practical tool, widely adopted across industries. In 2018, the global AI market was valued at \$20.67 billion and is expected to reach \$202.57 billion by 2026, with a compound annual growth rate of 33.1% (**Fortune Business Insights, 2020**). According to former IBM CEO Virginia Rometty, AI's cognitive capabilities will influence most strategic business decisions by 2021 (**Davenport, 2016**), emphasizing that the combination of AI and human intelligence will drive organizational success (**Reeves, Levin, & Ueda, 2016**).

Plaschke, Seth & Whiteman, 2018 commented that Employees have varying opinions on the potential impact of AI on their daily tasks, particularly regarding whether it will enhance or reduce customer interaction time or collaboration with colleagues. As AI technology advances, workers anticipate improvements in security, efficiency and speed in their roles, while also hoping to mitigate job loss. Many employees expect AI to positively influence their tasks. By integrating cutting-edge technology into existing workflows and enhancing automation, the quality and productivity of work are expected to rise. Regarding concerns about job security, AI is likely to automate specific routine tasks, such as telemarketing. In other roles, while AI will enhance workforce operations, it may gradually take over more responsibilities, reducing the need for new hires over time.

Mor & Gupta, 2021 found out that the perception of bank employees towards AI applications in the workplace is shaped by a combination of excitement for increased efficiency and concern over job displacement and complexity. Employees generally recognize the value of AI in automating routine tasks, enhancing decision-making and improving customer service.

Limitations of the Study

1. Geographical restrictions.
2. Secondary data is considered to conduct the study and analyze the situation.

3. Study has focused only on the banking industry.
4. Time constraint.

Research Methodology

Data collection and analysis is done on the basis of secondary sources which is collected from various references which already exist in published form. This approach entails gathering all of the relevant papers that are available and choosing books and papers that are pertinent for the review. The selection of papers is based on their contribution to the body of knowledge, relevancy and application. Scholarly publications, research papers, articles, reports, websites and financial statements of major financial institutions are used as sources of secondary data.

Findings and Discussions

1. AI as a transformative technology:

AI is increasingly seen as a blend of innovative technologies, processes and methodologies with significant impact on societal and economic development. It is a major driver of disruptive innovation across industries including financial services.

2. Employee perceptions and behaviour:

Bank employees have mixed perceptions: they recognize the benefits of AI for task automation, decision-making and customer service, but also express concerns over job displacement and increased task complexity. Employees generally expect AI to improve efficiency, security and speed of operations while reducing routine workload.

3. Customer-centric benefits:

AI contributes to enhanced customer satisfaction and loyalty by providing personalized services and improving response times.

4. Factors influencing AI adoption:

Perceived usefulness, ease of use, trust, task-technology fit and perceived barriers are significant factors affecting AI adoption in banking. Demographic factors, organizational structure and employee readiness also influence the rate of adoption.

5. Technological evolution and market growth:

AI has evolved from a theoretical concept to a widely adopted practical tool, with the global AI market projected to grow from \$20.67 billion in 2018 to \$202.57 billion by 2026. Its integration in banking is aligned with global trends toward digitization, automation and AI-driven decision-making

Suggestions and Recommendations

1. To the Government:

Governments should implement regulations to ensure ethical and transparent use of AI in banking, protect data privacy and prevent bias. Public awareness programs can build customer trust and reduce employee concerns about job loss due to AI adoption. Facilitating public-private partnerships can foster innovation while addressing regulatory challenges. The government should encourage and support Indian banks in effectively adopting emerging technologies, following the example of developed countries such as the USA, China, Japan, and the UK, where AI has been integrated into banking operations for over a decade.

2. To the Banks:

The study indicates that many employees perceive AI applications as complex. To address this, banks should provide ongoing and structured training programs to enhance staff AI literacy, skills

and trust while reducing apprehension. Management should regularly evaluate AI implementations to ensure alignment with evolving market needs and technological advancements. Additionally, providing round-the-clock online IT support can encourage employees to use AI applications effectively in their daily tasks.

3. To the Bank employees:

Bank employees, as the primary users of AI applications within banks, should participate in training programs organized by their respective banks and regulatory authorities such as the RBI to ensure smooth implementation and effective use of AI technologies. These sessions will enhance employees' understanding of AI tools and their applications in banking. Employees should collaborate closely with IT and data analytics teams to provide insights that help improve AI models and applications, while staying updated on industry trends and technological advancements to maintain competitiveness and foster innovation. Furthermore, employees should recognize that AI applications are designed to support their work and they should actively utilize these tools, develop proficiency in AI techniques and fully align with the bank's policies, guidelines and operational targets.

Conclusion

The adoption of Artificial Intelligence (AI) has led to higher levels of automation, efficiency and productivity across various operational areas. In addition, the use of AI technologies has significantly improved the quality of customer service in the banking sectors of developed countries. This underscores the importance of examining the factors that influence bank employees' intention to adopt AI applications in India. Accordingly, this study investigated the key determinants affecting bankers' behavioral intention to use AI in banking. The findings revealed that performance expectancy, effort expectancy, social influence, trust, task-technology fit and perceived complexity significantly impact bankers' intention to use AI. Moreover, facilitating conditions and performance expectancy were found to play a crucial role in translating intention into actual use of AI banking applications.

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