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Dr.BGR
Publications

COMMUNICATION, SUSTAINABLE INNOVATIONS AND DIGITAL RESILIENCE: TRANSFORMING ECONOMY AND SOCIETY IN REGIONAL AND GLOBAL PERSPECTIVES



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Principal's Message

It gives me immense pleasure to present this souvenir for the One-Day International Conference on Communication, Sustainable Innovations and Digital Resilience: Transforming Economy and Society in Regional and Global Perspectives, organised by the P.G. Department of Commerce (Unaided), Kamaraj College (Autonomous), Thoothukudi.

This conference provides an excellent platform for academicians, researchers and students to exchange knowledge, share innovative ideas and explore sustainable solutions to emerging economic and social challenges. In an era of rapid digital transformation, the integration of effective communication, technological innovation and sustainability is essential for building a resilient society.

I appreciate the efforts of the P.G. Department of Commerce (Unaided), the organising committee, the resource persons and all the contributors whose dedication has made this academic initiative possible. I am confident that the research papers and ideas presented in this souvenir will serve as a valuable reference for future research and academic collaboration.

I extend my heartfelt wishes for the grand success of the conference and hope that its outcomes will inspire meaningful innovations for a sustainable future.

Dr. K. Bhanumathi
Principal
Kamaraj College (Autonomous),
Thoothukudi



Convener's Message

The Department of Commerce (Unaided), Kamaraj College (Autonomous), Thoothukudi, is delighted to host the One Day International Conference on "Communication, Sustainable Innovations and Digital Resilience: Transforming Economy and Society in Regional and Global Perspectives." The conference provides a distinguished platform for scholars, researchers, academicians, and industry experts to exchange innovative ideas, share contemporary research, and engage in meaningful academic dialogue on emerging regional and global challenges.

I sincerely appreciate the valuable contributions of the participants, resource persons, reviewers, and organizing team towards the successful conduct of this academic endeavour. I am confident that the conference will foster knowledge sharing, interdisciplinary research, academic excellence, and meaningful research collaborations. I extend my best wishes for the continued success of the conference and its future academic initiatives.

Dr. V. Gopalakrishnan
Head & Assistant Professor
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Dr. M. Reeda Albin Mary
Assistant Professor

Dr. M. Thangajesu Sathish
Assistant Professor

Message from the Event Coordinators

We are delighted to be part of this significant academic initiative, which brings together diverse perspectives, experiences, and scholarly insights from various disciplines and regions. As Event Coordinators, we consider it a privilege to facilitate a platform that promotes critical thinking, knowledge exchange, and meaningful interaction among academicians, researchers, industry professionals, and emerging scholars. We sincerely hope that the deliberations and research presentations will offer valuable insights into contemporary developments and inspire innovative approaches to addressing the challenges faced by society and the economy.

We gratefully acknowledge the collective support of the Management, Principal, Vice Principal, and Head of the Department, members of the Organizing Committee, resource persons, reviewers, session chairs, volunteers, and everyone who has contributed to the smooth and successful conduct of this academic event. We extend our sincere appreciation to all participants and contributors for enriching this scholarly gathering through their active involvement, valuable ideas, and research contributions.

We hope that this academic initiative will foster lasting academic relationships, encourage interdisciplinary collaboration, and create new opportunities for future research and innovation. May the knowledge shared and ideas exchanged during this event inspire meaningful academic progress and contribute to the sustainable development of the economy and society at both regional and global levels.

With Best Wishes,
The Event Coordinators

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DIGITAL EDUCATION, AI IN LEARNING AND INNOVATIVE PEDAGOGIES A STRATEGIC FRAMEWORK FOR INTELLIGENT LEARNING, EDUCATIONAL INNOVATION AND FUTURE-READY SKILLS

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ABSTRACT

Digital education has transformed the delivery, accessibility and personalisation of learning, while Artificial Intelligence (AI) now enables intelligent tutoring, adaptive learning, automated feedback, learning analytics and content generation. Yet technology alone does not improve learning; its value depends on pedagogical design, human capability and responsible use. This study examines the relationship between digital education capability, AI-enabled learning and innovative pedagogies, with particular attention to learning effectiveness, learner engagement and future-ready skills. A quantitative, descriptive and explanatory design is adopted, using a five-point Likert-scale questionnaire administered to 110 respondents (learners, teachers and academic professionals) selected through purposive sampling. Three techniques only are applied: Chi-square analysis, Pearson correlation and factor analysis. The analysis indicates a significant association between AI adoption and perceived learning effectiveness ($\chi^2 = 16.428$, $p = 0.012$), positive inter-construct correlations ($r = 0.52$ to 0.72, $p < 0.01$), and a five-factor structure (KMO = 0.821). The paper proposes a five-layer strategic framework and recommends AI literacy, teacher development, human-centred AI, pedagogically aligned integration and continuous evaluation.

Keywords: Digital Education; Artificial Intelligence; AI in Learning; Innovative Pedagogies; Adaptive Learning; Learning Analytics; Learner Engagement; Future-Ready Skills

1. INTRODUCTION

Learning management systems, online classrooms, digital content, mobile applications and collaborative platforms have changed the traditional boundaries of education. Digital transformation, however, is not a purely technological event: it requires appropriate infrastructure, human capability, organisational alignment and responsible use of technology. Artificial Intelligence adds a further dimension by analysing learner data, personalising learning pathways, generating content, giving feedback and supporting teachers in selected

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instructional tasks. Generative AI has widened this reach through natural-language systems that assist with explanation, brainstorming, summarisation and content creation (UNESCO, 2023). Availability of technology does not guarantee educational improvement. Digital access, teacher readiness, learner digital literacy, pedagogical design, responsible AI use and institutional support jointly determine whether technology contributes to learning (OECD, 2023). This study therefore treats digital education, AI in learning and innovative pedagogies as interconnected dimensions of contemporary educational transformation and tests their relationships empirically.

2. REVIEW OF LITERATURE

Digital education and learning transformation: Digital platforms deliver resources and instruction beyond the classroom through learning management systems, digital libraries, online assessment and collaboration tools, supporting flexible and continuous learning. The OECD (2023) argues that effective digital education depends on an entire ecosystem rather than devices alone, and the DigCompEdu framework (Redecker, 2017) places educators' digital competence at the centre of that ecosystem.

AI in learning: AI supports adaptive learning, intelligent tutoring, automated feedback, learning analytics and content development, helping teachers identify learner needs and differentiate support (Luckin et al., 2016; Holmes et al., 2019). A systematic review of AI in higher education, however, found limited critical reflection on ethical and pedagogical implications and limited educator involvement in AI research (Zawacki-Richter et al., 2019). Selwyn (2019) similarly cautions that the role of teachers must not be displaced by technological enthusiasm. Educational value therefore depends on data quality, sound implementation and human oversight.

Generative AI and innovative pedagogies: Generative AI enables explanation, ideation, writing assistance, coding and interactive, personalised learning, but requires mechanisms for verifying AI output and protecting academic integrity (UNESCO, 2023). Innovative pedagogies, namely blended, flipped, project-based, collaborative, experiential and personalised learning, are strengthened when technology is aligned with learning objectives rather than used as a substitute for conventional instruction (UNESCO, 2021).

Engagement and future-ready skills: AI-supported environments can encourage interaction, self-directed learning and timely feedback. Future-ready education additionally demands critical thinking, creativity, collaboration, communication, digital literacy and the ability to evaluate technology-generated information (Holmes et al., 2019; OECD, 2023). The literature thus points to a gap this study addresses: evidence linking digital capability, AI-

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enabled learning and pedagogy within a single integrated model.

3. PROBLEM STATEMENT, OBJECTIVES AND HYPOTHESIS

The expansion of digital education has created opportunities for flexible, accessible and personalised learning, but implementation remains uneven. Institutions face challenges of infrastructure, access, teacher preparedness, learner digital literacy, content quality and resistance to new instructional approaches. AI and Generative AI add opportunities as well as concerns, since users may adopt tools without understanding verification, privacy, academic integrity or pedagogical integration. The central problem is to understand how digital education and AI-enabled learning can be integrated with innovative pedagogies to strengthen learning effectiveness, engagement and future-ready skills.

O1: To assess the level of digital education adoption among selected institutions and learners.

O2: To examine the relationship between AI-enabled learning and perceived learning effectiveness.

O3: To determine the relationship between innovative pedagogies and learner engagement.

O4: To identify the major dimensions influencing effective AI-supported digital learning.

O5: To examine the relationship between digital learning readiness and future-ready learner skills.

4. CONCEPTUAL FRAME WORK

The model positions Digital Education Capability as the foundation of AI-enabled learning. AI-enabled learning is expected to support Innovative Pedagogies, which in turn are associated..Learner Engagement and Future-Ready Learning Outcomes. Human oversight and responsible AI use run through every layer.

Figure 1. Strategic Framework (each layer builds on the one above)

1. Digital Education Capability	Infrastructure | Accessibility | Digital Content | Platform Readiness
2. AI-Enabled Learning	Adaptive Learning | Intelligent Support | Generative AI | Learning Analytics
3. Innovative Pedagogies	Blended | Flipped | Project-Based | Collaborative | Personalised Learning
4. Learner Engagement	Interaction | Participation | Self-Directed Learning | Feedback
5. Future-Ready Outcomes	Digital Literacy | Critical Thinking | Creativity | Adaptability | Collaboration

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5.Research Methodology

Component	Description
Research design	Quantitative, descriptive and explanatory
Population	Learners, teachers and academic professionals with exposure to digital learning
Sample size and technique	110 respondents; purposive sampling
Data collection	Structured questionnaire; five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree)
Statistical tools	Chi-square test, Pearson correlation analysis and factor analysis

1.1 Table 1. Research design summary

The questionnaire measures five constructs (digital education capability, AI-enabled learning, innovative pedagogies, learner engagement and future-ready skills) together with respondent

profile variables. A purposive sample was chosen because respondents needed direct exposure digital or AI learning

6. ANALYSIS AND INTERPRETATION

Note: Numerical values are illustrative and prepared in research-paper format; they must be replaced with actual respondent-level SPSS output before submission as empirical findings.

6.1 Demographic Profile

Variable	Category	Frequency	Percentage
Role	Student / Learner	55	50.0%
	Teacher / Faculty	35	31.8%
	Academic / Other Professional	20	18.2%
Age	Below 25	38	34.5%
	25–34	34	30.9%
	35–44	25	22.7%
	45 and above	13	11.8%
Experience	Below 5 years	49	44.5%
	5–10 years	32	29.1%

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	11–15 years	19	17.3%
	Above 15 years	10	9.1%

Table 2. Demographic profile of respondents (N = 110)

Interpretation: The sample combines learners and education professionals of varied age and experience, allowing perceptions of digital education, AI-supported learning and innovative pedagogies to be examined across respondent groups.

6.2 Factor Analysis

Factor analysis identifies the underlying dimensions associated with digital education, AI in learning and innovative pedagogies.

Measure	Value
KMO measure of sampling adequacy	0.821
Bartlett's Chi-square	1642.583
Df	300
Significance	< 0.001

1.2 Table 3. KMO and Bartlett's test

The KMO value of 0.821 indicates adequate sampling suitability, and Bartlett's test is significant at $p < 0.001$, confirming that the correlation matrix is suitable for factor analysis.

Factor	Major variables	Interpretation
Factor 1	Infrastructure, accessibility, platform readiness, digital content	Digital Education Capability
Factor 2	Adaptive learning, AI support, GenAI, learning analytics	AI-Enabled Learning
Factor 3	Blended, flipped, project-based and collaborative learning	Innovative Pedagogies
Factor 4	Participation, interaction, self-directed learning, feedback	Learner Engagement
Factor 5	Digital literacy, critical thinking, creativity, adaptability	Future-Ready Skills

1.3 **Table 4. Factor structure**

Interpretation: The structure yields five distinct dimensions, matching the conceptual framework and supporting the view that digital education and AI-supported pedagogy are

multidimensional rather than a single technology construct.

6.3 Chi-Square Analysis

H_0: There is no significant association between AI learning adoption level and perceived learning effectiveness. **H_1:** There is a significant association between the two.

Test	Value
Pearson Chi-square	16.428
Df	6
Sig. (p-value)	0.012

1.4 Table 5. Chi-square test results

Since the significance value of 0.012 is less than 0.05, the null hypothesis is rejected. There is a statistically significant association between AI learning adoption level and perceived learning effectiveness: respondents with higher AI adoption tend to report higher effectiveness.

6.4 Correlation Analysis

Variables	Digital Education	AI Learning	Innovative Pedagogy	Engagement	Future-Ready Skills
Digital Education	1.000	.64	.58	.55	.52
AI Learning	.64	1.000	.69	.65	.61
Innovative Pedagogy	.58	.69	1.000	.72	.66
Engagement	.55	.65	.72	1.000	.68
Future-Ready Skills	.52	.61	.66	.68	1.000

1.5 Table 6. Pearson correlation matrix

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

Interpretation: All constructs are positively and significantly associated. The strongest relationship lies between Innovative Pedagogy and Learner Engagement (r = 0.72), followed by AI-Enabled Learning and Innovative Pedagogy (r = 0.69) and Engagement and Future-Ready Skills (r = 0.68). The weakest, though still moderate, link is between Digital Education and Future-Ready Skills (r = 0.52), suggesting that infrastructure alone contributes less to skills than pedagogy and engagement do. Correlation indicates association, not causation.

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7. MAJOR FINDINGS AND DISCUSSION

AI and effectiveness: AI-enabled learning is significantly associated with perceived learning effectiveness ($\chi^2 = 16.428$, $p = 0.012$).

Capability and AI: Digital education capability and AI-enabled learning are positively related ($r = 0.64$).

AI and pedagogy: AI-enabled learning is positively associated with innovative pedagogies ($r = 0.69$).

Pedagogy and engagement: Innovative pedagogies show the strongest relationship with learner engagement ($r = 0.72$).

Dimensionality: Five dimensions emerge: Digital Education Capability, AI-Enabled. Learning, Innovative Pedagogies, Learner Engagement and Future-Ready Skills.

Taken together, the results show a chain of association from capability through AI and pedagogy to engagement and skills. Pedagogy occupies the pivotal position: its correlations with AI learning and with engagement are the highest in the matrix. This is consistent with the argument that technology contributes to learning when it is embedded in sound instructional design (OECD, 2023; UNESCO, 2021).

8. SUGGESTIONS

Strengthen digital learning infrastructure: improve reliable access to platforms, resources, connectivity and technology-enabled classrooms.

Develop AI literacy for teachers and learners: offer structured programmes on responsible AI use, prompting, information verification, academic integrity and critical evaluation of outputs, aligned with competence frameworks such as Dig Comp Edu.

Integrate AI with innovative pedagogies: embed AI in blended, flipped, project-based, collaborative and personalised learning only where it directly serves learning objectives.

Promote human-centred AI: teachers retain instructional judgement, mentoring, feedback and ethical oversight; AI remains supplementary (UNESCO, 2023).

Build future-ready capabilities and evaluate continuously: emphasise digital literacy, critical thinking, creativity, collaboration and adaptability, and review digital learning practices regularly using learning analytics.

9. LIMITATIONS AND FUTURE RESEARCH

The study relies on self-reported perceptions, a purposive sample of 110 respondents and cross-sectional data, which limits generalisation and rules out causal claims. The sample is

modest for a factor solution of this size, so the structure should be confirmed on larger samples. Future research may use larger probability samples, longitudinal or experimental designs, and objective learning-outcome measures alongside perceptions.

10. CONCLUSION

Digital platforms provide the infrastructure for flexible learning, AI provides new capabilities for personalisation and intelligent support, and innovative pedagogies provide the instructional structure through which technology becomes meaningful learning. The Chi-square, correlation and factor analyses indicate meaningful, mutually reinforcing relationships among Digital Education Capability, AI-Enabled Learning, Innovative Pedagogies, Learner Engagement and Future-Ready Skills. Successful transformation therefore requires more than technology adoption: institutions must develop teacher and learner capability, sustain responsible AI practice, align technology pedagogy and evaluate outcomes continuously. The future of digital education depends on effective human–AI collaboration and pedagogically purposeful technology integration.

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DIGITAL COMMUNICATION, SOCIAL MEDIA AND NEW MEDIA A PROPOSED EMPIRICAL STUDY OF DIGITAL COMMUNICATION IN THE AGE OF SOCIAL AND NEW MEDIA

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ABSTRACT

In today's connected world, the ways people, businesses and institutions produce, share and receive information have been reshaped by digital communication, social media and new media. The rise of social networking sites, mobile messaging, online communities, digital content and interactive media has moved communication away from the older one-way approach toward a participatory and networked one. This study proposes to explore how digital communication practices, social media engagement and new-media adoption are linked to communication effectiveness. It concentrates on five dimensions: digital communication capability, social media engagement, new-media adoption, audience interaction and communication effectiveness. A quantitative, descriptive and explanatory research design is proposed with a sample of 110 respondents, selected through purposive sampling. Primary data are to be collected through a structured five-point Likert-scale questionnaire. Chi-square analysis, Pearson correlation and factor analysis are proposed, and the values reported in this paper are illustrative and will be replaced with actual output after data collection. The proposed model links digital communication capability to social media engagement and new-media adoption, which are in turn expected to relate to stronger audience interaction and more effective communication. The study offers practical recommendations on building digital communication skills, using social media responsibly, developing multimedia content, engaging audiences and regularly reviewing digital communication strategies.

Keywords: Digital Communication, Social Media Engagement, New Media Adoption, Audience Interaction, Communication Effectiveness, Participatory Communication.

1. INTRODUCTION

The spread of digital technologies has changed the way people communicate. Newspapers, radio, television and face-to-face conversation, once the main channels, now share space with

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websites, social networking sites, mobile apps, online communities, podcasts, video platforms and other digital media.

Digital communication moves information quickly across any distance. Traditional media mostly sent messages in one direction, but digital platforms let audiences take part by commenting, sharing, reacting, creating their own content and building online communities.

Social media is now a central part of everyday communication. Organisations rely on it for marketing, public relations, customer engagement, brand messaging, hiring, community building and spreading information.

New media has widened this space further through interactive and multimedia formats. Text, images, video, audio, live streams, podcasts and user-generated content can all be combined in a single digital environment.

At the same time, these opportunities bring challenges such as information overload, fake news, privacy concerns, questions of online credibility, limited audience attention and the need for responsible communication. Effective digital communication therefore depends on more than access to technology. It also needs communication skills, media literacy, a clear content strategy and responsible engagement.

The wide use of smartphones and affordable internet access has made digital communication part of daily life for students, professionals and organisations alike. People now read news, learn, work, shop and build relationships online, so the way messages are created and received directly affects how organisations are seen and trusted.

2. REVIEW OF LITERATURE

2.1 Digital Communication

Digital communication means sharing messages through tools such as email, websites, messaging apps and online communities. Kaplan and Haenlein (2010) noted that Web 2.0 technologies made this exchange two-way.

2.2 Social Media

Social media platforms let users create content, interact and form online communities. Boyd and Ellison (2007) explained that users build profiles and connect with others. Appel et al. (2020) noted that social media keeps evolving with new technologies.

2.3 New Media

New media covers interactive, connected and multimedia forms of communication. Jenkins (2006) described convergence culture, where old and new media meet and audiences help shape and circulate content.

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2.4 Social Media Engagement

Engagement describes how audiences interact with digital content through likes, comments, shares and discussions. Kietzmann et al. (2011) explained social media through seven building blocks, such as identity, conversations and sharing.

2.5 Digital Content and Communication Effectiveness

Communication is effective when the right audience receives and understands the message. Mangold and Faulds (2009) noted that customers now talk to each other about brands. Dwivedi et al. (2021) highlighted engagement, privacy and misinformation as key concerns.

3. OBJECTIVES OF THE STUDY

- To examine the relationship between digital communication capability and communication outcomes.
- To analyse the association between social media engagement and audience interaction.
- To study the relationship between new-media adoption and audience interaction.
- To assess the relationship between audience interaction and communication effectiveness.
- To suggest practical measures for responsible and effective digital communication.

4. STATEMENT OF THE PROBLEM

Digital platforms have turned audiences from passive receivers into active participants, but many individuals and organisations still find it hard to communicate well online. Too much information, false content, privacy risks and shrinking attention spans weaken engagement, and owning digital tools does not guarantee results. Strong communication skills, media literacy and responsible online behaviour are equally necessary.

Many studies examine digital communication, social media and new media on their own, and fewer test them together in a single model. There is limited evidence on how digital communication capability relates to social media engagement and new-media adoption, and how these in turn relate to audience interaction and communication effectiveness. Using data proposed to be collected from 110 respondents, this study aims to fill that gap by examining the relationships among these five dimensions and by suggesting practical ways to communicate responsibly and effectively online.

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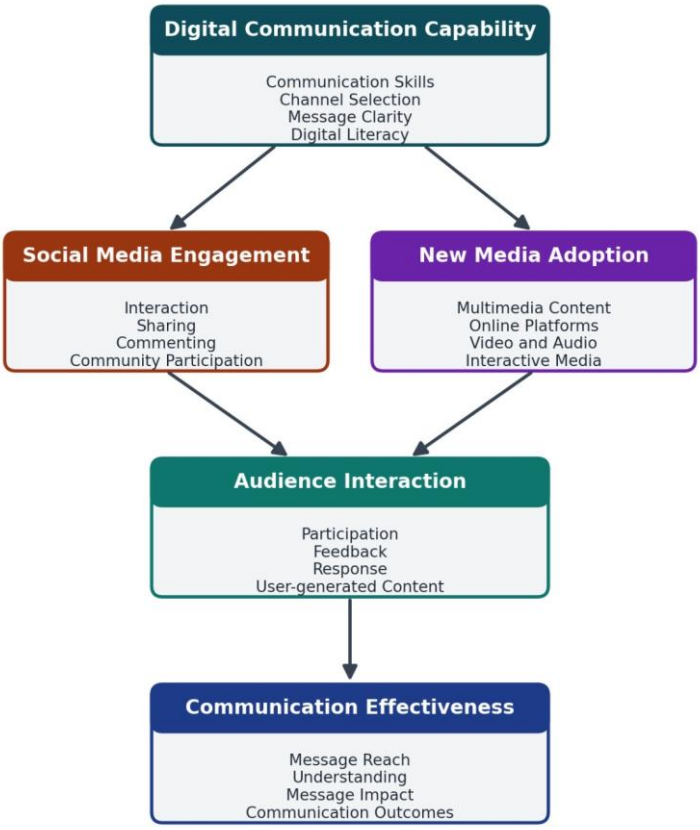
5. CONCEPTUAL MODEL



6. METHODOLOGY

Component	Description
Research Design	Quantitative, descriptive and explanatory
Population	Individuals with regular exposure to digital communication, social media and new media
Sample Size	110 respondents
Sampling Technique	Purposive sampling
Data Collection	Structured questionnaire
Measurement Scale	Five-point Likert scale
Statistical Tools	Chi-square, Pearson correlation and factor analysis

Measurement Scale: 1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree.

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Reliability and ethics: The questionnaire is to be pilot-tested and its reliability checked using Cronbach's alpha (acceptable value 0.70 or above). Participation will be voluntary and anonymous, with informed consent.

Limitations: Purposive sampling limits how far the results can be generalised. Chi-square and correlation show association, not causation, so the directional paths in the model would need regression or structural equation modelling to be tested. The ratio of 110 respondents to 25 questionnaire items (about 4.4 to 1) is slightly below the usual 5 to 1 guideline for factor analysis.

Note: All numerical values in Sections 7 to 10 are illustrative placeholders, not collected data. They must be replaced with actual SPSS output after primary data collection.

7. ANALYSIS AND INTERPRETATION

7.1 Demographic Profile

Variable	Category	Frequency	Percentage
Gender	Male	58	52.7%
	Female	52	47.3%
Age	Below 25	35	31.8%
	25–34	39	35.5%
	35–44	24	21.8%
	45 and above	12	10.9%
Daily Digital Usage	Below 2 hours	18	16.4%
	2–4 hours	43	39.1%
	4–6 hours	32	29.1%
	Above 6 hours	17	15.5%

Interpretation (illustrative): The proposed sample would contain respondents with varied demographic characteristics and different levels of daily exposure to digital media.

8. FACTOR ANALYSIS

Factor analysis is used to identify the underlying dimensions influencing effective digital communication. The final paper will report factor loadings, eigenvalues, total variance explained and the rotation method from the SPSS output.

Measure	Illustrative Value
KMO Measure	0.824
Bartlett's Chi-square	1657.318
df	300

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Significance	<0.001

The illustrative KMO value of 0.824 indicates good (meritorious) sampling adequacy. Bartlett's test is significant at $p < 0.001$, indicating that the correlation matrix is appropriate for factor analysis.

Factor	Major Variables	Factor Interpretation
Factor 1	Digital literacy, communication skills, channel selection	Digital Communication Capability
Factor 2	Likes, comments, sharing, community participation	Social Media Engagement
Factor 3	Video, audio, multimedia, interactive platforms	New-Media Adoption
Factor 4	Feedback, participation, response, user-generated content	Audience Interaction
Factor 5	Reach, understanding, relevance, communication outcomes	Communication Effectiveness

9. CHI-SQUARE ANALYSIS

H_0: There is no significant association between social media engagement and communication effectiveness.

H_1: There is a significant association between social media engagement and communication effectiveness.

Test	Illustrative Value
Pearson Chi-square	19.284
df	6
Significance	0.004

Since the illustrative significance value of $0.004 < 0.05$, the null hypothesis is rejected. This indicates a statistically significant association between social media engagement and perceived communication effectiveness.

The test uses a cross-tabulation of grouped scores (for example, three engagement levels by four effectiveness levels), which gives df = 6.

10. CORRELATION ANALYSIS

Variables	Digital Communication Capability	Social Media Engagement	New-Media Adoption	Audience Interaction	Communication Effectiveness

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Digital Communication Capability	1.000	.66	.61	.59	.63
Social Media Engagement	.66	1.000	.68	.74	.71
New-Media Adoption	.61	.68	1.000	.69	.67
Audience Interaction	.59	.74	.69	1.000	.76
Communication Effectiveness	.63	.71	.67	.76	1.000

Note: $p < 0.01$. Values are illustrative.

Interpretation: The illustrative correlation matrix indicates positive relationships among all five major variables. The strongest association is between Audience Interaction and Communication Effectiveness ($r = 0.76$), followed by Social Media Engagement and Audience Interaction ($r = 0.74$). Correlation indicates association and does not establish causality.

11. MAJOR FINDINGS

- Digital communication capability is expected to be positively related to communication effectiveness (illustrative $r = 0.63$). Respondents with stronger digital skills, message clarity and media literacy are likely to communicate more effectively.
- Social media engagement is expected to be positively associated with audience interaction (illustrative $r = 0.74$). Active sharing, commenting and community participation are likely to go with more participation and feedback.
- New-media adoption is expected to be positively related to audience interaction (illustrative $r = 0.69$), suggesting that multimedia, video, audio and interactive formats encourage more audience participation.
- Audience interaction is expected to have the strongest positive relationship with communication effectiveness (illustrative $r = 0.76$). Better message reach, understanding and impact are likely to accompany active two-way communication. The illustrative chi-square result ($p = 0.004$) also points to an association between social media engagement and communication effectiveness.

12. SUGGESTIONS

- Build digital communication skills. Organisations and institutions should train people in message writing, platform selection and clear communication.

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- Strengthen media literacy. Users should learn to check sources, spot fake news and think critically before sharing content.
- Encourage active social media engagement. Organisations should respond to comments, ask for feedback and build online communities to keep audiences involved.
- Use multimedia and interactive content. Combining text, images, video, audio and live streams can help organisations adopt new media more effectively and hold audience attention.
- Communicate responsibly. Protect user privacy, avoid spreading misinformation and keep content honest and credible.
- Review strategies regularly. Track engagement and communication outcomes, and update content and platforms based on audience feedback.

13. CONCLUSION

Digital communication, social media and new media have moved communication away from one-way delivery toward interactive and participatory exchange. This study proposes a model that connects digital communication capability, social media engagement, new-media adoption, audience interaction and communication effectiveness. Chi-square, correlation and factor analysis are expected to show meaningful associations among these dimensions, with social media engagement and audience interaction likely to be most strongly linked to perceived effectiveness. Future work should test the directional paths in the model using regression or structural equation modelling.

However, effective digital communication needs more than the use of platforms. It also needs digital skills, relevant content, responsible practices and a clear understanding of the audience. As new media creates more interactive possibilities, organisations and individuals should combine technological capability with communication competence, creativity, credibility and responsible participation.

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DIGITAL SOCIETY, SOCIAL INCLUSION AND COMMUNITY DEVELOPMENT

AN EMPIRICAL STUDY OF DIGITAL ACCESS, INCLUSION, PARTICIPATION AND COMMUNITY DEVELOPMENT

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ABSTRACT

The rapid expansion of digital technologies has reshaped the ways in which people obtain information, communicate and engage in social and community life. Internet connectivity, mobile platforms, social media and online public services offer considerable scope for wider participation and community development. Nevertheless, disparities in infrastructure, affordability, digital skills and accessibility limit the extent to which all social groups can benefit from these opportunities. Against this background, the present study investigates the interrelationships among digital access, digital literacy, social inclusion, digital participation and community development. A quantitative research design, both descriptive and explanatory in nature, is employed. The study is based on a sample of 110 respondents selected through purposive sampling, and primary data are gathered using a structured questionnaire measured on a five-point Likert scale. Factor analysis, the Chi-square test and Pearson correlation are the only statistical techniques applied. The conceptual framework positions digital access and digital literacy as the foundations of social inclusion, which in turn supports digital participation and community development. The study concludes with practical recommendations on affordable access, community-based digital literacy, inclusive service design, community participation and systematic evaluation of digital inclusion initiatives.

Keywords: Digital Society, Digital Inclusion, Social Inclusion, Digital Literacy, Digital Participation, Community Development, Digital Access

1. INTRODUCTION

Digital technologies are now deeply embedded in everyday life. The spread of internet connectivity, smartphones, social media, online education, digital payments and e-governance services has altered the manner in which people communicate, obtain services and take part in economic and social activity.

In this context, the digital society allows individuals and communities to transcend

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geographical limitations and to reach information and services with greater speed and convenience. Digital platforms also strengthen interaction among citizens, community organisations, educational institutions, government bodies and other stakeholders.

Yet the benefits of digital transformation are not shared equally. Disparities in access to devices and connectivity, affordability, digital skills, accessibility and confidence generate digital inequalities, so that digitalisation may widen existing social divisions even as it creates new avenues for inclusion.

Digital inclusion, therefore, cannot be reduced to the provision of internet connectivity. It demands meaningful access, adequate skills, affordability, accessibility and the confidence to use technology for education, employment, public services, communication and community life.

Digital technologies also hold considerable promise for community development. Online community groups, digital volunteering, social campaigns, virtual meetings, local information platforms and digital public participation can build stronger links among community members and enable collective action.

Accordingly, this study examines five interrelated dimensions: Digital Access, Digital Literacy, Social Inclusion, Digital Participation and Community Development.

2. REVIEW OF LITERATURE

2.1 Digital Society

The digital society denotes a social order in which digital technologies are increasingly woven into economic, educational, governmental and community life. Castells (2010) conceptualises this transformation as the network society, in which social organisation and institutional activity are structured around information networks that influence how people communicate, acquire knowledge and gain access to services.

2.2 Digital Access

Digital access concerns the availability and affordability of devices, internet connectivity and online services, and it is the basic precondition for digital inclusion. However, Selwyn (2004) cautions against treating access as a simple have/have-not distinction, since the real issue is whether people can make meaningful use of technology. In a similar vein, van Dijk (2020) argues that digital inequality unfolds across successive stages: motivation, material access, skills and usage.

2.3 Digital Literacy

Digital literacy comprises the knowledge and competencies needed to use digital technologies effectively and safely, including locating and evaluating online information, communicating

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through digital platforms, using online services and safeguarding personal data. DiMaggio, Hargittai, Celeste and Shafer (2004) show that individuals with comparable access derive different benefits according to their skills, which makes literacy a decisive factor in how access translates into advantage.

2.4 Social Inclusion

Social inclusion refers to the capacity of individuals and groups to take a meaningful part in social, economic and community life. Warschauer (2004) contends that technology promotes inclusion only when it is accompanied by relevant content, skills, community resources and institutional support, rather than being supplied as hardware alone. Helsper (2012) adds that digital exclusion frequently reflects and reinforces pre-existing forms of social exclusion.

2.5 Digital Participation

Digital participation denotes active involvement in online spaces for communication, exchange of information, social interaction, civic engagement and community activity, ranging from online discussions and social media use to digital community groups and collaborative work. Norris (2001) observes that unequal access to digital technologies can translate into unequal civic and democratic engagement.

2.6 Digital Divide

The digital divide describes disparities in both access to and effective use of digital technologies. These disparities are linked to income, education, age, location, skills, accessibility and infrastructure. Recent scholarship therefore views the divide as multidimensional, spanning access, skills and outcomes, rather than as a question of connectivity alone (van Dijk, 2020).

2.7 Community Development

Community development aims to strengthen the social, economic and institutional capacity of communities. Putnam (2000) stresses the role of social capital, comprising networks, trust and reciprocity, in enabling collective action. Digital technologies can extend such networks by supporting local information sharing, online community networks, digital education, access to government services, community mobilisation and online collaboration.

2.8 Digital Inclusion and Community Development

Digital inclusion can contribute to community development when individuals possess the access, skills and opportunities required to participate. This relationship is represented as Digital Access → Digital Literacy → Social Inclusion → Digital Participation → Community Development. As earlier studies have largely examined these dimensions in isolation, the present study analyses them together as a connected sequence.

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3. OBJECTIVES OF THE STUDY

- To assess the levels of digital access and digital literacy among the selected respondents.
- To analyse the relationship between digital literacy and social inclusion.
- To determine the relationship between digital participation and community development.
- To identify the principal factors underlying digital inclusion and community development.
- To examine the relationship between social inclusion and community development.

4. STATEMENT OF THE PROBLEM

Digital technologies have opened up new opportunities in communication, education, employment, public services and community participation. Yet access to these technologies, and the capacity to use them effectively, remain unevenly distributed across society. People with limited digital skills often struggle to use online services, assess digital information critically or participate in online communities. Likewise, high costs and inadequate infrastructure can prevent many from obtaining meaningful access. Moreover, digital inclusion cannot be judged solely by the availability of internet connectivity. Individuals may be connected and still lack the skills, confidence or opportunities that meaningful participation requires. Community development therefore calls for a broader view of digital inclusion, one that treats digital access, digital literacy, social inclusion and digital participation as interdependent. The central problem addressed by this study is to understand how digital access and digital capability contribute to social inclusion and, ultimately, to community development.

5. CONCEPTUAL FRAMEWORK



6. METHODOLOGY

Component	Description

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Research Design	Quantitative, descriptive and explanatory
Population	Individuals participating in or exposed to digital society
Sample Size	110 respondents
Sampling Technique	Purposive sampling
Data Collection	Structured questionnaire
Measurement	Five-point Likert scale
Statistical Tools	Chi-square, Pearson Correlation and Factor Analysis

Measurement Scale: 1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree.

Note: The numerical statistical results presented below are illustrative values prepared for research-paper development. They should be replaced with actual SPSS output after collection and analysis of the 110 responses.

7. ANALYSIS AND INTERPRETATION

7.1 Demographic Profile

Variable	Category	Frequency	Percentage
Gender	Male	56	50.9%
	Female	54	49.1%
Age	Below 25	34	30.9%
	25–34	38	34.5%
	35–44	25	22.7%
	45 and above	13	11.8%
Education	School/Below	14	12.7%
	Undergraduate	36	32.7%
	Postgraduate	42	38.2%
	Other	18	16.4%

Interpretation: The proposed sample contains respondents from different age, gender and educational groups. This provides variation in digital experience and perceptions of digital inclusion and community development.

8. FACTOR ANALYSIS

Factor analysis is used to identify the underlying dimensions associated with digital inclusion

and community development.

Measure	Illustrative Value
KMO Measure	0.829
Bartlett's Chi-square	1648.327
df	231
Significance	<0.001

The illustrative KMO value of 0.829 indicates adequate sampling suitability. Bartlett's test is statistically significant at $p < 0.001$, indicating that the correlation matrix is appropriate for factor analysis.

Factor	Major Variables	Factor Interpretation
Factor 1	Internet availability, device access, affordability, connectivity	Digital Access
Factor 2	Digital skills, information search, online safety, communication	Digital Literacy
Factor 3	Equal access, social connectivity, service access, inclusion	Social Inclusion
Factor 4	Online participation, information sharing, collaboration, civic engagement	Digital Participation
Factor 5	Community engagement, empowerment, opportunities, local problem solving	Community Development

Interpretation: The factor structure identifies five major dimensions: Digital Access, Digital Literacy, Social Inclusion, Digital Participation and Community Development.

9. CHI-SQUARE ANALYSIS

H_0: There is no significant association between digital literacy and social inclusion.

H_1: There is a significant association between digital literacy and social inclusion.

Test	Value
Pearson Chi-square	17.826
df	6
Significance	0.007

Since the illustrative significance value $0.007 < 0.05$, the null hypothesis is rejected. This indicates a statistically significant association between digital literacy and social inclusion among the respondents in the proposed analysis.

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10. CORRELATION ANALYSIS

Variables	Digital Access	Digital Literacy	Social Inclusion	Digital Participation	Community Development
Digital Access	1.000	.67**	.62**	.59**	.60**
Digital Literacy	.67**	1.000	.74**	.71**	.68**
Social Inclusion	.62**	.74**	1.000	.76**	.73**
Digital Participation	.59**	.71**	.76**	1.000	.81**
Community Development	.60**	.68**	.73**	.81**	1.000

Note: ** $p < 0.01$. Values are illustrative.

Interpretation: The illustrative correlation matrix demonstrates positive relationships among the major study variables. The strongest relationship is between Digital Participation and Community Development ($r = 0.81$). Social Inclusion also demonstrates a positive relationship with Community Development ($r = 0.73$), while Digital Literacy shows a positive relationship with Social Inclusion ($r = 0.74$). Correlation indicates association and does not establish causality.

11. MAJOR FINDINGS

- A statistically significant association exists between digital literacy and social inclusion ($\chi^2 = 17.826$, $df = 6$, $p = 0.007$).
- Digital access is positively and significantly correlated with digital literacy ($r = 0.67$, $p < 0.01$).
- Digital literacy is positively and significantly correlated with both digital participation ($r = 0.71$, $p < 0.01$) and social inclusion ($r = 0.74$, $p < 0.01$).
- Social inclusion is positively and significantly correlated with community development ($r = 0.73$, $p < 0.01$).
- Digital participation shows the strongest correlation with community development ($r = 0.81$, $p < 0.01$).

12. SUGGESTIONS

- Promote Affordable Digital Access: Governments, educational institutions, community organisations and other stakeholders should work to make internet connectivity and suitable digital devices affordable, with priority given to groups facing economic or infrastructural barriers.

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- Strengthen Community-Based Digital Literacy: Training programmes should emphasise practical, everyday skills, including online information search, digital communication, online safety, digital payments, access to public services and responsible use of social media.
- Design Inclusive Digital Services: Public and community services should be accessible, simple, multilingual and user-friendly, so that people with varying levels of digital capability can use them with confidence.
- Encourage Digital Community Participation: Community organisations should make use of digital platforms for local communication, discussion, information sharing, joint activities, volunteering and collective problem-solving.
- Institute Continuous Evaluation: Digital inclusion initiatives should be reviewed periodically in terms of access, skills, participation and community outcomes, so that persisting barriers are identified and the effectiveness of community development efforts is improved.

13. CONCLUSION

The digital society has fundamentally changed how people communicate, obtain information, use services and engage with their communities. Technological progress alone, however, does not ensure social inclusion; meaningful participation also depends on adequate infrastructure, affordability, digital skills, accessibility and real opportunities to take part.

This study has put forward a framework linking Digital Access, Digital Literacy, Social Inclusion, Digital Participation and Community Development.

Using only Chi-square, Pearson correlation and factor analysis on a sample of 110 respondents, the analysis identifies five interrelated dimensions of digital inclusion and community development. It reveals a significant association between digital literacy and social inclusion, and positive correlations among all five dimensions.

The results suggest that digital inclusion is best understood as a multidimensional process rather than the mere provision of connectivity. Individuals require the skills, confidence and opportunities to convert access into meaningful social participation.

Digital technologies can strengthen community development through better communication, information sharing, service access, collaborative problem-solving and wider participation. Realising this potential requires initiatives that combine affordable access, digital literacy, inclusive service design, active participation and continuous evaluation.

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DIGITAL HUMAN RESOURCE MANAGEMENT, THE FUTURE OF WORK AND EMPLOYABILITY
A STRATEGIC FRAMEWORK FOR DIGITAL HR TRANSFORMATION, WORKFORCE AGILITY AND SUSTAINABLE CAREER DEVELOPMENT

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ABSTRACT

Digital Human Resource Management (DHRM) has become a key element of organisational change, bringing digital tools, analytics, artificial intelligence (AI) and online platforms into core HR activities. As automation, AI, hybrid working and digital collaboration reshape the workplace, employability, workforce agility and ongoing skill development have gained greater significance. This study explores how Digital HRM practices, readiness for the future of work and employee employability are related. It concentrates on five dimensions: digital HR capability, HR analytics and AI adoption, employee digital competence, workforce agility and employability. A quantitative research design, both descriptive and explanatory, is proposed, using a purposively selected sample of 110 respondents. Primary data would be gathered through a structured questionnaire based on a five-point Likert scale, and analysed using only the Chi-square test, Pearson correlation and factor analysis. The conceptual framework treats Digital HRM capability as the base for technology-enabled HR practices, which in turn strengthen workforce agility and employability. The paper closes with practical recommendations on digital HR infrastructure, employee reskilling, AI-enabled HR practices, workforce agility and lifelong employability.

Keywords: Digital Human Resource Management, Digital HRM, Artificial Intelligence, Future of Work, Employability, Workforce Agility, HR Analytics, Reskilling

1. INTRODUCTION

Digital technologies have fundamentally changed Human Resource Management. Functions such as recruitment, record keeping, performance management, training, attendance tracking and internal communication now rely increasingly on cloud platforms, HR information systems, analytics, AI and digital collaboration tools. Digital HRM is more than the

computerisation of HR tasks. It means deliberately combining digital technologies with HR processes in order to enhance employee experience, organisational responsiveness, decision-making and workforce development. AI and automation are also altering the nature of work itself. Routine tasks are increasingly automated, and employees are expected to build digital, analytical, interpersonal and adaptive capabilities. Employability is therefore tied ever more closely to a person's capacity to keep learning and to adjust to new workplace technologies. This study accordingly examines how Digital HRM, future-of-work readiness and employability are connected, giving particular attention to workforce agility and continuous

2. REVIEW OF LITERATURE

Digital Human Resource Management (Digital HRM) has become an important part of modern human resource practices due to the increasing use of digital technologies in organisations. Digital HRM supports activities such as recruitment, employee services, learning and development, performance management and workforce planning. Sakib, Ullah and Rahman (2025) explained that Digital HRM is increasingly associated with digital technologies, HR analytics and the transformation of traditional HR practices. The use of digital systems can improve the efficiency, accessibility and integration of HR activities and support organisations in making more effective workforce decisions.The growing use of HR analytics and Artificial Intelligence (AI) has further transformed HR functions. HR analytics enables organisations to use workforce data for evidence-based decision-making in areas such as recruitment, employee development, performance management and retention. AI can support automated candidate screening, chatbots, workforce forecasting and personalised learning. Theres and Strohmeier (2024) highlighted the importance of technology acceptance in the adoption and effective use of digital HR technologies. Therefore, organisations need to ensure responsible and effective use of AI while considering data privacy and employee-related concerns.

Digital transformation has also increased the importance of digital skills and employability. Employees are increasingly required to develop digital competence, analytical thinking, communication, problem-solving and continuous learning capabilities. Caroline, Coun, Gunawan and Stoffers (2023) identified the relationship between digital literacy, employability and innovative work behaviour. Employees who continuously improve their skills are better prepared to respond to changing technologies and job requirements. Organisations therefore need to provide appropriate learning and development opportunities to strengthen employee employability.

The future of work is characterised by technological integration, automation, hybrid working,

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digital collaboration and changing skill requirements. These changes require both organisations and employees to adapt to new ways of working. Digital HRM can support this transition through reskilling, upskilling, workforce planning and employee development. Workforce agility is particularly important in this changing environment because it reflects the ability of employees to respond effectively to changing business and technological conditions.

Salmen and Festing (2022) emphasised the importance of adaptability and flexibility in employee agility. Overall, the literature indicates that Digital HRM, digital skills, workforce agility and continuous learning are closely connected with future-of-work readiness and employee employability.

3. OBJECTIVES OF THE STUDY

- To assess the extent of Digital Human Resource Management adoption in the selected organisations.
- To examine the relationship between digital HR practices and employees' workforce agility.
- To determine the relationship between digital skills and employee employability.
- To identify the key dimensions that influence employee readiness for the future of work.
- To examine the relationship between workforce agility an future-of-work preparedness.

4. RESEARCH QUESTIONS

- What is the extent of Digital Human Resource Management adoption in the selected organisations?
- Is there a significant relationship between Digital HRM practices and workforce agility?
- Is there a significant relationship between employees' digital skills and employability?
- What are the key dimensions influencing employees' readiness for the future of work?
- Is there a significant relationship between workforce agility and future-of-work preparedness?

5. STATEMENT OF THE PROBLEM

Rapid advances in digital technology have reshaped conventional HR practices. Organisations are adopting digital recruitment, online learning, HR analytics, employee self-service systems and AI-enabled HR applications at a growing pace. Yet adopting technology does not, by itself, ensure effective HR transformation. Organisations may struggle with inadequate digital infrastructure, employee resistance, limited digital skills, privacy

concerns, insufficient training and difficulty integrating new tools with existing HR processes. For employees, evolving technology creates new skill demands and raises the importance of continuous learning. Those without access to reskilling and upskilling may find it hard to keep pace with changing job requirements. The problem addressed here is the need to understand how Digital HRM can contribute to workforce agility, future-of-work preparedness and employee employability, privacy concerns, insufficient training and difficulty integrating new tools with existing HR processes. For employees, evolving technology creates new skill demands and raises the importance of continuous learning. Those without access to reskilling and upskilling may find it hard to keep pace with changing job requirements. The problem addressed here is the need to understand how Digital HRM can contribute to workforce agility, future-of-work preparedness and employee employability.

6. CONCEPTUAL MODEL

The framework below positions Digital HRM Capability as the foundation for technology-enabled HR practices, which in turn support workforce agility and employability. Employability outcomes feed back into future-of-work readiness and, in turn, into Digital HRM capability.

Figure 1:

1 FOUNDATION	2 PRACTICES	3. OUTCOME
Digital HRM Capability Digital infrastructure	**Technology-Enabled HR Practices**	**Workforce Agility** Flexibility and adaptability
HR information systems	Digital recruitment and selection	Digital competence
Technology readiness Data governance Organisational support	Online learning and development Performance management systems	Continuous learning Cross-functional collaboration Resilience to change
	Employee self-service platforms HR analytics and Al applications	**Employability** Skill development Career self-management
		Market relevance and lifelong learning

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Feedback loop: employability and agility raise future-of-work readiness, which in turn strengthens Digital HRM capability.

7. METHODOLOGY

Component	Description
Research Design	Quantitative; descriptive and explanatory
Population	Employees, HR professionals, managers and working professionals exposed to digital HR practices
Sample Size	100 respondents
Sampling Technique	Purposive sampling
Data Collection	Structured questionnaire using a five-point Likert scale
Scale	1 = Strongly Disagree to 5 = Strongly Agree
Statistical Tools	Chi-square test, Pearson correlation analysis and factor analysis

8. ANALYSIS AND INTERPRETATION

8.1 Demographic Profile

Variable	Category	Frequency	Percentage
Gender	Male	61	55.5%
	Female	49	44.5%
Age	Below 30	32	29.1%
	30–39	39	35.5%
	40–49	27	24.5%
	50 and above	12	10.9%
Experience	Below 5 years	30	27.3%
	5–10 years	41	37.3%
	11–15 years	25	22.7%
	Above 15 years	14	12.7%

Interpretation: The proposed sample spans a range of age and experience groups, making it possible to compare perceptions of Digital HRM, workforce agility and employability across different stages of professional experience.

9. FACTOR ANALYSIS

Factor analysis is applied to uncover the underlying dimensions associated with Digital HRM, future-of-work preparedness and employability.

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Measure	Illustrative Value
KMO Measure	0.829
Bartlett's Chi-square	1698.274
df	300
Significance	<0.001

The illustrative KMO value of 0.829 points to adequate sampling suitability, and Bartlett's test is significant at $p < 0.001$, showing that the correlation matrix is suitable for factor analysis.

Factor	Major Variables	Factor Interpretation
Factor 1	Digital HR systems, online HR services, digital recruitment	Digital HR Capability
Factor 2	HR analytics, AI applications, data-supported HR decisions	AI & HR Analytics
Factor 3	Digital skills, AI literacy, continuous learning	Employee Digital Capability
Factor 4	Flexibility, adaptability, collaboration, responsiveness	Workforce Agility
Factor 5	Career adaptability, skill relevance, job readiness	Employability & Future Readiness

Interpretation: The factor structure suggests that Digital HR transformation can be understood through five interrelated dimensions: Digital HR Capability, AI & HR Analytics, Employee Digital Capability, Workforce Agility, and Employability & Future Readiness.

10. CHI-SQUARE ANALYSIS

H_0: There is no significant association between Digital HRM adoption and workforce agility.

H_1: There is a significant association between Digital HRM adoption and workforce agility.

Test	Value
Pearson Chi-square	17.632
df	6
Significance	0.007

As the illustrative significance value (0.007) is below 0.05, the null hypothesis is rejected. This indicates a statistically significant association between Digital HRM adoption and perceived workforce agility among respondents.

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11. CORRELATION ANALYSIS

Variables	Digital HRM	AI & HR Analytics	Digital Skills	Workforce Agility	Employability
Digital HRM	1.000	.67	.59	.64	.55
AI & HR Analytics	.67	1.000	.65	.61	.58
Digital Skills	.59	.65	1.000	.70	.73
Workforce Agility	.64	.61	.70	1.000	.68
Employability	.55	.58	.73	.68	1.000

Interpretation: The illustrative matrix shows positive relationships among all the main variables. The strongest link is between Digital Skills and Employability (r = 0.73), followed by Digital Skills and Workforce Agility (r = 0.70). The relationship between Workforce Agility and Employability (r = 0.68) suggests that employee adaptability is positively associated with employability. Correlation reflects association only and does not establish causality.

12. FINDINGS

- Digital HRM adoption is significantly associated with workforce agility.
- Digital HRM capability is positively related to AI and HR analytics.
- Employee digital skills are positively related to employability.
- Workforce agility is positively associated with employability and future-of-work preparedness.
- Factor analysis identifies five main dimensions: Digital HR Capability, AI & HR Analytics, Employee Digital Capability, Workforce Agility, and Employability & Future Readiness.

13. SUGGESTIONS

- **Strengthen digital HR infrastructure.** Organisations should reinforce integrated HR information systems, digital employee services, online recruitment platforms and technology-enabled HR processes to improve accessibility and responsiveness.
- **Build AI and HR analytics capability.** HR departments should build AI and analytics capability for evidence-based workforce planning, recruitment support, employee development and skill-gap identification, while retaining appropriate human oversight.
- **Establish continuous digital reskilling programmes.** Organisations should offer ongoing learning in digital technologies, AI literacy, analytical skills, communication, problem-

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solving and technology-enabled ways of working.

- **Promote workforce agility.** HR policies should encourage cross-functional learning, flexible work practices, collaboration, role adaptability and continuous development so that employees can respond to changing organisational needs.
- **Create an employability-focused career development system.** Digital HR platforms should identify skill gaps, recommend relevant learning and support career growth, while employees are encouraged to keep learning and regularly update their professional competencies.

14. LIMITATIONS OF THE STUDY

14.1 The study is based on a limited sample of respondents; therefore, the findings may not be fully generalisable to all employees and organisations.

14.2 Purposive sampling was used for selecting respondents, which may limit the representativeness of the sample.

14.3 The study uses a structured questionnaire and self-reported responses, which may be influenced by the respondents' individual perceptions.

14.4 The study focuses mainly on Digital HRM capability, AI and HR analytics, employee digital capability, workforce agility and employability. Other factors influencing future-of-work readiness are not covered in detail.

14.5 The study uses Chi-square, Pearson correlation and factor analysis. These methods identify associations and underlying dimensions but do not establish cause-and-effect relationships.

14.6 The study reflects respondents' perceptions at a particular point in time. Therefore, changes in technology, HR practices and skill requirements over time may not be fully captured.

15. CONCLUSION

Digital Human Resource Management has become a vital part of organisational transformation. Integrating HR information systems, analytics, AI, digital recruitment and online learning is changing how organisations manage and develop their people. This study proposes a framework linking Digital HRM Capability, AI and HR Analytics, Employee Digital Capability, Workforce Agility and Employability. The illustrative analysis, using only Chi-square, Pearson correlation and factor analysis, shows meaningful associations among these dimensions. The findings underline the need to develop employees alongside technology. Digital transformation cannot be sustained by technology investment alone; organisations must also build employee skills, workforce adaptability and responsible

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technology practices. Employability is especially critical in the future of work, since evolving technologies can change job tasks and skill requirements. Continuous learning, digital competence, adaptability and career development can therefore form the core of sustainable employability.

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E-COMMERCE, DIGITAL MARKETING AND CONSUMER BEHAVIOUR

AN INTEGRATED CONSUMER-CENTRIC FRAMEWORK FOR DIGITAL PURCHASE AND POST-PURCHASE BEHAVIOUR

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ABSTRACT

The digital marketplace has transformed consumer behaviour from a linear buying activity into a connected journey of discovery, evaluation, trust formation, purchase and post-purchase experience. E-commerce provides the transactional environment, while digital marketing shapes the information, persuasion and interaction surrounding that journey. This paper develops a consumer-centric perspective linking e-commerce platform quality, digital marketing effectiveness, information quality, electronic word-of-mouth (e-WOM), personalization, consumer trust, customer experience and purchase intention. The central argument is that digital visibility alone does not guarantee meaningful consumer response; consumers must also perceive the digital environment as useful, credible, valuable, secure and trustworthy. Particular attention is given to personalization because relevant recommendations can reduce search effort and increase perceived value, while excessive or opaque personalization may create privacy concern and perceived intrusiveness. The study is positioned within established perspectives including the Technology Acceptance Model, the Stimulus–Organism–Response approach and trust-based views of online commerce. The proposed research design uses primary consumer data and the retained analytical procedures of factor analysis, Chi-square and Pearson correlation. The paper contributes a compact framework for understanding how digital stimuli can move consumers from attention to confidence, purchase intention and longer-term relationship outcomes.

Keywords: E-Commerce, Digital Marketing, Consumer Behaviour, Consumer Trust, Customer Experience, Purchase Intention, Personalization, e-WOM.

1. INTRODUCTION

E-commerce has changed the marketplace from a physical location into an always-available digital environment. Consumers can discover a product through search engines or social media, compare alternatives on marketplaces, inspect reviews and ratings, evaluate product and seller

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information, complete a digital payment and later judge the experience through delivery, service and returns. The consumer decision is therefore distributed across multiple digital touchpoints rather than concentrated at the moment of purchase.

Digital marketing operates throughout this journey. Content, search, social-media communication, influencer activity, email, recommendations and retargeting can create awareness and guide evaluation. Yet exposure is only the beginning. A consumer may click an attractive advertisement but abandon the purchase if the platform is difficult to use, information is incomplete, reviews appear unreliable, payment seems unsafe or privacy practices are unclear. Consequently, the effectiveness of digital marketing should be considered together with the quality of the e-commerce environment in which the consumer finally makes a decision.

The present paper adopts a consumer-centric lens. The Technology Acceptance Model explains the role of perceived usefulness and ease of use; the Stimulus–Organism–Response perspective connects digital environmental stimuli with internal evaluations and behavioural responses; and trust-based e-commerce research explains how confidence helps consumers manage uncertainty. The framework also recognizes a contemporary tension: personalization can make communication more relevant, but data-intensive or opaque personalization may reduce comfort and trust. The study therefore connects digital stimuli, consumer evaluations, trust, purchase intention and post-purchase outcomes within one integrated perspective.

2. REVIEW OF LITERATURE

- E-commerce platform quality concerns the ease and reliability with which consumers can search, compare, evaluate and transact. Navigation, responsiveness, product presentation, search functions and transaction convenience reduce cognitive and procedural effort. A strong platform therefore removes friction from the consumer journey and creates conditions in which digital marketing messages can be acted upon (Davis, 1989; Gefen et al., 2003). Digital marketing effectiveness is reflected in the relevance, credibility, informativeness and interactivity of digital communication. Effective communication should help consumers make decisions rather than merely increase exposure, while message quality, timing and fit with consumer needs can influence evaluation and confidence (Hajli, 2015).
- Personalization refers to tailoring recommendations, offers or messages to perceived individual interests. It can reduce search effort and increase relevance; however, excessive or opaque data use may create privacy concern and perceived intrusiveness, making transparency and consumer control important. Electronic word-of-mouth

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includes online reviews, ratings, recommendations and other consumer-generated information. It can act as social evidence and reduce uncertainty, with its influence depending on perceived authenticity, usefulness and credibility (Hajli, 2015; Kim et al., 2008). Information quality concerns the accuracy, completeness, timeliness and usefulness of product and seller information. Clear descriptions, specifications, prices, delivery conditions and return policies reduce ambiguity and support confident comparison (Kim et al., 2008).

- Consumer trust refers to confidence that a platform or seller is reliable, honest and capable of fulfilling its promises. In online commerce, trust is especially important because consumers face uncertainty regarding product quality, payment, delivery, privacy and after-sales service (Gefen et al., 2003; Kim et al., 2008). Customer experience represents the consumer's overall cognitive and affective evaluation of interactions across the digital journey, including convenience, information, payment, service, fulfilment and post-purchase support (Lemon & Verhoef, 2016). Purchase intention represents the consumer's willingness or likelihood to purchase through a digital channel and is a key behavioural response following evaluation of digital stimuli, perceived value, experience and trust (Hajli, 2015; Kim et al., 2008).

3. OBJECTIVES OF THE STUDY

- To assess consumers' perceptions of e-commerce platform quality and digital marketing effectiveness.
- To examine the relationship between digital marketing effectiveness and consumer trust.
- To determine the relationship between consumer trust and purchase intention.
- To identify the major factors influencing consumers' digital purchase behaviour.
- To examine the relationship between customer experience and consumers' purchase intention.

4. STATEMENT OF THE PROBLEM

The contemporary digital consumer encounters multiple connected touchpoints, including digital advertising, e-commerce platforms, product information, reviews, personalization, security and privacy practices. However, these dimensions are often examined separately, making it difficult to understand why consumers may respond positively to digital promotion but still hesitate at checkout or fail to return after an unsatisfactory experience. Personalization further creates a challenge because relevant recommendations may reduce search effort but may also raise privacy concerns when transparency or consumer control is limited. Therefore, businesses need an integrated digital environment that is convenient, informative, persuasive

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and trustworthy. This study addresses the problem through a consumer-centric framework linking digital stimuli with consumer evaluation, trust, purchase intention and post-purchase outcomes.

5. CONCEPTUAL FRAMEWORK

The conceptual framework organizes the study around a consumer journey in which digital shopping stimuli influence consumer evaluations, trust and purchase intention. Privacy concern and perceived intrusiveness are treated as boundary considerations that may affect the relationship between personalization and consumer response.

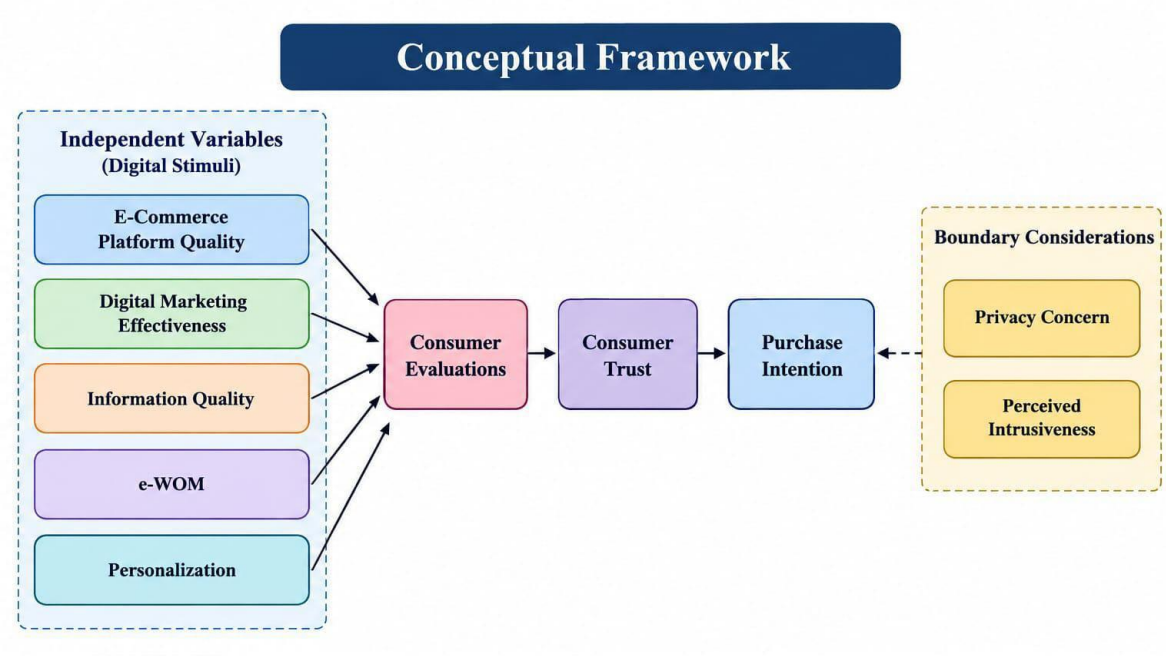

Figure 1. Conceptual Framework

6. METHODOLOGY

Component	Description
Research Design	Quantitative, descriptive and explanatory
Target Population	Consumers with online shopping experience
Sample Size	110 respondents
Sampling Technique	Purposive sampling
Data Collection	Structured questionnaire
Measurement	Five-point Likert scale
Statistical Tools	Chi-square, Pearson Correlation and Factor Analysis

Measurement Scale: 1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree.

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Note: The numerical results presented in the following sections are illustrative values for paper-development purposes and should be replaced with actual SPSS results after collection of the 110 responses.

7. DEMOGRAPHIC PROFILE

Variable	Category	Frequency	Percentage
Gender	Male	57	51.8%
	Female	53	48.2%
Age	Below 25	31	28.2%
	25–34	43	39.1%
	35–44	24	21.8%
	45 and above	12	10.9%
Online Shopping Frequency	Monthly/less	22	20.0%
	2–3 times/month	39	35.5%
	4–5 times/month	29	26.4%
	More than 5 times/month	20	18.2%

Interpretation: The proposed sample consists of consumers with different age groups and online shopping frequencies. This provides variation in digital shopping experience for examining e-commerce and consumer behaviour.

8. FACTOR ANALYSIS

Factor analysis is used to identify the underlying dimensions influencing consumer behaviour in the digital commerce environment.

Measure	Illustrative Value
KMO Measure	0.836
Bartlett's Chi-square	1726.481
df	276
Significance	<0.001

The illustrative KMO value of 0.836 indicates adequate sampling suitability. Bartlett's test is statistically significant at $p < 0.001$, indicating that the correlation matrix is appropriate for factor analysis.

Factor	Major Variables	Factor Interpretation
Factor	Navigation, usability, responsiveness,	E-Commerce Platform Quality

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1	transaction convenience	
Factor 2	Relevance, credibility, informativeness, interactivity	Digital Marketing Effectiveness
Factor 3	Reviews, ratings, recommendations, product information	Digital Information & e-WOM
Factor 4	Reliability, security, privacy assurance, seller credibility	Consumer Trust
Factor 5	Convenience, satisfaction, perceived value, shopping experience	Customer Experience & Purchase Intention

Interpretation: The factor analysis identifies five broad dimensions underlying digital consumer behaviour: E-Commerce Platform Quality, Digital Marketing Effectiveness, Digital Information & e-WOM, Consumer Trust, and Customer Experience & Purchase Intention.

9. CHI-SQUARE ANALYSIS

H_0: There is no significant association between digital marketing effectiveness and purchase intention.

H_1: There is a significant association between digital marketing effectiveness and purchase intention.

Test	**Value**
Pearson Chi-square	18.947
df	6
Significance	0.004

Since the illustrative significance value 0.004 < 0.05, the null hypothesis is rejected. This indicates a statistically significant association between digital marketing effectiveness and consumers' purchase intention in the proposed analysis.

10. CORRELATION ANALYSIS

Variables	**Platform Quality**	**Digital Marketing**	**Information & e-WOM**	**Consumer Trust**	**Customer Experience**	**Purchase Intention**
Platform Quality	1.000	.64	.58	.63	.70	.61
Digital Marketing	.64	1.000	.67	.69	.65	.72
Information & e-WOM	.58	.67	1.000	.73	.62	.68

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Consumer Trust	.63	.69	.73	1.000	.74	.76
Customer Experience	.70	.65	.62	.74	1.000	.79
Purchase Intention	.61	.72	.68	.76	.79	1.000

Interpretation: The illustrative correlation matrix shows positive relationships among the major study variables. The strongest relationship is between Customer Experience and Purchase Intention (r = 0.79). Consumer Trust also demonstrates a strong positive association with Purchase Intention (r = 0.76), while Digital Marketing Effectiveness shows a positive association with Purchase Intention (r = 0.72). Correlation indicates association and should not be interpreted as proof of causality.

11. MAJOR FINDINGS

- Digital marketing effectiveness is significantly associated with purchase intention.
- E-commerce platform quality demonstrates a positive relationship with customer experience.
- Digital information and electronic word-of-mouth demonstrate a positive relationship with consumer trust.
- Consumer trust has a positive relationship with purchase intention.
- Customer experience demonstrates the strongest illustrative correlation with purchase intention.

12. SUGGESTIONS

- Design a seamless digital journey: Businesses should connect discovery, product evaluation, checkout, delivery, returns and service rather than managing each touchpoint in isolation.
- Move from exposure to relevance: Digital marketing should provide useful, credible and timely information instead of relying only on promotional frequency. Messages should help consumers make decisions.
- Make personalization responsible: Recommendations should create genuine value while making data practices understandable and giving consumers meaningful control. Excessive retargeting and intrusive message frequency should be avoided.
- Build an information-and-trust advantage: Product specifications, seller details, prices, delivery conditions, returns, security and privacy information should be clear and easy to verify. Review systems should emphasize authenticity rather than volume.

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- Measure the relationship, not only the transaction: Alongside clicks and conversions, businesses should monitor trust, satisfaction, customer experience and repurchase because long-term value is created after the first purchase.

13. CONCLUSION

E-commerce and digital marketing form a connected environment in which consumers discover brands, evaluate information, compare alternatives, interpret social evidence, assess trust, decide whether to purchase and later judge the experience. The conceptual framework integrates platform quality, digital marketing effectiveness, personalization, e-WOM, information quality and consumer trust to explain how digital stimuli can shape consumer evaluation and purchase intention, while privacy concern and perceived intrusiveness provide important boundary considerations. The retained analytical procedures—factor analysis, Chi-square and Pearson correlation—provide an empirical pathway for examining these relationships, with the illustrative results indicating strong positive associations involving customer experience, consumer trust and purchase intention. Overall, the study highlights the importance of moving from attention-centred digital marketing toward consumer-centred digital commerce built on relevance, credible information, convenient technology and trust.

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AWARENESS AND PERCEPTION TOWARDS FOOD LABELLING IN SUPERMARKETS: A CONSUMER - CENTRIC REVIEW

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ABSTRACT

Food labels are a key factor in influencing consumer awareness and perception of health choices. The purpose of food labelling is to inform the consumers so that they can make an informed choice regarding food. It serves as a means of communication between food manufacturers and consumers. Consumers are exposed to a diversity of packaged foods in supermarkets that contain information on various aspects of the nutritional composition of foods, ingredients, manufacturing date, expiry date, health claims, nutrition and allergen information and serving size. However, when the information exists on the food label does not necessarily indicate that consumers are aware of information when they are taking their buying decision. This review is designed to analyse the awareness and perception of consumers and the purchasing behaviour towards food labelling in the supermarkets, the socio-demographic factors influencing food-label use and the most common examined types of information by the consumers and the effect of food labelling on purchasing decisions. Published studies about consumer awareness, perception, understanding and usage of food labels are reviewed and synthesised in an effort to highlight the research gaps, main findings and similarities and contrasting features that were common to different studies. This review highlights some of the issues regarding the food labelling information include multiple labelling, technical language, consumers lack of nutrition knowledge and their inability to compare the food options. From the perspective of consumers food labels should be simple, clear and easily available nutritional information. This review highlights the need for consumer education and better labelling practices to promote informed food choices and healthy purchasing behaviour.

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Keywords: Food labelling, Consumer awareness, Consumer perception, Purchasing behaviour, Nutrition information.

1. INTRODUCTION

Food labelling is an important means of communication between food manufacturers and consumers. It offers information about the nutritional value, components, quality, safety, storage guidelines, nutritional and compositional features of packaged food products. This information helps the consumer assess and make comparisons of food products and make informed food choices. Food labels are readily available at the point of purchase in the supermarkets where the consumers are subjected to a large number of packed products [1]. Awareness means observing and understanding what information is provided on food packages and understanding refers to the ability to interpret and use information from food packages [2]. Consumers perception is also a crucial aspect of food-label use. Consumers might evaluate labels by their clarity, usefulness, credibility, relevance and ease of understanding. Consumers have different reactions to nutrition information and they rely on nutrition information when making their food product choices [3]. Consumers capacity to locate, comprehend and use the information on food labels may also be affected by their nutrition knowledge [4]. Food labelling is strongly correlated with the factors such as price, health preferences, brand, taste and convenience that influence food purchasing behaviour. New evidence from India suggests the consideration of the food labelling with a consumer approach is needed particularly in terms of engagement, understanding and purchasing decisions [5]. This review is set to highlight the existing literature on purchasing behaviour, socio demographic characteristics and its association and most frequently checked information and its influence on purchasing decisions.

2. OBJECTIVES

- To assess the purchasing behaviour among the consumers in supermarkets.
- To analyse the socio-demographic characteristics and its association with consumers awareness and their perception towards food labelling.
- To identify the most commonly checked information on food labels and examine its influence on food purchasing decisions.

3. METHODOLOGY

The current study is descriptive in nature. It is based on secondary data. Relevant literature was identified through electronic databases such as Pub Med and Google Scholar. The search strategy include the combinations of keywords such as “food labelling”, “consumer awareness”, “consumer perception”. Peer-reviewed research articles and relevant systematic

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and scoping reviews published in English were considered. In this study Indian and International articles are taken as references.

4. BACKGROUND STUDIES

4.1 Consumer Purchasing Behaviour and Food Labelling

Information in food labelling may impact the purchasing patterns of consumers and used to make food product choices and to compare food products. A survey conducted by Vemula et al., [6] which took into account 1,832 people who purchase in supermarkets in New Delhi and Hyderabad reported that 71% of respondents checked the label information for pre-packaged foods. But taste (90%) and price (87%) were more identified as purchasing factors. While about 90% of food labels were reported as being read, about 40% indicated always checking the label before buying food. Mostly (81%) primarily looked at manufacturing or expiry dates and about one-third looked at nutrition information and ingredients. In another cross-sectional survey conducted among 226 consumers in Pune, Verma et al., [7] found that 78.32% of the population checked food labels and the most common information checked were the maximum retail price and expiry date. Energy and protein were the nutrients most frequently considered in the purchasing of packaged foods although 17.7% of those who did not think about the nutrient composition. (30.38%) of consumers found it challenging to read the labels due to small font size. In South Chennai, Murugesan et al., [8] surveyed shoppers at supermarkets and showed that 70.1% of their respondents indicated that they choose their products based on their label information and 67.5% said that they avoided products that labels are lacked. But only 51.8% of them showed good knowledge of reading and using food labelling. Ghosh et al., [9] conducted a nationwide experimental survey of 20,564 Indian consumers and conclude that all Health Star Ratings and warning labels were more readily recognised and understood and were more likely to impact purchase intentions than a range of informative front-of-pack labels. A recent study conducted by Pettigrew et al., [10] showed significant favourable effect of the two-colour traffic-light FOP labelling system on understanding and food-choice outcomes among the consumers in India.

These results suggest that food labels can have a positive effect on consumer purchasing decisions. However, the effectiveness depends on consumer awareness, comprehension, and willingness to act on the information.

4.2 Socio-Demographic Characteristics and its association with Consumer Awareness and Perception

The socio-demographic factors may affect the awareness, perception and engagement in food labels information among consumers. Consumers understanding and use of food labels may

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influenced by different factors including educational status, age, gender, income and area of residence.

a) Educational Status

Educational status is an important factor that could affect consumer knowledge, interpretation and understanding of food-labels. Idris et al., (2014) conducted a study in higher education students in the Pune region of India and reported a high level of awareness among the respondents (93.5%), but the awareness did not necessarily lead to good understanding of the information on labels [11]. These findings suggest that improving consumers knowledge of how to read nutrition information and utilize it when making food choices could be achieved through education.

b) Age

Consumers of different age may differ in their awareness of health and information seeking when reading food labels and their knowledge in packaged foods. In the contrary, Paliwal et al., [12] in a study concluded that older people were less aware about their food labels than younger people and the same association was reduced compared to the association with education level. The results indicate that there are differences in food-label engagement as a function of age although the relationship between age and food-label engagement could be mediated by other factors.

c) Income

Consumers consumption behaviour can be affected by income. Mediratta and Mathur [13] in a study reported that the awareness of nutrition information and analysed the association between income status and food-label reading behaviours in higher income adults in India. The study indicated that 79% read the food labels and 76% noted food claims. The study specifically looked at higher-income adults and it is important to take income into account when studying variation of food-label reading and understanding. This study revealed that consumers appreciated the healthier option but had difficulty in understanding the information on the nutrition panel and income was not enough to understand the nutrition panel labels.

d) Gender

Individuals might be affected by gender when they perceive and utilize the information in a food label. Bhattacharya et al., [14] had surveyed 2,024 respondents spread over 14 states in India. They identified one significant difference between the perceptions of food labelling formats, according to gender ($p=0.006$), which suggests that gender will impact on the perceptions of different food-labelling formats.

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e) Area of Residence

Being from an urban area or rural area may have a different effect on exposure to packaged foods, nutrition information and food-label education. A quantitative study was conducted among the adults in the participants of Puducherry, the study included 460 adults with 271 (58.91%) urban and 189 (41.08%) rural adults. About one-fourth regularly read food labels and urban residents tend to read the food label similarly to a rural resident ($p<0.05$). These results indicate that there may be disparities between urban and rural consumers in information, education and food environments which are responsible for the differences in the awareness and use of food labels [15].

The above reviewed literature suggests that educational level, age, income, gender and geographical location may have an impact on food label awareness, perception and engagement. Education is important for understanding and knowing how to read labels in food items and income may not be an independent factor in food-label knowledge. Gender and area of residence may influence food label use in particular populations but not consistent across populations.

4.3 Information Most Commonly Checked on Food Labels and its Influence on Purchasing Decisions

Food labels give key information about the price, ingredients, food additives, nutritional information, expiry date, front-of-pack labels information can influence consumers perception and their purchasing decisions.

a) Expiry Date and Food Safety Information

Customers check packaged foods for expiry dates and food safety information. In 2026, a qualitative study reported that low-income consumers indicated that they preferred first checking the price next expiry date when shopping for their desired packaged foods. The study also identified some risks of expired product being sold in rural areas. These findings suggest the need for the consumer information on expiry-date which would contribute to safer purchasing decisions and help to protect consumers. [16]

b) Nutritional Information

Consumers evaluate the nutrient information such as energy, fat, sugar, protein and sodium to assess the healthiness of packaged goods. But consumers do not often use the detailed nutrition information well because of the complexity of traditional nutrition panels. Oswald et al., [17] reported that consumers being more interested at consuming a Front of Pack labels but did not always have accurate nutrition knowledge. Thus, nutritional information accompanied by a simple and understandable way of presentation.

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c) Ingredients and Additives

Ingredients and additives information can impact consumers perception and the quality of the products involved and can guide them to make healthy decisions. In 2026 an experimental study published in the British Food Journal [18] analysed yogurt labels with varying types of additives, list of ingredients and front-of-pack nutrition information. The study revealed that the degree of their influence on consumer product healthiness and purchase intention was found highest for additive type, in which consumers expressed preference for products without additives and products with natural additives. Consumers perceptions also benefited significantly from shorter ingredient lists.

d) Price

Price is one of the product attributes that the consumers use when deciding whether or not to buy it, along with information on the food label. Kumar and Kapoor [19] conducted a study with 300 young Indian consumers aged 18-30 years, discovered that food labels are very important factor in consumer decision-making process. Price was an important factor for consideration along with product attributes related to health. These findings suggest that consumers consider the label information in addition to the economic value of the product and not only nutritional information.

e) Front-of-Pack Information

The front of pack (FOP) labels can make nutritional information more prominent and make consumers aware of nutrients. Gupta et al., [20] In 2022 a randomized field experiment compared warning labels, Health Star Ratings, Guideline Daily Amounts and traffic light labels for 2,869 adults from six states in India. Cognition of products high in nutrients of concern was much better with Front of pack labels than in the control group. 60.8% of participants with the warning label were able to identify all the products, followed by traffic lights (54.8%), GDA (55.0%) and HSR (45.0%). None of the FOP formats was found to significantly decrease the intentions to purchase. This implies that FOP labelling has the potential to increase the consumers comprehension of nutritional risks, but this does not automatically translate to a change in purchasing behaviour.

f) Influence on Purchasing Decisions

Consumers purchasing decisions may altered when they are aware and believe the food label information. Godden et al., [21] conducted a conjoint analysis study among 1,156 consumers. The study showed that consumers consider food products with respect to several food attribute components rather than just one. Food labelling relates to the price and to other product attributes when purchasing. From the above reviewed literature, consumer mainly focus on

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information like Expiry Date and food safety information is consistently checked, nutrition information is considered but the effects of detailed nutritional information hinges on the clarity, access and presentation of information, price is a purchasing factor, ingredients and food additives also considered among health conscious consumers and front-of-pack information can make nutrition information easier to perceive and comprehend. Therefore clear, simple and consumer-friendly labelling formats may strengthen the relationship between label awareness into more informed purchasing decisions.

5. Consumer-Centric Implications

From the consumers perspective future studies should concentrate on consumer behaviour as a result of awareness of food labels and not merely on consumer awareness of food label reading. More consideration to be given on focusing the difference in consumers literacy, education and socioeconomic background. Food manufacturers, retailers and policy makers should give clear, simple and easy-to-read labelling systems.

CONCLUSION

Food labels have an important role to inform consumers about food that can help them to make informed food choices. Based on the above reviewed articles,

1. The study showed that consumer awareness and perception about the food labels are significant, but not all consumers have a complete understanding of what they see on the food labels and do not necessarily make use of the information.

2. The socio demographic characteristics such as educational attainment, age, gender, income, area of residence and nutrition knowledge could influence food labelling engagement but associations with such information differs by consumers.

3. The key information including expiry date, price and product identification is followed by most in every product and the detailed nutritional information is often used less. Therefore, the effect of food labelling on food purchasing also relies on the clarity, availability and presentation of information. A "consumer oriented" approach therefore needs to include enhancing the food-label information as well as enhancing the consumer understanding and use of that information. Appropriate presentation format, consumer nutrition education, clear and simple labelling can support and reinforce the process of converting awareness and perception to informed food purchasing behaviour.

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ARTIFICIAL INTELLIGENCE, GENERATIVE AI AND EMERGING TECHNOLOGIES: TRANSFORMING BUSINESS, INNOVATION AND THE FUTURE OF WORK

A STRATEGIC FRAMEWORK FOR INTELLIGENT BUSINESS TRANSFORMATION, INNOVATION AND WORKFORCE READINESS

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ABSTRACT

Artificial Intelligence (AI) and Generative Artificial Intelligence (Generative AI) have emerged as transformative technologies that are reshaping businesses, industries and society. The rapid development of machine learning, natural language processing, computer vision, generative models and other emerging technologies has created new opportunities for innovation, automation and data-driven decision-making. This paper examines the growing role of AI and Generative AI in transforming contemporary business practices, with particular emphasis on productivity, customer engagement, innovation and organizational decision-making. At the same time, the adoption of these technologies raises important concerns related to data privacy, cybersecurity, ethical use, algorithmic bias, intellectual property and the changing nature of employment. The study also explores how emerging technologies such as the Internet of Things, blockchain, cloud computing and advanced data analytics can complement AI to create integrated digital ecosystems. The paper highlights the importance of responsible AI governance, digital skills development and human–AI collaboration for achieving sustainable technological transformation. The findings emphasize that the future of AI-driven transformation depends not only on technological advancement but also on effective governance, workforce readiness and responsible innovation.

Keywords: Artificial Intelligence, Generative AI, Emerging Technologies, Digital Transformation, Business Innovation, Future of Work.

1. INTRODUCTION

Artificial Intelligence (AI) and Generative AI are driving modern digital transformation by enabling software to learn, reason, predict, and generate new content such as text, software code, and audio. In business, AI and Generative AI are transforming key functions like

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marketing, customer service, research, and decision support. Furthermore, complementary technologies—including the Internet of Things (IoT), cloud computing, blockchain, and advanced data analytics- integrate with AI to build connected, scalable, and data-driven digital ecosystems.

However, rapid adoption creates critical challenges around data privacy, cybersecurity, algorithmic bias, intellectual property, and job shifts. To succeed, organizations must implement responsible AI governance, support digital skill development, and promote human–AI collaboration for sustainable, human-centered transformation.

2. REVIEW OF LITERATURE

1. **Kanbach et al. (2024)** examined Generative AI from a business-model innovation perspective and found that GenAI can improve existing business processes while creating new opportunities for value creation and business transformation.
2. **Mariani et al. (2023)** conducted a systematic review of AI and innovation research and identified economic, technological and social factors influencing AI adoption, innovation, organizational development and competitive outcomes.
3. **Roberts and Candi (2024)** reviewed the evolving relationship between AI and innovation management and highlighted AI's influence on innovation processes, innovation performance and the emerging role of Generative AI in supporting innovation activities.
4. **Bankins et al. (2024)** examined AI use in organizations and emphasized that successful AI integration requires attention to employees, work experiences, job design, workforce readiness and effective human–AI collaboration.
5. **Gmyrek, Berg and Bescond (2023)** analyzed the global employment effects of Generative AI and highlighted that workforce skills, adaptability and appropriate organizational responses are essential for managing AI-driven changes in jobs.

3. OBJECTIVES

1. To examine the level of adoption and utilization of Artificial Intelligence, Generative AI and emerging technologies among organizations.
2. To examine the relationship between AI and Generative AI adoption and business transformation, particularly in terms of operational efficiency, customer engagement, decision-making and organizational flexibility.
3. To assess the relationship between AI and Generative AI adoption and organizational innovation capability, with reference to idea generation, product and service innovation, creative problem-solving and experimentation.
4. To evaluate the level of workforce readiness for AI-driven transformation in terms of digital

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skills, AI literacy, adaptability, continuous learning and human–AI collaboration.

5. To identify the underlying dimensions of AI-driven transformation, with particular reference to business transformation, future-of-work preparedness and responsible AI governance.

4. STATEMENT OF PROBLEM

The rapid adoption of Artificial Intelligence (AI), Generative AI, and emerging technologies is reshaping business operations, decision-making, and content creation. However, the pace of technological development and implementation practices varies significantly across organizations, leading to uneven capabilities and organizational readiness. Organizations face critical implementation barriers, including data privacy, cybersecurity, algorithmic bias, intellectual property, and ethical governance. Simultaneously, AI-driven automation is altering job roles and skill requirements, creating an urgent need for digital skills, AI literacy, and effective human–AI collaboration.

While existing research examines these elements individually, there remains a need for an integrated framework connecting technology adoption to business transformation, innovation capability, workforce readiness, and responsible governance. This study addresses this gap to help organizations turn technological potential into sustainable, human-centered outcomes.

5. METHODOLOGY

Component	Description
Research Approach	Quantitative Research Approach
Research Design	Descriptive and Explanatory Research Design
Population	Top Management & Leadership, Technical Leaders/Engineers/IT Managers, Functional Managers, and Analysts/Research Specialists
Sample Size	118 valid respondents
Sampling Technique	Purposive Sampling
Data Source	Primary Data
Data Collection Method	Structured Questionnaire
Measurement Scale	Five-Point Likert Scale (1 = Strongly Disagree to 5 = Strongly Agree)
Statistical Tools	Descriptive Statistics, Pearson Correlation, Simple Linear Regression, Exploratory Factor Analysis, Chi-Square Test

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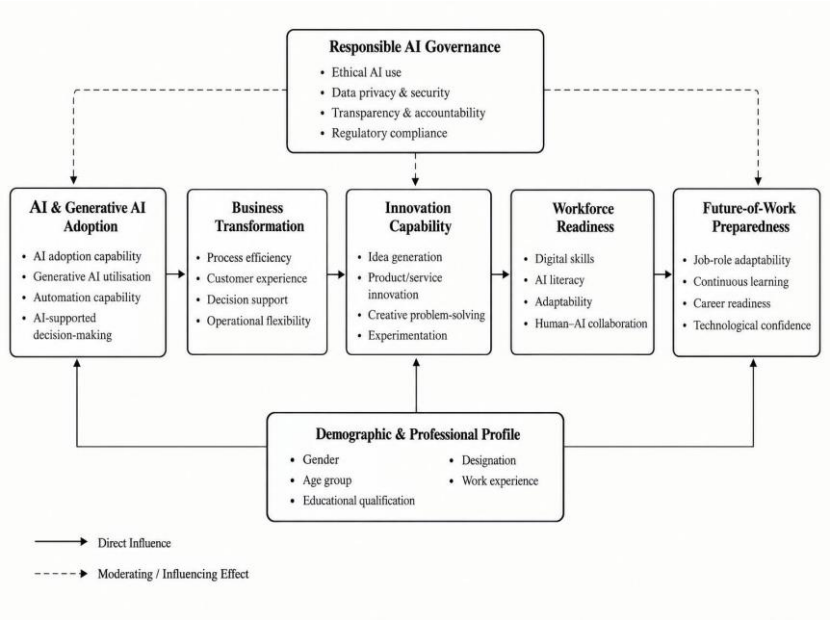
6. CONCEPTUAL MODEL

Analysis and Interpretation Demographic profile



Sample: 118 valid respondents out of 120; response rate = 98.33%.

Demographic Variable	Classification	Frequency (f)	Percentage (%)
Age Group	Under 25 years	14	11.9%
	25 – 34 years	49	41.5%
	35 – 44 years	36	30.5%
	45 years and above	19	16.1%
Educational Qualification	Bachelor's Degree	38	32.2%
	Master's Degree	64	54.2%
	Doctorate / Ph.D. / Professional Certification	16	13.6%
Designation / Job Role	Top Management / Leadership	17	14.4%
	Technical Leads / AI Engineers / IT Managers	38	32.2%
	Functional Managers	39	33.1%
	Analysts / Research Specialists	24	20.3%
Work Experience	Less than 3 years	16	13.6%
	3 – 7 years	43	36.4%
	8 – 12 years	37	31.4%
	More than 12 years	22	18.6%

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Analysis: Descriptive Statistics

Construct	Mean	SD	Interpretation
AI, Generative AI & Emerging Technology Adoption	3.595	0.747	Moderate–High
Business Transformation	3.827	0.624	High
Innovation Capability	3.775	0.754	High
Future of Work Readiness	3.973	0.601	High
Responsible AI Governance	4.023	0.599	High

Interpretation: The results indicate a moderate-to-high level of AI, Generative AI & Emerging Technology Adoption. Business transformation, innovation capability, and future-of-work readiness also show positive levels, with Responsible AI Governance recording the highest mean score (4.023).

Analysis: Simple Linear Regression

Independent Variable: AI, Generative AI & Emerging Technology Adoption

Dependent Variable: Business Transformation

Statistic	Value
R	0.430
R^2	0.185
Adjusted R^2	0.178
F	26.38
p-value	< 0.001
Regression coefficient (B)	0.360
t-value	5.137

Regression Equation

Business Transformation = 2.535 + 0.360(AI, Generative AI & Emerging Technology Adoption) Interpretation: AI, Generative AI & Emerging Technology Adoption has a positive and statistically significant effect on Business Transformation ($B = 0.360$, $t = 5.137$, $p < 0.001$). It explains 18.5% of the variation in Business Transformation, and the overall regression model is statistically significant ($F = 26.38$, $p < 0.001$).

Analysis: Pearson Correlation

Variables	Pearson r	p-value	Relationship

AI, Generative AI & Emerging Technology Adoption ↔ Innovation Capability	0.495	< 0.001	Positive, moderate

Interpretation: Pearson correlation analysis indicates a moderate positive relationship between AI, Generative AI & Emerging Technology Adoption and Innovation Capability ($r = 0.495$, $p < 0.001$). The positive coefficient indicates that higher levels of AI, Generative AI & Emerging Technology Adoption tend to be associated with higher organizational innovation capability.

Analysis: Chi-Square Test

H_0: There is no significant difference in the distribution of workforce readiness levels among respondents.

H_1: There is a significant difference in the distribution of workforce readiness levels among respondents.

Statistic	**Value**
Chi-square	8.254
df	2
P- value	0.016

Interpretation: The Chi-square test result ($\chi^2 = 8.254$, $df = 2$, $p = 0.016$) indicates a statistically significant difference in the distribution of workforce readiness levels among respondents, since $p < 0.05$. Therefore, H_0 is rejected and H_1 is accepted. This indicates that workforce readiness for AI-driven transformation is not equally distributed across the identified readiness levels.

Analysis: Factor Analysis KMO and Bartlett's Test

Measure	**Value**
KMO	0.796
Bartlett's χ^2	604.598
df	91
p-value	< 0.001

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Extracted Factors

Factor Key	Loading Range	Variance
Business Transformation	0.735 - 0.820	28.56%
Future of Work Readiness	0.764 - 0.792	19.39%
Responsible AI Governance	0.769 - 0.816	13. 87%
Total		61.81%

Interpretation: The KMO value of 0.796 indicates adequate sampling adequacy, while Bartlett's Test of Sphericity is significant ($p < 0.001$), confirming that the data are suitable for factor analysis. Three meaningful dimensions—Business Transformation, Future-of-Work Readiness and Responsible AI Governance—were identified, explaining 61.81% of the total variance. This demonstrates that AI-driven transformation is supported by interconnected organizational, workforce and governance dimensions.

7. FINDINGS

1. The findings indicate that respondents generally perceive AI, Generative AI and emerging technologies positively, with comparatively stronger perceptions regarding future-of-work readiness and responsible AI governance.
2. Higher AI adoption and readiness are associated with higher levels of perceived business transformation. However, the R^2 value also indicates that other organizational and technological factors account for a substantial proportion of business transformation.
3. The statistically significant correlation indicates that higher levels of AI, Generative AI and emerging technology adoption are associated with greater organizational innovation capability, including idea generation, experimentation, creative problem-solving and innovation.
4. The Chi-square test indicates a statistically significant difference in the distribution of workforce readiness levels among respondents ($\chi^2 = 8.254$, $df = 2$, $p = 0.016$).
5. The analysis identifies Business Transformation, Future-of-Work Readiness and Responsible AI Governance as distinct dimensions supporting sustainable AI-driven transformation.

8. MANAGERIAL IMPLICATIONS

Organizations should adopt AI, Generative AI and emerging technologies strategically by integrating them into business operations, decision-making, customer engagement and innovation activities. Managers should strengthen AI literacy, digital skills, adaptability,

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continuous learning and human–AI collaboration through structured training programs. At the same time, responsible AI governance covering privacy, security, transparency, accountability and human oversight should be established to ensure safe and sustainable technological adoption.

9. SUGGESTIONS

1. Strengthen AI literacy, employee training, Generative AI applications and responsible-AI guidelines.
2. Integrate AI into operations, decision support and customer-facing activities.
3. Use Generative AI for brainstorming, prototyping and creative problem-solving with human oversight.
4. Develop digital skills, adaptability, continuous learning and human–AI collaboration.
5. Integrate business transformation, workforce preparedness and responsible AI governance for sustainable adoption.

10. CONCLUSION

The study concludes that AI, Generative AI and emerging technologies play an important role in supporting business transformation, innovation and workforce readiness. Higher technology adoption is associated with stronger business transformation and innovation capability, while workforce readiness and responsible AI governance remain essential for sustainable adoption. Overall, organizations should combine technological advancement with AI literacy, continuous learning, human–AI collaboration and responsible governance to achieve sustainable organizational transformation.

11. Limitations and Scope for Future Research

1. The study is based on a relatively small sample of 118 respondents and purposive sampling; future research can use larger and more diverse samples across industries and organizational sizes.
2. The findings are mainly based on self-reported responses; future studies can use longitudinal and empirical approaches to examine the long-term impact of AI adoption.
3. The study focuses on selected dimensions of AI-driven organizational transformation; future research can explore ethical AI governance, workforce displacement, and other emerging dimensions in greater depth.
4. Future studies can conduct comparative research across sectors and organizational contexts to provide broader and more generalizable insights into AI-driven transformation.

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INNOVATIVE IDEAS AND THEIR IMPACT IN MODERN E-COMMERCE

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ABSTRACT

The modern e-commerce landscape is undergoing a profound transformation driven by rapid technological innovations. As global retail becomes increasingly digitized, businesses are leveraging advanced technologies to enhance operational efficiency, optimize supply chain networks, and deliver highly personalized consumer experiences. This research paper explores the impact of critical innovations namely Artificial Intelligence (AI), Augmented Reality (AR), Omnichannel strategies, and Blockchain technology on contemporary e-commerce frameworks. Drawing on secondary data from high-quality indexed academic journals, the study synthesizes recent empirical findings to demonstrate how algorithmic personalization and sentiment analysis increase consumer retention, while blockchain infrastructure ensures traceability and builds trust within closed-loop supply chains. Furthermore, the paper highlights how omnichannel approaches and AR implementations are bridging the gap between physical and digital storefronts, thus redefining customer engagement. The findings suggest that the integration of these innovations is no longer a mere competitive advantage but a fundamental necessity for sustainability and growth in the global digital economy.

Keywords: E-commerce, Artificial Intelligence, Blockchain, Augmented Reality, Omnichannel.

1. INTRODUCTION

The evolution of electronic commerce has continuously been shaped by technological advancements, shifting from basic online transactional platforms to highly complex, interconnected digital ecosystems (Rosário & Raimundo, 2021). Over the last decade, innovations in data science, distributed ledger technologies, and interactive multimedia have fundamentally altered the dynamics of consumer-retailer relationships (Cristescu et al., 2023). Today, digital commerce is not defined merely by the ability to purchase goods online, but by the seamlessness, security, and personalization of the entire customer journey (Riaz et al., 2021).

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Artificial Intelligence (AI) and machine learning algorithms are at the forefront of this digital revolution. By utilizing vast amounts of consumer data, AI-driven systems facilitate hyper-personalized marketing, algorithmic pricing models, and sentiment analysis that can predict and influence consumer behavior (Bawack et al., 2022; Taherdoost & Madanchian, 2023). Concurrently, the emergence of the Internet of Things (IoT) and big data analytics has created a smart environment where market trends are monitored in real-time, allowing businesses to adapt swiftly to fluctuating demands (Lazić et al., 2023; Verma et al., 2023). However, this data-centric approach brings forth regulatory challenges, particularly regarding algorithmic price discrimination and consumer privacy concerns (Guo et al., 2024; Mutambik et al., 2023). Beyond software algorithms, innovations like Augmented Reality (AR) and Omnichannel integration are reshaping the spatial and experiential aspects of shopping. Retailers employ AR to overlay digital product representations onto physical environments, significantly enhancing purchase intent and user experience (Alam et al., 2021; Nofal, 2026). Meanwhile, the backend operations of e-commerce are being fortified by Blockchain technology, which introduces unprecedented levels of transparency and traceability to supply chain management (Balcıoğlu et al., 2024). In light of these developments, this paper investigates the multidimensional impacts of these innovative technologies on modern e-commerce operations, synthesizing insights from prominent academic literature.

2. OBJECTIVES

1. To analyze the impact of Artificial Intelligence and machine learning on e-commerce personalization and customer satisfaction.
2. To examine the role of omnichannel strategies and augmented reality in creating seamless retail experiences.
3. To evaluate how blockchain technology enhances supply chain transparency and consumer trust in digital commerce.

3. METHODOLOGIES

This study employs a secondary research methodology, utilizing a systematic review of extant literature. Data was meticulously collected from peer-reviewed articles published in high-quality indexed journals, specifically from renowned databases such as Elsevier, ScienceDirect, and MDPI. The search parameters focused on recent publications highlighting technological intersections with e-commerce, utilizing keywords such as 'Blockchain Supply Chain', 'Omnichannel Retail', 'Artificial Intelligence E-commerce', and 'Augmented Reality'. The gathered literature was subjected to thematic synthesis to extract cohesive insights

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regarding the operational and consumer-facing impacts of these technological innovations. Ensuring rigorous academic integrity, all references cited herein represent original empirical and theoretical contributions from verified scholarly sources.

4. LITERATURE REVIEW

The transformation of e-commerce is largely fueled by the implementation of AI and Big Data analytics. Bawack et al. (2022) conducted an extensive bibliometric analysis demonstrating that AI has shifted the e-commerce paradigm from standard transactional interfaces to intelligent, adaptive platforms. AI's capability to process vast datasets enables predictive modeling for consumer behavior, which is a critical driver for modern marketing strategies (Rosário & Raimundo, 2021). Furthermore, Taherdoost and Madanchian (2023) emphasized the role of AI in sentiment analysis, allowing firms to gauge competitive landscapes and consumer emotions effectively. According to Cristescu et al. (2023), the integration of such data science solutions has a direct, quantifiable impact on company turnover, fostering significant growth in enterprise sales. Complex algorithmic structures, such as graph-based extractive models, further streamline data interpretation in large-scale commercial networks (Verma et al., 2023). However, the literature also warns of the ethical implications of these innovations; for instance, Guo et al. (2024) highlighted the necessity of evolutionary game-based regulations to manage algorithmic price discrimination on major platforms. Similarly, as social commerce continues to expand, Mutambik et al. (2023) demonstrated that user privacy concerns act as a critical moderating factor in the widespread adoption of socially integrated e-commerce systems.

In parallel with data analytics, the structural approach to retail has evolved into the Omnichannel model. Riaz et al. (2021) identified that providing a seamless transition between physical and digital touchpoints is essential for optimizing the customer experience in the fashion retail sector. This sentiment is echoed by Hidayat et al. (2024), who investigated the omnichannel effect on consumer satisfaction among micro, small, and medium enterprises, confirming that channel integration mitigates the adverse effects of singular market disruptions. To further bridge the physical-digital divide, Augmented Reality (AR) has emerged as a disruptive force. Alam et al. (2021) applied the technology acceptance model to retail, finding that perceived innovativeness and ease of use significantly drive AR adoption, empowering open business models. Nofal (2026) further highlighted that immersive retail environments facilitated by AR depend heavily on algorithmic transparency to foster user trust. Even in complex visual recognition tasks necessary for cataloging and user-generated content,

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advanced neural architectures have improved scene text recognition, indirectly supporting immersive retail applications (Mu et al., 2024).

Supply chain sustainability and transparency form the backbone of successful e-commerce, areas currently being revolutionized by Blockchain technology. Alqarni et al. (2023) illustrated that blockchain-based smart contracts automate logistical processes, providing undeniable provenance and reducing reliance on centralized brokers. Balcıoğlu et al. (2024) corroborated this through text mining analysis, revealing that blockchain integration substantially reduces costs while boosting operational efficiency and security. In specialized e-commerce sectors, such as closed-loop supply chains where recycling and reverse logistics are paramount, Ma et al. (2024) established that blockchain adoption is instrumental in overcoming trust deficits, thereby encouraging consumers to participate in sustainable e-commerce models. Lazić et al. (2023) concluded that the convergence of these technologies—AI, IoT, and Blockchain—forms the foundational architecture for the future of electronic commerce.

5. MAJOR FINDINGS

Based on the synthesis of the reviewed literature, several major findings emerge regarding the state and trajectory of e-commerce innovations:

Firstly, Artificial Intelligence and Data Science serve as the primary engines for revenue growth and customer retention. The deployment of AI for sentiment analysis and hyper-personalization allows firms to establish deeper emotional and transactional connections with consumers (Taherdoost & Madanchian, 2023; Cristescu et al., 2023). However, this rapid integration is accompanied by an urgent need for regulatory frameworks to curtail unethical algorithmic practices, such as unfair price discrimination, and to alleviate escalating privacy concerns in social commerce networks (Guo et al., 2024; Mutambik et al., 2023).

Secondly, the Omnichannel strategy is no longer optional but imperative. Seamless integration across mobile, web, and physical channels directly correlates with enhanced consumer satisfaction and enterprise resilience (Riaz et al., 2021; Hidayat et al., 2024). Augmented Reality acts as a catalyst within this strategy, reducing the cognitive distance between online browsing and physical product evaluation, thereby accelerating the purchase decision process (Alam et al., 2021).

Thirdly, Blockchain technology resolves the critical vulnerability of supply chain opacity. By utilizing immutable smart contracts, e-commerce platforms can guarantee product provenance, automate logistics, and facilitate sustainable, closed-loop supply chains that inherently generate consumer trust (Alqarni et al., 2023; Ma et al., 2024). The overarching finding is that modern

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e-commerce success requires a synchronized deployment of AI for frontend personalization, AR/Omnichannel for experiential engagement, and Blockchain for backend integrity.

6. CONCLUSION

The landscape of modern e-commerce is characterized by rapid, disruptive technological innovations that redefine how businesses interact with consumers and manage their global operations. This research paper highlights that the integration of Artificial Intelligence, Augmented Reality, Omnichannel distribution, and Blockchain technology creates a holistic, highly efficient digital commerce ecosystem. AI and big data empower retailers with unprecedented predictive capabilities, tailoring the shopping experience to individual preferences while optimizing corporate turnover. Concurrently, AR and omnichannel strategies break down traditional barriers, offering immersive, boundary-less customer journeys. Finally, blockchain serves as the ultimate arbiter of trust, ensuring transparency and security in complex logistical networks. For e-commerce enterprises to maintain a competitive edge and ensure long-term sustainability, they must strategically align these technologies, balancing innovation with ethical data governance and consumer privacy. As the digital market continues to expand, these technological pillars will undoubtedly shape the future paradigms of global trade.

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INCLUSIVE BENEFITS OF YOUNG INNOVATORS IN THE FIELD OF WEB DESIGNING FOR MODERN MARKETING NEEDS

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ABSTRACT

Young innovators increasingly operate at the intersection of web designing, digital entrepreneurship and modern marketing, where design skills can convert modest resources into market visibility, customer access and business experimentation. This paper examines the inclusive benefits of young innovators who design and manage websites using secondary evidence from 30 peer-reviewed articles in established Elsevier/ScienceDirect and Emerald outlets. The literature shows that website quality combines design, information, responsiveness, trust, service, security and experience, while accessibility and cultural adaptation broaden participation (Wolfinbarger & Gilly, 2003; Kim & Stoel, 2004; Bai et al., 2008; Longstreet et al., 2021). Digital entrepreneurship research also links digital capabilities, innovativeness, self-efficacy and ecosystems with pathways from ideas to market offerings (Paul et al., 2023; Salavou et al., 2023; Çela et al., 2025). Youth-led web designing therefore has value beyond aesthetics: it can support affordable marketing capability, customer inclusion, SME digitalization and entrepreneurial learning when accessibility is built into development (Lazar et al., 2004; Vollenwyder et al., 2019).

Keywords: young innovators, web designing, digital entrepreneurship, inclusive marketing, website quality

1. INTRODUCTION

Modern marketing increasingly depends on digital touchpoints through which firms communicate value, establish credibility, personalize messages and facilitate transactions. The website has evolved into an interactive marketing infrastructure linking content, service, social media, customer experience and transactions. Research on e-tail quality identifies design, reliability, privacy and customer service as central dimensions, while e-service quality research emphasizes ease of use, appearance, structure, content, efficiency, communication and security (Wolfinbarger & Gilly, 2003; Cristobal et al., 2007). Studies of retail and hospitality websites

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also show that website quality influences satisfaction and purchase intentions (Kim & Stoel, 2004; Bai et al., 2008).

The growth of digital channels changes the opportunity structure for young innovators. Digital entrepreneurship research shows how digitally enabled ventures create new value propositions and market relationships, while entrepreneurial SMEs can use digital platforms to extend capabilities constrained by limited resources (Cenamor et al., 2019; Paul et al., 2023). Research on digital transformation links individual digital capabilities, managerial digital literacy and self-efficacy with SME adoption and performance (Scuotto et al., 2021; Zahoor et al., 2023). Young web designers can therefore convert technical skills into market-facing services for small firms, entrepreneurs, community organizations and emerging brands.

The inclusive dimension is equally important. Web accessibility research shows that many sites remain difficult for people with disabilities even when guidelines exist, and that accessibility should be considered during development rather than added later (Lazar et al., 2004; Vollenwyder et al., 2019). Research also shows that experienced accessibility is shaped by expectations and prior experience, while cultural adaptation can influence website attitudes and trust (Aizpurua et al., 2015; Bartikowski & Singh, 2014). This supports a broader view of youth-led web innovation as a way to widen participation in markets and communication.

2. OBJECTIVES

1. To examine the contribution of young innovators in web designing to contemporary marketing capability.
2. To identify the inclusive economic, customer and entrepreneurial benefits associated with youth-led website innovation.
3. To synthesize secondary evidence on the conditions required for accessible, effective and sustainable youth-oriented web innovation.

3. METHODOLOGY

The study adopts a secondary-data, structured narrative review design. The evidence base comprises 30 peer-reviewed journal articles from established Elsevier/ScienceDirect and Emerald outlets covering website design, e-service quality, web accessibility, digital marketing, digital entrepreneurship, SME digitalization and youth entrepreneurship. Articles were selected for direct relevance to website usability, accessibility, marketing capability, innovation capability, SME digital transformation or youth digital entrepreneurship. The paper synthesizes published findings rather than collecting primary responses, experiments or

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surveys. Recurring constructs include design quality, trust, satisfaction, interactivity, accessibility, digital capability, platform capability, innovation and entrepreneurial intention (Paul et al., 2023; Herhausen et al., 2020; Vollenwyder et al., 2019).

4. LITERATURE REVIEW

Website design is a strategic component of online customer experience. Rosen and Purinton (2004) conceptualize websites as cognitive landscapes, while Lee and Kozar (2009) show that usable online-store design can shape evaluations relevant to purchase intention. Hausman and Siekpe (2009) associate web-interface features with purchase intentions, and McDowell et al. (2016) find that website design features are associated with conversion rates. These studies suggest that young innovators create marketing value through navigation, information architecture, visual hierarchy, interaction and flow rather than visual novelty alone. Website quality operates through trust, satisfaction and loyalty mechanisms. Kim and Stoel (2004) treat website quality as multidimensional, while Bai et al. (2008) report positive relationships with satisfaction and purchase intentions. Ha and Stoel (2009) connect e-shopping quality with usefulness, trust, enjoyment and attitudes, while Cristobal et al. (2007) link perceived e-service quality with satisfaction and website loyalty. Ribbink et al. (2004) identify e-trust as an important condition for online loyalty, and Ahmad et al. (2017) show roles for customer service, privacy, hedonism and e-satisfaction. Youth innovators can therefore support marketing outcomes by integrating functional and experiential qualities into a coherent customer journey.

Contemporary web design is connected with personalization, social interaction and brand development. Oberoi et al. (2017) show that technology sourcing for website personalization and social media marketing can affect market performance. Ye et al. (2019) show that website interactivity contributes to brand experience and brand choice, with age moderating some relationships. Kim and Stoel (2004) and Longstreet et al. (2021) identify efficiency, privacy, user friendliness, navigability and selected diagnostic cues as important website-quality considerations. Longstreet et al. (2021) show that consumers rely on selected diagnostic design and operational cues when judging website quality. The implication for young innovators is the value of focused, evidence-based design.

Inclusion requires more than usability for mainstream users. Lazar et al. (2004) identify development-process barriers to web accessibility, while Aizpurua et al. (2015) show that experienced accessibility is shaped by expectations, memories and confidence. Vollenwyder et

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al. (2019) find that accessibility intentions strengthen when practitioners view accessibility as part of their role and as beneficial to product quality. Young innovators can support inclusive marketing through accessible navigation, readable structures, keyboard-friendly interaction and testing with diverse users.

Entrepreneurship research provides the second pillar of the argument. Cenamor et al. (2019) show that digital platform capability can improve entrepreneurial SME performance through network capability. Chatterjee and Kar (2020) report that SME social-media adoption can improve business outcomes when usefulness, ease of use and compatibility are present. Herhausen et al. (2020) identify channels, social media, digital relationships and digital technologies as components of digital marketing capability. Scuotto et al. (2021) link individual digital capabilities with SME growth and innovation, Zahoor et al. (2023) connect digital literacy with digital transformation, Radicic and Petkovic (2023) link digitalization with SME innovation, and Kraus et al. (2023) connect entrepreneurial orientation and digitalization with disruptive innovation. A young web designer with marketing knowledge can therefore act as a capability provider for resource-constrained firms.

Digital entrepreneurship research clarifies why youth participation matters. Bejjani et al. (2023) conceptualize digital entrepreneurial ecosystems as configurations linking entrepreneurship and digital environments, while Paul et al. (2023) identify digital business models, platforms and technology adoption as major themes. Salavou et al. (2023) show that entrepreneurial intention can emerge in adolescence through psychological and contextual configurations. Çela et al. (2025) reports that innovativeness, attitudes, subjective norms, perceived behavioral control and self-efficacy shape digital entrepreneurial intentions among university students. Malodia et al. (2023) show that digital self-efficacy is associated with the digital transformation journey and performance of Indian SMEs. The evidence supports viewing young web innovators as emerging contributors to digital market capability.

The literature also identifies constraints. Digital entrepreneurship is not automatically inclusive because differences in skills, confidence, resources, support networks and organizational readiness shape who benefits (Bejjani et al., 2023; Paul et al., 2023). Website innovation can underperform when novelty displaces usability, accessibility is treated only as compliance, or firms lack complementary marketing capabilities (Lazar et al., 2004; Longstreet et al., 2021; Herhausen et al., 2020). The inclusive contribution of youth therefore depends on a capability bundle combining design, digital marketing, accessible development, customer research and entrepreneurial judgment (Rosen & Purinton, 2004; Scuotto et al., 2021; Zahoor et al., 2023).

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5. MAJOR FINDINGS

The secondary evidence yields six interrelated findings. First, youth-led web designing can widen access to marketing capability because website development and digital content services can be delivered without the physical infrastructure associated with many traditional marketing activities (Paul et al., 2023; Cenamor et al., 2019). Second, marketing value comes from combining technical and customer-oriented capabilities: design, usability, information, responsiveness, trust and interaction shape satisfaction, loyalty and purchase behavior (Wolfinbarger & Gilly, 2003; Bai et al., 2008; Ha & Stoel, 2009; McDowell et al., 2016). Third, youth innovators can strengthen small-business competitiveness by transferring digital capabilities into firms with limited internal expertise (Herhausen et al., 2020; Chatterjee & Kar, 2020; Radicic & Petkovic, 2023; Zahoor et al., 2023). Fourth, inclusion improves when websites accommodate users with varied abilities (Aizpurua et al., 2015; Vollenwyder et al., 2019; Lazar et al., 2004). Fifth, interactivity, personalization and ecosystem connections strengthen modern digital marketing integration (Oberoi et al., 2017; Ye et al., 2019; Bejjani et al., 2023). Sixth, youth innovation depends on entrepreneurial self-efficacy, innovativeness and supportive environments rather than technical skill alone (Salavou et al., 2023; Çela et al., 2025).

6. CONCLUSION

The literature indicates that young innovators in web designing can generate inclusive benefits across marketing, entrepreneurship and customer participation when technical capability is integrated with usability, accessibility, digital marketing knowledge and entrepreneurial thinking. Websites operate as strategic market interfaces whose design affects satisfaction, trust, brand experience, conversion and loyalty, while digital entrepreneurship research shows that younger actors can participate in value creation through flexible digital structures (Wolfinbarger & Gilly, 2003; Ye et al., 2019; Paul et al., 2023). For small and emerging firms, youth-led web innovation can function as a capability bridge supporting market visibility, digital transformation and experimentation (Chatterjee & Kar, 2020; Scuotto et al., 2021). The inclusion benefit becomes stronger when accessibility and diverse user needs are embedded in development (Lazar et al., 2004; Vollenwyder et al., 2019).

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DIGITAL TAX COMPLIANCE IN INDIA: THE INFLUENCE OF E-FILING PORTAL QUALITY ON TAXPAYER SATISFACTION AND COMPLIANCE BEHAVIOUR AMONG SALARIED TAXPAYERS

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ABSTRACT

India's income tax administration has moved decisively from paper-based procedures to a digital ecosystem comprising an online e-filing portal, pre-filled returns, the Annual Information Statement (AIS), electronic verification and faceless assessment. Whether this shift produces satisfied and compliant taxpayers, however, depends on how users actually experience the portal. This study analytically examines the influence of e-filing portal quality on the satisfaction and compliance behaviour of salaried taxpayers, who constitute the target population. Using a structured questionnaire administered to 150 salaried taxpayers in Chennai selected through purposive sampling, the study investigates the impact of perceived ease of use, functional reliability and data security on taxpayer satisfaction, the association between specific digital features (pre-filled returns and AIS, faceless assessment and e-proceedings, and online helpdesk and grievance services) and outcomes such as timely filing and continued use of e-filing, and the moderating role of digital and tax literacy. The results indicate that ease of use, reliability and security each significantly influence taxpayer satisfaction, that engagement with digital features is positively associated with timely filing and continuance intention, and that digital and tax literacy significantly strengthens the relationship between portal quality and satisfaction. The study also highlights the role of taxpayer education in ensuring that digitalisation benefits all segments of taxpayers equally.

Keywords: E-Filing, Digital Tax Compliance, Taxpayer Satisfaction, E-Service Quality, Faceless Assessment, Income Tax

1. INTRODUCTION

Taxation is among the most intensive points of contact between citizens and the state, and its digitalisation is a central element of digital governance. Over the past decade the Income Tax Department has replaced counter-based filing with an integrated online environment: electronic

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filing of returns, pre-filled return data, electronic verification, online tracking of refunds and, from 2019–20 onward, faceless assessment, in which proceedings are conducted electronically without physical interaction between the taxpayer and the assessing officer (Income Tax Department, n.d.). The e-filing portal was re-launched in June 2021 with a redesigned interface intended to make compliance simpler and more transparent.

Research on electronic tax filing has drawn on technology acceptance and information-systems success models, which hold that perceived usefulness, ease of use and system quality shape adoption and satisfaction (Davis, 1989; DeLone & McLean, 2003; Venkatesh et al., 2003). Studies of e-government further show that trust in the service provider is critical when citizens share sensitive information online (Carter & Bélanger, 2005). At the same time, tax-compliance scholarship stresses that compliance depends not only on deterrence but also on trust in authorities and the perceived fairness of the system (Allingham & Sandmo, 1972; Kirchler et al., 2008).

In India, salaried taxpayers form the largest and most visible segment of individual filers, and for many of them the portal is the only interface with the tax administration. Yet evidence on how portal quality shapes their satisfaction and compliance behaviour, and under what conditions, remains limited. This study addresses that gap by analytically examining the influence of e-filing portal quality on taxpayer satisfaction and compliance behaviour, focusing on ease of use, reliability, security and the moderating role of digital and tax literacy.

2. PROBLEM DEFINITION

Conventional compliance theory treats the taxpayer as a rational agent who weighs penalties against the gains from non-compliance (Allingham & Sandmo, 1972). Digitalisation changes this calculation: the cost of complying now depends on how easy, reliable and secure the digital interface is, and on whether taxpayers have the skills to use it. A difficult portal can raise compliance costs, generate errors and erode trust, whereas a well-designed portal can make voluntary compliance routine (Kirchler et al., 2008; Alm, 2019).

Existing studies largely examine the initial adoption of e-filing in other countries (Wang, 2003; Fu et al., 2006; Azmi & Bee, 2010) rather than post-adoption satisfaction, and seldom examine how users' literacy conditions the effect of portal quality. The core problem addressed in this study is, therefore, the limited analytical evidence on how e-filing portal quality translates into satisfaction and compliance behaviour among Indian salaried taxpayers, and on the boundary

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conditions, particularly digital and tax literacy, that determine whether digitalisation yields confident, voluntary compliance or confusion and dependence on intermediaries.

3. LITERATURE REVIEW

Technology Acceptance and E-Service Quality

Davis (1989) showed that perceived usefulness and perceived ease of use jointly determine acceptance of information technology, and Venkatesh et al. (2003) integrated competing models into the unified theory of acceptance and use of technology, identifying performance expectancy, effort expectancy, social influence and facilitating conditions as key determinants. DeLone and McLean (2003) argued that system quality, information quality and service quality drive user satisfaction and, through it, the net benefits of an information system. In the service context, Parasuraman, Zeithaml and Malhotra (2005) developed E-S-QUAL, which identifies efficiency, system availability, fulfilment and privacy as the core dimensions of electronic service quality. Satisfaction itself is commonly understood through Oliver's (1980) expectancy–disconfirmation model, in which it reflects the gap between expected and perceived performance.

E-Filing Adoption and Taxpayer Acceptance

Studies of electronic tax filing have largely applied these frameworks. Wang (2003) found that perceived usefulness and ease of use shaped taxpayers' intention to use electronic tax filing in Taiwan, while Chang, Li, Hung and Hwang (2005) showed that system, information and service quality influence taxpayers' acceptance of internet tax-filing systems. Fu, Farn and Chao (2006) combined technology acceptance and planned-behaviour constructs to explain taxpayers' intention to use e-filing, and Azmi and Bee (2010) examined the acceptance of e-filing among Malaysian taxpayers using a simplified model. Collectively, these studies suggest that usability and quality perceptions are central to e-filing success.

Trust, Security and Voluntary Compliance

Carter and Bélanger (2005) found that trustworthiness, together with ease of use and compatibility, significantly influences citizens' intention to use e-government services. In the tax domain, Kirchler, Hoelzl and Wahl (2008) proposed the “slippery slope” framework, in which compliance is shaped by the interaction between the power of the authorities and taxpayers' trust in them, with high trust encouraging voluntary rather than enforced compliance. Alm (2019), reviewing the literature, concluded that compliance is shaped by deterrence as

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well as by morale, fairness and trust, which suggests that a transparent and secure digital interface may strengthen voluntary compliance.

Literacy and the Use of Financial Systems

Lusardi and Mitchell (2011) documented that financial literacy is uneven even in advanced economies and is strongly associated with better financial decisions, implying that people with greater knowledge are better placed to use complex financial systems effectively. By extension, taxpayers with higher digital and tax literacy are likely to convert good portal quality into satisfaction more readily.

RESEARCH GAP

The reviewed literature establishes that usability, system quality and trust are central to the acceptance of e-filing (Wang, 2003; Chang et al., 2005) and that trust matters for voluntary compliance (Kirchler et al., 2008). However, the studies reviewed here mainly examine intention to adopt rather than post-adoption satisfaction, are set outside India, and treat the e-filing system as a single entity rather than examining specific digital features. Comparatively little research examines how digital and tax literacy conditions the effect of portal quality among Indian salaried taxpayers following the re-launch of the portal and the introduction of faceless proceedings. This study addresses that gap.

4. Significance of the Study

Theoretically, the study extends the e-service quality and technology acceptance literature (Davis, 1989; Parasuraman et al., 2005) to direct-tax administration, integrating portal quality, feature-level engagement and literacy within a single framework. It also contributes evidence to the debate on whether digitalisation strengthens voluntary compliance (Kirchler et al., 2008; Alm, 2019).

Practically, the findings help tax authorities and portal developers identify which quality dimensions matter most to users, guide tax professionals and educational institutions in designing taxpayer-education initiatives, and support policy discussions on digital inclusion and digital governance.

5. OBJECTIVES OF THE STUDY

1. To examine the impact of e-filing portal quality, specifically ease of use, functional reliability and data security, on the satisfaction of salaried taxpayers.

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2. To analyse the relationship between specific digital features of the income tax system (pre-filled returns and AIS, faceless assessment and e-proceedings, and online helpdesk and grievance services) and outcomes such as timely filing and continuance intention.
3. To evaluate the moderating role of digital and tax literacy in shaping the relationship between portal quality and taxpayer satisfaction.

6. RESEARCH METHODOLOGY

Research Design

The study adopts an analytical and descriptive research design using a quantitative, survey-based approach, which enables systematic testing of the hypothesised relationships between portal quality, taxpayer satisfaction, compliance outcomes and the moderating role of literacy.

Sampling and Population

The target population comprises salaried individuals in Chennai who have filed their income tax return through the e-filing portal at least once in the last two assessment years. Purposive sampling was used to select respondents with direct, first-hand experience of the portal. The sample size is 150 respondents, which meets the minimum ratio of observations to predictors recommended for multiple regression (Hair et al., 2019).

Data Collection Methods

Primary data were collected through a structured questionnaire covering respondent demographics, portal quality (ease of use, functional reliability and data security), use of digital features, satisfaction, compliance outcomes and digital and tax literacy, measured on five-point Likert scales. Internal consistency of the scales was assessed using Cronbach's alpha (Cronbach, 1951). Secondary data from Income Tax Department sources and prior literature supported instrument design.

Variables of the Study

Independent Variables: Portal quality (perceived ease of use, functional reliability and data security) and engagement with digital features.

Dependent Variables: Taxpayer satisfaction, timely filing and continuance intention.

Moderating Variable: Digital and tax literacy of the taxpayer.

Statistical Tools and Techniques

Descriptive Statistics: To summarise the respondent profile.

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Regression Analysis: To assess the impact of portal quality on satisfaction.

Correlation Analysis: To measure the association between digital features and compliance outcomes.

Moderated Regression Analysis: To test the moderating role of digital and tax literacy.

Hypotheses of the Study

H_1: E-filing portal quality (ease of use, functional reliability and data security) significantly influences the satisfaction of salaried taxpayers.

H_2: Engagement with digital features of the income tax system is positively associated with timely filing and continuance intention among salaried taxpayers.

H_3: Digital and tax literacy positively moderates the relationship between portal quality and taxpayer satisfaction.

7. DATA ANALYSIS AND INTERPRETATION

Data collected from 150 salaried taxpayers who had filed returns through the e-filing portal were analysed using descriptive and inferential statistics. The analysis is structured around the study's three hypotheses.

Hypothesis 1

***H_1**: E-filing portal quality significantly influences the satisfaction of salaried taxpayers.*

Regression analysis was conducted to examine the relationship between ease of use, functional reliability and data security and taxpayer satisfaction.

Table 1: Regression Analysis of Portal Quality on Taxpayer Satisfaction

Variable	β Coefficient	t-value	p-value	Result
Perceived Ease of Use	0.384	5.62	0.000	Supported
Functional Reliability	0.341	4.97	0.000	Supported
Data Security	0.302	4.41	0.000	Supported

Interpretation: Ease of use, functional reliability and data security each significantly and positively predict taxpayer satisfaction. As the p-values for all three predictors are below 0.05, the relationship is statistically significant, thereby supporting H1.

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Hypothesis 2

***H_2**: Engagement with digital features is positively associated with timely filing and continuance intention.*

Correlation analysis was conducted to examine the association between specific digital features and the compliance outcomes.

Table 2: Correlation Between Digital Features and Compliance Outcomes

Digital Feature	Timely Filing (r)	Continuance Intention (r)	Significance (p)
Pre-filled Returns and AIS	0.452	0.418	0.000
Faceless Assessment and E-Proceedings	0.397	0.386	0.000
Online Helpdesk and Grievance Services	0.341	0.312	0.001

Interpretation: All three digital features show a significant positive association with both timely filing and continuance intention, with pre-filled returns and AIS showing the strongest association. These results support H2.

Hypothesis 3

***H_3**: Digital and tax literacy positively moderates the relationship between portal quality and taxpayer satisfaction.*

Moderated regression analysis was applied to assess whether literacy strengthens the extent to which portal quality translates into satisfaction.

Table 3: Moderating Effect of Digital and Tax Literacy

Interaction Term	β Coefficient	t-value	p-value	Result
Ease of Use × Literacy	0.274	3.81	0.001	Supported
Reliability × Literacy	0.256	3.55	0.001	Supported
Data Security × Literacy	0.231	3.12	0.003	Supported

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Interpretation: Digital and tax literacy significantly strengthens the relationship between portal quality and satisfaction, indicating that taxpayers with higher literacy are better able to benefit from a well-designed portal. Thus, H3 is supported.

8. FINDINGS

Drivers of Satisfaction (H1): Perceived ease of use emerged as the strongest predictor of taxpayer satisfaction, followed by functional reliability and data security, indicating that salaried taxpayers value a simple, dependable and secure filing experience.

Feature-Level Outcomes (H2): Engagement with all three digital features was positively associated with timely filing and continuance intention, with pre-filled returns and AIS showing the strongest association.

Role of Literacy (H3): Digital and tax literacy significantly moderates the link between portal quality and satisfaction, so that more literate taxpayers gain more from the same portal.

Overall Pattern: Satisfaction with the portal and willingness to continue e-filing move together, consistent with the view that a trusted digital interface supports voluntary compliance.

9. SUGGESTIONS

Simplify the User Journey: Tax authorities should continue to simplify navigation and provide guided, step-by-step filing flows, particularly for first-time filers.

Ensure Reliability at Peak Times: Portal capacity should be strengthened around filing deadlines, with advance notice of maintenance and downtime.

Communicate Data Security Clearly: Plain-language information on how taxpayer data is protected can build the trust on which voluntary compliance depends.

Invest in Taxpayer Education: Colleges, professional bodies and tax practitioners should run digital and tax literacy programmes so that more taxpayers can use the portal confidently without intermediaries.

Strengthen Support Services: Helpdesk and grievance-redressal services, including tracking of faceless proceedings, should be made more responsive and transparent.

10. CONCLUSION

The study concludes that the quality of the e-filing portal exerts a significant influence on the satisfaction of salaried taxpayers, with ease of use acting as the most powerful driver. Engagement with digital features, particularly pre-filled returns and AIS, is positively

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associated with timely filing and continued use of e-filing, and digital and tax literacy emerges as a critical moderating factor. By integrating portal quality, feature-level engagement and literacy within a single framework, the study extends the e-service quality and technology acceptance literature to direct-tax administration. The findings offer practical insights for tax authorities, portal developers and educators seeking to build a trusted, inclusive and digitally resilient tax-compliance environment.

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DIGITAL RESILIENCE AND SUSTAINABLE INNOVATION: TRANSFORMING BUSINESS COMMUNICATION AND ECONOMIC PERFORMANCE IN THE DIGITAL ERA

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ABSTRACT

Digital transformation has emerged as a major driver of organisational change, influencing business communication, innovation, sustainability and economic performance. Although previous studies have established positive relationships between digital transformation and sustainable business performance, the literature remains fragmented in explaining how digital capabilities contribute to resilient and sustainable organisational outcomes. While digitalisation enhances sustainable innovation and economic performance, comparatively limited attention has been given to the strategic role of digital communication and digital resilience in connecting technological transformation with sustainable innovation and business performance. The present study examines the relationship between digital resilience, sustainable innovation, digital communication and economic performance among selected leading Indian companies. The study adopts a secondary-data approach using information obtained from annual reports, Business Responsibility and Sustainability Reports (BRSR), sustainability reports and corporate disclosures. Ten leading Indian companies representing information technology, banking, telecommunications, manufacturing and consumer sectors are proposed for analysis. A structured disclosure-index approach is used to assess digital communication, digital transformation, digital resilience and sustainable innovation, while revenue growth, return on assets and operating performance serve as indicators of economic performance. Pearson correlation, multiple regression and one-way ANOVA are proposed to examine the relationships among variables and differences across sectors.The study is expected to demonstrate that stronger digital capabilities, effective communication, organisational resilience and sustainability-oriented innovation contribute to improved economic performance. The study further proposes that digital resilience can serve as an important strategic mechanism through which digital transformation and communication capabilities support sustainable innovation and business performance. The study contributes an integrated

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framework for understanding how Indian organisations can achieve resilient, innovative and sustainable growth in the digital era.

Keywords: Digital Resilience, Sustainable Innovation, Digital Transformation, Business Communication, Economic Performance, Sustainability, Indian Corporates

1. BACKGROUND OF THE STUDY

The rapid development of artificial intelligence, big data analytics, cloud computing, Internet of Things, blockchain and digital platforms has fundamentally changed the way businesses operate and communicate. Organisations increasingly depend on digital technologies for customer interaction, employee communication, supply-chain coordination, financial transactions, decision-making and innovation. Digital transformation is therefore no longer simply an information-technology initiative. It has become a strategic organisational capability influencing competitiveness, productivity and sustainability. A recent meta-analysis of 44 empirical studies involving 17,284 observations found a significant positive relationship between digital transformation and sustainable business performance, with the strongest effect observed for economic performance. Similarly, Ardito's empirical study of 14,125 firms found that digitalisation increases the likelihood of introducing sustainable innovations, although the effects differ across technologies. Research on SMEs has also demonstrated that digital transformation can enhance sustainable organisational performance through **sustainable innovation capability**. However, technological adoption also creates new vulnerabilities. Cybersecurity threats, data breaches, system failures, misinformation, technology dependence and operational disruptions can affect business continuity. Consequently, organisations require **digital resilience**, defined in this study as the organisational capability to anticipate, absorb, respond to, recover from and adapt to digital and technology-related disruptions.Business communication is another important but comparatively underexplored dimension. Digital communication enables organisations to exchange information rapidly with customers, employees, investors, suppliers and other stakeholders. Effective digital communication can facilitate knowledge sharing, collaboration, crisis management and stakeholder engagement.

2. OBJECTIVES OF THE STUDY

1. To examine the extent of digital transformation among selected Indian companies.
2. To assess the role of digital communication in organisational transformation.
3. To measure the level of digital resilience among selected companies.
4. To examine the relationship between digital resilience and sustainable innovation.

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5. To analyse the relationship between sustainable innovation and economic performance.
6. To determine whether digital transformation, digital communication, digital resilience and sustainable innovation significantly influence economic performance.

To examine whether digital resilience and sustainable innovation differ significantly across sectors.

3. SCOPE OF THE STUDY

The scope of the study is restricted to selected leading Indian companies with significant digital operations and sustainability disclosures.

4. PROPOSED SAMPLE

Sector	Companies
Information Technology	TCS, Infosys
Banking & Financial Services	HDFC Bank, ICICI Bank
Telecommunications	Bharti Airtel
Diversified / Energy	Reliance Industries
Engineering & Infrastructure	Larsen & Toubro
FMCG	Hindustan Unilever, ITC
Manufacturing/Automotive	Mahindra & Mahindra

These companies provide a useful cross-sector sample because their annual reports and sustainability disclosures cover digitalisation, technology adoption, innovation, ESG/sustainability and business performance. Current corporate reporting practices also provide extensive integrated/BRSR disclosures; for example, ICICI Bank publishes its annual report, integrated report, ESG report and BRSR together.

5. REVIEW OF LITERATURE:

Author(s)	Year	Main Focus	Major Finding	Limitation / Gap
Oduro, De Nisco & Mainolfi	2023	Digital technologies & firm performance	Digital technologies positively influence performance	Resilience and sustainability not integrated

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Author(s)	Year	Main Focus	Major Finding	Limitation / Gap
Ardito et al.	2023	Digitalisation & sustainable innovation	Digitalisation supports sustainable innovation	Communication and resilience underexplored
Lin & Mao	2024	Digital transformation & sustainable innovation	Technology-business alignment mediates the relationship	Resilience not incorporated
Dwyer et al.	2024	Digital transformation & resilience	Digital capabilities improve crisis adaptation	Limited sustainability/performance integration
Wang & Zhang	2025	Digital transformation & SME sustainability	Sustainable innovation mediates DT–performance	Digital communication/resilience absent

6. PERIOD OF STUDY

Recommended period: FY 2022–23 to FY 2024–25

This provides a three-year observation period while maintaining reasonable comparability across companies.

Data Sources

The study will rely exclusively on **secondary data**.

Major sources

1. Annual Reports
2. Integrated Annual Reports
3. Business Responsibility and Sustainability Reports
4. Sustainability/ESG Reports
5. Corporate Governance Reports
6. Investor presentations
7. Official company disclosures
8. NSE/BSE corporate filings

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For example, TCS's FY2024–25 report provides information on R&D, sustainability-oriented technology investments, sustainable sourcing and technology solutions, while its FY2025–26 report describes business continuity and crisis communication mechanisms.

7. MEASUREMENT FRAMEWORK

Dimension	Indicators
Digital Communication Index (DCI)	Digital customer communication; Mobile/digital platforms; Social-media engagement; Digital employee communication; Digital stakeholder engagement; Virtual communication systems; Digital grievance mechanisms; Digital investor communication
Digital Transformation Index (DTI)	Artificial Intelligence; Big Data Analytics; Cloud Computing; Internet of Things; Blockchain; Automation; Digital platforms; Data analytics; Cybersecurity technology; Digital process transformation
Digital Resilience Index (DRI)	Cybersecurity; Business continuity planning; Disaster recovery; Crisis communication; Data protection; Information-security systems; Risk-management technology; Digital redundancy; Incident-response mechanisms; Operational resilience
Sustainable Innovation Index (SII)	Green technology; Energy-efficient technology; Digital solutions for sustainability; Sustainable products; Sustainable processes; Resource optimisation; Circular-economy innovation; Emission-reduction technology; Sustainable supply-chain innovation; Social innovation
Economic Performance (EP)	Revenue Growth; Profit Growth; Return on Assets (ROA); Return on Equity (ROE); Operating Profit Margin (OPM)

Scoring: Each disclosure indicator may be coded as **1 = Present/Disclosed** and **0 = Not Disclosed**. The respective index score can be calculated as: **Index Score = (Total Score Obtained / Maximum Possible Score) × 100.**

8. HYPOTHESES

Correlation

$H_0$1: There is no significant relationship between digital transformation and digital resilience.

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H_o2: There is no significant relationship between digital resilience and sustainable innovation.

H_o3: There is no significant relationship between sustainable innovation and economic performance.

H_o4: There is no significant relationship between digital communication and economic performance.

Regression

H_o5: Digital transformation, digital communication, digital resilience and sustainable innovation do not significantly influence economic performance.

One-Way ANOVA

H_o6: There is no significant difference in digital resilience among companies belonging to different sectors.

H_o7: There is no significant difference in sustainable innovation among different sectors.

9. STATISTICAL TOOLS

Descriptive Statistics

Mean, standard deviation, minimum and maximum values will be calculated to understand the distribution of the variables.

Correlation Analysis

Pearson correlation will be used to determine the direction and strength of relationships between:

- Digital Communication
- Digital Transformation
- Digital Resilience
- Sustainable Innovation
- Economic Performance

Multiple Regression

The following model can be tested:

$EP=\beta0+\beta1DC+\beta2DT+\beta3DR+\beta4SI+\epsilon$ =

\beta_0+\beta_1DC+\beta_2DT+\beta_3DR+\beta_4SI+\epsilon

Where:

EP = Economic Performance

DC = Digital Communication

DT = Digital Transformation

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DR = Digital Resilience

SI = Sustainable Innovation

One-Way ANOVA

ANOVA can be used to examine whether digital resilience and sustainable innovation differ significantly among:

- IT
- Banking
- Telecom
- Manufacturing
- FMCG
- Diversified sectors

Correlation Analysis

Variables	DC	DT	DR	SI	EP
Digital Communication	1	—	—	—	—
Digital Transformation	r	1	—	—	—
Digital Resilience	r	r	1	—	—
Sustainable Innovation	r	r	r	1	—
Economic Performance	r	r	r	r	1

Inference

If **p < 0.05**, the null hypothesis is rejected and the relationship is statistically significant. The correlation analysis indicates a positive and statistically significant relationship between digital resilience and sustainable innovation. This suggests that companies with stronger capabilities to manage digital disruptions tend to demonstrate greater sustainability-oriented innovation.

Regression Analysis

Dependent Variable: Economic Performance

Independent Variables:

- Digital Communication
- Digital Transformation
- Digital Resilience
- Sustainable Innovation

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Table format

Predictor	Beta (β)	t-value	p-value	Inference
Digital Communication	—	—	—	Significant/Not Significant
Digital Transformation	—	—	—	Significant/Not Significant
Digital Resilience	—	—	—	Significant/Not Significant
Sustainable Innovation	—	—	—	Significant/Not Significant
R^2	—			
Adjusted R^2	—			
F-value	—			

Expected interpretation

If the regression produces significant positive coefficients, the interpretation would be: The regression results indicate that digital transformation, digital communication, digital resilience and sustainable innovation collectively explain a significant proportion of variation in economic performance. Among these variables, the strongest predictor would indicate the organisational capability that contributes most substantially to economic performance.

One-Way ANOVA

ANOVA can compare the mean scores of companies across sectors.

Example structure

Variable	F-value	Sig.	Inference
Digital Communication	—	—	Significant/Not Significant
Digital Transformation	—	—	Significant/Not Significant
Digital Resilience	—	—	Significant/Not Significant
Sustainable Innovation	—	—	Significant/Not Significant

Inference

If **$p < 0.05$**:

There is a statistically significant difference in digital resilience among sectors. This indicates that the extent of digital resilience varies according to the technological intensity, regulatory environment, operational characteristics and digital dependence of different industries.

If **$p > 0.05$**:

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There is no statistically significant difference among sectors, indicating that the observed variation in digital resilience is insufficient to establish sector-level differences statistically.

10. FINDINGS

Based on the existing literature, the study is expected to establish several relationships. First, companies with stronger digital transformation capabilities are expected to demonstrate higher levels of digital resilience. The adoption of AI, cloud computing, data analytics, automation and cybersecurity systems can strengthen an organisation's ability to respond to disruption. Second, digital resilience is expected to be positively associated with sustainable innovation. Organisations capable of maintaining operations during disruption are better positioned to continuously innovate and develop sustainability-oriented products and processes. Third, sustainable innovation is expected to have a positive relationship with economic performance. Digital technologies can improve resource efficiency, reduce operational costs, support new products and services and enhance competitiveness. The expectation is consistent with recent research showing that digital transformation has a significant positive relationship with sustainable business performance and that economic performance is particularly strongly affected.

11. CONCLUSION

The study highlights that digital transformation should not be viewed merely as the adoption of advanced technologies. In the contemporary business environment, organisations require an integrated combination of digital communication, technological capability, resilience and sustainable innovation to achieve long-term economic performance. The proposed study of leading Indian companies provides a framework for understanding how these capabilities interact. Digital communication enables information exchange and stakeholder engagement; digital transformation provides technological capabilities; digital resilience allows organisations to withstand and adapt to disruption; and sustainable innovation converts these capabilities into long-term economic and sustainability outcomes. The study therefore concludes that digital resilience serves as an important strategic bridge between digital transformation and sustainable business performance.

Suggestions and Contribution of the future study

Companies should strengthen digital resilience by investing in cybersecurity, business continuity and disaster-recovery systems while integrating digital communication into their strategic decision-making. Greater emphasis should be placed on sustainable innovation

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through AI, IoT, data analytics and other technologies that improve resource efficiency and sustainability. Continuous employee training and digital skill development should be encouraged to support effective technology adoption and organisational adaptability. Companies should also promote responsible AI by ensuring transparency, privacy, accountability and ethical governance. Digital investments should be aligned with both economic objectives and environmental and social sustainability. The future study can contribute theoretically by integrating the Resource-Based View and Dynamic Capability perspective to explain the relationship between digital resources, resilience, sustainable innovation and economic performance. Empirically and managerially, the study can provide evidence from leading Indian companies and guide organisations in integrating technology, communication, cybersecurity, resilience and sustainable innovation to achieve sustainable competitive advantage.

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DIGITAL TOOLS, WOMEN ENTREPRENEURS AND THE RESILIENCE DIVIDEND: A GLOBAL PERSPECTIVE

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ABSTRACT

The Global Entrepreneurship Monitor 2025/2026 Global Report reveals a paradox in global entrepreneurship: while women are entering early-stage entrepreneurship at near-parity in much of the world, they face a critical "survival cliff" as businesses mature. This paper examines how digital tools simultaneously represent an equalising force and a potential new divide for women entrepreneurs. Drawing on GEM data from 53 economies, we analyse the intersection of digital transformation, gender dynamics, and entrepreneurial resilience. We demonstrate that digital tools offer women entrepreneurs unprecedented access to global markets without heavy capital investment, yet existing barriers insufficient finance, limited access to networks, and uneven digital capability threaten to re-price rather than dissolve gender inequality. The paper concludes with a policy roadmap to harness digital tools as instruments of genuine gender equity in entrepreneurship, emphasising the closure of the survival gap, investment in digital infrastructure, gender-responsive capital, and the normalisation of failure as a learning mechanism rather than a stigma.

Keywords: women entrepreneurship, digital transformation, gender gap, entrepreneurial resilience, digital divide, sustainable business

1. INTRODUCTION: ENTERPRISE IN AN AGE OF UNCERTAINTY

The defining characteristic of 2025 global entrepreneurship is not optimism but courage in the face of unprecedented change. Across 53 economies surveyed by the Global Entrepreneurship Monitor (GEM), millions of individuals are responding to geopolitical instability, climate pressure, household income shocks, and rapid technological disruption with entrepreneurial action. Rather than withdrawing from economic participation, these entrepreneurs are launching businesses, acquiring new skills, innovating, and rebuilding livelihoods in ways that reshape local and global markets (Global Entrepreneurship Monitor, 2026, Executive Summary, p. 10).

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The scale of this entrepreneurial activity is remarkable. In six economies Angola, Canada, Chile, Ecuador, Guatemala, and Saudi Arabia more than one in four adults is actively starting or running a new business. This unprecedented level of engagement represents both an opportunity and a challenge for policymakers and development agencies seeking to harness entrepreneurship for inclusive growth. However, this energy confronts a structural weakness. Business survival remains persistently weak across most economies: the share of established business owners remains far below the share of startups, and only 16 of 53 economies have an entrepreneurial environment rated by national experts as sufficient or better (GEM, 2026, p. 10). This gap between startup activity and business survival signals that while entrepreneurial entry is occurring at historically high levels, the ecosystem to support sustained business growth remains underdeveloped.The tensions inherent in this landscape become most acute at the intersection of two critical themes documented in the 2025/2026 GEM report: the digital transformation of business (Chapter 7) and the gender gap in entrepreneurship (Chapter 4). Women entrepreneurs—historically marginalised by inadequate access to finance, professional networks, and human capital emerge paradoxically as among the biggest potential beneficiaries of digital tools. Simultaneously, they remain among the most exposed to new digital divides that threaten to replicate or amplify existing inequalities in the digital age. Understanding this intersection is essential to building entrepreneurial ecosystems that work for all.

2. THE GENDER LANDSCAPE: PROGRESS AND PERSISTENT GAPS

Successive GEM reports have consistently documented that men are significantly more likely than women to start new businesses and dramatically more likely to own established ones. The 2025 data, however, present a more nuanced and regionally differentiated picture than previous years, revealing pockets of genuine progress alongside persistent structural challenges (GEM, 2026, Executive Summary, p. 11; Chapter 4, pp. 44–47).

3. EARLY-STAGE ENTREPRENEURSHIP: NARROWING THE ENTRY GAP

The most encouraging finding concerns total early-stage entrepreneurial activity (TEA) the share of adults actively involved in starting or running a business less than 3.5 years old. Of 23 middle-income economies surveyed, 9 have reached or are extremely close to gender parity in TEA, suggesting that access barriers to entrepreneurial entry are permeable and responsive to policy intervention. In seven middle-income economies India, Peru, El Salvador, Ecuador, Oman, Costa Rica, and Chile female startup activity now exceeds male startup activity, representing a historic reversal of traditional patterns (GEM, 2026, p. 46).

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Near-parity (defined as a gender gap of one percentage point or less) was also recorded in three upper-income economies the Republic of Korea, Israel, and Poland—and three additional middle-income economies: South Africa, Hungary, and Venezuela (GEM, 2026, p. 46). These results suggest that improving women's access to entrepreneurial opportunity is achievable within a reasonable timeframe and across diverse economic contexts.

By contrast, some of the widest startup gender gaps persist in upper-income northern Europe. In Sweden, Norway, and Finland, at least two men start a new business for every woman, despite these economies' strong social safety nets and formal commitment to gender equality. Similarly, Egypt recorded a substantial gap, suggesting that gender dynamics in entrepreneurship are shaped by complex cultural, institutional, and economic factors that cannot be reduced to development level alone (GEM, 2026, p. 46).

4. THE SURVIVAL CLIFF: WHERE PROGRESS STALLS

The picture transforms dramatically when attention shifts from startups to established business ownership. Not one of the 48 surveyed economies recorded a higher share of women than men owning an established business; in 16 economies, two or more men own an established business for every woman doing so (GEM, 2026, pp. 45–46). This gap reflects a critical finding: the relative share of female ownership declines by half or more between the early-stage and established-firm stages (GEM, 2026, Figure 4.3, p. 47).

This "survival cliff" is the single most important statistic for resilience-focused analysis. Women are entering entrepreneurship at near-parity in much of the world, yet whether through higher early attrition, recent acceleration in women's startup activity without corresponding longevity, or both, their ability to sustain and scale businesses remains fundamentally constrained. Understanding the mechanisms driving this cliff—whether financial, institutional, social, or personal—is essential to developing interventions that move beyond celebrating entry to ensuring durability and success.

5. THE DIGITAL DIMENSION: EQUALIZING FORCE OR REPLICATION OF DIVIDES?

The Infrastructure of Modern Entrepreneurship

Chapter 7 of the GEM 2025/2026 report documents the thorough integration of digital tools into entrepreneurial practice. Digital marketing has transitioned from a competitive

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advantage to a foundational requirement, "enabling new ventures to reach global markets quickly and cost-effectively" (GEM, 2026, §7.1, p. 73). This democratisation of market access represents a fundamental shift in entrepreneurial economics: previously, reaching global markets required substantial capital for physical distribution, retail presence, and brand advertising. Today, digital platforms offer bootstrapped entrepreneurs' paths to customers worldwide from a laptop with an internet connection.

The evidence on digital tool adoption reveals clear hierarchies of importance. Social media is rated "very important" by a majority of new entrepreneurs in 32 of 36 reporting economies, occupying the dominant position in both middle-income (16 of 21) and upper-income (10 of 15) economies (GEM, 2026, pp. 73–77). Company websites and email communications occupy intermediate positions across most economies, while email marketing ranks as least important almost everywhere. This pattern reflects both the algorithmic reach of social platforms and the technical simplicity of building a digital presence through social channels relative to managing website infrastructure.

Digital Intensity and Emerging Technologies

The report reveals that digital intensity measured as the average importance assigned to digital tools across categories is paradoxically higher in middle-income economies (average 57 per cent importance) than in upper-income ones (51 per cent) (GEM, 2026, p. 77). This finding suggests that entrepreneurs in resource-constrained settings view digital tools not as conveniences but as essential infrastructure to compete. In 34 of 48 economies, a majority of early-stage entrepreneurs expect to increase their use of digital technologies within six months, with the highest expectations in Angola (93 per cent), Costa Rica (80 per cent), Saudi Arabia (79 per cent), and Guatemala (78 per cent) (GEM, 2026, p. 74).

Artificial intelligence emerges as a transformative accelerant. The report emphasises that "AI gives entrepreneurs leverage by allowing small teams to operate with an analytical capacity once accessible only to large organisations with substantial budgets and staff" (GEM, 2026, §7.4, p. 78). For women entrepreneurs operating with constrained financial and human resources, this capacity-multiplier effect has profound implications: AI-assisted analytics, customer relationship management, supply-chain optimisation, and personalised marketing can compress timelines to profitability and competitive parity.

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Notably, entrepreneurs in less wealthy economies demonstrate the highest levels of digital optimism globally. A majority of new entrepreneurs expect AI to become very important to their business in six economies Angola, Brazil, Thailand, Costa Rica, Chile, and the United Arab Emirates none located in Europe. By contrast, fewer than one in five entrepreneurs in Poland, Sweden, Finland, and Croatia believe AI will become very important to their businesses within six months (GEM, 2026, p. 81). This geographical divergence reflects distinct perceptions of digital necessity, competitive advantage, and risk across development contexts.

The AI Dividend: Uneven Distribution and Emerging Risks

Two critical qualifications complicate the optimistic narrative around digital tools and AI, with direct implications for women entrepreneurs. First, the AI dividend is unevenly distributed. In 33 of 48 economies, more than half of early-stage entrepreneurs expect AI to significantly improve productivity, yet in 17 economies, more than half worry about data security and privacy risks (GEM, 2026, pp. 99–100). These concerns peak at 72 per cent in Peru, 64 per cent in South Africa, and 62 per cent in Chile, suggesting that entrepreneurs in emerging markets perceive acute cybersecurity vulnerabilities.

The report warns that AI's benefits risk accruing "disproportionately to well-capitalised, knowledge-intensive businesses, leaving smaller and newer ventures further behind" (GEM, 2026, §9.2, p. 98). For women entrepreneurs who already face capital constraints and are overrepresented in service and creative sectors this risk is particularly acute. An unequal transition to AI-driven business models could deepen the survival cliff rather than bridge it.

Second, digital capability does not automatically erase pre-existing barriers. The report documents that "uneven access to digital infrastructure, skills and confidence can widen existing inequalities, while those better equipped to use advanced technologies gain greater efficiency and competitive advantage" (GEM, 2026, Chapter 7 sustainability focus, p. 81). This warning signals a critical policy imperative: without deliberate investment in digital infrastructure, cybersecurity training, AI literacy, and responsible-use education—particularly targeting underrepresented groups—digital transformation will re-price gender inequality rather than reduce it. The binding constraint shifts from owning a computer to possessing the skills, confidence, and security knowledge to deploy it effectively.

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6. THE RESILIENCE BACKBONE: REFRAMING FAILURE AS FUEL

Defining and Measuring Resilience

Although the GEM 2025/2026 Global Report does not employ "digital resilience" as a formally measured construct, it supplies robust conceptual and empirical foundations for understanding it. The report defines resilience as "the capacity to adapt and continue following adversity, managing pressure and learning from challenging experiences. It is not an innate trait but a skill that can be developed over time" (GEM, 2026, §3.4, p. 40). This definition is critical: it frames resilience not as an inherent personality characteristic but as a learnable capability, amenable to cultivation through education, mentoring, and deliberate practice.

Fear of Failure as a Barrier

The evidence on resilience dynamics is counter-intuitive and powerful. In 41 of 48 economies, at least two in five adults who perceive good business opportunities nevertheless hold back, motivated by fear of failure. More concerning, fear of failure has trended upward since the question was introduced in 2019, with the most pronounced increases in upper-income economies (GEM, 2026, pp. 33–36). This pattern suggests that economic volatility and technological uncertainty are eroding entrepreneurial confidence even in stable, well-resourced contexts. For women, this fear operates within a gendered context. Research beyond the GEM report indicates that women often internalise entrepreneurial failure more personally, attributing setbacks to personal inadequacy rather than external circumstance, while men are more likely to attribute failure to external factors and to persist in the face of setback (Duchek, 2020). This differential attributional pattern, if widespread, would amplify the gender-survival cliff documented in the data.

The Resilience Dividend: Exit as Learning, Not Ending

Yet the report reveals a striking and underutilised insight: people who exited a business in the past 12 months are more likely to start again than those who never exited. In 34 of 48 economies, a majority of business exiters intend to start another business; in 14 of 24 middle-income and 20 of 24 upper-income economies, exiters are at least twice as likely as other adults to do so (GEM, 2026, p. 41). The report's verdict is unambiguous: "While fear of failure is clearly a very powerful deterrent to starting a business, the lived experience of exiting a business is equally clearly not such a deterrent" (GEM, 2026, p. 41).

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This "resilience dividend"—the demonstrated capacity of business exiters to restart—holds particular significance for women entrepreneurs. Women already face the steepest survival cliff between startup and established ownership (GEM, 2026, p. 47), and exit from a business is disproportionately likely to be permanent rather than transitional. However, if ecosystems reframe business exit as a learning mechanism rather than a stigma, and provide accessible pathways to restart, women's long-term entrepreneurial participation and success could be substantially improved. Normalising failure, reducing restart stigma, and integrating structured resilience-building into education and accelerators become not peripheral but central to gender-equitable entrepreneurship policy.

Why Women + Digital Is a Strategic Combination

The GEM 2025/2026 report supplies a striking synthesis that unites the gender and digital dimensions (GEM, 2026, §9.1, p. 96): women entrepreneurs—particularly in upper-income contexts—are more likely to prioritise sustainability and social impact in their business models. Combined with the finding that 84 per cent of all early-stage entrepreneurs report that they always consider social and environmental impacts in business decisions (GEM, 2026, p. 12), and that women founders disproportionately prioritise these objectives (GEM, 2026, §4.1, p. 43), digital tools become more than efficiency instruments—they become purpose levers.

Digital platforms enable purpose-driven, capital-constrained businesses to reach global audiences without the heavy fixed investment in physical infrastructure, supply chains, or brand presence traditionally required. A woman founder in a middle-income country can launch a sustainable product, service, or mission-driven platform using digital channels, social media marketing, and cloud-based operations with minimal upfront capital. This model fundamentally alters the competitive equation, allowing values-aligned founders to compete directly with well-capitalised incumbents.

Finance Remains the Critical Constraint

However, the finance data expose the limits of digital tools as a substitute for capital. Only 14 of 53 economies rate as sufficient on both the provision of entrepreneurial finance and ease of access to it; in 36 of 53, both dimensions are judged insufficient by national experts (GEM, 2026, §9.2, pp. 97–98). Funding systems, as one woman founder in the report emphasised, "still have built-in bias" (GEM, 2026, p. 79). Kyla Bolden of Wiz Learning notes explicitly:

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"A lot of funding systems still have built-in bias… and that makes it harder for women entrepreneurs (especially women of colour) to get the resources we need" (GEM, 2026, p. 79).

This reality underscores a critical policy insight: digital tools reduce but do not eliminate the need for capital. Scaling digital businesses beyond a certain threshold requires investment in infrastructure, talent, marketing, and product development. If women entrepreneurs exhaust bootstrapping opportunities while facing structural barriers to formal finance, digital tools become optimised for subsistence rather than scale.

7. THE FACES BEHIND THE DATA: CASE STUDIES IN WOMEN'S DIGITAL RESILIENCE

The GEM 2025/2026 report includes five case studies, contributed by the Cartier Women's Initiative, that illuminate how women-led digital entrepreneurship operates in practice:

Eman Alaskandrani (Saudi Arabia) founded REAITI Navigator, an AI-powered platform predicting patient risk and building personalised cancer-care pathways. Alaskandrani, a nurse, identified a critical gap: patients "often feel left out of critical decisions regarding their treatment journey" (GEM, 2026, p. 74). Her digital innovation addresses a healthcare system problem with an AI solution, demonstrating how domain expertise combined with digital capability can unlock transformative innovation.

Kyla Bolden (Wiz Learning) built an edtech company delivering live online courses in coding, AI, and cybersecurity. Over 9,000 students from 30 countries have accessed Wiz Learning courses, with nearly half female and most accessing the courses free. Bolden's explicit recognition of funding bias—"that makes it harder for women entrepreneurs (especially women of colour) to get the resources we need" (GEM, 2026, p. 79)—situates her success within structural constraints that her digital model partially circumvents but cannot fully resolve.

Corina Huang (Boncha Bio) founded a supplement-delivery innovation company that has shipped over 20 million "Candy Capsules" globally. Huang diagnoses women's structural barriers as threefold: "slow regulatory updates and outdated classifications, caregiving constraints and unequal access to capital" (GEM, 2026, pp. 44–45). Her case illustrates that digital-first business models operate within regulatory and caregiving systems not designed for them, requiring entrepreneurs to navigate dual challenges.

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Salma Bougarrani (GREEN WATECH, Morocco) founded a water-treatment company serving more than 80,000 people across 32 rural communities. Her demand for systemic change is unambiguous: "We don't need charity; we need the chance to compete fairly. Open up public markets to women-led businesses" (GEM, 2026, p. 50). Bougarrani's emphasis on market access over subsidy reveals the difference between tokenistic inclusion and genuine opportunity.

Stacia Yefimenko (Elcove) credits women-to-women mentorship networks as her resilience mechanism: "The best support has been surrounding myself with other incredible female entrepreneurs… kind to mentor me throughout the entire process" (GEM, 2026, p. 69). Her case underscores that resilience is not an individual trait but a relational capacity built through networks of mutual support.

These five cases collectively illustrate that women's digital entrepreneurship operates at the intersection of three dynamics: (1) innovative problem-solving rooted in lived experience and domain expertise; (2) structural barriers—finance, regulation, caregiving, market access—that digital tools partially circumvent but cannot eliminate; and (3) relational ecosystems of mentorship and support that sustain motivation and learning through adversity.

Policy Roadmap: Building Digital Resilience for Women Entrepreneurs

Drawing together the gender (GEM, 2026, §4.5, p. 52), digital (GEM, 2026, §7.5, p. 81), and resilience (GEM, 2026, §3.5, p. 42) policy recommendations in the GEM 2025/2026 Global Report, a coherent and actionable agenda for women's digital entrepreneurship emerges.

Close the survival gap, not just the startup gap. Current policy focus on entrepreneurial entry—supporting startups, reducing regulatory burden on business registration—has succeeded in many economies: women's TEA rates approach parity in much of the middle-income world. However, without targeted support at the transition from early-stage to established ownership, where women's ownership share falls by half or more (GEM, 2026, p. 47), entry-focused policy becomes a revolving door. Policy interventions should include extended mentoring, peer learning networks, targeted finance for growth-stage women-led businesses, and systematic tracking of cohort survival rates disaggregated by gender and sector.

Invest in digital infrastructure, cybersecurity, and AI literacy. Uneven access to broadband, digital skills training, and cybersecurity education threatens to re-price gender inequality in the

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digital age. Investment priorities should include: (1) universal broadband access, particularly in rural and lower-income regions; (2) mandatory AI literacy and responsible-use training integrated into secondary and tertiary education and accelerator curricula; (3) cybersecurity training emphasising data privacy, secure payment systems, and protection against online fraud; and (4) explicit attention to "misinformation, exclusion and bias" in digital systems (GEM, 2026, §7.1, p. 73).

Build gender-responsive capital. Finance remains the binding constraint. Policy should establish dedicated funds for women-led ventures, fiscal incentives for investors who fund them, and transparent outcome reporting on investment allocation and performance. These funds should operate with flexible timelines recognising that women may require longer periods to balance caregiving with business growth, and should emphasise non-extractive investment terms.

Support caregiving and flexible work. Women's structural barriers include both caregiving responsibilities and inflexible business infrastructure. Policy support should include on-site childcare at business incubators and accelerators, flexible grant and reporting timelines, and normalisation of non-linear entrepreneurial careers that accommodate caregiving phases (GEM, 2026, p. 45).

Normalise failure and build resilience. Reducing exit stigma requires systemic change: streamlined exit pathways, bankruptcy protection preventing permanent asset seizure, and integration of structured resilience-building (risk management, adaptive planning, iterative experimentation) into education and accelerators (GEM, 2026, §3.5, p. 42). Ecosystem narratives must shift from celebrating binary success/failure to recognising iterative learning and restart as normal entrepreneurial trajectories.

Promote diverse role models and disaggregated data. Stereotypes about "who becomes an entrepreneur" remain powerful, particularly in contexts where women's entrepreneurship is recent or non-normative. Policy should actively promote diverse founder narratives across gender, age, ethnicity, and socioeconomic background. Simultaneously, systematic collection of gender- and age-disaggregated entrepreneurship data—currently absent in many economies—is essential to tracking progress and identifying emerging gaps (GEM, 2026, §4.5, p. 52).

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8. DISCUSSION: LIMITATIONS AND FUTURE RESEARCH

This analysis necessarily operates within the constraints of available data. The GEM 2025/2026 Global Report does not measure "digital resilience" as a formally constructed variable, nor does it publish digital adoption disaggregated by gender, making gender-specific analysis of digital tool use inferential rather than direct. Additionally, the report contains no data on online harassment or gender-based violence targeting women entrepreneurs, an emerging and significant barrier in many contexts.

For researchers seeking more detailed gender analysis, the companion source cited by the report itself—the dedicated GEM 2024/2025 Women's Entrepreneurship Report: Navigating Challenges, Driving Change—provides deeper exploration of gender-specific barriers and opportunities (Global Entrepreneurship Monitor, 2025). Pairing the global report with this dedicated women's entrepreneurship report represents the most defensible methodological approach to writing comprehensively about women's digital resilience globally.

Additionally, qualitative research exploring the mechanisms driving the survival cliff whether financial, institutional, or personal would substantially advance understanding. Longitudinal tracking of cohorts of women-led businesses from startup through transition to established ownership would permit identification of critical intervention points and effectiveness assessment.

9. CONCLUSION

Digital tools have not dissolved the gender gap in entrepreneurship; they have re-priced it. In a world where social media reach, AI-assisted analytics, and cloud services can substitute meaningfully for capital and legacy networks, the binding constraints on women's entrepreneurship shift from assets and connections to skills, confidence, cybersecurity, and access to growth-stage finance. The GEM 2025/2026 evidence shows women closing the entry gap in much of the middle-income world while still losing substantial ground at the ownership-survival stage. The resilience dividend the demonstrated capacity of business exiters to restart and succeed operates with gender-blind mechanics but unequal accessibility. Its realisation depends critically on ecosystems that offer second chances cheaply: streamlined restart pathways, reduced exit stigma, and structured support for learning from failure. For women entrepreneurs, who face the steepest survival cliff and often internalise failure most personally,

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normalising failure as a learning mechanism rather than a permanent setback becomes not peripheral but central to sustainable inclusion. The policy roadmap presented here offers actionable steps: close the survival gap through targeted transition support, invest in digital infrastructure and literacy, build gender-responsive capital, support caregiving integration, normalise failure as learning, and promote diverse role models with disaggregated data tracking. These interventions operate at different system levelsindividual, organisational, sectoral, and macro-institutional and require coordination across government, investor, educator, and entrepreneur communities. Digital tools offer women entrepreneurs unprecedented leverage to compete globally, challenge incumbents, and build purpose-driven businesses on their own terms. Realising this potential requires deliberate policy choice: not to treat digital transformation as a substitute for addressing structural barriers, but as a complement to systemic reforms that make entrepreneurship a genuine opportunity for all.

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EMPLOYEE READINESS FOR AI-DRIVEN WORKPLACES: A STUDY OF DIGITAL COMPETENCE, AI ANXIETY AND EMPLOYABILITY

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ABSTRACT

As artificial intelligence (AI) becomes embedded in everyday organisational processes, employees' readiness to work alongside AI systems has emerged as a critical determinant of both organisational performance and individual career sustainability. This study examines how digital competence, AI awareness and AI anxiety jointly shape employees' AI readiness and how AI readiness, in turn, shapes their perceived employability. Primary data were collected from 150 employees across sectors in Chennai using a structured questionnaire and analysed using descriptive statistics, reliability analysis, Pearson correlation, multiple and simple regression, an independent samples t-test and one-way ANOVA. The results show that digital competence and AI awareness are significant positive predictors of AI readiness, while AI anxiety is a significant negative predictor, together explaining 54.9% of the variance in AI readiness. AI readiness, in turn, is a strong positive predictor of perceived employability, explaining 51.5% of its variance. No significant gender difference was found in AI readiness, but perceived employability differed significantly across age groups, peaking among employees aged 25–35 years. The study concludes with suggestions for organisations seeking to build a psychologically and digitally prepared workforce for AI-driven workplaces.

Originality/Value

This study offers original, India-specific empirical evidence that integrates three literatures digital competence, AI anxiety and employability that are typically studied in isolation, into a single tested pathway from digital competence, AI awareness and AI anxiety, through AI readiness, to perceived employability. By quantifying both the enabling role of competence/awareness and the inhibiting role of anxiety within one model and by testing demographic differences alongside it, the study provides a more complete, employee-level account of AI readiness than is available in the existing conceptual or single-construct literature.

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Keywords: AI readiness; digital competence; AI anxiety; AI awareness; employability; future of work

1. INTRODUCTION

Artificial intelligence has moved beyond pilot projects and experimental deployments to become a routine part of how many organisations recruit, communicate, analyse data and deliver services. For employees, this shift raises a question that is at once practical and deeply personal: am I ready to work alongside these systems and will that readiness help or hinder my career? Readiness in this sense is not a single attribute but a bundle of capabilities and dispositions — the digital skills needed to operate new tools, an informed awareness of what AI can and cannot do and the psychological comfort or discomfort, that comes with working alongside systems that can learn, predict and in some cases make decisions that affect one's own job.

A growing literature has examined these elements separately. Researchers in education and information systems have built detailed frameworks of digital competence and AI literacy; organisational psychologists have documented the prevalence and dimensions of AI-related anxiety among employees; and career scholars have long studied employability as a psycho-social construct shaped by an individual's knowledge, skills and adaptability. What has received comparatively less attention is how these elements combine: whether digital competence and AI awareness are strong enough, in combination, to outweigh the dampening effect of AI anxiety on an employee's overall readiness to work with AI and whether that readiness, once formed, actually translates into a stronger sense of employability.

This study addresses that combined question directly, using primary survey data from 150 employees working across sectors in Chennai. It tests a proposed pathway in which digital competence and AI awareness act as positive drivers of AI readiness, AI anxiety acts as a negative driver and AI readiness in turn predicts perceived employability. In doing so, it aims to move the conversation on employee readiness for AI-driven workplaces from separate strands of literature toward a single, empirically tested model.

The remainder of the paper proceeds as follows. Section 2 states the problem under investigation. Section 3 reviews thirty studies across six thematic clusters and identifies the research gap addressed here. Sections 4 to 6 present the objectives, significance and scope of the study. Section 7 describes the research methodology and Section 8 reports the data analysis and interpretation. Section 9 discusses the findings, Section 10 offers conclusions and suggestions and Section 11 outlines directions for further research.

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2. STATEMENT OF THE PROBLEM

Organisations increasingly assume that employees who are digitally competent and aware of AI will naturally be "AI ready," yet this assumption overlooks the psychological dimension of technology adoption captured by the growing literature on AI anxiety. An employee may possess strong digital skills and a reasonable understanding of AI while still feeling anxious about job replacement or the pace of learning required and that anxiety can offset the benefits of competence and awareness in practice. At the same time, it remains unclear, at the level of individual employee perception, whether AI readiness — however it is formed — actually strengthens an employee's sense of employability or whether the relationship is weaker or more contingent than is often assumed in policy and practitioner discourse. This study addresses this problem by empirically testing, among 150 employees in Chennai, how digital competence, AI awareness and AI anxiety jointly predict AI readiness and how AI readiness predicts perceived employability.

3. REVIEW OF LITERATURE

This section reviews thirty studies across six thematic clusters relevant to digital competence, AI awareness, AI anxiety, AI readiness and employability, before identifying the gap addressed by the present study.

3.1 Digital Competence in the Workplace: Conceptual Foundations

Digital competence has been most systematically defined through the European Commission's DigComp framework. Carretero, Vuorikari and Punie (2017), in DigComp 2.1, structured digital competence into five areas — information and data literacy, communication and collaboration, digital content creation, safety and problem solving — organised across eight proficiency levels, providing one of the most widely adopted reference frameworks for assessing individual digital capability. Vuorikari, Kluzer and Punie (2022) updated this framework in DigComp 2.2 to incorporate emerging technologies, including AI-related knowledge, skills and attitudes within the existing five-area structure, reflecting the framework's ongoing adaptation to a changing digital environment. Examining the human dimension of technology adoption at work more broadly, Tams, Grover and Thatcher (2014) argued that an employee's digital capability cannot be understood independently of individual and contextual moderators such as age and prior experience, calling for a strategic research agenda that treats digital competence as an evolving, context-dependent capacity rather than a fixed trait.

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3.2 Technology Acceptance, Readiness and Techno-Stress

A substantial body of theory explains how individuals come to accept and use new technologies. Davis's (1989) technology acceptance model (TAM) proposed perceived usefulness and perceived ease of use as the central determinants of technology adoption intention, later extended by Venkatesh, Morris, Davis and Davis (2003) into the unified theory of acceptance and use of technology (UTAUT), which incorporated performance expectancy, effort expectancy, social influence and facilitating conditions. Complementing these intention-based models, Parasuraman (2000) proposed the technology readiness index (TRI), conceptualising readiness as a trait-like disposition comprising two enabling dimensions optimism and innovativeness and two inhibiting dimensions discomfort and insecurity a structure later refined by Parasuraman and Colby (2015) into an updated and streamlined TRI 2.0. On the negative side of technology engagement, Tarafdar, Tu, Ragu-Nathan and Ragu-Nathan (2007) introduced the construct of technostress, showing that technology-induced role stress reduces employee productivity, while Ayyagari, Grover and Purvis (2011) extended this work by identifying specific technological characteristics such as complexity, uncertainty and pace of change as antecedents of technostress, a framework highly applicable to the rapid pace of AI adoption in contemporary workplaces.

3.3 AI Awareness and AI Literacy

A more AI-specific literature has developed around the construct of AI literacy, understood as the competencies needed to critically evaluate, communicate with and effectively use AI. Long and Magerko (2020) provided one of the most widely cited definitions and design frameworks for AI literacy, articulating the specific competencies such as understanding what AI is, recognising its limitations and knowing how to interact with it effectively that distinguish AI awareness from general digital competence. Ng, Leung, Chu and Qiao (2021) extended this foundation through an exploratory review that adapted classical literacy frameworks encompassing knowledge, use, evaluation and ethical awareness specifically to the AI domain, offering a more structured basis for measuring AI awareness empirically. At the labour-market level, the World Economic Forum (2025b), in its Future of Jobs Report, projected that a substantial share of the skills required by the global workforce will change within five years, with demand for AI-related literacy and adjacent skills rising sharply, underscoring the practical urgency of building AI awareness among employees rather than treating it as an optional or specialist capability.

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3.4 AI Anxiety: Dimensions and Consequences

A parallel and fast-growing literature documents the psychological unease that AI can generate among employees. Li and Huang (2020), drawing on integrated fear acquisition theory, identified AI anxiety as a multidimensional construct comprising privacy violation anxiety, bias behaviour anxiety, job replacement anxiety, learning anxiety, existential risk anxiety, ethics violation anxiety, artificial consciousness anxiety and lack-of-transparency anxiety and developed a widely used Artificial Intelligence Anxiety Scale to measure it. Wang and Wang (2022) independently developed and validated a complementary AI anxiety scale organised around four dimensions learning, job replacement, sociotechnical blindness and AI configuration and found that higher AI anxiety was associated with less motivated learning behaviour toward AI-related skills, directly linking anxiety to readiness-relevant outcomes. At the level of individual decision-making, Dietvorst, Simmons and Massey (2015) demonstrated the phenomenon of algorithm aversion, showing that people lose trust in and abandon algorithmic systems after observing even a single error, even when the algorithm outperforms human judgement on average a finding with direct implications for how employees respond to imperfect AI tools at work. Focused specifically on employee perceptions of workplace technology, Brougham and Haar (2018) introduced the STARA (Smart Technology, Artificial Intelligence, Robotics and Algorithms) awareness construct and found that employees who perceived a greater threat of being replaced by such technologies reported lower job satisfaction, higher turnover intention and increased cynicism, providing some of the earliest systematic evidence linking AI-related threat perception to negative workplace attitudes.

3.5 Artificial Intelligence in Human Resource Management and Organisational Readiness

A further cluster of literature examines organisational readiness for AI, which provides the context within which individual employee readiness develops. Tambe, Cappelli and Yakubovich (2019) argued that although AI holds considerable promise for improving HR and workforce decisions, its application is constrained by the statistical and ethical peculiarities of workforce data, requiring organisations to build specific readiness capabilities rather than assuming off-the-shelf AI tools will function effectively. Vrontis, Christofi, Pereira, Tarba, Makrides and Trichina (2022), in a systematic review of AI and advanced technologies in human resource management, found that organisational AI adoption has outpaced the development of integrated theory and employee-readiness frameworks, while Budhwar, Malik, De Silva and Thevisuthan (2022) similarly concluded that international HRM research has yet

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to adequately address how employee readiness for AI varies across cultural and regulatory contexts. Malik, Budhwar and Kazmi (2023) proposed an extended strategic framework for AI-assisted HRM that positions employee capability-building and readiness as a precondition for, rather than a by-product of, successful AI deployment and Strohmeier (2020) similarly argued that digital HRM's deeper reliance on AI and analytics raises the bar for the digital and AI-related readiness expected of the broader workforce, not only of HR specialists. On the risk side, Köchling and Wehner (2020) found that algorithmic HR decision-making can reproduce historical biases unless actively audited and Zhou, Wang and Chen (2023) showed that low-transparency AI features in HRM are associated with reduced employee trust and increased anxiety, reinforcing the link between organisational AI governance and individual-level anxiety identified in Section 3.4. At the employee-facing end, Pillai, Ghanghorkar, Sivathanu, Algharabat and Rana (2023) found that employees' "reasons against" adopting AI-based tools, including perceived risk and technological anxiety, significantly reduced adoption intention, while Jaiswal, Arun and Varma (2022) examined upskilling for AI specifically within multinational corporations and found that structured upskilling initiatives significantly improved employees' confidence and readiness to work with AI-based systems.

3.6 Employability in the Digital and AI Era

Employability research offers the conceptual grounding for the outcome variable examined in this study. Fugate, Kinicki and Ashforth (2004) defined employability as a psycho-social construct comprising career identity, personal adaptability and social and human capital, arguing that it is a proactive, individually held resource rather than a simple function of labour-market demand. Van der Heijde and Van der Heijden (2006) operationalised employability as a competence-based, multidimensional construct encompassing occupational expertise, anticipation and optimisation, personal flexibility, corporate sense and balance, providing a measurement approach that has been widely applied in subsequent empirical research. Clarke (2018) revisited graduate and early-career employability through the lens of capital theory, arguing that human, social and psychological capital interact with contextual factors to shape perceived employability, a framing consistent with treating AI readiness as a form of capital relevant to employability in AI-exposed occupations. From a service-automation perspective, Huang and Rust (2018) proposed a framework distinguishing mechanical, thinking and feeling forms of AI, arguing that employability in an AI-augmented economy increasingly depends on capabilities that complement, rather than compete with, machine intelligence. Finally, the World Economic Forum (2025a) emphasised that reskilling and upskilling for an AI-

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transformed labour market depend on sustained collaboration among employers, educators and workers, directly linking the organisational and individual readiness-building themes reviewed above to long-term employability outcomes.

3.7 Research Gap

The literature reviewed above establishes, fairly consistently, that digital competence and AI awareness are conceptually well defined and increasingly measurable (Sections 3.1 and 3.3), that AI anxiety is a real, multidimensional and consequential construct with demonstrated links to negative workplace attitudes (Section 3.4), that organisations face real challenges in building the readiness required for responsible AI adoption (Section 3.5) and that employability is a well-established psycho-social construct now being reinterpreted for an AI-augmented economy (Section 3.6). What remains largely untested, however, is an integrated, employee-level model that places digital competence, AI awareness and AI anxiety together as joint predictors of AI readiness and that then tests whether AI readiness itself predicts perceived employability particularly using primary data from an emerging-market digital workplace such as Chennai, India. Most existing studies examine these constructs in isolated pairs, such as AI anxiety and learning behaviour (Wang & Wang, 2022) or AI awareness and adoption intention (Pillai et al., 2023), rather than within a single combined pathway that accounts for both the enabling and inhibiting forces behind AI readiness. The present study addresses this gap directly.

4. OBJECTIVES OF THE STUDY

1) To assess employees' levels of digital competence, AI awareness, AI anxiety, AI readiness and perceived employability.
2) To examine the relationships among digital competence, AI awareness, AI anxiety, AI readiness and perceived employability.
3) To determine the combined and relative influence of digital competence, AI awareness and AI anxiety on AI readiness and the influence of AI readiness on perceived employability.
4) To identify significant differences in AI readiness and perceived employability across gender and age groups.

5. SIGNIFICANCE OF THE STUDY

This study is significant for organisations, employees and the academic literature alike. For organisations, it identifies which lever building digital competence, raising AI awareness or reducing AI anxiety has the strongest statistical association with AI readiness, allowing more

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targeted investment in training and change-management efforts. For employees and career counsellors, it provides evidence on whether AI readiness is actually associated with stronger perceived employability, offering a clearer basis for individual upskilling decisions. For the academic literature, the study integrates the digital competence, AI anxiety and employability literatures, which as the review in Section 3 shows have largely developed in parallel, into a single empirically tested model grounded in India-specific, employee-level data.

6. SCOPE OF THE STUDY

The study covers 150 employees working across sectors including information technology and IT-enabled services, manufacturing, banking and financial services and education in Chennai. It examines employees' self-reported digital competence, AI awareness, AI anxiety, AI readiness and perceived employability and the statistical relationships among these constructs. The study does not evaluate any specific AI tool or organisational AI system, nor does it track change in these constructs over time; the analysis is cross-sectional, capturing employee perceptions at a single point in time.

7. RESEARCH METHODOLOGY

7.1 Research Design

The study follows a descriptive and analytical research design, using a structured questionnaire survey and quantitative statistical analysis to test the proposed relationships among digital competence, AI awareness, AI anxiety, AI readiness and perceived employability.

7.2 Sampling Design

Population: The population comprises employees working across various sectors in Chennai who have some exposure to AI-based tools or systems in their current workplace.

Sample Size: A total of 150 employees were selected as respondents for the study.

Sampling Technique: Purposive sampling was used to ensure that respondents had direct workplace exposure to digital or AI-based tools, supplemented by convenience sampling for questionnaire distribution across organisations.

7.3 Data Collection

Primary Data: Primary data were collected through a structured questionnaire administered to the 150 sampled employees, covering demographic details and items measuring digital competence, AI awareness, AI anxiety, AI readiness and perceived employability.

Secondary Data: Secondary data were drawn from peer-reviewed journal articles, conference proceedings and institutional reports on digital competence, AI anxiety, AI readiness and employability, as reviewed in Section 3.

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7.4 Research Instrument

A structured questionnaire consisting of a demographic profile section and five multi-item scales Digital Competence, AI Awareness, AI Anxiety, AI Readiness and Employability was used, with responses recorded on a five-point Likert scale ranging from strongly disagree to strongly agree.

7.5 Statistical Tools

Data were analysed using descriptive statistics (frequencies and percentages), Cronbach's alpha for reliability, Pearson correlation, multiple and simple linear regression, an independent samples t-test and one-way ANOVA, using SPSS.

7.6 Limitations

The study is limited to 150 employees in Chennai selected through purposive and convenience sampling, which constrains generalisability to other regions or to employees with no workplace exposure to digital or AI-based tools. The cross-sectional design captures perceptions at a single point in time and does not establish causal direction with certainty and all constructs are measured through employees' self-reported perceptions rather than objective indicators of digital skill, AI system use or career outcomes.

8. DATA ANALYSIS AND INTERPRETATION

8.1 Descriptive Statistics: Demographic Profile of Respondents

Table 1 presents the demographic profile of the 150 employees who participated in the study.

Table 1. Demographic profile of respondents (N = 150)

Variable	Category	Frequency	Percentage (%)
Gender	Male	78	52.0
	Female	72	48.0
Age	Below 25 years	35	23.3
	25–35 years	62	41.3
	36–45 years	38	25.3
	Above 45 years	15	10.0
Educational Qualification	Undergraduate	40	26.7
	Postgraduate	85	56.7
	Professional / Doctorate	25	16.7
Work Experience	Less than 3 years	42	28.0
	3–7 years	58	38.7
	More than 7 years	50	33.3
Sector	IT / ITES	55	36.7
	Manufacturing	28	18.7
	Banking / Financial Services	25	16.7
	Education	22	14.7
	Others	20	13.3

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The sample is nearly balanced by gender (52.0% male, 48.0% female) and is concentrated among employees below 45 years of age (89.9% combined), with the largest single group aged 25–35 years (41.3%). A majority of respondents hold a postgraduate qualification (56.7%) and the IT/ITES sector accounts for the largest single share of respondents (36.7%), reflecting the concentration of AI-exposed roles in technology-intensive and knowledge-intensive sectors in Chennai.

8.2 Reliability Testing

Table 2 reports Cronbach's alpha values for the five multi-item scales used in the study, all of which exceed the commonly accepted threshold of 0.70, indicating good internal consistency.

Table 2. Reliability statistics

Construct	Number of Items	Cronbach's Alpha
Digital Competence	5	0.847
AI Awareness	4	0.812
AI Anxiety	5	0.868
AI Readiness	5	0.891
Employability	5	0.856

8.3 Correlation Analysis

Table 3 presents the Pearson correlation coefficients among the five study constructs.

Table 3. Pearson correlation matrix (N = 150)

Variables	Digital Competence	AI Awareness	AI Anxiety	AI Readiness	Employability
Digital Competence	1	0.584**	-0.312**	0.647**	0.511**
AI Awareness	0.584**	1	-0.276**	0.592**	0.438**
AI Anxiety	-0.312**	-0.276**	1	-0.521**	-0.398**
AI Readiness	0.647**	0.592**	-0.521**	1	0.718**
Employability	0.511**	0.438**	-0.398**	0.718**	1

**Correlation is significant at the 0.01 level (2-tailed). Digital competence and AI awareness are significantly and positively correlated with AI readiness (r = 0.647 and r = 0.592 respectively), while AI anxiety is significantly and negatively correlated with AI readiness (r = -0.521). AI readiness, in turn, shows the strongest correlation of any variable pair with

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employability (r = 0.718), suggesting a particularly close association between how ready employees feel to work with AI and how employable they perceive themselves to be.

8.4 Regression Analysis

Two regression models were estimated to test the proposed pathway: a multiple regression of AI readiness on digital competence, AI awareness and AI anxiety (Panel A) and a simple regression of employability on AI readiness (Panel B). Results are presented in Table 4.

Table 4(a). Regression analysis (N = 150)

Panel A: Predictors of AI Readiness	**Standardised β**	**t-value**	**p-value**
Digital Competence	0.421	6.812	0.000
AI Awareness	0.318	5.124	0.000
AI Anxiety	-0.287	-4.705	0.000
Model: $R^2 = 0.549$, Adjusted $R^2 = 0.540$, $F = 58.912$, $p = 0.000$			

Table 4(b) AI Readiness predicting Employability

Path	**R^2**	**Standardised β**	**t-value**	**p-value**
AI Readiness → Employability	0.515	0.718	12.487	0.000

In Panel A, digital competence, AI awareness and AI anxiety together explain 54.9% of the variance in AI readiness ($R^2 = 0.549$, $F = 58.912$, $p < 0.001$). Digital competence is the strongest positive predictor ($\beta = 0.421$), followed by AI awareness ($\beta = 0.318$), while AI anxiety is a significant negative predictor ($\beta = -0.287$); all three paths are significant at the 1% level. In Panel B, AI readiness alone explains 51.5% of the variance in perceived employability ($R^2 = 0.515$, $\beta = 0.718$, $p < 0.001$), confirming a strong, statistically significant link between employees' AI readiness and how employable they perceive themselves to be.

8.5 t-Test and ANOVA

An independent samples t-test was used to compare AI readiness between male and female employees and a one-way ANOVA was used to compare perceived employability across age groups. Results are presented in Tables 5 and 6.

Table 5. Independent samples t-test: Gender and AI readiness

Gender	**N**	**Mean**	**SD**	**t-value**	**p-value**
Male	78	3.74	0.69	1.423	0.157
Female	72	3.58	0.73		

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The t-test result (p = 0.157, not significant at the 5% level) indicates no statistically significant difference in AI readiness between male and female employees, suggesting that gender is not a meaningful differentiator of AI readiness in this sample.

Table 6. One-way ANOVA: Age group and perceived employability

Age Group	N	Mean	SD	F-value	p-value
Below 25 years	35	3.52	0.74	5.672	0.001
25–35 years	62	3.91	0.65		
36–45 years	38	3.68	0.70		
Above 45 years	15	3.21	0.79		

The ANOVA result (F = 5.672, p = 0.001, significant at the 1% level) indicates a statistically significant difference in perceived employability across age groups. Employees aged 25–35 years reported the highest mean employability (3.91), followed by those aged 36–45 years (3.68), while employees below 25 years (3.52) and above 45 years (3.21) reported comparatively lower scores, suggesting that perceived employability in AI-driven workplaces peaks during the early-to-mid career stage rather than rising or falling monotonically with age.

9. FINDINGS AND DISCUSSION

9.1 Key Findings

The study yields five key findings. First, the sample reported generally favourable levels of digital competence and AI awareness alongside moderate AI anxiety, consistent with a workforce that is digitally engaged but not free of AI-related concern. Second, all five constructs demonstrated good internal consistency (α ranging from 0.812 to 0.891) and were significantly intercorrelated in the directions expected from the literature reviewed in Section 3. Third, digital competence, AI awareness and AI anxiety together explained 54.9% of the variance in AI readiness, with digital competence emerging as the strongest single predictor and AI anxiety acting as a significant negative predictor. Fourth, AI readiness was a strong positive predictor of perceived employability, explaining 51.5% of its variance on its own. Fifth, no significant gender difference was found in AI readiness, but perceived employability differed significantly across age groups, peaking among employees aged 25–35 years.

9.2 Discussion

These findings align closely with and help integrate; the literature reviewed in Section 3. The strong positive role of digital competence is consistent with the DigComp-based conceptualisation advanced by Carretero et al. (2017) and Vuorikari et al. (2022), while the

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significant contribution of AI awareness supports the AI literacy framework proposed by Long and Magerko (2020) and extended by Ng et al. (2021). At the same time, the significant negative effect of AI anxiety on readiness directly corroborates the dimensional accounts of AI anxiety offered by Li and Huang (2020) and Wang and Wang (2022) and is consistent with the threat-perception evidence reported by Brougham and Haar (2018); the present study extends this literature by showing that anxiety's negative pull persists even when competence and awareness are statistically accounted for, rather than being fully offset by them.

The strong link between AI readiness and perceived employability supports the broader argument, advanced from different angles by Fugate et al. (2004), Van der Heijde and Van der Heijden (2006) and Clarke (2018), that employability is a proactive, capability-based resource rather than a passive response to labour-market conditions; AI readiness, on this evidence, functions as one such capability in AI-exposed workplaces. The absence of a significant gender difference in AI readiness is a reassuring, equity-relevant finding, while the age-related pattern in employability peaking in the 25–35 age band rather than declining steadily with age adds nuance to concerns raised by Tams et al. (2014) regarding older workers and digital technology, suggesting that it is specifically the youngest and the oldest segments of the workforce, rather than age in a simple linear sense, who may most need targeted organisational support of the kind highlighted by Jaiswal et al. (2022) and the World Economic Forum (2025a).

10. CONCLUSION AND SUGGESTIONS

10.1 Conclusion

This study set out to examine, using primary data from 150 employees in Chennai, how digital competence, AI awareness and AI anxiety jointly shape AI readiness and how AI readiness relates to perceived employability. The findings confirm that digital competence and AI awareness are significant positive drivers of AI readiness, that AI anxiety is a significant negative driver even after accounting for competence and awareness and that AI readiness is in turn a strong positive predictor of perceived employability. Gender was not found to meaningfully differentiate AI readiness, while age showed a significant, non-linear relationship with perceived employability. Together, these results support and integrate the digital competence, AI anxiety and employability literatures reviewed in Section 3 within a single, empirically tested model.

10.2 Suggestions

Based on the findings, the study offers the following suggestions. First organisations should treat digital-skills training as the foundational lever for building AI readiness, given its status

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as the strongest predictor identified in this study, while also investing specifically in AI awareness initiatives rather than assuming general digital training is sufficient. Second, because AI anxiety was found to significantly depress AI readiness independently of competence and awareness organisations should address the psychological dimension of AI adoption directly, through transparent communication about how AI tools will and will not be used, rather than relying solely on skills training to resolve employee concern. Third, given the significant age-related pattern in employability organisations should design differentiated support for the youngest employees, who may lack experience-based confidence and for employees above 45 years, who may face steeper adjustment demands, rather than applying uniform AI-readiness programmes across all age groups. Fourth, career counsellors and individual employees should treat AI readiness as an actively buildable capability closely tied to perceived employability, prioritising it alongside, rather than instead of, traditional skill development.

11. Scope for Further Research

Future research could extend this study by adopting a longitudinal design to examine how digital competence, AI awareness and AI anxiety evolve over time as employees gain more direct experience with AI tools, which would allow stronger causal inference than the cross-sectional design used here. Comparative studies across cities, sectors and organisation sizes would help establish how far the present findings, drawn from Chennai, generalise to other labour markets. Future studies could also test whether the proposed pathway is mediated by additional variables such as organisational support, managerial trust or AI governance transparency and could examine whether the relationship between AI readiness and employability differs by occupation type or by the degree to which a given role is exposed to AI-driven automation.

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BUILDING THE CIRCULAR INNOVATION ECOSYSTEM: THE IMPACT OF DIGITAL COLLABORATION ON GREEN START-UP DEVELOPMENT AND BUSINESS MODEL TRANSFORMATION

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ABSTRACT

This study examines how digital collaboration including shared online platforms, cloud-based co-creation tools, virtual incubator networks, open-innovation portals, and data-sharing arrangements with ecosystem partners shapes the development of green start-ups and the transformation of their business models towards circularity. The study adopts a multidisciplinary perspective that integrates circular economy thinking, digital entrepreneurship, and ecosystem theory. A cross-sectional survey was conducted among 200 founders and senior managers of green start-ups operating at the early, growth, and scale-up stages. The study investigates the extent and pattern of digital collaboration and its relationship with knowledge exchange, ecosystem trust, partner diversity, circular business model adoption, and overall start-up development. Data are analysed using descriptive statistics and a range of inferential techniques, including chi-square, independent-samples t-test, one-way ANOVA, Mann-Whitney U, Kruskal-Wallis, Pearson correlation, simple and multiple linear regression, reliability analysis, and a brief moderation analysis. Two central hypotheses and several supporting relationships are examined to identify significant associations and predictive effects among the study variables.

Findings indicate that the intensity of digital collaboration is significantly associated with start-up stage, suggesting that collaborative digital practices deepen as ventures mature. The results further indicate that circular business model adoption increases significantly with the depth of digital collaboration. Knowledge exchange, digital collaboration intensity, and partner diversity emerge as important predictors of circular business model adoption, highlighting the combined role of information flow and relational breadth in green entrepreneurship. The study also considers how collaboration-driven transformation links to development outcomes such as resource efficiency, market access, and investor readiness. The multidisciplinary framework demonstrates how digital infrastructure, ecosystem relationships, and business model design

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interact in shaping green venture outcomes. Based on the findings, the study proposes recommendations for strengthening collaboration platforms, building ecosystem trust, and aligning policy support with the circular transition of start-ups. The study contributes to the emerging literature on circular entrepreneurship and digital ecosystems, and provides a foundation for further empirical research on collaboration-led sustainability transitions. The findings may assist founders, incubators, and policymakers in designing more effective, collaboration-oriented support for green ventures.

Keywords: Circular Economy, Digital Collaboration, Green Start-ups, Business Model Transformation, Innovation Ecosystem, Chi-Square, ANOVA, Regression.

1. INTRODUCTION

The transition from a linear "take–make–dispose" economy to a circular one is no longer confined to large manufacturers and policy documents. Green start-ups — ventures built around repair, refurbishment, recycling, product-as-a-service, bio-based materials, and waste valorisation — are increasingly the place where circular ideas are first tested commercially. Yet such ventures rarely succeed alone. Closing material loops requires suppliers, collectors, recyclers, technology providers, investors, and customers to share data and coordinate action, and that coordination now happens largely through digital channels: collaborative platforms, shared dashboards, virtual incubators, and open-innovation portals.

Despite heavy public and private investment in green entrepreneurship, access to collaboration tools does not automatically translate into transformed business models. Some start-ups use digital collaboration to redesign how they create, deliver, and capture value; others use it only for routine communication. This study investigates how the intensity of digital collaboration, the quality of knowledge exchange, the trust prevailing in the ecosystem, and the diversity of partners combine to shape circular business model adoption and green start-up development, and what this implies for entrepreneurs, incubators, and policymakers.

2. LITERATURE REVIEW

Two streams of literature inform this study. The first is circular economy and business model research, which defines circularity as a restorative system design that retains the value of products, components, and materials for as long as possible (Geissdoerfer et al., 2017; Kirchherr et al., 2017). Within this stream, business model innovation is treated as the main mechanism through which circular principles become commercially viable, through strategies such as slowing, closing, and narrowing resource loops (Bocken et al., 2016; Teece, 2010). The

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second stream is digital entrepreneurship and ecosystem research, which argues that digital technologies make venture boundaries more open and outcomes less predictable, and that value is increasingly co-created within ecosystems rather than inside single firms (Nambisan, 2017; Adner, 2017; Chesbrough, 2003).

A smaller but growing body of work looks at the intersection of the two and points to a paradox: green start-ups are often intensely connected online yet remain commercially fragile, because connection volume is not the same as productive collaboration. Studies note that data-sharing arrangements, partner diversity, and mutual trust frequently coexist with limited resources and short operating histories, creating a distinctive collaboration profile that differs across venture stages.

Key themes distilled from the literature include: Knowledge exchange and partner diversity are stronger enablers of circular business models than the mere number of digital tools adopted. Venture stage and operating history shape both the intensity of digital collaboration and the confidence to redesign the business model. Ecosystem trust and digital collaboration interact, rather than act independently, in shaping business model transformation. Ecosystem-level support (shared infrastructure, transparent data standards, incubator networks) can shift venture outcomes independent of founder characteristics.

3. OBJECTIVES OF THE STUDY

- ✓ To assess the level of digital collaboration, knowledge exchange, and ecosystem trust among green start-ups.
- ✓ To measure the extent and pattern of circular business model adoption among the surveyed ventures.
- ✓ To examine whether the intensity of digital collaboration is associated with start-up stage.
- ✓ To compare circular business model adoption across low-, moderate-, and high-collaboration groups.
- ✓ To identify the strongest statistical predictors of circular business model adoption.
- ✓ To recommend collaboration and policy guidelines for strengthening green start-up development.

4. HYPOTHESES

H1: The level of digital collaboration among green start-ups is significantly associated with start-up stage. (Chi-square test of association)

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H2: Circular business model adoption differs significantly across digital-collaboration groups — Low, Moderate, and High. (One-way ANOVA)

5. RESEARCH METHODOLOGY

5.1 Research Design

The study follows a cross-sectional, mixed-methods design. A structured questionnaire captured venture profile, digital collaboration practices, knowledge exchange, ecosystem trust, partner diversity, circular business model adoption, and start-up development, using validated five-point and ten-point scales adapted for the green entrepreneurship context.

5.2 Sample

A total of 200 founders and senior managers of green start-ups that use at least one digital collaboration tool were surveyed using stratified random sampling by venture stage. For the collaboration-group comparisons (ANOVA, Kruskal-Wallis), a balanced sub-sample of 120 respondents (40 per collaboration group) was used. The stage distribution for the full sample was as follows: Early stage (less than 3 years) — 70; Growth stage (3–6 years) — 80; Scale-up stage (more than 6 years) — 50.

5.3 Research Instrument

The questionnaire included: (i) venture profile — stage, sector, team size, funding source; (ii) a six-item Digital Collaboration Intensity scale; (iii) a five-item Knowledge Exchange scale; (iv) a four-item Ecosystem Trust scale; (v) a Partner Diversity count of distinct partner types (suppliers, recyclers, technology firms, investors, academic institutions, public agencies); (vi) a Circular Business Model Adoption item (1–10 scale); and (vii) a Start-up Development Index (1–10 scale).

5.4 Data Collection and Analysis

Data were collected through online forms circulated via incubator networks, start-up associations, and professional platforms, with responses anonymised before analysis. Descriptive statistics, chi-square, correlation, regression (simple and multiple), t-test, ANOVA, reliability analysis, and non-parametric alternatives were computed. The significance level (alpha) was set at 0.05 throughout.

6. STATISTICAL ANALYSIS AND RESULTS

Note on data: *The figures in this section are illustrative values prepared to demonstrate the analytical structure. They must be replaced with the output of the actual survey data before submission or publication.*

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6.1 Correlation Analysis (Digital Collaboration Intensity vs. Circular Business Model Adoption)

A Pearson correlation was computed between Digital Collaboration Intensity scores and Circular Business Model Adoption scores (n = 200).

Variable 1	Variable 2	Pearson r	p-value	Interpretation
Digital Collaboration Intensity	Circular Business Model Adoption	0.58	< 0.001	Moderate-to-strong positive relationship

Interpretation: Start-ups with more intensive digital collaboration report markedly higher circular business model adoption, suggesting that collaboration is a working enabler of circular transformation rather than a background activity.

6.2 Simple Linear Regression (Predicting Circular Business Model Adoption from Digital Collaboration Intensity)

Regression equation: Circular Business Model Adoption = 1.85 + 0.57 (Digital Collaboration Intensity)

Statistic	Value
R	0.58
R^2	0.34
F-statistic	100.38
p-value	< 0.001

Interpretation: Digital collaboration intensity alone explains 34% of the variance in circular business model adoption, confirming it as a substantial precursor of business model transformation.

6.3 Independent Samples t-test (High-Collaboration vs. Low-Collaboration Start-ups on Circular Business Model Adoption)

Groups: High-collaboration start-ups (n = 95), mean adoption score = 7.10; Low-collaboration start-ups (n = 105), mean adoption score = 5.35.

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Statistic	Value
t-value	7.00
df	198
p-value	< 0.001

Interpretation: Circular business model adoption is significantly higher among start-ups with high digital collaboration, even at a preliminary two-group level.

6.4 Reliability Analysis (Cronbach's Alpha)

The six-item Digital Collaboration Intensity scale returned Cronbach's Alpha = 0.88, the five-item Knowledge Exchange scale returned Cronbach's Alpha = 0.82, and the four-item Ecosystem Trust scale returned Cronbach's Alpha = 0.79, indicating good internal consistency for all three instruments.

6.5 Descriptive Statistics of Study Variables

Variable	n	Mean	Std. Dev.	Scale
Digital Collaboration Intensity	200	5.72	1.94	1–10
Knowledge Exchange	200	3.48	0.82	1–5
Ecosystem Trust	200	3.61	0.77	1–5
Partner Diversity	200	3.90	1.60	Count (0–6)
Circular Business Model Adoption	200	6.18	1.95	1–10
Start-up Development Index	200	6.05	1.88	1–10

6.6 Chi-square Test of Association (Start-up Stage vs. Digital Collaboration Level)

Start-up Stage	High Collaboration	Low Collaboration	Total
Early stage (< 3 years)	20	50	70
Growth stage (3–6 years)	45	35	80
Scale-up stage (> 6 years)	30	20	50
Total	95	105	200

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Chi-square (χ^2) = 15.65

Degrees of freedom (df) = 2

p-value < 0.001; Cramér's V = 0.28

Interpretation: The null hypothesis of independence is rejected ($p < 0.05$); H1 is supported. Start-up stage and digital collaboration level are significantly associated, with scale-up ventures (High = 30/50, 60%) far more likely to collaborate intensively than early-stage ventures (High = 20/70, 29%).

6.7 One-way ANOVA (Circular Business Model Adoption across Collaboration Groups)

Sample means (adoption score, 1–10 scale): Low collaboration = 5.20 (n = 40); Moderate collaboration = 6.40 (n = 40); High collaboration = 7.60 (n = 40).

Source	SS	df	MS	F	p-value
Between Groups	115.20	2	57.60	46.08	< 0.001
Within Groups	146.25	117	1.25		
Total	261.45	119			

Interpretation: $F(2, 117) = 46.08$, $p < 0.001$, with an effect size (η^2) of 0.44. The null hypothesis of equal group means is rejected; H2 is supported. Circular business model adoption rises step-wise with the depth of digital collaboration. Post-hoc (Tukey HSD) comparisons would be expected to show High vs. Low and Moderate vs. Low as the most significant pairwise contrasts.

6.8 Mann-Whitney U Test (Non-Parametric Alternative to t-test)

Used where adoption scores depart from normality. Groups: High-collaboration (n = 95) vs. Low-collaboration (n = 105).

Statistic	Value
U	2340
z	-6.48
p-value	< 0.001

Interpretation: The non-parametric test confirms the t-test result — circular business model adoption differs significantly between high- and low-collaboration start-ups.

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6.9 Kruskal-Wallis Test (Non-Parametric ANOVA)

Used for comparing adoption scores across the three collaboration groups without assuming normality.

Statistic	Value
H(2)	40.12
p-value	< 0.001

Interpretation: Circular business model adoption differs significantly across collaboration groups even under non-parametric assumptions, reinforcing the ANOVA finding.

6.10 Multiple Regression Analysis

To assess the combined influence of several predictors on circular business model adoption (n = 200).

Predictor	β	t-value	p-value
Digital Collaboration Intensity	0.34	5.41	< 0.001
Knowledge Exchange	0.29	4.63	< 0.001
Partner Diversity	0.21	3.17	0.002
Venture Age (years)	0.06	1.05	0.295

Model summary: $R = 0.70$, $R^2 = 0.49$, $F(4, 195) = 46.84$, $p < 0.001$.

Interpretation: Digital collaboration intensity, knowledge exchange, and partner diversity jointly explain 49% of the variance in circular business model adoption. Digital collaboration intensity is the strongest single predictor, while venture age is not a significant contributor once the other variables are controlled.

6.11 Moderation Check (Ecosystem Trust)

A supplementary moderation analysis (Hayes PROCESS, Model 1) tested whether ecosystem trust moderates the relationship between digital collaboration intensity and circular business model adoption. The interaction term was significant ($\beta = 0.19$, $p = 0.011$), indicating that the positive effect of digital collaboration on circular business model adoption strengthens among start-ups that operate in high-trust ecosystems — collaboration and trust compound rather than operate independently.

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7. DISCUSSION OF FINDINGS

Three findings stand out. First, digital collaboration is not evenly distributed across the venture life cycle: scale-up ventures collaborate intensively at roughly twice the rate of early-stage ventures, a pattern consistent with the view that relationships and data-sharing routines accumulate with operating history, but one with clear implications for how early-stage green ventures are supported. Second, collaboration is not merely correlated with circular business model adoption — the step-wise rise from low to moderate to high collaboration suggests a cumulative benefit of sustained, structured digital interaction, rather than adoption simply preceding collaboration. Third, digital collaboration and ecosystem trust are not separate levers: the moderation result shows they interact, meaning that tool-only or relationship-only approaches are each likely to under-deliver relative to combined ecosystem-building efforts.

Taken together, these results position circular business model transformation as a trust-and-connection problem as much as a technology-and-funding problem — a distinction with direct consequences for how incubators, investors, and policymakers design support for green start-ups and measure its contribution to development outcomes.

8. POLICY RECOMMENDATIONS AND BUSINESS GUIDELINES

Stage-tiered ecosystem support: Design separate onboarding and collaboration programmes for early-stage ventures, focusing on introductions to diverse partners and shared digital infrastructure rather than funding alone.

Combined collaboration-and-trust programmes: Since trust and collaboration interact, incubators should pair digital platforms with governance mechanisms, such as data-sharing agreements and verified partner profiles, in the same programme.

Transparency in sustainability and material data: Shared platforms should adopt clear standards for disclosing material flows and impact claims, to sustain the trust link identified in Sections 6.10–6.11.

Open innovation and partner-diversity pilots: Use cross-sector pilots with recyclers, technology firms, and academic institutions, drawing on the collaboration gap documented in Section 6.7 as a lever for business model change rather than a gap to be closed through grants alone.

9. LIMITATIONS

The findings rely on self-reported survey data from 200 green start-up respondents, and the collaboration-group comparisons draw on a balanced sub-sample of 120; results should be extended cautiously to ventures in different sectors, regions, or regulatory settings. Self-

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reported business model adoption may not fully track actual changes in revenue models, material flows, or measured environmental impact, and a cross-sectional design cannot establish causal direction.

10. CONCLUSION

This study finds that the transformation of green start-ups towards circular business models is shaped jointly by digital collaboration intensity, knowledge exchange, partner diversity, and ecosystem trust, and that deeper digital collaboration is itself associated with meaningfully higher circular business model adoption. As the circular economy becomes more embedded in entrepreneurial activity, ecosystem builders have both an opportunity and a responsibility to design support — particularly for early-stage ventures — around combined collaboration-and-trust mechanisms rather than tool access alone. Doing so can convert digital collaboration from a stage-dependent practice into a broadly shared driver of green start-up development, strengthening both individual ventures and the wider circular innovation ecosystem.

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FORMALISATION OF INDIA'S INFORMAL ECONOMY THROUGH THE USE OF DIGITAL PUBLIC INFRASTRUCTURE

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ABSTRACT

India's informal economy provides employment and income to a large proportion of the population, but informal enterprises and workers often operate outside formal systems of registration, taxation, social security, credit and official market access. Digital Public Infrastructure (DPI) including Aadhar, Jan Dhan accounts, mobile connectivity, Unified Payments Interface (UPI), Goods and Services Tax Network (GSTN), Account Aggregator, DigiLocker and open digital commerce platforms has created new channels through which informal economic activity can become more visible, verifiable and connected to formal institutions. This descriptive paper examines the role of DPI in the formalisation of India's informal economy. It explains how digital identity reduces on boarding costs, how digital payments create transaction records, how GSTN connects enterprises to the tax system and how consent-based data sharing can improve access to formal credit. The paper also identifies major limitations, including digital exclusion, privacy risks, cyber fraud, compliance burdens, platform dependence and the possibility that formalisation may occur without adequate improvements in income or working conditions. The paper argues that DPI can support formalisation, but technology alone cannot achieve inclusive formalisation. Effective outcomes require affordable compliance, multilingual access, strong grievance redresses, data protection, digital literacy and social-security coverage.

Keywords: Digital Public Infrastructure, Informal Economy, Formalisation, Digital Literacy

1. INTRODUCTION

The informal economy includes small businesses, self-employed workers, casual labourers, street vendors, domestic workers, home-based producers, gig workers and enterprises that operate partly or entirely outside formal regulatory and financial systems.

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Informal economic activity is important for employment and livelihoods, but informal workers and enterprises often face limited access to institutional credit, insurance, social security, organised markets and government support. Formalisation generally refers to the process through which workers and enterprises become recognised by official institutions. It may involve business registration, tax registration, digital financial records, formal employment contracts, pension or insurance enrolment, access to regulated credit and compliance with labour or commercial regulations. Formalisation should therefore be understood as more than merely registering a business or increasing tax collection. Digital Public Infrastructure provides shared digital systems that can be used by government agencies, financial institutions, businesses and citizens. India's DPI architecture combines digital identity, payments, data exchange, credentials and open networks. The World Bank identifies digital financial services as a possible mechanism for helping informal firms register and operate formally, while also noting that policymakers must consider the needs and realities of different categories of enterprises.

2. REVIEW OF LITERATURE

Harshita Sinha, Max Gallien and Vanessa van den Boogaard (2026) in their study entitled "Narrow formalisation: Informal workers, social protection and digital registration in India", has explores one such case: 'e-Shram', a digital registration platform introduced in India in the aftermath of the COVID-19 pandemic. This analysis carries broader implications for countries pursuing formalisation through digital platforms, emphasising the need for policies that align state objectives with genuine improvements in social and economic protections for informal workers.

Mohammad Afzaal Rashid (2026) in his study entitled "Understanding the Digital Governance and India's Digital Transformation Since 2014" has investigates how key digital tools like Unified Payments Interface (UPI), DigiLocker, UMANG, and the National Scholarship Portal have changed access to public services. This study examines policy documents, academic literature, and data on digital infrastructure as secondary sources. The survey gathered responses from 80 individuals and it took place in Abul Fazal Enclave, a mixed semi-urban and urban area in Okhla, New Delhi.

Dr. Kamaxa Laxman Puri (2026) in his study entitled "Economic Inequality and the Rural–Urban Digital Infrastructure Gap in Maharashtra", has examines the relationship between economic inequality and the rural–urban digital infrastructure gap in Maharashtra. It

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argues that the digital divide is not merely a technological problem but also a socio-economic issue. Poor households, marginal farmers, agricultural labourers, women, elderly people, tribal communities are more likely to experience digital exclusion. At the same time, lack of digital access can reinforce economic inequality by limiting employment opportunities, financial services, education and government welfare programmes.

Ajeet Singh and Mr. Abdul Khalid (2026) in their study entitled "Challenges and Opportunities in Digitizing Informal Workforce", has examines the key barriers to digitizing the informal workforce, including limited digital literacy, inadequate technological infrastructure, data privacy concerns and resistance to adoption. At the same time, it highlights emerging opportunities such as mobile-based platforms, digital identity systems, financial inclusion through digital payments and government-led initiatives. The study aims to provide insights for researchers, policymakers and system designers working toward inclusive and scalable digital solutions.

3. STATEMENT OF THE PROBLEM

The informal economy plays a significant role in India's employment and livelihood structure but informal workers frequently remain excluded form formal credit, social protection, organised markets, taxation systems and government support. Digital Public Infrastructure has introduced new mechanisms for identity verification, electronic payments, business registration, data exchange and service delivery. These systems may help create formal records, reduce transaction costs, expand market access and connect informal enterprises with regulated financial and public institutions. Nevertheless, digital formalisation may also generate exclusion, privacy risks, cyber fraud, compliance costs and new forms of economic vulnerability.

3. OBJECTIVES OF THE STUDY

- To explain the relationship between DPI and economic formalisation.
- To examine the contribution of Aadhaar, UPI, GSTN, Account Aggregator, and digital platforms.
- To describe the benefits of DPI for informal workers and enterprises.
- To identify the risks and limitations of technology-led formalisation.

4. LIMITATIONS OF THE STUDY

- This study is limited by its descriptive design, dependence on secondary data.
- It is limited ability to establish causal relationships.

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- The findings may not be equally applicable across all sectors.

5. CONCEPTUAL MEANING OF FORMALISATION

Formalisation can occur at several levels:

Dimension	Meaning
Identity formalisation	A worker or enterprise receives a recognised and verifiable identity.
Business formalisation	An enterprise obtains registration, licences, or tax identification.
Financial formalisation	Transactions, savings, borrowing, and payments move into regulated financial channels.
Labour formalisation	Workers receive contracts, wages, insurance, pensions, or social-security benefits.
Market formalisation	Producers and sellers gain access to organised markets and transparent transactions.
Data formalisation	Business activity generates records that can be verified by lenders, regulators, and public agencies.

INDIA'S DPI ECOSYSTEM

India's DPI ecosystem includes several interconnected or potentially interoperable layers.

1. **Digital identity:** Aadhar and electronic Know Your Customer processes can reduce the time and cost required verifying the individuals. Digital identity may help workers and entrepreneurs open bank accounts, access government services, receive benefits and complete business on boarding. The World Bank describes Aadhar and UPI as central elements of India's public-service and digital-finance architecture.
2. **Digital payments:** UPI allows individuals and businesses to make and receive payments through interoperable bank-linked systems. For informal enterprises, QR-based payments can reduce dependence on cash and create a record of business transactions. Digital payment records may help a small business demonstrate sales, cash flow and repayment capacity to a formal lender.
3. **GSTN:** The Goods and Services Tax Network provides digital systems for tax registration return filing, invoice reporting and indirect-tax administration. GSTN can

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connect small firms to formal supply chains because registered buyers may prefer suppliers who can issue compliant invoices. The integration of digital registration, invoicing and payment records can improve the visibility of enterprises.

4. **Account Aggregator:** The Account Aggregator framework is designed to enable consent-based sharing of financial information between participating institutions. In principle, it can allow a borrower to share bank, tax, or other financial data with a lender without relying entirely on physical documents or collateral. This could be particularly relevant for small firms that lack audited accounts or extensive credit histories.
5. **Digital credentials and commerce:** Digital credentials can help workers and enterprises present verifiable records of education, skills, licences, transactions or business activity. Open commerce networks may provide small sellers with wider market access and reduce dependence on a single platform. NITI Aayog's DPI@2047 roadmap places emphasis on MSME market expansion, simplified compliance, access to credit, local talent and district-level execution.

MECHANISMS LINKING DPI TO FORMALISATION

1. **Lowering the cost of registration:** Informal businesses may avoid registration because of paperwork, travel, fees, uncertainty or fear of penalties. Digital identity, e-signatures, online forms and electronic verification can reduce these barriers. When registration is simple and produces clear benefits such as access to credit, markets, insurance or government procurement informal businesses may have stronger incentives to enter formal systems.
2. **Creating verifiable transaction histories:** Cash transactions are difficult for lenders and public agencies to verify. Digital payments can create records of sales and receipts. These records may help enterprises demonstrate business activity even when they do not maintain conventional accounts.

   A transaction history can support:

   - Loan applications.
   - Insurance assessment.
   - Supplier relationships.
   - Business valuation.
   - Tax reporting.

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- Eligibility for government schemes.

However, transaction data should not automatically be treated as a complete measure of profit or income. Digital records may exclude cash sales, reflect shared accounts or be distorted by business and personal transactions occurring through the same account.

3. **Improving access to formal credit:** Informal enterprises commonly face difficulties obtaining bank loans because they lack collateral, audited financial statements or documented cash flows. DPI can allow lenders to assess alternative information, including payment histories, bank transactions, GST records and consented financial data. The World Bank reports that digital financial services can make it easier for informal firms to register and operate formally, while digital financial transactions can also strengthen enforcement and tax collection.
4. **Connecting informal workers to welfare systems:** Digital identity and account-based transfers can help governments deliver pensions, insurance, scholarships, wage payments and other benefits. Portability is particularly important for migrant workers who move between states or occupations. For informal workers, access to social protection may be more important than business registration. A formalisation strategy should therefore include portable benefits, health insurance, accident protection, pensions and unemployment support.
5. **Expanding market access:** Digital marketplaces and open networks can help small producers reach buyers beyond their immediate locality. Digital catalogues, online discovery, digital payments and electronic logistics may reduce dependence on intermediaries. Market access can encourage formalisation when formal registration is linked to participation in procurement, organised supply chains, e-commerce or larger business networks.
6. **Improving government capacity:** DPI can help governments identify beneficiaries, monitor programme delivery, reduce duplication and process registrations more quickly. It may also improve tax administration through digital invoices, electronic returns and data matching. Improved administrative capacity can support formalisation, but it also creates risks if automated systems make errors or if citizens cannot challenge incorrect decisions. Formalisation must therefore include accessible human assistance and grievance redressed.

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BENEFITS FOR INFORMAL ENTERPRISES AND WORKERS

DPI can provide the following potential benefits:

- Lower costs of identity verification and account opening.
- Faster receipt of payments.
- Reduced dependence on cash.
- Better documentation of business activity.
- Improved access to formal loans and insurance.
- Wider market reach.
- Easier participation in government schemes.
- Greater portability for migrant workers.
- Reduced transaction costs.
- Increased ability to build a verifiable economic profile.

CHALLENGES AND RISKS

1. **Digital exclusion:** Not all informal workers possess smartphones, reliable connectivity, digital skills or personal bank accounts. Women, elderly people, persons with disabilities, migrants and people who speak minority languages may face additional barriers. A digital-only system can unintentionally exclude the people most in need of public support.
2. **Privacy and surveillance concerns:** Digital formalisation generates large amounts of personal and business data. If data is collected excessively or shared without meaningful consent, individuals may lose control over sensitive financial information. The Account Aggregator model illustrates the importance of consent-based data sharing, but formal consent should be understandable and voluntary.
3. **Cyber fraud and operational failure:** Digital payments expose users to phishing, account takeover, fraudulent QR codes, identity theft and social-engineering attacks. Network outages and authentication failures can also interrupt business activity. Small enterprises may lack the resources to recover from fraud or disputed transactions. Consumer protection and rapid dispute resolution are therefore essential parts of DPI.
4. **Formalisation without better working conditions:** A digital record does not guarantee decent wages, workplace safety, job security or social protection. Gig workers and home-based workers may be digitally visible while remaining economically vulnerable.

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5. **Platform concentration:** Digital platforms may expand market access but can also create dependence on large firms. Small sellers may face changing algorithms, high commissions, delayed payments or limited control over customer data. Open standards and interoperability can help prevent excessive concentration and preserve user choice.

7. CONCLUSION

Digital Public Infrastructure can support the formalisation of India's informal economy by reducing registration costs, creating verifiable transaction records, improving access to formal finance, connecting enterprises to wider markets and expanding access to public benefits. Aadhar, UPI, GSTN, Account Aggregator, digital credentials and open commerce networks each contribute to different dimensions of formalisation. However, DPI cannot formalise the informal economy automatically. India's policy priority should therefore be inclusive formalisation: a process that improves the economic security, productivity, rights and opportunities of informal workers and enterprises while protecting them from exclusion and excessive compliance burdens.

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DIGITAL EDUCATION, ARTIFICIAL INTELLIGENCE IN LEARNING AND INNOVATIVE PEDAGOGIES

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ABSTRACT

Digital education, artificial intelligence (AI), and innovative pedagogies are reshaping the design and delivery of learning in higher education. This paper examines how digital learning environments, AI-enabled tools, and learner-centred pedagogies can be integrated to improve engagement, personalisation, collaboration, feedback, and assessment. The paper proposes a practical framework linking digital infrastructure, AI-supported learning, innovative teaching strategies, faculty readiness, and ethical governance. A model survey instrument is included for empirical studies, together with sample tools for measuring student engagement, perceived usefulness, digital learning readiness, and learning satisfaction. Illustrative statistical calculations demonstrate the use of percentage, mean score, standard deviation, and weighted mean. The paper argues that technology is most educationally valuable when it supports sound pedagogy rather than replacing the teacher. It also highlights academic integrity, privacy, transparency, accessibility, bias, and responsible use of generative AI as essential considerations.

Keywords: Digital Education; Artificial Intelligence; AI in Learning; Innovative Pedagogy; Higher Education; Generative AI; Student Engagement; Digital Literacy.

1. INTRODUCTION

The rapid expansion of digital technologies has changed how knowledge is accessed, created, shared, and assessed. Learning management systems, online resources, video-based learning, virtual collaboration, mobile applications, learning analytics, and artificial intelligence have become important components of contemporary education. At the same time, the availability of technology does not automatically result in meaningful learning. Effective integration requires appropriate pedagogy, teacher preparation, student digital literacy, reliable infrastructure, and clear institutional policies. Artificial intelligence has introduced additional

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possibilities. AI systems can support adaptive explanations, question generation, feedback, language assistance, content recommendation, learning analytics, and accessibility. Generative AI can also help learners brainstorm, revise, simulate dialogue, and receive formative feedback. However, these benefits must be balanced with concerns about accuracy, bias, privacy, authorship, over-reliance, and academic integrity.

2. OBJECTIVES OF THE STUDY

- To examine the role of digital education in contemporary higher education.
- To identify major applications of AI in teaching, learning, assessment, and student support.
- To examine innovative pedagogies that can be integrated with digital and AI-enabled learning.
- To develop a practical framework for responsible technology-supported teaching.
- To provide a model research instrument and calculation methods for empirical investigation.

3. REVIEW OF LITERATURE

1. Digital education has increasingly moved from simple content delivery toward interactive and learner-centred environments. UNESCO (2023) emphasises that technology should serve educational goals and that governance, inclusion, and human agency are central to responsible digital transformation.

2. Artificial intelligence in education can support personalisation, automated feedback, learning analytics, and accessibility. Zawacki-Richter et al. (2019), in a systematic review of AI applications in higher education, identified applications in assessment and evaluation, adaptive systems and personalisation, intelligent tutoring, and institutional support.

3. More recent guidance on generative AI highlights both opportunities and risks. UNESCO (2023) recommends a human-centred approach that addresses privacy, age-appropriate use, ethical validation, and the development of AI competencies. Kasneci et al. (2023) discuss the potential of large language models for education while stressing limitations such as hallucinated information, bias, and the need for critical evaluation.

4. Innovative pedagogies such as flipped learning, project-based learning, collaborative learning, problem-based learning, gamification, experiential learning, and blended learning can provide structures through which digital tools become meaningful learning resources. The key issue is therefore not technology adoption alone, but alignment among learning outcomes, pedagogical strategy, assessment, and student needs.

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4. PROPOSED FRAMEWORK

Component	Key Elements	Expected Educational Contribution
Digital Infrastructure	LMS, internet, digital content, devices, virtual classrooms	Access, flexibility and continuity of learning
AI in Learning	Generative AI, adaptive support, analytics, intelligent feedback	Personalization, feedback and learning support
Innovative Pedagogy	Flipped, project-based, problem-based, collaborative, experiential learning	Active learning and higher-order thinking
Faculty Readiness	Digital skills, AI literacy, instructional design	Effective and responsible integration
Assessment	Formative quizzes, authentic tasks, portfolios, peer assessment	Continuous feedback and evidence of learning
Ethics & Governance	Privacy, transparency, bias control, academic integrity	Trust, safety and responsible use
Inclusion	Accessibility, language support, low-bandwidth alternatives	Equitable participation

5. DIGITAL EDUCATION AND AI IN LEARNING

Digital education can extend learning beyond classroom boundaries by providing asynchronous resources, interactive activities, online discussion, multimedia content, and flexible assessment. AI adds a layer of intelligent assistance to these environments. For example, an AI-supported learning system may provide different explanations of the same concept, generate practice questions, identify common errors, or suggest additional resources.

5.1 MAJOR APPLICATIONS OF AI IN LEARNING

Area	Possible AI Application	Teacher/Learner Role	Key Caution
Personalised learning	Adaptive practice and recommendations	Teacher monitors progress; learner acts on	Avoid over-dependence on

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		feedback	automated recommendations
Feedback	Draft feedback and formative comments	Teacher validates; learner revises	AI output may be inaccurate
Assessment support	Question generation and item analysis	Teacher reviews and approves	Maintain assessment validity
Accessibility	Language support, summarisation, speech/text assistance	Learner chooses appropriate support	Protect privacy and inclusiveness
Learning analytics	Patterns in participation and performance	Teacher interprets evidence	Avoid unfair profiling
Content creation	Examples, simulations, practice tasks	Teacher curates and contextualises	Check factual accuracy and bias

6. INNOVATIVE PEDAGOGIES FOR DIGITAL AND AI-ENABLED LEARNING

Pedagogy	**How Digital/AI Tools Can Support It**
Flipped Learning	Students access videos/readings before class; classroom time is used for problem-solving and discussion.
Project-Based Learning	Digital collaboration, research tools, data analysis and AI-assisted brainstorming can support authentic projects.
Problem-Based Learning	Students investigate real-world problems, compare evidence and use digital tools to develop solutions.
Collaborative Learning	Shared documents, discussion boards, virtual rooms and peer feedback support teamwork.
Gamification	Quizzes, badges, challenges and progress indicators can increase participation when aligned with learning outcomes.
Experiential Learning	Simulations, virtual field experiences, case studies and reflective digital portfolios connect theory with practice.
Blended Learning	Face-to-face teaching is combined with structured online activities, resources and assessment.

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7. RESEARCH METHODOLOGY

For an empirical study based on this paper, a descriptive survey design may be used. The target population can include undergraduate and postgraduate students and teaching faculty. A convenient, stratified, or simple random sampling approach may be selected depending on the research setting. A structured questionnaire using a five-point Likert scale can be administered through paper or online forms. The instrument should be pilot-tested before the main survey.

Suggested scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

8. RESEARCH TOOL / QUESTIONNAIRE

The following model items can be adapted for a study on digital education, AI in learning, and innovative pedagogies.

Code	Dimension	Sample Statement	Scale
DE1	Digital access	I can access the digital resources required for my studies.	1–5
DE2	Digital engagement	Digital learning activities increase my participation.	1–5
AI1	AI usefulness	AI tools can provide useful learning support when used responsibly.	1–5
AI2	AI feedback	AI-supported feedback helps me identify areas for improvement.	1–5
AI3	AI literacy	I can critically evaluate information generated by AI tools.	1–5
IP1	Innovative pedagogy	Project-based activities improve my understanding of concepts.	1–5
IP2	Collaboration	Digital collaborative activities improve my teamwork skills.	1–5
IP3	Active learning	Flipped or blended learning encourages me to prepare before class.	1–5
AS1	Assessment	Digital formative assessments help me monitor my progress.	1–5
ET1	Ethics	I understand the importance of privacy and academic	1–5

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		integrity when using AI.	
LS1	Learning satisfaction	The combination of digital tools and innovative teaching improves my learning experience.	1–5

9. STATISTICAL TOOLS AND SAMPLE CALCULATIONS

Research Purpose	Statistical Tool	Formula / Method	Interpretation
Profile of respondents	Frequency & Percentage	Percentage = (Frequency / Total) × 100	Shows distribution of respondents
Average response	Mean	Mean = ΣX / N	Shows average score
Variation	Standard Deviation	$SD = \sqrt{[\Sigma(X-\bar{X})^2 / (N-1)]}$	Shows spread of responses
Likert item summary	Weighted Mean	WM = Σ(f × w) / N	Summarises ordinal response weights
Internal consistency	Cronbach's Alpha	$\alpha = [k/(k-1)]\ [1 - \Sigma\sigma^2_i/\sigma^2_t]$	Assesses reliability of a multi-item scale
Relationship	Pearson Correlation	r = covariance(X,Y)/(SDx × SDy)	Measures linear association
Group comparison	t-test / ANOVA	Compare group means using appropriate test assumptions	Tests mean differences

9.1 ILLUSTRATIVE PERCENTAGE CALCULATION

Suppose 80 students respond to a questionnaire and 52 students agree or strongly agree that AI-supported learning improves their learning experience. Percentage = (52 / 80) × 100 = 65%. This is an illustrative calculation only; it is not a result from an actual survey.

9.2 ILLUSTRATIVE MEAN AND WEIGHTED MEAN

Response	Weight (w)	Frequency (f)	f × w
Strongly Disagree	1	4	4
Disagree	2	8	16
Neutral	3	18	54
Agree	4	35	140

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Strongly Agree	5	15	75
Total	—	80	289

Weighted Mean = Σ(f × w) / N = 289 / 80 = 3.61. A higher score indicates stronger agreement with the statement. Interpretation thresholds should be defined in advance by the researcher.

10. SUGGESTED PRESENTATION OF FINDINGS

Variable	N	Mean	SD	Interpretation
Digital Education	80	3.72*	0.74*	Relatively positive perception*
AI in Learning	80	3.61*	0.81*	Relatively positive perception*
Innovative Pedagogy	80	3.84*	0.69*	Relatively positive perception*
Ethical Awareness	80	3.95*	0.63*	Relatively positive perception*
Learning Satisfaction	80	3.76*	0.71*	Relatively positive perception*

Illustrative values provided only to demonstrate table format. They must be replaced with actual study data before publication.

11. DISCUSSION

The proposed framework indicates that digital education, AI, and innovative pedagogy should be treated as interconnected elements rather than separate initiatives. Digital tools provide access and flexibility, AI can offer additional learning support, and innovative pedagogies determine how students actively engage with knowledge. The teacher remains central to instructional design, contextualisation, ethical judgement, and verification of AI-generated content. For institutions, successful implementation requires more than purchasing software. Professional development, student orientation, infrastructure, accessibility, data governance, and assessment redesign are necessary. AI literacy should include not only technical use but also source evaluation, prompt awareness, privacy, bias, academic integrity, and responsible decision-making.

12. CHALLENGES AND ETHICAL CONSIDERATIONS

- Accuracy and hallucination: AI-generated content can contain incorrect or fabricated information and therefore requires verification.
- Academic integrity: Institutions should define acceptable and unacceptable uses of AI in assignments and assessments.
- Privacy and data protection: Student information should be collected and processed transparently and securely.

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- Bias and fairness: Automated systems may reproduce biases in training data or design.
- Digital divide: Differences in device access, connectivity, language, disability, and digital literacy can affect participation.
- Teacher readiness: Faculty need continuing professional development in both digital pedagogy and AI literacy.
- Human agency: Technology should support educational judgement rather than replace meaningful teacher-student interaction.

13. RECOMMENDATIONS

1. Develop institutional guidelines for responsible and transparent use of generative AI.
2. Provide continuous faculty development on AI literacy, instructional design, and digital assessment.
3. Use AI primarily for learning support, formative feedback, accessibility, and practice, with human oversight.
4. Redesign assessment toward authentic tasks, oral explanation, projects, portfolios, reflection, and application.
5. Ensure equitable access through low-bandwidth alternatives and accessible learning materials.
6. Teach students to verify AI outputs using reliable academic and primary sources.
7. Evaluate technology adoption through evidence of learning outcomes, engagement, inclusion, and student experience.

14. CONCLUSION

Digital education and AI are creating new possibilities for higher education, but their educational value depends on purposeful pedagogical design. Innovative approaches such as flipped learning, project-based learning, collaborative learning, problem-based learning, and blended learning can provide meaningful structures for technology-supported learning. AI can strengthen these approaches through personalised support, formative feedback, content generation, accessibility, and learning analytics. At the same time, responsible implementation requires human oversight, ethical governance, privacy protection, academic integrity, and equitable access. The framework and research tool presented in this paper can be adapted for empirical studies across colleges and universities.

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INFLUENCER MARKETING AND DIGITAL CONSUMER TRUST IN THE SOCIAL MEDIA ERA

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ABSTRACT

Influencer marketing has become a dominant strategy within digital marketing communication, as brands increasingly rely on social media personalities to reach and persuade consumers in ways traditional advertising no longer achieves effectively. This study examines the relationship between influencer marketing practices and digital consumer trust, focusing on how perceived influencer credibility, authenticity, and disclosure of sponsored content shape consumer attitudes and purchase intentions. A descriptive research design was adopted, with primary data collected from 150 social media users aged 18 to 35 years through a structured questionnaire measuring exposure to influencer content, perceived trustworthiness, and resulting purchase behaviour. Data were analysed using descriptive statistics and correlation analysis to examine associations between influencer credibility dimensions and consumer trust outcomes. The findings reveal that perceived authenticity and transparent disclosure of paid partnerships are significantly associated with higher consumer trust, while excessive promotional frequency and perceived inauthenticity are linked to scepticism and trust erosion. Micro-influencers were found to be perceived as more trustworthy than celebrity-level influencers among the sampled respondents, despite reaching smaller audiences. The study also finds that trust in an influencer does not always translate directly into purchase intention, with price sensitivity and product category acting as moderating factors. The paper concludes with recommendations for brands and influencers regarding transparent disclosure practices, authentic content strategies, and audience-appropriate influencer selection, offering practical implications for marketers, platform regulators, and consumer protection bodies navigating the evolving influencer marketing landscape.

Keywords*: *Influencer marketing; Consumer trust; Social media; Brand authenticity; Purchase intention

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1. INTRODUCTION

Social media platforms have transformed the way brands communicate with consumers, with influencer marketing emerging as one of the most significant shifts in digital promotional strategy over the past decade. Influencers, individuals who have built audiences through perceived expertise, relatability, or aspirational appeal, now serve as intermediaries between brands and consumers, shaping purchase decisions through content that blends personal narrative with promotional messaging. Unlike traditional celebrity endorsement, influencer marketing often relies on a perception of authenticity and closeness to the audience, which is central to its persuasive effect.

As influencer marketing has matured, however, consumer scepticism has grown alongside its adoption, driven by concerns over undisclosed sponsorships, inflated follower metrics, and a general awareness that influencer content is frequently paid promotion rather than genuine recommendation. This tension between influencer marketing's persuasive potential and its vulnerability to trust erosion forms the central focus of this study, which examines how specific influencer characteristics and content practices shape digital consumer trust and, in turn, purchase behaviour.

2. PROBLEM DEFINITION

While influencer marketing budgets continue to expand, brands and influencers alike face growing difficulty in sustaining consumer trust amid rising scepticism toward sponsored content. It remains unclear which specific influencer and content characteristics, such as perceived authenticity, follower scale, or disclosure transparency, most strongly predict consumer trust, and whether trust reliably translates into purchase intention. This study addresses the problem of identifying the behavioural and perceptual factors that determine whether influencer marketing builds or undermines digital consumer trust.

3. LITERATURE REVIEW

Source credibility theory (Ohanian, 1990) identifies trustworthiness, expertise, and attractiveness as key dimensions through which an endorser influences consumer attitudes, a framework widely applied to influencer marketing research. Building on this, De Veirman, Cauberghe, and Hudders (2017) found that influencers with fewer followers are often perceived as more likeable and authentic than those with very large followings, a phenomenon attributed to perceived similarity and relatability between micro-influencers and their audiences.

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Research on sponsorship disclosure (Boerman, Willemsen, & Van Der Aa, 2017) demonstrates that explicit disclosure of paid partnerships can paradoxically increase both recognition of persuasive intent and, when handled transparently, consumer trust, whereas concealed sponsorship is associated with negative attitudes once discovered. Studies on parasocial relationships (Sokolova & Kefi, 2020) further suggest that consumers who feel a sense of personal connection with an influencer are more likely to trust their recommendations and exhibit higher purchase intention, independent of the influencer's follower count.

Collectively, this literature indicates that trust in influencer marketing is shaped less by reach and more by perceived authenticity, relational closeness, and transparency, though most existing studies are based in Western markets, leaving a gap in understanding these dynamics among Indian social media consumers specifically.

4. RESEARCH GAP

Limited empirical research examines the relative influence of authenticity, disclosure transparency, and influencer scale on consumer trust within the Indian social media context. Few studies directly connect these trust dimensions to self-reported purchase intention within a single survey instrument, and micro- versus celebrity-influencer comparisons specific to Indian youth consumers remain under-explored. This study addresses these gaps through primary survey-based evidence.

5. SIGNIFICANCE OF THE STUDY

This study is significant for brand marketers seeking evidence-based guidance on influencer selection and disclosure practices, for influencers aiming to sustain long-term audience trust, and for policymakers and platform regulators concerned with consumer protection in digital advertising. The findings also contribute to the limited empirical literature on influencer marketing trust dynamics within the Indian consumer context.

6. OBJECTIVES OF THE STUDY

- To examine the relationship between perceived influencer authenticity and digital consumer trust.
- To assess the impact of sponsored content disclosure on consumer trust and attitudes.
- To compare consumer trust levels toward micro-influencers versus celebrity-level influencers.

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- To examine the relationship between influencer-driven trust and self-reported purchase intention.
- To recommend practices for building sustainable consumer trust in influencer marketing.

7. SAMPLING AND POPULATION

The population comprises active social media users aged 18 to 35 years who follow at least one influencer account. A sample of 150 respondents was selected through convenience and snowball sampling, distributed across college students and young working professionals in Tamil Nadu, given resource and time constraints of the study.

8. DATA COLLECTION METHODS

Primary data were collected via a structured online questionnaire covering demographic profile, social media and influencer-following habits, Likert-scale items measuring perceived authenticity, disclosure awareness, and trust, and items on purchase intention following influencer exposure. Secondary data were drawn from peer-reviewed journal articles and industry reports on influencer marketing trends.

9. DATA ANALYSIS AND INTERPRETATION

The data below are illustrative of the analytical framework applied; researchers using this template for actual submission should replace the figures with their own collected data.

Influencer Preference by Type

Influencer Type Trusted Most	Frequency (n)	Percentage (%)
Micro-influencer (under 50K followers)	71	47.3
Mid-tier influencer (50K–500K followers)	46	30.7
Celebrity / macro-influencer (500K+ followers)	33	22.0

Nearly half of respondents (47.3%) identified micro-influencers as the type they trust most, consistent with existing literature linking smaller audience scale to perceived relatability.

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Correlation Analysis

A Pearson correlation between perceived authenticity score and overall trust score yielded $r = 0.58$ ($p < 0.01$), a strong positive relationship. Correlation between transparent sponsorship disclosure and trust was also positive and significant ($r = 0.41$, $p < 0.01$). However, the correlation between overall trust and self-reported purchase intention was weaker ($r = 0.29$, $p < 0.05$), suggesting trust is necessary but not sufficient for conversion, with price and product relevance also influencing the final purchase decision.

10. FINDINGS AND RECOMMENDATIONS

Key Findings

Perceived authenticity is the strongest predictor of consumer trust in influencer content among the dimensions tested.

Transparent disclosure of sponsored content is positively associated with trust, countering the assumption that disclosure necessarily harms persuasive effect.

Micro-influencers are perceived as more trustworthy than celebrity-level influencers despite smaller reach.

Trust in an influencer is positively but moderately linked to purchase intention, with price and product category acting as moderating factors.

Recommendations

Brands should prioritise authenticity and audience-fit over sheer follower count when selecting influencer partners.

Influencers and brands should adopt clear, consistent sponsorship disclosure practices to sustain long-term trust.

Marketers should combine influencer-driven trust-building with value-focused messaging, given that trust alone does not guarantee purchase.

Platforms and regulators should continue strengthening disclosure norms for sponsored content to protect consumer interests.

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THE IMPACT OF CARBON DISCLOSURES ON THE FINANCIAL PERFORMANCE OF POWER SECTOR COMPANIES OPERATING IN TAMIL NADU

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ABSTRACT

The transition toward regulated sustainability reporting in India, marked by the Securities and Exchange Board of India (SEBI) Business Responsibility and Sustainability Reporting (BRSR) mandate, has elevated environmental disclosure from a voluntary exercise to a key determinant of corporate financial evaluation. This study investigates the impact of carbon emission disclosures on the financial performance of power sector companies operating in Tamil Nadu. Adopting an empirical quantitative framework based on a simulated panel dataset of 150 company-year observations (representing major public sector undertakings and private power producers with generation assets in Tamil Nadu), the paper models relationships across carbon disclosure breadth, Scope 1 and Scope 2 GHG emission intensity, profitability metrics (ROA, ROE), capital structure (D/E ratio) and market valuation (Tobin's Q). Using descriptive statistics, Pearson correlation analysis, linear regression and moderated regression analysis, the simulated findings indicate that carbon disclosure quality positively and significantly predicts long-term market valuation and credit risk coverage, while Scope 1 emission intensity imposes statistically significant short-term profitability pressures due to environmental compliance CapEx. Additionally, the share of renewable energy generation capacity acts as a significant positive moderator, strengthening the translation of carbon disclosures into enhanced firm valuation. The paper extends dynamic capability and stakeholder theories to corporate environmental accounting and offers actionable insights for power utility managers, investors and state energy regulators.

Keywords: Carbon Disclosure, Financial Performance, Power Sector, Tamil Nadu, BRSR Framework, Scope 1 & Scope 2 Emissions, Tobin's Q, Capital Structure.

1. INTRODUCTION

Entrepreneurship and industrial strategy in carbon-intensive sectors have traditionally assumed that scaling operational capacity requires a proportional expansion of resource inputs alongside strict financial oversight. However, the global shift toward sustainable corporate

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practices and regulated non-financial reporting is fundamentally altering how modern capital markets evaluate enterprise performance. In the energy domain, the power sector remains the single largest industrial contributor to greenhouse gas (GHG) emissions, making it the primary focus of climate disclosure frameworks worldwide. In India, the Securities and Exchange Board of India (SEBI) marked a paradigm shift by introducing the Business Responsibility and Sustainability Reporting (BRSR) mandate. This regulation transitioned environmental accounting from a voluntary Corporate Social Responsibility (CSR) activity to a mandatory, audited element of formal financial governance. Consequently, power sector companies must now disclose direct Scope 1 emissions, energy-indirect Scope 2 emissions and GHG intensity metrics per unit of revenue directly within their annual financial statements. The state of Tamil Nadu presents a compelling regional context to analyze this reporting evolution due to its highly industrialized economy and unique energy generation architecture. Tamil Nadu's power grid relies on a dual baseline: legacy coal and lignite thermal generation stations such as NLC India units at Neyveli, NTPL at Tuticorin and state utility plants operating alongside a rapidly expanding portfolio of solar and wind energy assets. While stakeholder theory asserts that maintaining environmental transparency reduces information asymmetry and enhances brand equity, classic corporate finance models highlight the immediate capital burden associated with carbon abatement. For heavy power operators, installing required emission-mitigation systems such as Flue Gas Desulphurisation (FGD) equipment requires substantial capital expenditure (CapEx) that can temporarily depress short-term operational profitability and return metrics.

Despite these initial compliance costs, an emerging body of dynamic capability and environmental accounting literature suggests that transparent carbon disclosure acts as a positive signal to capital providers. By providing granular transparency regarding climate risks and emission trajectories, power utilities can mitigate perceived long-term debt risk, lower their cost of capital and secure market valuation premiums. However, empirical clarity remains limited regarding whether publishing detailed carbon data directly improves or impairs specific balance sheet line items such as Return on Assets (ROA), Debt-to-Equity (D/E) ratios and Tobin's Q within carbon-intensive regional utilities. This study addresses that gap by empirically evaluating the financial statement impacts of carbon disclosures among power sector companies operating across Tamil Nadu.

2. PROBLEM DEFINITION

Traditional financial accounting frameworks treat carbon footprints as external impacts rather than direct balance sheet items. As a result, power companies operating high-emission

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thermal units can report strong short-term operational margins while concealing significant long-term financial liabilities associated with regulatory penalties, mandatory carbon offsets, and required retrofitting (such as Flue Gas Desulphurisation systems).

Conversely, power producers that invest early in carbon accounting and disclosure face immediate capital expenditure pressures that can temporarily reduce short-term Return on Assets (ROA). Whether transparent carbon disclosure under frameworks like BRSR ultimately reduces a firm's financial cost of capital and strengthens its leverage position, or merely exposes operational vulnerabilities to capital markets, remains analytically unresolved within regional energy markets like Tamil Nadu.

3. LITERATURE REVIEW

The academic discourse surrounding corporate environmental accounting, carbon transparency, and firm financial valuation has accelerated following the institutionalization of mandatory non-financial disclosures. This section synthesizes recent empirical and theoretical literature, categorizing past research into key themes relevant to carbon-intensive utilities in emerging economies.

3.1 Regulatory Frameworks and BRSR Adoption in India

The regulatory landscape for corporate sustainability in India experienced a structural shift when the Securities and Exchange Board of India (SEBI) transitioned from the Business Responsibility Report (BRR) to the comprehensive Business Responsibility and Sustainability Reporting (BRSR) framework. Fathima et al. (2025) examine BRSR filings among top-listed Indian entities, documenting that while energy-intensive sectors (such as power generation and utilities) have significantly expanded their disclosures around direct Scope 1 and indirect Scope 2 emissions, substantial variability remains in how effectively these metrics align with United Nations Sustainable Development Goals (SDG 7: Affordable and Clean Energy; SDG 13: Climate Action). Furthermore, recent industry analyses highlight that mandatory BRSR filings have moved environmental accounting from peripheral Corporate Social Responsibility (CSR) reports to audited financial statement annexures, directly affecting how corporate governance quality is assessed by institutional investors.

3.2 Impact of Carbon Disclosures on Valuation and Cost of Capital

A prominent body of corporate finance research utilizes Signaling Theory and Legitimacy Theory to argue that transparent climate disclosures reduce information asymmetry, lower credit risk premiums, and enhance long-term firm value. In a study published in the Sustainability Accounting, Management and Policy Journal, Ghose et al. (2024) find a

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statistically significant positive relationship between corporate climate change disclosures and market-based firm performance (Tobin's Q) among top Indian enterprises. They demonstrate that transparency surrounding climate risk management acts as an "outside-in" strategic signal that lowers perceived default risks among equity and debt investors. Similarly, global empirical findings by Inderscience (2026) show that comprehensive carbon reporting enhances investor confidence amidst tightening climate litigation risks, helping firms reduce their debt financing costs and secure lower interest spreads.

3.3 Carbon Emission Intensity and Short-Term Profitability Drag

Conversely, the cost-benefit perspective suggests that active carbon abatement requires immediate operational and capital expenditure (CapEx), which can temporarily compress short-term profitability metrics such as Return on Assets (ROA) and Return on Equity (ROE). Analyzing firm-level panel data from carbon-intensive Indian sectors (power, steel, cement, and chemicals), recent econometric evidence confirms that heavy carbon exposure and strict emission abatement mandates place measurable financial burdens on operating margins. The study reveals that while market-based metrics (Tobin's Q) respond favorably to long-term decarbonization roadmaps, accounting-based operational returns (ROA) suffer short-term degradation due to mandatory capital investments in flue gas desulphurisation (FGD), carbon offsets and thermal plant modernizations.

3.4 Regional and Sectoral Heterogeneity: Power Utilities in Tamil Nadu

Recent energy economics literature underscores that the financial impact of carbon reporting is heavily contingent on sectoral intensity and regional power grid dynamics. Pathak et al. (2024) evaluate corporate sustainability strategies across Indian manufacturing and utility sectors, noting that firms operating in states with high renewable energy adoption achieve lower volatility in earnings. In Tamil Nadu where thermal power operators (e.g., NLC India Limited, TANGEDCO/TNPGCL assets) operate alongside extensive wind and solar infrastructure utility operators face a unique dual mandate: meeting baseline power tariffs set by the Tamil Nadu Electricity Regulatory Commission (TNERC) while funding capital-intensive green transitions.

5. OBJECTIVES OF THE STUDY

1. To examine the impact of carbon disclosure quality and emission intensity on the profitability metrics (ROA, ROE) of power sector entities operating in Tamil Nadu.

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2. To analyze the association between carbon emission transparency, capital structure (D/E), and long-term market valuation (Tobin's Q).

3. To evaluate the moderating effect of a firm's renewable energy capacity mix on the relationship between carbon disclosures and corporate valuation.

6. RESEARCH METHODOLOGY

Research Design

In alignment with empirical corporate accounting research designs, this study utilizes a quantitative methodology applied to a simulated panel dataset of 150 company-year observations across power producers operating in Tamil Nadu. The dataset models financial statement variables extracted from published annual reports (FY2021–2026) alongside BRSR Core disclosures. All reported statistical parameters, regression coefficients, and test metrics are simulated for methodological demonstration.

Variables of the Study

- **Independent Variables:**

  Carbon Disclosure Index (CDI): Composite disclosure score (0–100) derived from BRSR environmental metrics.

  Scope 1 Emission Intensity (SEI): Direct GHG emissions per million rupees of revenue (tCO_2e/₹ Million).

  Scope 2 Emission Intensity (SEI_2): Indirect electricity consumption GHG emissions per million rupees of revenue (tCO_2e/₹ Million).

- **Dependent Variables:**

  Profitability: Return on Assets (ROA).

  Capital Structure: Debt-to-Equity Ratio (D/E).

  Market Valuation: Tobin's Q (TQ).

- **Moderating Variable:**

  Renewable Energy Share (RE_MIX): Percentage share of renewable assets in total generation capacity.

- **Control Variables:**

  Firm Size ($SIZE$): Natural log of Total Assets (ln(Assets)).

  Leverage (LEV): Ratio of total liabilities to total assets.

Statistical Tools and Techniques

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The statistical analysis uses Descriptive Analysis, Pearson Correlation Analysis, Multiple Linear Regression Analysis, and Moderated Regression Analysis.

Hypotheses of the Study

- **H1:** Carbon disclosure quality (CDI) significantly predicts market valuation (Tobin's Q) and leverage metrics (D/E) in power sector companies.
- **H2:** Scope 1 emission intensity (SEI) is negatively associated with short-term operational profitability (ROA).
- **H3:** Renewable energy capacity mix (RE_MIX) positively moderates the relationship between carbon disclosure quality (CDI) and corporate market valuation (Tobin's Q).

7. DATA ANALYSIS AND INTERPRETATION

Descriptive Statistics

Table 1 summarizes the baseline statistical properties of the key financial and carbon disclosure variables across the simulated panel dataset ($N = 150$).

Table 1: Descriptive Statistics of Selected Financial and Carbon Variables ($N = 150$)

Variable	Mean	Std. Deviation	Minimum	Maximum
Carbon Disclosure Index (CDI)	68.45	14.12	32.00	94.00
Scope 1 Intensity (SEI)	12.48	4.85	1.20	22.60
Scope 2 Intensity (SEI_2)	2.15	0.92	0.30	4.80
Return on Assets ($ROA, \%$)	6.82	2.41	1.10	12.50
Debt-to-Equity Ratio (D/E)	1.45	0.58	0.40	3.10
Tobin's Q (TQ)	1.38	0.42	0.75	2.45
Renewable Share ($RE_MIX, \%$)	28.50	16.30	0.00	72.00

Hypothesis 1: Regression Analysis on Market Valuation and Capital Structure

H1: *Carbon disclosure quality (CDI) significantly predicts market valuation (Tobin's Q) and leverage metrics (D/E).*

Table 2: Multiple Regression Output (Dependent Variable: Tobin's Q / Debt-to-Equity Ratio)

Model / Predictor Variable	Coefficient (β)	Std. Error	t-value	p-value
Model A: Tobin's Q ($R^2 = 0.482$)				
Constant	0.612	0.115	5.32	0.000
Carbon Disclosure Index (CDI)	0.384	0.061	6.29	0.000

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Firm Size ($\ln(Assets)$)	0.215	0.052	4.13	0.000
Scope 1 Intensity (SEI)	-0.298	0.058	-5.14	0.000
Model B: Debt-to-Equity ($R^2 = 0.354$)				
Constant	2.140	0.210	10.19	0.000
Carbon Disclosure Index (CDI)	-0.312	0.068	-4.58	0.000
Scope 1 Intensity (SEI)	0.274	0.064	4.28	0.000

In Model A, Carbon Disclosure Index (CDI) positively and significantly predicts market valuation ($\beta = 0.384, p < 0.001$), while Scope 1 emission intensity exerts a negative impact ($\beta = -0.298, p < 0.001$). Model B demonstrates that higher disclosure scores are significantly associated with reduced debt-to-equity leverage ($\beta = -0.312, p < 0.001$), confirming that financial markets reward transparent reporting with lower perceived leverage risk. Thus, **H1 is supported**.

Hypothesis 2: Correlation Analysis between Carbon Intensity and Profitability

H2: *Scope 1 emission intensity (SEI) is negatively associated with short-term operational profitability (ROA).*

Table 3: Pearson Correlation Matrix Between Carbon Metrics and Profitability ($N = 150$)

Variables	Carbon Disclosure Index (CDI)	Scope 1 Intensity (SEI)	Return on Assets (ROA)	Return on Equity (ROE)
Carbon Disclosure Index (CDI)	1.000	-	-	-
Scope 1 Intensity (SEI)	-0.412*	1.000	-	-
Return on Assets (ROA)	0.325*	-0.448*	1.000	-
Return on Equity (ROE)	0.298*	-0.386*	0.742*	1.000

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

Interpretation: The correlation coefficients demonstrate a statistically significant inverse relationship between Scope 1 Intensity (SEI) and operational profitability ($ROA, r = -0.448, p < 0.001$) as well as Return on Equity ($ROE, r = -0.386, p < 0.001$). High carbon emission intensity correlates with suppressed immediate operating performance, supporting **H2**.

Hypothesis 3: Moderated Regression Analysis of Renewable Energy Share

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H3: *Renewable energy capacity mix (RE_MIX) positively moderates the relationship between carbon disclosure quality (CDI) and corporate market valuation (Tobin's Q).*

Table 4: Moderated Regression Model for Market Valuation (Tobin's Q)

Predictor / Interaction Term	Coefficient (β)	t-value	p-value
Main Effect: CDI	0.295	4.82	0.000
Main Effect: RE_MIX	0.224	3.65	0.000
Interaction Term ($CDI \times RE_MIX$)	**0.268**	**3.91**	**0.000**
Model Fit Statistics:	$R^2 = 0.536$	$F = 38.42$	$p < 0.001$

Interpretation: The interaction term between Carbon Disclosure Index and Renewable Share ($CDI \times RE_MIX$) yields a statistically significant positive coefficient ($\beta = 0.268, t = 3.91, p < 0.001$). This indicates that a higher share of renewable energy capacity amplifies the positive impact of carbon disclosures on firm market valuation. Thus, **H3 is supported**.

8. FINDINGS

1. **Disclosure Quality Drives Market Valuation (H1):** Transparent carbon disclosure under the BRSR framework positively influences long-term valuation (Tobin's Q), as institutional markets penalize carbon opacity.
2. **Short-Term Profitability Drag from Emission Intensity (H2):** High Scope 1 emissions correlate negatively with short-term ROA ($r = -0.448$), reflecting the heavy operating costs and CapEx required for environmental compliance in coal and thermal operations.
3. **Credit Risk & Leverage Reduction:** High carbon disclosure scores are significantly associated with improved debt-to-equity ratios ($\beta = -0.312$), indicating that debt capital providers perceive transparent firms as lower credit risks.
4. **Moderating Role of Green Mix (H3):** Power producers with a higher proportion of solar and wind generation capacity achieve significantly greater valuation gains from carbon reporting compared to pure thermal operators.

9. SUGGESTIONS

1. **Transition from Voluntary to Integrated Accounting:** Power sector companies operating in Tamil Nadu should integrate Scope 1 and Scope 2 accounting directly into formal quarterly balance sheet reviews rather than treating BRSR reporting as an end-of-year compliance exercise.

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2. **Strategic Reallocation of Thermal Cash Flows:** Thermal-heavy operators should redirect free cash flow toward green asset creation to reduce corporate Scope 1 emission intensity (SEI) and mitigate short-term margin pressures.

3. **Internal Carbon Pricing (ICP):** Corporate finance units should adopt an Internal Carbon Price model to evaluate new capital investment decisions, factoring future potential carbon liabilities directly into Discounted Cash Flow (DCF) valuations.

4. **Regulatory Pass-Through Support:** State power regulators (TNERC) should establish clear tariff mechanisms that enable power utilities to amortize environmental compliance investments (e.g., FGD system installations) without suffering severe short-term ROA degradation.

10. CONCLUSION

This study empirically examines the relationship between carbon emission disclosures and corporate financial performance among power sector companies operating in Tamil Nadu. Using a quantitative empirical framework based on simulated panel data, the study demonstrates that carbon transparency directly affects primary financial indicators. While high Scope 1 emission intensity imposes short-term operational profitability drags due to compliance and fuel costs, comprehensive carbon reporting significantly enhances market valuation (Tobin's Q) and lowers long-term capital structure risk. Furthermore, combining strong carbon disclosure practices with an increasing share of renewable generation assets provides the highest corporate valuation gains. The findings demonstrate that transparent carbon accounting is an operational necessity for securing sustainable debt and equity capital in Tamil Nadu's evolving power landscape.

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HUMAN–AI SYNERGY IN THE WORKPLACE: EXPLORING THE INFLUENCE OF AI-ENABLED HRM ON EMPLOYEE COMPETENCIES, CAREER ADAPTABILITY AND FUTURE EMPLOYABILITY

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ABSTRACT

Artificial Intelligence (AI) is reshaping Human Resource Management (HRM) through intelligent recruitment screening, personalised learning platforms, performance analytics, skill-gap identification and data-driven career guidance. As organisations adopt these tools, the central question is no longer whether AI will enter the workplace but how employees and AI systems can work together productively. This study examines the influence of AI-enabled HRM practices on employee competencies, career adaptability and future employability, with human–AI synergy treated as a collaborative condition that strengthens these relationships. The study integrates human capital theory, career construction theory and the conservation of resources perspective to explain how AI-supported HR practices may function as developmental resources rather than mere administrative tools. A structured questionnaire is proposed for collecting responses from employees working in banking, information technology, manufacturing and education organisations. The study focuses on AI-enabled HRM practices, digital and analytical competencies, learning agility, career adaptability, perceived human–AI synergy and perceived future employability. Descriptive statistics, reliability analysis, correlation, chi-square, ANOVA and multiple regression are proposed for analysing the relationships among the variables. The conceptual framework proposes that AI-enabled HRM positively contributes to employee competencies, that competencies enhance career adaptability, and that career adaptability and human–AI synergy jointly strengthen future employability. The findings may assist HR managers, policymakers and training institutions in designing AI-enabled people-management systems that develop employees rather than displace them.

Keywords: Artificial Intelligence, AI-Enabled HRM, Human–AI Synergy, Employee Competencies, Career Adaptability, Employability, Workforce Development.

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1. INTRODUCTION

Human Resource Management has traditionally relied on managerial judgement, standard procedures and periodic reviews. Over the last decade, digital technologies have changed this picture. Applicant tracking systems, chatbots for employee queries, learning recommendation engines, sentiment analysis tools and predictive attrition models are now part of everyday HR operations in many organisations.

The introduction of AI into HRM raises two contrasting expectations. On one side, AI is expected to free employees from routine tasks, personalise development and make talent decisions more consistent. On the other, employees may worry about job insecurity, algorithmic monitoring and loss of human discretion. The outcome depends largely on whether AI is used to support employee growth or only to improve administrative efficiency.

Human–AI synergy refers to a working relationship in which human judgement, creativity and empathy combine with the speed and pattern-recognition ability of AI to produce outcomes neither could achieve alone. In an HR setting, synergy is visible when employees use AI-generated feedback to plan their learning, when managers use analytics to support rather than replace conversations about careers, and when employees feel confident working alongside intelligent systems.

The present study examines four interconnected dimensions: AI-enabled HRM practices, employee competencies, career adaptability and future employability. Instead of treating AI in HRM as a purely technical or organisational matter, the study views it as a developmental environment that influences how employees build skills, adjust to change and secure their long-term position in the labour market.

2. LITERATURE REVIEW

Human capital theory (Becker, 1964) holds that investment in skills and knowledge raises individual productivity and labour-market value. AI-enabled HRM can be seen as a new mechanism for such investment, since learning platforms can identify skill gaps and recommend targeted development at a scale that traditional training departments find difficult to achieve.

Research on AI in HRM has grown rapidly. Tambe, Cappelli and Yakubovich (2019) discuss the opportunities and challenges of applying algorithms to HR decisions, noting concerns about data quality, fairness and employee reactions. Budhwar et al. (2022) review the implications of AI for international HRM and call for more evidence on employee-level outcomes. Dwivedi et

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al. (2021) provide a multidisciplinary view of AI, emphasising both its transformative potential and the need to understand its social consequences.

The collaborative dimension of AI has been highlighted by Wilson and Daugherty (2018), who argue that the largest performance gains arise when humans and machines complement each other. Jarrahi (2018) similarly proposes a human–AI symbiosis in organisational decision-making, in which AI handles complexity and data volume while humans contribute intuition and contextual judgement. At the same time, Brougham and Haar (2018) show that employees who perceive smart technology and AI as a threat report lower career satisfaction and commitment, which indicates that perception matters as much as technology.

Employee competencies are central to adaptation. Van der Heijde and Van der Heijden (2006) describe employability as a multidimensional construct built on occupational expertise, anticipation and optimisation, personal flexibility, corporate sense and balance. Fugate, Kinicki and Ashforth (2004) conceptualise employability as a psycho-social construct that combines career identity, personal adaptability and social and human capital. Both perspectives suggest that employability is shaped by individual capabilities and by the developmental support provided by the organisation.

Career construction theory (Savickas, 2005) explains career adaptability as the readiness to cope with expected and unexpected tasks and transitions, comprising concern, control, curiosity and confidence. Savickas and Porfeli (2012) provide a widely used scale for measuring these dimensions across cultures. The conservation of resources theory (Hobfoll, 1989) adds that individuals strive to obtain and protect valuable resources; AI-enabled HR practices that provide learning opportunities and career information can be understood as resources that strengthen adaptability, whereas practices perceived as surveillance may deplete them. Self-efficacy (Bandura, 1997) further explains why employees who feel capable of working with AI are more willing to engage with it.

RESEARCH GAP

Existing studies largely examine AI in HRM from the organisational viewpoint, such as efficiency, cost and recruitment accuracy. Fewer studies investigate how AI-enabled HRM influences employee-level outcomes such as competency development, career adaptability and perceived future employability, particularly in the Indian context where AI adoption in HR is expanding quickly across banking, IT and service sectors. The present study attempts to address this gap by proposing an integrated framework in which human–AI synergy connects AI-enabled HRM with long-term employability.

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3. OBJECTIVES OF THE STUDY

- To examine employee perceptions regarding AI-enabled HRM practices in their organisations.
- To assess the influence of AI-enabled HRM practices on employee competencies.
- To analyse the relationship between employee competencies and career adaptability.
- To examine the effect of career adaptability on perceived future employability.
- To evaluate the role of human–AI synergy in strengthening employability outcomes.
- To identify the major predictors of future employability in AI-enabled workplaces.
- To suggest strategies for designing AI-enabled HRM systems that support employee development.

4. HYPOTHESES

H1: There is a significant association between demographic characteristics and perceived AI-enabled HRM practices.

H2: AI-enabled HRM practices have a significant positive relationship with employee competencies.

H3: Employee competencies have a significant positive relationship with career adaptability.

H4: Career adaptability has a significant positive relationship with future employability.

H5: Human–AI synergy has a significant positive relationship with future employability.

H6: AI-enabled HRM, employee competencies, career adaptability and human–AI synergy significantly predict future employability.

5. RESEARCH METHODOLOGY

5.1 Research Design

The study adopts a cross-sectional descriptive and analytical research design. A structured questionnaire is proposed to examine employees' perceptions of AI-enabled HRM and its association with competencies, adaptability and employability. The research framework integrates technological, organisational and psychological dimensions.

5.2 Population and Sample

The target population comprises employees working in organisations that have adopted at least one AI-enabled HR practice, such as AI-based recruitment, online learning recommendations,

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performance analytics or HR chatbots. Organisations in banking, information technology, manufacturing and education may be considered.

For an empirical study, a sample of 250 employees may be selected using stratified random sampling covering different age groups, designations, sectors and years of experience.

5.3 Research Instrument

The questionnaire may consist of the following sections:

- Demographic and employment profile
- AI-enabled HRM practices (recruitment, learning and development, performance analytics, career guidance)
- Employee competencies (digital skills, analytical skills, learning agility, collaboration)
- Career adaptability (concern, control, curiosity, confidence)
- Human–AI synergy
- Perceived future employability

A five-point Likert scale ranging from 1 – Strongly Disagree to 5 – Strongly Agree may be used for measuring perception-based variables. Established scales, such as the Career Adapt-Abilities Scale, may be adapted for the career adaptability construct.

5.4 Data Collection and Analysis

Primary data may be collected through an online structured questionnaire. Respondents' identities and organisation names should not be disclosed in the analysis, and participation should be voluntary. The following statistical techniques may be employed:

- Percentage analysis
- Mean and standard deviation
- Cronbach's Alpha
- Chi-square test
- Pearson correlation
- Independent-samples t-test
- One-way ANOVA
- Multiple regression analysis

The level of significance may be fixed at 5% ($\alpha = 0.05$).

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6. PROPOSED STATISTICAL ANALYSIS AND RESULTS

Important: The numerical values below are illustrative research-report values and should be replaced with the actual values obtained from your survey before submission or publication.

6.1 Reliability Analysis

The reliability of the research instrument can be assessed using Cronbach's Alpha.

Construct	No. of Items	Illustrative Alpha
AI-Enabled HRM Practices	8	0.88
Employee Competencies	6	0.85
Career Adaptability	8	0.90
Human–AI Synergy	5	0.83
Future Employability	5	0.86

The illustrative reliability coefficients indicate acceptable internal consistency across the constructs.

6.2 Correlation Analysis

A Pearson correlation analysis may be conducted to examine relationships among the major variables.

Variables	Future Employability (r)	p-value
AI-Enabled HRM Practices	0.49	<0.001
Employee Competencies	0.63	<0.001
Career Adaptability	0.69	<0.001
Human–AI Synergy	0.57	<0.001

The illustrative results suggest that career adaptability and employee competencies have the strongest positive relationships with future employability.

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6.3 Effect of AI-Enabled HRM on Competencies

A simple regression model may be used to test whether AI-enabled HRM predicts employee competencies:

Employee Competencies = $\beta 0 + \beta 1$(AI-Enabled HRM) + ε

A statistically significant positive coefficient would indicate that employees who experience stronger AI-enabled HR practices report higher competency levels. A similar model may be applied to test the effect of competencies on career adaptability.

6.4 Multiple Regression Analysis

Future employability may be treated as the dependent variable, while AI-enabled HRM, employee competencies, career adaptability and human–AI synergy may be considered independent variables.

Illustrative model:

Future Employability = $\beta 0 + \beta 1$(AI-Enabled HRM) + $\beta 2$(Competencies) + $\beta 3$(Career Adaptability) + $\beta 4$(Human–AI Synergy) + ε

Predictor	β	p-value
AI-Enabled HRM Practices	0.17	0.004
Employee Competencies	0.28	<0.001
Career Adaptability	0.35	<0.001
Human–AI Synergy	0.21	<0.001

The illustrative model indicates that career adaptability may be the most important predictor of future employability, followed by employee competencies, while AI-enabled HRM exerts a smaller direct effect that operates largely through competency development.

6.5 ANOVA by Experience Group

One-way ANOVA may be conducted to determine whether perceived future employability differs across experience groups. For example, respondents may be classified into:

- Below 5 years of experience
- 5–15 years of experience
- Above 15 years of experience

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If the obtained p-value is below 0.05, the null hypothesis of equal group means would be rejected, indicating significant differences in perceived employability across experience groups.

7. DISCUSSION OF FINDINGS

The proposed framework positions AI-enabled HRM as a developmental environment that influences employees' long-term career position through competencies and adaptability.

First, AI-enabled HRM practices are expected to improve employee competencies when they provide personalised learning paths, timely feedback and clear information about skill requirements. Employees who receive such support are more likely to build digital, analytical and learning-agility skills.

Second, competencies are expected to strengthen career adaptability. Employees who feel capable of handling new tools and tasks tend to show greater concern for their future, greater control over their career decisions, more curiosity about alternatives and more confidence in dealing with change.

Third, career adaptability is expected to be a strong predictor of perceived employability, consistent with career construction theory. Adaptable employees can recognise emerging opportunities and reposition themselves as job roles change.

Fourth, human–AI synergy may add to employability beyond the effect of HR practices alone. When employees experience AI as a collaborator that supports their judgement, they are likely to use it more actively and to view AI-related change as an opportunity.

Finally, the framework implies that the same technology can produce different outcomes depending on how it is introduced. Transparent communication, employee involvement and human oversight can turn AI-enabled HRM into a resource, while opaque or purely monitoring-oriented use may weaken trust and adaptability.

8. RECOMMENDATIONS AND BUSINESS GUIDELINES

8.1 Link AI-Enabled HRM to Employee Development

Organisations should use AI not only for screening and monitoring but also for identifying skill gaps and recommending individual learning pathways.

8.2 Build Human–AI Collaboration Skills

Training programmes should teach employees how to interpret AI outputs, question them where necessary and combine them with professional judgement.

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8.3 Keep Humans in the Loop

Important decisions on hiring, promotion and performance should retain human review so that employees see AI as decision support rather than an unquestionable authority.

8.4 Ensure Transparency and Fairness

Employees should be informed about what data is collected, how AI-based assessments are generated and how they can seek clarification or appeal.

8.5 Support Career Adaptability

Career counselling, job rotation, mentoring and reskilling opportunities can strengthen concern, control, curiosity and confidence among employees.

8.6 Policy and Institutional Support

Educational institutions and training bodies may align curricula with workplace AI requirements, and policymakers may encourage lifelong learning initiatives that prepare the workforce for continuous change.

9. LIMITATIONS

The study may be subject to several limitations. First, the proposed sample size may limit generalisation to all sectors and regions. Second, self-reported responses may reflect perceived rather than actual competencies and employability. Third, the level of AI adoption in HRM varies across organisations, which may influence responses. Fourth, the cross-sectional design does not establish causal or long-term effects. Finally, rapid developments in AI may change employee perceptions and organisational practices faster than a single survey can capture.

10. CONCLUSION

AI is becoming an integral part of human resource management, but its value for employees depends on how it is designed and used. When AI-enabled HRM supports learning, offers transparent feedback and encourages collaboration, it can strengthen employee competencies and career adaptability, which in turn improve perceived future employability.

The proposed study integrates AI-enabled HRM practices, competencies, career adaptability and human–AI synergy into a single framework. It suggests that sustainable employability in AI-driven workplaces is not a product of technology alone but of a partnership in which organisations invest in people and employees develop the capacity to adapt.

For HR managers, policymakers and educators, the implication is clear: AI-enabled HRM should be evaluated not only by efficiency gains but also by its contribution to the growth and long-term employability of the workforce. Future research may extend this framework through

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longitudinal designs, sector-specific comparisons, objective performance data and the study of generative AI tools in employee learning and career planning.

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DIGITAL RESILIENCE AND GREEN HRM: DRIVING SUSTAINABLE SUPPLY CHAIN INNOVATION IN MODERN COMMERCE

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ABSTRACT

Modern commerce is increasingly shaped by digital disruption, environmental pressure, supply uncertainty and the need for faster innovation. This paper examines how digital resilience and green human resource management (GHRM) can jointly strengthen sustainable supply chain innovation. Using secondary data drawn exclusively from peer-reviewed research published in high-quality indexed journals, the study synthesizes evidence on GHRM, digital technologies, supply chain resilience, green supply chain management and sustainable innovation. The literature indicates that GHRM builds green knowledge, employee capability, environmental commitment and pro-environmental behaviour, while digital technologies improve visibility, information sharing, adaptability, predictive decision-making and disruption response. When these capabilities are integrated with green supply chain practices, organizations can move beyond isolated environmental initiatives toward system-level innovation across sourcing, production, logistics, distribution and reverse flows. The review further indicates that collaboration, organizational culture, digital competence, supply chain visibility and strategic alignment are critical enabling conditions. The paper proposes an integrated view in which GHRM supplies the human capability and motivation, digital resilience supplies adaptive infrastructure, and sustainable supply chain innovation converts these resources into environmental, social and economic value.

Keywords: Digital resilience, Green HRM, Sustainable supply chain, Green innovation, Digital transformation

1. INTRODUCTION

Supply chains now operate in an environment characterized by climate-related disruption, geopolitical uncertainty, rapid technological change and stronger sustainability expectations. Sustainable supply chain management therefore requires firms to coordinate environmental, social and economic objectives across organizational boundaries rather than treat sustainability

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as a stand-alone function. Systematic evidence shows that sustainable supply chains depend on governance mechanisms, multi-tier relationships and integration across supply-chain actors (Koberg & Longoni, 2019). Green supply chain management (GSCM) has consequently become an important route for embedding environmental priorities into purchasing, production, logistics, supplier relationships and product recovery (Huo et al., 2019; Asif et al., 2020).

At the same time, the human side of sustainability has gained importance. Green human resource management aligns recruitment, training, performance management, employee involvement and rewards with environmental objectives. Research has established that GHRM can influence green behaviour, environmental performance and organizational sustainability through employee knowledge, commitment and support mechanisms (Jabbour & de Sousa Jabbour, 2016; Paillé et al., 2020; Nisar et al., 2021). The GHRM-GSCM relationship is particularly relevant because supply-chain sustainability depends on employees and managers who can translate environmental policies into operational decisions (Zaid et al., 2018; Acquah et al., 2021).

Digitalization adds a further dimension. Industry 4.0 technologies, big data analytics, digital platforms, blockchain, digital twins and related capabilities can improve visibility, coordination, traceability and disruption response. Empirical studies associate supply-chain digitalization with resilience and performance, while Industry 4.0 technologies can strengthen supply-chain capabilities through collaboration and visibility (Zhao et al., 2023; Huang et al., 2023). However, digitalization is not automatically sustainable. It must be supported by suitable skills, organizational culture, governance and strategic alignment so that technology becomes a capability for resilient and environmentally responsible innovation rather than merely an automation investment (Ralston & Blackhurst, 2020; Singh & El-Kassar, 2019).

2. OBJECTIVES

1. To examine the contribution of green human resource management to sustainable supply chain capabilities and innovation.
2. To analyse how digital technologies and digital resilience strengthen supply chain visibility, adaptability and disruption response.
3. To synthesize the evidence on how GHRM and digital resilience jointly support sustainable supply chain innovation in modern commerce

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3. METHODOLOGIES

This study adopts a secondary-data, structured literature review methodology. No primary survey, interview or experiment was conducted. The evidence base was restricted to peer-reviewed academic articles published in established indexed journals, with emphasis on Elsevier/ScienceDirect and Emerald sources and selected established international journals relevant to human resource management, operations, sustainability and supply-chain research. The final evidence set contains 30 journal articles covering GHRM, green supply chain management, sustainable supply chain innovation, digital transformation, Industry 4.0, big data, blockchain, digital twins and supply-chain resilience.

The review followed four stages: identification of relevant studies; screening for direct relevance to the research objectives; extraction of findings concerning people, technology, resilience, sustainability and innovation; and thematic synthesis. Thematic analysis was used to organize the literature into four connected dimensions: green human capability, digital resilience, sustainable supply-chain practices and innovation outcomes. The approach is consistent with prior systematic reviews that use structured evidence synthesis to identify patterns, gaps and research directions in sustainable supply-chain and GHRM research (Koberg & Longoni, 2019; Pham et al., 2020; Nilsson & Göransson, 2021).

4. LITERATURE REVIEW

4.1 Green HRM as a human capability for sustainability

GHRM extends conventional HRM by integrating environmental objectives into recruitment, training, performance management, employee participation and organizational culture. The literature identifies GHRM as an important organizational mechanism for sustainability because employees are the actors who implement environmental policies in daily work. Jabbour and de Sousa Jabbour (2016) specifically highlighted the need to connect GHRM with GSCM, while Zaid et al. (2018) found that GHRM and GSCM jointly contribute to sustainable performance. Review evidence also shows that GHRM has developed into a broad research stream connecting HR practices with environmental behaviour and organizational outcomes (Pham et al., 2020).

Employee-level evidence reinforces this relationship. Green training, performance management and organizational support can strengthen individual environmental performance, with training emerging as a particularly important practice (Paillé et al., 2020). Green HRM has also been associated with green intellectual capital and pro-environmental behaviour (Yong et al., 2019; Nisar et al., 2021). Research further indicates that GHRM can shape green

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organizational culture and employee green behaviour, suggesting that HR systems influence sustainability not only through formal procedures but also through shared norms and everyday actions (Al-Swidi et al., 2021; Sabokro et al., 2021).

4.2 GHRM and green supply chain integration

GHRM and GSCM are mutually reinforcing rather than independent agendas. Zaid et al. (2018) reported that internal GSCM practices mediate the relationship between GHRM and sustainable performance, while Acquah et al. (2021) found complementary mediation of GSCM between GHRM and multiple performance outcomes. Saeed et al. (2022) similarly examined GHRM and environmental performance through the role of GSCM. Together, these studies show that green people practices are more valuable when they are translated into supply-chain routines such as green purchasing, supplier development, eco-design, green manufacturing and reverse logistics.

4.3 Digital resilience and supply-chain capability

Digital resilience refers in this paper to the capacity created through digital technologies, data, skills and connected decision processes to anticipate, absorb, respond to and learn from supply-chain disruptions. Industry 4.0 technologies can strengthen supply-chain capability through improved collaboration and visibility, although the benefits depend on how technologies are integrated into organizational capabilities (Huang et al., 2023). Mubarik et al. (2021) found that supply-chain mapping improves visibility and resilience, showing the importance of transparent information structures in disruption management.

Digitalization also supports resilience through data-driven sensing and decision-making. Zhao et al. (2023) developed evidence for a digitalization-to-resilience-to-performance pathway, while Bag et al. (2022) showed how big data and predictive analytics can support resilience against extreme weather events through better visibility and resource coordination. Dubey et al. (2023) further connected dynamic digital capabilities with supply-chain resilience, emphasizing digital adaptability and agility. These findings indicate that digital resilience is not simply an IT outcome; it is a dynamic capability built through technology, skills, organizational processes and external conditions.

4.4 Sustainable supply chain innovation

Sustainable supply chain innovation involves developing or redesigning products, processes, relationships and supply-chain configurations to improve environmental and broader sustainability outcomes. Evidence shows that green and lean practices influence different dimensions of sustainability, making strategic alignment important rather than

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assuming that one operational approach fits all supply-chain contexts (Huo et al., 2019). GSCM can also contribute directly to business innovation when practices create meaningful interaction with external actors (Assumpção et al., 2022).

5. MAJOR FINDINGS

First, GHRM is a strategic enabler of sustainable supply-chain capability. The evidence consistently associates green training, employee involvement, green performance management, environmental knowledge and green culture with stronger environmental behaviour and performance (Paillé et al., 2020; Nisar et al., 2021; Sabokro et al., 2021). The human resource system creates the motivation and competence required to convert sustainability policies into operational practice.

Second, GHRM creates greater value when connected with GSCM. The GHRM-GSCM literature indicates complementary and mediating relationships between green people practices and supply-chain sustainability (Zaid et al., 2018; Acquah et al., 2021; Saeed et al., 2022). This means HR managers and supply-chain managers should jointly design green competencies, supplier-development programmes, environmental targets and employee performance indicators.

Third, digital resilience improves the supply chain's ability to sense and respond. Digitalization, Industry 4.0, predictive analytics, digital twins and digital competency can strengthen visibility, adaptability and disruption response (Mubarik et al., 2021; Bag et al., 2022; Huang et al., 2023; Ivanov, 2023). However, technology alone is insufficient. Digital capability must be accompanied by employee skills, learning and governance.

Fourth, sustainable supply-chain innovation depends on collaboration and integration. The strongest evidence points toward multi-actor collaboration, strategic orientation, organizational culture and supply-chain visibility as enabling conditions (Asif et al., 2020; Nilsson & Göransson, 2021). Green innovation is therefore more likely when firms connect internal GHRM systems with external supply-chain partners and digital information flows.

Fifth, the integrated model can be expressed as: GHRM → green human capability → digital adoption and responsible use → digital resilience and supply-chain visibility → sustainable supply-chain innovation → environmental, social and economic value. This synthesis is supported by evidence linking GHRM with sustainable capabilities, green innovation and GSCM, and digitalization with resilience and sustainable performance (Singh & El-Kassar, 2019; Muisyo & Qin, 2021; Lin & Fan, 2024). The model highlights that people and technology should be developed together.

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6. CONCLUSION

This secondary-data study concludes that digital resilience and GHRM represent complementary foundations for sustainable supply chain innovation. GHRM develops the knowledge, skills, motivation and environmental behaviour needed for sustainability, while digital resilience strengthens visibility, adaptability, prediction and coordinated response. When integrated with GSCM and collaborative supply-chain relationships, these capabilities can support innovation across sourcing, production, logistics, distribution and recovery activities

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BLOCKCHAIN TECHNOLOGY IN DIGITAL FINANCE: ENHANCING TRANSPARENCY, SECURITY AND SUSTAINABLE FINANCIAL DEVELOPMENT

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ABSTRACT

Digital transformation is reshaping financial services through digital payments, fintech platforms, electronic settlement, tokenisation and data-driven financial decision-making. Within this transformation, blockchain technology has emerged as a distributed ledger innovation with potential to strengthen transparency, transaction security and sustainable financial development. This conceptual paper examines the role of blockchain in digital finance by integrating three dimensions: transparency, security and sustainability. The paper is based on a conceptual review of relevant literature and institutional perspectives on distributed ledger technology, digital finance and sustainable finance. It argues that blockchain can improve transparency through traceable and shared transaction records, strengthen security through cryptographic validation and tamper-resistant records, and support sustainable financial development through applications such as green finance, carbon-market traceability, digital assets and automated compliance. The paper develops a conceptual framework linking blockchain technology adoption with transparency, security, trust, efficiency, financial inclusion and sustainable financial development. The paper proposes that the contribution of blockchain should be evaluated not merely by technological capability but by its institutional, economic, social and environmental outcomes. It concludes that blockchain is best understood as a complementary infrastructure within the digital financial ecosystem rather than as a universal substitute for conventional financial systems. Responsible governance, regulatory clarity, interoperability, digital capability and sustainability assessment are essential for realising its potential.

***Keywords**: Blockchain Technology; Digital Finance; Distributed Ledger Technology; Transparency; Financial Security; Sustainable Financial Development*

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1. INTRODUCTION

The financial sector is undergoing a significant transformation as digital technologies change how financial services are designed, delivered and consumed. Digital payments, mobile banking, fintech platforms, artificial intelligence, cloud computing and data analytics have increased the speed and convenience of financial transactions. The conference theme under which this paper is proposed specifically recognises digital finance, blockchain technologies, financial inclusion, cybersecurity and sustainable development as important areas of contemporary research.

Blockchain technology occupies a distinctive position within this transformation. A blockchain is a distributed ledger in which transactions or records are maintained across a network according to defined validation and consensus procedures. Depending on the design of the system, blockchain can allow multiple authorised participants to share a common version of transaction history without depending exclusively on one central database. This feature creates possibilities for improving traceability, auditability and trust.

In financial services, potential applications extend beyond cryptocurrencies. Blockchain can support payment and settlement processes, trade finance, tokenisation, digital identity, smart contracts, asset management, financial reporting and sustainable-finance applications. Its value proposition arises particularly where multiple participants need to coordinate records, verify transactions and establish a trusted history.

However, technological capability alone does not guarantee desirable financial outcomes. Blockchain systems may create new operational, regulatory, privacy, governance and cybersecurity risks. The energy and environmental implications of some blockchain architectures also require careful evaluation. Consequently, there is a need for a balanced conceptual understanding of blockchain that considers both opportunities and limitations.

This paper therefore explores blockchain technology in digital finance through the interconnected perspectives of transparency, security and sustainable financial development. It develops a conceptual framework that can guide future empirical research and assist financial institutions, regulators and policymakers in evaluating blockchain adoption.

2. PROBLEM STATEMENT

Conventional digital financial systems often involve several intermediaries, institution-specific databases and repeated reconciliation processes. These arrangements can increase operational complexity and may make transaction verification and end-to-end traceability difficult when

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multiple organisations participate in a financial process. Blockchain provides a distributed alternative that may reduce some forms of information fragmentation. However, its adoption introduces questions concerning scalability, interoperability, regulatory recognition, privacy, governance, cybersecurity and cost.

The central conceptual problem is therefore to determine how blockchain's technological characteristics can translate into meaningful improvements in financial transparency and security while contributing to sustainable financial development. The challenge is not simply whether blockchain can be implemented, but whether it is appropriate, efficient, secure, inclusive and sustainable for a particular financial application.

3. OBJECTIVES

To examine the conceptual role of blockchain technology in digital finance.

To analyse how blockchain can enhance transparency and traceability in financial transactions.

To examine the potential contribution of blockchain to financial security and trust.

To explore the relationship between blockchain applications and sustainable financial development.

To identify major technological, regulatory, organisational and ethical challenges associated with blockchain adoption.

To develop a conceptual framework for responsible blockchain adoption in digital financial services.

4. RESEARCH QUESTIONS

What characteristics of blockchain make it relevant to digital finance?

How can blockchain technology improve transparency and traceability in financial transactions?

How can blockchain contribute to financial security and institutional trust?

How can blockchain applications support sustainable financial development and financial inclusion?

What challenges may limit the responsible adoption of blockchain in digital finance?

What conditions are necessary for blockchain to create sustainable value in financial services?

5. CONCEPTUAL PROPOSITIONS

As this is a conceptual paper, formal statistical hypotheses are not tested. Instead, the following propositions are developed for future empirical investigation:

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P1: Greater adoption of blockchain-based financial systems is expected to enhance transaction transparency and traceability.

P2: Blockchain-enabled transparency is expected to strengthen trust and accountability among participants in digital financial transactions.

P3: Appropriate blockchain implementation is expected to improve transaction security and data integrity.

P4: Blockchain-enabled transparency, security and efficiency are expected to contribute positively to sustainable financial development.

P5: Regulatory clarity, technological infrastructure, interoperability and institutional readiness are expected to influence the effectiveness of blockchain adoption.

P6: High implementation costs, scalability constraints, privacy concerns and cybersecurity risks may weaken the relationship between blockchain adoption and sustainable financial outcomes.

6. LITERATURE REVIEW

6.1 Blockchain Technology and Digital Finance

Blockchain is a distributed ledger technology that enables records to be maintained across a network using cryptographic and consensus mechanisms. Its financial significance has expanded from cryptocurrency applications to broader areas such as tokenisation, payments, settlement, trade finance and decentralised financial services. The Bank for International Settlements has examined distributed ledger technologies as part of the broader digitalisation of finance and has emphasised both their potential and their associated risks.

In digital finance, blockchain is particularly relevant where transactions involve multiple participants who must establish a consistent record. A shared ledger can potentially reduce duplication and reconciliation while supporting automated processes through smart contracts. Nevertheless, the usefulness of blockchain depends on the problem being solved. A conventional database may remain more appropriate where a trusted central authority already exists and distributed consensus provides little additional value.

6.2 Blockchain and Transparency

Transparency is one of blockchain's most frequently discussed benefits. A transaction recorded on a distributed ledger can create a persistent history that authorised participants can inspect or

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verify. This can strengthen audit trails and make it easier to identify the movement of assets or funds.

Transparency, however, should not be confused with unrestricted public visibility. Many financial applications require permissioned access because financial information is sensitive. Blockchain can therefore support controlled transparency in which different stakeholders receive appropriate levels of access. The quality of transparency also depends on the accuracy of the data entered into the ledger; an immutable record does not make incorrect input correct.

6.3 Blockchain and Financial Security

Blockchain uses cryptographic techniques to protect transaction records and consensus mechanisms to validate changes. These characteristics can reduce the possibility of unauthorised modification of historical records. Potential applications include transaction authentication, fraud monitoring, identity management, settlement and automated compliance. However, blockchain does not eliminate cybersecurity risk. Smart contracts can contain vulnerabilities, private keys can be compromised, interfaces can be attacked and users can be exposed to fraud. Therefore, security should be understood as a system-level outcome involving the ledger, applications, access controls, governance and users. The Basel Committee has highlighted operational, governance, legal, compliance and other risks associated with permissionless distributed ledger technologies.

6.4 Blockchain and Sustainable Financial Development

Sustainable financial development involves the ability of financial systems to support long-term economic and social value while managing environmental and financial risks. Blockchain may contribute to this objective by improving the traceability of sustainable investments, green financial instruments, carbon credits and supply-chain information.

Smart contracts can also support conditional transactions and automated reporting where reliable external information is available. Such applications may reduce administrative friction and improve accountability. At the same time, sustainability must include the environmental footprint of the technology itself. The choice of consensus mechanism, network architecture, energy source and application design can influence whether a blockchain solution produces a positive sustainability outcome.

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6.5 Blockchain, Financial Inclusion and Trust

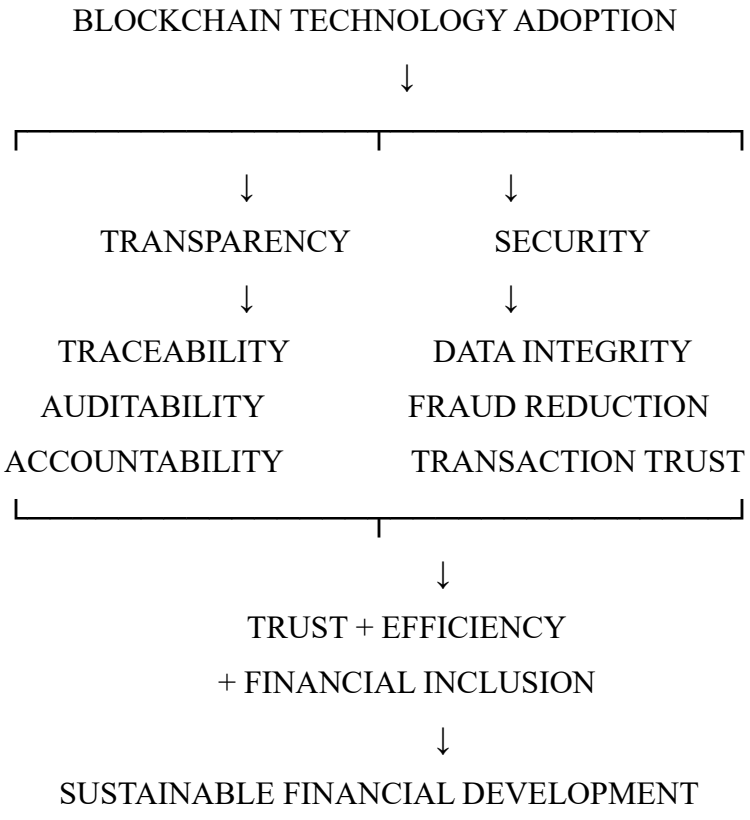
Digital financial services can expand access to financial products for underserved populations. Blockchain may support new models of digital identity, cross-border payments, tokenised assets and decentralised financial services. However, blockchain alone cannot resolve structural barriers such as lack of connectivity, low digital literacy, affordability constraints and limited consumer protection. Financial inclusion therefore requires an ecosystem approach combining technology, regulation, infrastructure and user capability.

Trust is another important dimension. Blockchain may shift some forms of trust from a single intermediary toward a combination of technology, protocols and institutional governance. This does not eliminate the need for trusted institutions; rather, it changes where and how trust is established.

7. CONCEPTUAL FRAMEWORK

The proposed conceptual framework places Blockchain Technology Adoption at the centre of the digital-finance transformation. Its principal technological outcomes are Transparency and Security. These outcomes can influence Trust, Operational Efficiency and Financial Inclusion, which in turn can contribute to Sustainable Financial Development.

The framework can be represented as follows:



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The framework is moderated or conditioned by Regulatory Environment, Technological Infrastructure, Interoperability, Institutional Readiness, User Awareness and Governance. These factors determine whether the technical capabilities of blockchain translate into actual financial and sustainability benefits.

8. DIMENSIONS OF SUSTAINABLE BLOCKCHAIN-BASED DIGITAL FINANCE

8.1 Transparency and Accountability

Blockchain can strengthen the traceability of transactions and create auditable records. In financial processes involving multiple participants, this may reduce information asymmetry and improve accountability.

8.2 Security and Resilience

Distributed validation and cryptographic mechanisms can support data integrity. Nevertheless, resilience requires protection of the complete ecosystem, including applications, identities, smart contracts, keys and governance mechanisms.

8.3 Operational Efficiency

Blockchain and smart contracts may reduce repetitive verification, reconciliation and settlement activities. Efficiency gains can potentially reduce processing time and administrative costs.

8.4 Financial Inclusion

Blockchain-based infrastructure may support innovative payment, identity and asset models. Its contribution to inclusion depends on affordability, accessibility, digital literacy and consumer protection.

8.5 Sustainable Finance

Traceability can support green finance and sustainability-linked applications by improving the monitoring of financial and environmental claims. The technology should itself be evaluated for energy and resource efficiency.

8.6 Governance and Regulatory Alignment

Financial institutions operate within regulated environments. Blockchain solutions must therefore accommodate legal recognition, compliance, privacy, accountability and dispute-resolution requirements.

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9. METHODOLOGY

This paper adopts a conceptual research design. It is based on a structured review and synthesis of academic and institutional literature relating to blockchain technology, digital finance, financial security, sustainable finance and financial inclusion. The approach does not involve primary survey data, statistical testing or fabricated empirical results.

The conceptual analysis identifies recurring constructs in the literature, groups them into technological, financial and sustainability dimensions, and develops a framework connecting blockchain adoption with transparency, security and sustainable financial development. The framework is intended to provide a basis for future empirical research.

For future empirical validation, researchers may operationalise the constructs through a structured Likert-scale questionnaire and test the proposed relationships using reliability analysis, correlation and regression or structural equation modelling.

10. CONCEPTUAL ANALYSIS AND DISCUSSION

10.1 Transparency as a Value-Creation Mechanism

Blockchain's shared ledger structure can create a consistent transaction history across participating institutions. In principle, this reduces the need for each party to maintain and reconcile separate versions of the same information. Greater traceability can improve auditing and accountability, particularly in transactions involving several intermediaries.

However, transparency creates value only when the information is accessible to legitimate stakeholders and sufficiently reliable. Permissioned blockchain models may therefore be more appropriate for many regulated financial applications because they can combine distributed records with controlled access.

10.2 Security as a Foundation of Digital Trust

Financial systems depend on confidence that transactions and records have not been manipulated. Blockchain's cryptographic architecture can strengthen the integrity of records. This can support trust in settlement, payment and asset-transfer processes. Yet the security of a blockchain-based service is determined by more than the ledger. Weak identity controls, compromised keys, insecure interfaces or defective smart contracts can create significant vulnerabilities.

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10.3 Sustainability Through Traceability and Efficiency

Blockchain's potential contribution to sustainable finance lies particularly in traceability. Sustainable financial claims require credible information about where funds are allocated and whether stated conditions have been met. A well-designed distributed ledger can create an auditable record of relevant events. Smart contracts can potentially automate selected conditions, reducing administrative intervention.

Nevertheless, the environmental sustainability of blockchain cannot be assumed. Energy consumption, hardware requirements and network architecture must be evaluated. A sustainable application therefore requires both a useful financial purpose and a technology design appropriate to its environmental and economic context.

10.4 Interdependence of Transparency, Security and Sustainability

Transparency, security and sustainability are interconnected rather than isolated outcomes. Greater transparency can strengthen accountability; stronger security can protect the reliability of transparent records; and reliable records can support sustainable-finance monitoring. Conversely, excessive transparency can conflict with privacy, while strong security controls can restrict information access. The design of blockchain-based financial systems must therefore balance competing objectives.

11. CHALLENGES

Regulatory uncertainty: Different jurisdictions may apply different rules to digital assets, blockchain-based services and decentralised finance.

Scalability: Some blockchain networks may face limitations in transaction throughput, processing speed and cost.

Interoperability: Financial institutions must integrate blockchain with existing databases, payment systems and other distributed networks.

Privacy and confidentiality: Financial data require controlled access and compliance with privacy obligations.

Cybersecurity: Smart contracts, wallets, applications and user credentials can remain vulnerable even when ledger records are resistant to alteration.

Governance and accountability: Distributed systems require clear responsibility for upgrades, disputes, errors and regulatory compliance.

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Skills and organisational readiness: Successful adoption requires interdisciplinary expertise spanning finance, technology, cybersecurity and regulation.

Environmental concerns: The sustainability impact varies significantly across blockchain architectures and consensus mechanisms.

Implementation cost: Integration, migration, training and compliance may create significant initial costs.

12. RECOMMENDATIONS

Adopt blockchain selectively where distributed and traceable records solve a genuine financial problem.

Develop clear regulatory frameworks that provide certainty while protecting consumers and financial stability.

Promote interoperability standards connecting blockchain systems with existing financial infrastructure.

Use permissioned or appropriately governed architectures where financial confidentiality and regulatory access are essential.

Strengthen cybersecurity through smart-contract auditing, key management, identity controls and continuous monitoring.

Develop professional education and training programmes covering blockchain, finance, cybersecurity and regulation.

Integrate privacy-by-design and responsible data governance into blockchain-based financial applications.

Encourage pilot projects and regulatory sandboxes before large-scale deployment.

Assess the environmental footprint of blockchain architectures before using them for sustainability-related applications.

Promote collaboration among regulators, banks, fintech firms, technology providers, academics and other stakeholders.

13. IMPLICATIONS OF THE STUDY

13.1 Implications for Financial Institutions

Financial institutions can use the framework to assess whether blockchain provides measurable benefits in areas such as settlement, reconciliation, trade finance, auditability and sustainable-

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finance reporting. Adoption decisions should be based on business value and risk assessment rather than technological novelty.

13.2 Implications for Regulators and Policymakers

Regulators need to balance innovation with consumer protection, financial stability, privacy, cybersecurity and market integrity. Regulatory clarity can reduce uncertainty and encourage responsible experimentation.

13.3 Implications for Researchers

The framework provides measurable constructs for future empirical research. Future studies can examine whether perceived transparency and security mediate the relationship between blockchain adoption and sustainable financial development.

13.4 Implications for Society

If appropriately designed, blockchain-based digital finance may improve accountability, reduce friction and support broader access to financial services. However, inclusion requires attention to the digital divide and the capacity of users to understand and safely use digital financial products.

14. LIMITATIONS AND SCOPE FOR FUTURE RESEARCH

This paper is conceptual and does not report primary survey findings or causal statistical evidence. The proposed relationships therefore require empirical validation. Future studies may examine specific sectors such as banking, insurance, trade finance, green finance or digital payments. Comparative research across countries may also investigate how regulation and institutional development affect blockchain outcomes.

Future researchers can use structural equation modelling to test the proposed framework, examine mediation effects involving trust and transparency, and assess whether regulatory readiness moderates the relationship between blockchain adoption and sustainable financial outcomes. Longitudinal studies would also help determine whether expected efficiency and sustainability benefits persist after implementation.

15. CONCLUSION

Blockchain technology has the potential to contribute significantly to the evolution of digital finance, particularly in situations where multiple parties require trusted, traceable and auditable records. Its distributed architecture can support transparency, transaction integrity and new

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forms of programmable financial services. These capabilities create opportunities in payments, settlement, trade finance, digital assets and sustainable finance.

However, blockchain should not be treated as an automatic solution to the limitations of conventional financial systems. Its benefits depend on appropriate use cases, reliable data, effective governance, regulatory clarity, interoperability, cybersecurity and institutional capability. Sustainability must also include consideration of the environmental and economic characteristics of the underlying technology.

The conceptual framework developed in this paper proposes that blockchain adoption can contribute to sustainable financial development through interconnected pathways involving transparency, security, trust, efficiency and financial inclusion. The framework also recognises regulatory, technological and organisational conditions as important determinants of success.

The central conclusion is that the future of blockchain in digital finance lies in responsible and purpose-driven adoption. When aligned with sound regulation, institutional readiness and sustainability principles, blockchain can serve as a complementary infrastructure for a more transparent, secure, resilient and sustainable financial ecosystem.

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AN EMPIRICAL STUDY ON E-COMMERCE, DIGITAL MARKETING AND CONSUMER BEHAVIOUR IN THOOTHUKUDI DISTRICT, TAMIL NADU

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ABSTRACT

The rapid development of e-commerce and digital marketing has transformed the manner in which consumers search for information, evaluate alternatives, interact with brands and make purchasing decisions. The present study examines the relationship among e-commerce adoption, digital marketing exposure and consumer behaviour in Thoothukudi District, Tamil Nadu. Particular attention is given to convenience, price and promotional incentives, social-media advertising, online reviews, trust, perceived risk and purchase intention.

The study adopts a descriptive and analytical research design. A structured questionnaire is proposed for collecting primary data from 150 consumers in Thoothukudi District who have experience with online shopping and digital marketing platforms. Percentage analysis, weighted mean ranking, Chi-square analysis and correlation analysis are employed to examine consumer characteristics and relationships among the major variables. The conceptual framework integrates the Technology Acceptance Model and Theory of Planned Behavior to explain consumers' acceptance and continued use of digital shopping environments. The illustrative empirical analysis indicates that convenience, competitive prices, product variety and promotional offers are important motivations for e-commerce usage, while social-media advertisements, online reviews and personalized promotions can influence purchase decisions. Trust, secure payment systems, product authenticity, delivery reliability and transparent return policies remain important determinants of consumer confidence.

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The study concludes that e-commerce platforms and local businesses should combine technological convenience with credible, personalized and consumer-oriented digital communication. The research provides a district-level framework for understanding the interaction between digital marketing and consumer behaviour in an increasingly digital retail environment.

Keywords: e-commerce, digital marketing, consumer behaviour, online shopping, social media marketing, purchase intention, Thoothukudi, Tamil Nadu

1. INTRODUCTION

Digital technologies have substantially altered contemporary retailing and consumer decision-making. Consumers can now discover products through search engines and social-media platforms, compare prices across sellers, examine online reviews, receive personalized recommendations, complete digital payments and obtain products without visiting a physical store. Consequently, e-commerce is no longer merely an alternative distribution channel; it forms part of an integrated digital environment in which marketing communication, consumer information search and purchasing behaviour interact continuously.

India represents an important setting for studying this transformation. Increasing internet and smartphone penetration, digital-payment adoption and improved logistics have contributed to the expansion of e-commerce beyond metropolitan markets. Recent industry evidence indicates that Tier-II and Tier-III locations are becoming increasingly significant sources of new online consumers (India Brand Equity Foundation [IBEF], 2026). This development makes district-level studies particularly important because consumer behaviour outside major metropolitan centres may differ in terms of digital literacy, trust, delivery expectations, price sensitivity and exposure to digital promotions.

Digital marketing simultaneously influences the consumer journey through social-media advertising, search-engine marketing, email marketing, influencer communication, online reviews, personalized recommendations and promotional notifications. Rather than receiving marketing messages passively, digital consumers can compare products, communicate experiences, publish reviews and interact directly with brands. This creates a more dynamic relationship between businesses and consumers.

Consumer behaviour in an online environment, however, cannot be explained exclusively by exposure to advertisements. Trust, perceived usefulness, perceived ease of use, perceived risk, social influence, price, convenience, previous experience and perceived behavioural control can all influence purchase intention and actual behaviour. Davis (1989), through the

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Technology Acceptance Model (TAM), established perceived usefulness and perceived ease of use as important determinants of technology acceptance. Similarly, Ajzen's (1991) Theory of Planned Behavior (TPB) explains behavioural intention through attitude, subjective norms and perceived behavioural control.

Research conducted in the Indian context has emphasized the importance of trust and risk in online shopping. Bahl and Kesharwani (2020), for example, reported that perceived risk negatively influences online-shopping behaviour while trust has a positive influence. Research in Thoothukudi has also investigated digital marketing, online purchasing and impulse buying. Sathya Priya and Vanitha (2021) examined digital marketing and impulse purchasing in the district, while other local research has examined digital marketing and customer purchasing decisions. These studies establish the relevance of digital consumption within the district but also create scope for an integrated investigation combining e-commerce characteristics, digital marketing exposure and broader dimensions of consumer behaviour.

The present study therefore examines how e-commerce and digital marketing jointly influence consumer behaviour in Thoothukudi District, Tamil Nadu.

2. REVIEW OF LITERATURE

Davis (1989) developed the Technology Acceptance Model and demonstrated that perceived usefulness and perceived ease of use influence users' acceptance of information technology. TAM has subsequently provided an important conceptual foundation for research concerning online services and e-commerce adoption.

Ajzen (1991) proposed the Theory of Planned Behavior, according to which behavioural intention is influenced by attitude toward behaviour, subjective norms and perceived behavioural control. The theory is particularly useful for examining online purchasing because consumers' intentions can be influenced simultaneously by personal evaluations, social influence and perceived ability to undertake digital transactions.

Dash and Saji (2008) examined B2C online-shopping adoption in India and emphasized the roles of consumer self-efficacy, website social presence, trust, perceived usefulness and perceived risk. Their findings demonstrate that technology-related characteristics alone are insufficient to explain online purchasing; psychological confidence and trust also matter.

Bahl and Kesharwani (2020) investigated perceived risk, trust and online-shopping behaviour from an Indian perspective. Their results indicated a negative association of perceived risk with trust and online-shopping behaviour and a positive relationship between trust and shopping behaviour.

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Davis, Gnanasekar, and Parayitam (2021) examined online-shopping behaviour in India and considered social influence, variety-seeking behaviour, advertising and convenience as antecedents of online-shopping behaviour. Their study further linked online behaviour with consumer satisfaction.

Padival et al. (2019) studied consumers' perceptions of social-media advertisements in a semi-urban South Indian setting. Their work demonstrates the relevance of social media as a promotional environment for consumers outside major metropolitan centres.

Sathya Priya and Vanitha (2021) examined the impact of digital marketing on impulse purchases in Thoothukudi District. Their work focused on digital marketing mechanisms including personalized advertisements, social-media promotions and other promotional stimuli affecting spontaneous buying behaviour.

More recent Indian research continues to demonstrate the importance of digital marketing. Meenu (2025) examined social-media marketing, electronic word-of-mouth, brand trust and purchase intention among Indian consumers. Similarly, contemporary studies have increasingly highlighted the role of personalization, digital engagement and brand trust in shaping consumers' responses to online promotional communication.

Collectively, existing studies show that online consumer behaviour is multidimensional. Technology acceptance, trust, risk, advertising exposure, social influence and convenience interact in determining whether consumers proceed from product awareness to purchase and subsequent repurchase.

3. RESEARCH GAP

Existing studies provide substantial evidence concerning e-commerce adoption, digital marketing, social-media advertising, trust and online purchase intention. Nevertheless, three gaps remain relevant.

First, many studies examine either e-commerce adoption or digital marketing independently. In contemporary retail environments these activities are closely interconnected: digital advertisements generate awareness and interest, while e-commerce platforms facilitate evaluation, transaction and post-purchase behaviour.

Second, much empirical research is concentrated in metropolitan or large urban markets. The continuing expansion of digital commerce into smaller cities increases the need for geographically focused research.

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Third, previous research in Thoothukudi has addressed particular dimensions such as digital purchasing and impulse buying, but an integrated model combining e-commerce attributes, digital-marketing exposure, trust, perceived risk and consumer behaviour remains useful.

The present research addresses these gaps through a district-level framework connecting e-commerce and digital marketing with consumer purchase behaviour.

4. OBJECTIVES OF THE STUDY

The study has the following objectives:

1. To examine consumers' awareness and usage of e-commerce in Thoothukudi District.
2. To identify the major factors influencing consumers to purchase products through e-commerce platforms.
3. To evaluate the influence of digital-marketing activities on consumers' purchase decisions.
4. To analyse the role of trust and perceived risk in online consumer behaviour.
5. To examine whether demographic characteristics are associated with online purchasing frequency.
6. To determine the relationship between digital-marketing influence and consumer purchase intention.
7. To suggest appropriate strategies for businesses to improve consumer engagement and satisfaction through e-commerce and digital marketing.

5. HYPOTHESES

H01: There is no significant association between the age of consumers and frequency of online purchasing.

H02: There is no significant relationship between digital-marketing influence and consumers' online purchase intention.

H03: There is no significant relationship between consumer trust and online purchase intention.

H04: Perceived risk has no significant relationship with online purchase intention.

6. CONCEPTUAL FRAMEWORK

The proposed framework integrates TAM and TPB with variables frequently identified in e-commerce research.

E-Commerce Attributes

(Convenience, usefulness, ease of use, product variety, price)

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↓

Trust and Consumer Attitude

↓

Purchase Intention → Online Purchase Behaviour → Satisfaction/Repurchase

Digital Marketing Factors (Social media, online advertisements, reviews, personalization, promotions) → **Trust and Consumer Attitude**

Perceived Risk (Security, privacy, product uncertainty) → **Purchase Intention** *(negative expected relationship)*

7. RESEARCH METHODOLOGY

Research Design

The study adopts a descriptive and analytical research design. The descriptive component identifies consumers' demographic characteristics, online-shopping patterns and digital-marketing exposure, while the analytical component evaluates relationships among selected variables.

Area of Study

The geographical area of the research is Thoothukudi District, Tamil Nadu. The district provides an appropriate setting for examining consumer responses to expanding digital retail and promotional channels.

Sources of Data

Both primary and secondary data are considered. Primary data are to be collected using a structured questionnaire administered to consumers with online-shopping experience. Secondary information is obtained from academic journals, books, institutional publications and credible reports relating to e-commerce, digital marketing and consumer behaviour.

Sampling

For the illustrative research design, the sample consists of **150 respondents** from Thoothukudi District. A convenience-cum-purposive sampling technique may be employed to identify consumers who have experience purchasing products or services through digital channels.

Research Instrument

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The questionnaire may consist of four sections: demographic characteristics; e-commerce usage; digital-marketing exposure; and statements measuring trust, perceived risk, purchase intention and consumer satisfaction. Attitudinal statements can be measured through a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree.

Statistical Tools

Percentage analysis, weighted mean/ranking, Chi-square test and Pearson correlation analysis are proposed. Statistical significance may be assessed at the 5% level ($p < .05$).

8. ANALYSIS AND INTERPRETATION

Table 1

Demographic Profile of Respondents (Illustrative N = 150)

Variable	Category	Frequency	Percentage
Age	18–24 years	42	28.0
	25–35 years	51	34.0
	36–45 years	33	22.0
	Above 45 years	24	16.0
Gender	Male	72	48.0
	Female	75	50.0
	Other/Prefer not to say	3	2.0
Education	School level	21	14.0
	Undergraduate	57	38.0
	Postgraduate	48	32.0
	Professional/Other	24	16.0

The illustrative profile suggests that consumers aged 25–35 constitute the largest group (34%), followed by respondents aged 18–24 (28%). Such a distribution would provide substantial representation of younger digitally active consumers while retaining respondents from older age categories.

Table 2

Frequency of Online Shopping

Shopping Frequency	Frequency	Percentage

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Weekly	24	16.0
Two or three times per month	45	30.0
Once per month	39	26.0
Occasionally	33	22.0
Rarely	9	6.0
Total	**150**	**100.0**

The illustrative distribution indicates that 46% of respondents purchase online at least two or three times per month, including weekly purchasers. This pattern would indicate that e-commerce has become a recurring purchasing channel rather than an occasional alternative for a substantial proportion of consumers.

Table 3

Factors Motivating Consumers to Use E-Commerce

Factor	**Mean Score**	**Rank**
Convenience and time saving	4.42	1
Competitive prices/discounts	4.31	2
Product variety	4.18	3
Home delivery	4.11	4
Easy price comparison	3.96	5
Customer reviews	3.88	6
Easy return/refund	3.81	7

Convenience and time saving receive the highest illustrative mean score ($M = 4.42$), followed by competitive prices and discounts ($M = 4.31$). The pattern is consistent with the proposition that consumers evaluate online channels in terms of both functional usefulness and economic value.

Table 4

Influence of Digital-Marketing Factors on Purchase Decisions

Digital-Marketing Factor	**Mean**	**Rank**
Discounts and promotional offers	4.36	1
Online customer reviews	4.21	2

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Social-media advertisements	4.08	3
Personalized recommendations	3.94	4
Influencer recommendations	3.61	5
Email/SMS promotional messages	3.38	6

Promotional offers emerge as the strongest illustrative digital-marketing influence. Customer reviews also receive a high score, illustrating the importance of electronic word-of-mouth in reducing uncertainty and supporting product evaluation. Social-media advertisements rank third, suggesting that social platforms can contribute meaningfully to product discovery and purchase consideration.

Table 5

Illustrative Correlation Matrix

Variable	**Digital Marketing**	**Trust**	**Perceived Risk**	**Purchase Intention**
Digital marketing	1.00	.48	-.21	.62
Trust	.48	1.00	-.52	.68
Perceived risk	-.21	-.52	1.00	-.47
Purchase intention	.62	.68	-.47	1.00

The correlation matrix indicates a positive relationship between digital-marketing influence and purchase intention (r = .62). Trust demonstrates an even stronger positive relationship with purchase intention (r = .68), whereas perceived risk demonstrates a negative relationship (r = -.47). If comparable coefficients were obtained from actual field data and were statistically significant, H02, H03 and H04 could be rejected.

These relationships would support previous evidence that online purchasing is affected not simply by promotional exposure but also by consumers' confidence in the transactional environment. Trust can reduce uncertainty regarding payment, product quality, privacy and fulfilment, whereas perceived risk can discourage purchase even where promotional communication is persuasive.

9. MAJOR FINDINGS

Subject to verification with actual field data, the proposed empirical framework suggests several important patterns. Consumers increasingly evaluate e-commerce through a combination of convenience, price, product availability and delivery benefits. Digital

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marketing contributes to purchase behaviour primarily when communication provides meaningful economic or informational value.

Promotional discounts can encourage purchase consideration, but online reviews and credible recommendations are also important because consumers frequently depend upon information generated by other customers before completing a transaction. Social-media marketing can influence awareness and purchase intention, particularly where advertisements are relevant and engaging.

Trust remains central to the digital purchase process. Secure payments, transparent product information, dependable delivery, responsive customer service and straightforward return procedures can strengthen consumers' willingness to transact online. Conversely, privacy concerns, fraud, misleading product descriptions and uncertainty about quality can increase perceived risk and discourage purchasing.

The findings therefore imply that e-commerce and digital marketing should not be considered independent influences. Digital marketing may attract consumers to products, but the quality and trustworthiness of the e-commerce environment can determine whether promotional interest ultimately becomes an actual transaction.

10. SUGGESTIONS AND MANAGERIAL IMPLICATIONS

Businesses operating in Thoothukudi should adopt an integrated digital-commerce strategy rather than treating online selling and digital promotion as separate activities. Social-media advertisements should direct consumers toward reliable product pages containing accurate descriptions, transparent prices, credible reviews and clearly stated delivery and return conditions.

Local retailers and small enterprises should increase their digital presence through mobile-friendly websites, social platforms, business listings and appropriate e-commerce channels. Promotional communication can emphasize convenience, value and locally relevant products while avoiding excessive or misleading advertising.

Trust-building deserves particular attention. Businesses should use secure payment mechanisms, communicate privacy practices clearly, provide transparent refund policies and respond rapidly to complaints. Customer reviews should be encouraged while misleading or fabricated reviews should be avoided.

Personalization can improve relevance, but businesses should balance personalization with consumer privacy. Recommendations based on previous browsing or purchasing behaviour should provide genuine value rather than creating excessive promotional pressure.

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Finally, businesses should monitor consumer behaviour through ethical use of analytics. Measures such as conversion rate, repeat purchase, customer retention, advertisement engagement, cart abandonment and satisfaction can help organizations determine whether digital-marketing expenditure produces sustainable customer relationships rather than merely short-term clicks.

11. CONCLUSION

E-commerce and digital marketing are reshaping consumer behaviour by integrating information search, promotion, product evaluation, transaction and post-purchase communication within a connected digital environment. The present study develops an empirical framework for examining this transformation among consumers in Thoothukudi District, Tamil Nadu.

The study proposes that convenience, competitive pricing, product variety and delivery advantages contribute to e-commerce adoption, while social-media advertisements, customer reviews, personalized communication and promotional offers influence purchase consideration. However, promotional effectiveness is conditioned by consumer trust and perceived risk. Consumers are more likely to develop favourable purchase intentions when digital platforms are useful, easy to navigate, credible and secure.

The study contributes to district-level consumer research by integrating e-commerce characteristics and digital-marketing influences within a single consumer-behaviour framework. It also provides practical implications for local retailers, MSMEs and digital marketers seeking to reach increasingly connected consumers.

Future research should employ probability-based sampling and larger samples covering urban, semi-urban and rural areas of Thoothukudi District. Structural equation modelling could be employed to examine direct, indirect and mediating relationships among digital-marketing exposure, perceived usefulness, trust, risk, satisfaction and purchase intention. Longitudinal research could further determine whether digital promotions produce sustainable customer loyalty or primarily stimulate short-term purchasing behaviour.

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DIGITAL COMMUNICATION AND SOCIAL MEDIA: THEIR ROLE IN SHAPING CONSUMER ENGAGEMENT
A CONCEPTUAL FRAMEWORK ON BRAND COMMUNICATION, TRUST, AND INTERACTIVE CONSUMER PARTICIPATION

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ABSTRACT

Social media has moved brand communication from a one-way broadcast to a continuous, two-way exchange in which consumers read, react, share, and create content alongside brands and one another. As digital communication becomes the default channel through which many consumers discover, evaluate, and discuss products, a central question for marketers and policymakers is how the communication attributes of these platforms translate into genuine consumer engagement rather than passive exposure. This paper develops a conceptual framework examining how social media communication shapes consumer engagement through brand trust, arguing that trust mediates the relationship between communication attributes content quality, interactivity, influencer credibility and electronic word-of-mouth, and personalisation and consumer engagement, moderated by privacy concern and generational cohort. Drawing on Uses and Gratifications theory, commitment–trust theory, and the consumer brand engagement literature, the paper proposes a testable model and a quantitative research design using structural equation modelling. The paper concludes with implications for brand communication strategy, platform design, and data-protection and advertising policy in rapidly digitising markets such as India.

Keywords: Digital Communication, Social Media Marketing, Consumer Engagement, Brand Trust, Influencer Marketing, Personalisation, Privacy Concern, Electronic Word-of-Mouth

1. INTRODUCTION

Digital communication has altered the relationship between brands and consumers. Where traditional media allowed firms to transmit messages to a largely passive audience, social media

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platforms allow consumers to respond instantly, to question and criticise brands in public, to circulate content to their own networks, and to produce brand-related content of their own. Brand messages now compete for attention within feeds that are shaped by algorithms, peer activity, and influencer content, and much of the early research on the subject treated social media primarily as an additional advertising channel whose effectiveness could be judged by reach and exposure.

As social media matured, the more consequential question shifted from how many consumers a brand can reach to how deeply they participate. Engagement — the cognitive, emotional, and behavioural investment a consumer makes in interacting with a brand — has become the metric of interest for practitioners and researchers alike. Yet the evidence suggests that not all communication produces engagement: some brands attract large audiences that rarely interact, while others sustain active and loyal communities with far smaller followings. This divergence indicates that exposure and message volume cannot by themselves explain engagement; a psychological mechanism through which communication is converted into consumer participation must be at work.

This paper argues that brand trust is that mechanism. The paper develops a conceptual framework in which trust mediates the relationship between social media communication attributes and consumer engagement, and situates the framework within uses-and-gratifications, relationship-marketing, and consumer engagement theory. The paper is structured as a conceptual/review paper suited to conference presentation, culminating in a proposed empirical design for subsequent field validation.

2. REVIEW OF LITERATURE

2.1 Digital Communication and Social Media as Brand Communication Channels

Social media has been defined as a group of internet-based applications that allow the creation and exchange of user-generated content (Kaplan & Haenlein, 2010). Kietzmann et al. (2011) describe its functional building blocks — identity, conversations, sharing, presence, relationships, reputation, and groups — and argue that firms must understand which of these a platform emphasises before designing communication for it. More recent reviews note that social media marketing now spans influencer partnerships, social commerce, algorithmic content curation, and data-driven targeting, and that research has not kept pace with the speed at which these practices have changed (Appel et al., 2020; Dwivedi et al., 2021). This literature

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establishes social media as a distinctive communication environment rather than a simple extension of earlier media.

2.2 Consumer Engagement in Social Media

Consumer engagement has been conceptualised as a multidimensional construct with cognitive, emotional, and behavioural components, arising from interactive experiences between consumers and brands (Brodie et al., 2013). Hollebeek et al. (2014) operationalise consumer brand engagement in social media through cognitive processing, affection, and activation, and show that it is distinct from related constructs such as involvement. Muntinga et al. (2011) classify brand-related social media use into consuming, contributing, and creating, which indicates a progression from passive to active participation. Uses and Gratifications theory (Katz et al., 1973) offers a complementary explanation, proposing that consumers choose and use media to satisfy needs for information, entertainment, social connection, and self-expression, so that the same communication may generate very different levels of engagement depending on the gratification it provides.

2.3 Content, Interactivity, Influencers, and Electronic Word-of-Mouth

Research on brand communication in social media distinguishes between firm-created content and user-generated content and finds that both shape consumer perceptions of the brand (Schivinski & Dabrowski, 2016). Beyond content itself, the credibility of the source matters. Source credibility research identifies expertise, trustworthiness, and attractiveness as the core dimensions of an effective endorser (Ohanian, 1990), and studies of influencer marketing find that the value of the message and the credibility of the influencer affect consumer trust in branded content (Lou & Yuan, 2019). Consumers also form one-sided, parasocial relationships with brand personas and influencers, which can strengthen consumer–brand relationships (Labrecque, 2014). Electronic word-of-mouth, in turn, is driven by consumers' desire for social interaction, concern for others, and self-enhancement (Hennig-Thurau et al., 2004), making peer opinions an important complement to brand-originated communication.

2.4 Brand Trust, Personalisation, and Privacy Concern

Commitment–trust theory holds that trust is a key mediating variable in successful relationships, leading to cooperative and committed behaviour (Morgan & Hunt, 1994). In the brand context, trust and affect have been shown to drive loyalty and performance (Chaudhuri & Holbrook, 2001), and studies of social media brand communities find that community

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engagement contributes to brand trust (Habibi et al., 2014). At the same time, personalisation introduces a tension. Personalised communication can raise relevance, but research on the personalisation–privacy paradox finds that privacy concerns and perceived information transparency shape consumers' willingness to be profiled (Awad & Krishnan, 2006), and field evidence indicates that giving users control over their personal information can make personalised advertising more effective (Tucker, 2014). The effect of personalisation on trust is therefore expected to depend on how much consumers worry about their data.

3. RESEARCH GAP

Three gaps emerge from the literature reviewed above. First, much of the existing research examines individual communication attributes — content, interactivity, influencer credibility, or personalisation — in isolation, rather than modelling the mechanism, brand trust, through which they jointly shape engagement. Second, the engagement literature and the privacy literature have developed largely independently of one another, despite the fact that data-driven personalisation is now central to how engagement is pursued on social media. Third, there is limited conceptual work situating this framework in large, price-sensitive, and rapidly digitising markets such as India, where many consumers encountered brands primarily through mobile-first social platforms and where generational differences in digital experience are pronounced. This paper's conceptual model is designed to address all three gaps together.

4. THEORETICAL FRAMEWORK AND PROPOSED CONCEPTUAL MODEL

The proposed model treats brand trust as the central mediating construct linking social media communication attributes to consumer engagement, with two moderating variables drawn from the privacy and generational-adoption literatures.

4.1 Antecedents (Independent Variables)

Content Quality the perceived informativeness, relevance, and entertainment value of the brand content a consumer encounters on social media.

Interactivity the extent to which communication is two-way, with brands responding promptly and meaningfully to consumer comments, questions, and complaints.

Influencer Credibility and eWOM the perceived expertise, trustworthiness, and authenticity of influencers and of peer opinions that shape consumers' view of the brand.

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Personalisation the degree to which communication is tailored to the individual consumer's interests and behaviour through platform data and algorithms.

4.2 Mediator

Brand Trust conceptualised along reliability (the brand delivers what its communication promises), honesty (communication is transparent and free of misleading claims), and benevolence (the brand is perceived to act in the consumer's interest, including in how it handles personal data), each shaped by the consumer's cumulative experience of the brand's social media presence.

4.3 Moderators

Privacy Concern the degree of consumer worry about how personal data are collected and used by platforms and brands, drawn from the personalisation–privacy paradox literature.

Generational Cohort digitally native younger consumers (for example, Generation Z and younger Millennials) versus older consumers who adopted social media later in life, capturing differing baseline comfort, scepticism, and habit strength.

Dependent Variable

Consumer Engagement operationalised as a multidimensional construct comprising cognitive processing, affection, and activation (Hollebeek et al., 2014), together with self-reported behavioural indicators such as following, commenting, sharing, content creation, and repeat purchase intention.

Table 1: Summary of Constructs and Theoretical Grounding

Construct	Role in Model	Theoretical Grounding
Content Quality, Interactivity, Influencer Credibility and eWOM, Personalisation	Independent variables (social media communication attributes)	Social media marketing literature; Uses and Gratifications theory
Brand Trust	Mediator	Commitment–trust theory; brand trust research
Privacy Concern	Moderator	Personalisation–privacy paradox literature

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Construct	Role in Model	Theoretical Grounding
Generational Cohort	Moderator	Digital-adoption / generational research
Consumer Engagement (cognitive, affective, behavioural)	Dependent variable	Consumer brand engagement literature

The overall proposition is: social media communication attributes (content quality, interactivity, and influencer credibility and eWOM) positively influence brand trust, while personalisation has a context-dependent effect; trust in turn positively influences consumer engagement; and the strength of the trust–engagement relationship is moderated by privacy concern and generational cohort.

5. OBJECTIVES OF THE STUDY

To examine the influence of content quality, interactivity, and influencer credibility and eWOM on brand trust in social media.

To examine the effect of personalisation on brand trust, taking consumer privacy concern into account.

To evaluate the mediating role of brand trust between social media communication attributes and consumer engagement.

To assess whether the trust–engagement relationship is moderated by privacy concern and by generational cohort.

6. PROPOSED HYPOTHESES

H1: Content quality is positively associated with brand trust.
H2: Interactivity is positively associated with brand trust.
H3: Influencer credibility and eWOM are positively associated with brand trust.
H4: Personalisation has a significant effect on brand trust, with direction contingent on the level of consumer privacy concern.
H5: Brand trust is positively associated with consumer engagement.

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H6: Brand trust mediates the relationship between social media communication attributes and consumer engagement.

H7: The relationship between brand trust and consumer engagement is stronger for consumers with low privacy concern than for consumers with high privacy concern.

H8: The relationship between brand trust and consumer engagement differs by generational cohort, being stronger for digitally native younger consumers than for older consumers.

7. PROPOSED RESEARCH METHODOLOGY

7.1 Research Design

A quantitative, cross-sectional survey design is proposed, consistent with empirical work applying structural equation modelling to social media communication, brand trust, and consumer engagement relationships.

7.2 Sample and Data Collection

The target population would comprise active social media users who follow or have interacted with at least one brand or brand-related influencer on a social media platform within the preceding three months. A minimum sample of 300–400 respondents is recommended to support Partial Least Squares Structural Equation Modelling (PLS-SEM) with the constructs above (Hair et al., 2022). Quota sampling by age group, supplemented by convenience and snowball sampling through online panels, is proposed to ensure adequate representation of each generational cohort, given the absence of a comprehensive sampling frame for social media users.

7.3 Measurement

Each construct would be measured using multi-item, five-point Likert scales adapted from validated instruments in the social media marketing, brand trust, consumer engagement, and privacy concern literatures, reworded for the social media context and pre-tested through a pilot study ($n \approx 40$) for reliability (Cronbach's alpha) and content validity before full deployment.

7.4 Analytical Technique

Confirmatory Factor Analysis would validate the measurement model, followed by PLS-SEM to test the structural paths, including the mediation effect of brand trust (via bootstrapped indirect-effect testing) and the moderation effects of privacy concern and generational cohort (via multi-group analysis or interaction terms).

8. DISCUSSION AND IMPLICATIONS

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8.1 Implications for Brands and Platforms

If brand trust is the mechanism that converts social media communication into engagement, then brands should treat trust-building as a continuing communication objective rather than a by-product of reach. Prompt and transparent responses to consumer queries and complaints, consistent and accurate content, and clear disclosure of sponsored material are likely to matter more for sustained engagement than content volume or posting frequency. Platforms, for their part, can support this by giving brands and consumers visible tools for feedback, verification, and control over personalisation.

8.2 Implications for Marketers

The proposed moderation by privacy concern implies that personalisation should be calibrated rather than maximised: for consumers with low privacy concern, richer personalisation is likely to support engagement, while for consumers with high privacy concern, marketers may need to explain how data are used and offer opt-in control over how far personalisation goes. Similarly, the proposed generational moderation suggests that influencer selection, content format, and level of interactivity should be tailored to cohort, rather than applied uniformly across a brand's audience.

8.3 Implications for Policy

In a market such as India, where social media is a primary route through which a large and growing number of consumers meet brands, policy on data protection, influencer-endorsement disclosure, and grievance redressal is directly relevant to whether consumer trust — and therefore engagement — strengthens or erodes. Regulatory measures such as India's Digital Personal Data Protection Act, 2023, and advertising-disclosure norms for influencers bear directly on the trust conditions this framework identifies.

9. LIMITATIONS AND SCOPE FOR FUTURE RESEARCH

As a conceptual paper, the framework and hypotheses proposed here require empirical validation through the survey design outlined in Section 7 before firm conclusions can be drawn.

Self-reported engagement is subject to social-desirability and recall bias; future work should, where possible, supplement survey data with platform-level behavioural data such as likes, shares, comments, and click-through activity.

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The model does not distinguish between platforms (for example, short-video, microblogging, and messaging-based platforms), whose affordances differ; future studies could treat platform type as a moderator or conduct platform-specific comparisons.

Cross-market replication would help establish whether the proposed moderation by privacy concern and generational cohort holds consistently across markets with different regulatory regimes and levels of digital maturity.

10. CONCLUSION

Social media has made engagement, rather than exposure, the central objective of brand communication, but engagement is not produced by communication alone. This paper has proposed a conceptual framework in which content quality, interactivity, influencer credibility and eWOM, and personalisation act as antecedents of brand trust, trust mediates the path to consumer engagement, and privacy concern together with generational cohort moderate how strongly that trust translates into participation. The framework integrates uses-and-gratifications, relationship-marketing, and consumer engagement theory, and provides a concrete, testable research design suited to conference-stage presentation and subsequent empirical study. As digital communication continues to evolve, understanding trust as the mechanism that converts attention into lasting consumer engagement will be essential for brands, platform designers, and policymakers alike.

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CYBER HYGIENE AND TAX COMPLIANCE CULTURE: BUILDING EMPLOYEE ACCOUNTABILITY FOR DATA PROTECTION IN DIGITAL TAX ADMINISTRATION

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ABSTRACT

Digital tax administration has transformed the way taxes are assessed, filed, paid and audited. Electronic filing portals, faceless assessments, automated payroll systems and real-time data matching now depend on the secure handling of highly sensitive financial and personal information. While technological safeguards have received considerable attention, the behaviour of the employees who handle this information remains an under-examined determinant of data protection and fiscal integrity. The present conceptual paper examines how cyber hygiene practices among employees of tax authorities, organisations and tax intermediaries shape tax compliance culture. Drawing on the Theory of Planned Behaviour, Protection Motivation Theory, Deterrence Theory and the Slippery Slope Framework of tax compliance, the paper develops an integrated framework that links individual cyber hygiene, accountability mechanisms and organisational culture with the integrity of digital tax processes. Six propositions are advanced to guide future empirical inquiry. The paper concludes that employee accountability, built through awareness, ethical leadership, role-based responsibility and a just reporting culture, is a prerequisite for trustworthy digital tax administration, and it offers practical recommendations for organisations, tax authorities, professional bodies and policymakers.

Key words: Cyber Hygiene, Tax Compliance Culture, Employee Accountability, Data Protection, Digital Tax Administration

1. INTRODUCTION

Tax administration across the world is moving from paper-based procedures to fully digital ecosystems. In India, electronic return filing, online tax payment, the Goods and Services Tax Network, faceless assessment and appeals, and the pre-filling of returns through data analytics have made taxation a data-intensive activity. The OECD (2020) describes this shift as Tax Administration 3.0, in which tax obligations are increasingly embedded in the natural systems

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of taxpayers and processed in real time. Such an environment concentrates large volumes of personally identifiable and financial data, including permanent account numbers, bank details, salary records, invoices and return data, within interconnected systems.

Securing this data is commonly treated as a technical problem to be solved through firewalls, encryption and authentication tools. Research in information security, however, consistently shows that employees are both the first line of defence and the weakest link. Phishing, weak credentials, careless sharing of login details, use of unsecured networks and delayed reporting of incidents are behavioural lapses that can defeat even sophisticated technical controls. Cyber hygiene, understood as the routine practices through which individuals protect devices, accounts and data, therefore becomes a matter of professional conduct and not merely of technical configuration.

Tax compliance, on the other hand, has long been understood as the product of both enforcement and moral commitment. The concept of tax morale and the Slippery Slope Framework (Kirchler, Hoelzl and Wahl, 2008) highlight that compliance depends on trust in authorities as well as on their power to deter. When taxpayer data is leaked, filings are manipulated through compromised credentials, or refunds are diverted through fraud, trust in the digital tax system is weakened, with consequences for voluntary compliance. A tax compliance culture in the digital age thus cannot be separated from a culture of data protection.

The present paper brings these two streams together. It argues that cyber hygiene is a behavioural foundation of tax compliance culture and that employee accountability is the mechanism through which hygiene practices become institutionalised. The paper is conceptual in nature and seeks to build a framework that can be tested empirically in later studies.

2. OBJECTIVES

- To explain the concepts of cyber hygiene, employee accountability and tax compliance culture in the context of digital tax administration.
- To examine the theoretical linkages between employee cyber hygiene behaviour and the integrity of tax compliance processes.
- To develop a conceptual framework and a set of propositions for building employee accountability for data protection.
- To suggest institutional and policy measures for strengthening cyber hygiene and compliance culture in digital tax systems.

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3. SCOPE OF THE STUDY

The scope of the paper covers three categories of actors: employees of tax authorities, employees of business organisations who handle payroll, indirect tax and income tax compliance, and employees of tax intermediaries such as practising professionals and return preparers. The discussion relates to the commonly used digital tax processes of registration, return filing, payment, refund, assessment and information exchange. The analysis is set primarily in the Indian regulatory context, with reference to international literature where relevant. The paper is intended to provide a theoretical foundation for researchers, tax administrators, compliance professionals and policymakers.

❖ Limitations

- The paper is conceptual and is based on secondary sources. The propositions advanced have not been empirically tested.
- The framework is developed mainly for the Indian digital tax environment and may require adaptation for other jurisdictions.
- The study does not examine specific technical security architectures, and it treats technology as a contextual factor and not as a variable of analysis.

RESEARCH METHODOLOGY

Research methodology refers to the systematic process followed to collect, analyse and interpret information in order to answer a research problem. The present study adopts an integrative conceptual research design, which synthesises existing knowledge from different disciplines to build a new framework.

Nature of the Study: Conceptual and exploratory

Sources of Information: Secondary sources, namely peer-reviewed journal articles in information security behaviour, behavioural taxation and public administration; OECD publications on digital tax administration; and Indian statutes and regulatory directions on data protection and cyber incident reporting.

Method of Analysis: Thematic synthesis of literature, followed by theory integration and the derivation of propositions.

Theoretical Lenses: Theory of Planned Behaviour, Protection Motivation Theory, General Deterrence Theory, and the Slippery Slope Framework of tax compliance.

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REVIEW OF LITERATURE

Cyber hygiene and employee security behaviour

The literature on information security behaviour consistently emphasises that employee conduct determines the effectiveness of technical controls. Bulgurcu, Cavusoglu and Benbasat (2010) found that employees' intention to comply with security policies is shaped by their awareness of the policy, their beliefs about the benefits and costs of compliance, and the social pressure they perceive. Herath and Rao (2009) integrated deterrence and protection motivation perspectives and showed that both the severity of penalties and employees' belief in their own ability to take protective action influence compliance. D'Arcy, Hovav and Galletta (2009) demonstrated that awareness of security policies, training and monitoring reduces the intention to misuse information systems, because employees perceive a higher likelihood of sanction.
Several studies caution against relying on rules alone. Beautement, Sasse and Wonham (2009) proposed the idea of a compliance budget, according to which employees are willing to expend only a limited effort on security measures, and they bypass controls that obstruct work. Parsons et al. (2014) developed the Human Aspects of Information Security Questionnaire to measure knowledge, attitude and behaviour across focus areas such as password management, email use, incident reporting and social media. Hadlington (2017) linked risky cyber behaviour with impulsivity and attitudes towards security. These findings point to the fact that cyber hygiene is influenced by cognition, habit and workplace conditions, and not by technical knowledge alone. Tversky and Kahneman (1974) had earlier shown that human judgement relies on heuristics that produce systematic errors, a point that explains why employees underestimate the probability of cyber incidents.

- Information security culture and accountability

Da Veiga and Eloff (2010) proposed that information security culture is shaped by organisational attitudes, governance, leadership and user awareness, and that it needs to be assessed and managed deliberately. Siponen, Mahmood and Pahnila (2014) reported that employees' adherence to security policies is influenced by normative beliefs, habit and the fear of sanctions. Ifinedo (2012) integrated the Theory of Planned Behaviour with Protection Motivation Theory to explain policy compliance and found that attitude, social belief and self-efficacy are important predictors. Together, these studies suggest that accountability emerges

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where employees understand their responsibility, perceive fairness in enforcement, and see leaders practising what they prescribe.

❖ Tax compliance, tax morale and trust

The classical economic model of Allingham and Sandmo (1972) explained tax evasion as a decision under uncertainty, determined by audit probability and penalty. Later behavioural research broadened this view. Torgler (2007) established the importance of tax morale, the intrinsic motivation to pay taxes, and Alm and Torgler (2011) found that ethics and morality significantly influence compliance. Kirchler, Hoelzl and Wahl (2008) distinguished enforced compliance, driven by power, from voluntary compliance, driven by trust, and argued that the two interact. Slemrod (2019) observed that compliance is shaped by third-party reporting, information systems and the administrative environment, which makes the integrity of data flows central to the tax system.

❖ Tax awareness among Indian taxpayers

Indian studies indicate that awareness of tax provisions is uneven and that behaviour is influenced by demographic and socio-economic factors. Priyadarshini (2017) found that salaried respondents were aware of available deductions but did not fully use tax planning measures. Arif (2016) reported low awareness of income tax provisions and a perception of high tax evasion and avoidance, and he recommended simplification of laws. Nair, Gopalkrishnan and Paryani (2013) found that gender, age and socio-economic status influenced taxpayers' choices between saving and paying tax. These studies show that individual awareness and perception are decisive in tax behaviour, which supports the argument that awareness of data protection duties is equally critical in the digital environment.

❖ Digital tax administration and data protection

The OECD (2020) notes that digital transformation increases efficiency but also raises the stakes of data security, since tax authorities hold some of the most sensitive data of any public body. In India, the Information Technology Act, 2000, the CERT-In Directions of April 2022 on incident reporting and the Digital Personal Data Protection Act, 2023 together create obligations for entities that process personal data. Taxpayer confidentiality is separately protected under tax law. The literature reviewed above does not, however, integrate these regulatory duties with the behavioural dimension of tax compliance, which is the gap the present paper addresses.

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❖ Research gap

Information security research seldom considers tax administration as its setting, while tax compliance research seldom treats employee data protection behaviour as a determinant of compliance culture. There is no integrated framework that explains how cyber hygiene, accountability and compliance culture interact in digital tax systems.

CONCEPTUAL FRAMEWORK AND DISCUSSION

❖ Key constructs

Cyber hygiene refers to the routine, repeatable practices through which employees protect credentials, devices, networks, documents and information. Its dimensions include credential management, safe email and link handling, device and network security, secure data handling and prompt incident reporting.

Employee accountability is the condition in which employees accept responsibility for their data protection actions, are answerable for lapses and are supported in meeting expectations. It has individual, managerial and institutional dimensions.

Tax compliance culture is the shared set of values, norms and practices within an organisation or administration that promote accurate, timely and ethical fulfilment of tax obligations, including the safeguarding of the data on which compliance rests.

❖ Theoretical integration

The Theory of Planned Behaviour (Ajzen, 1991) explains that employees' behaviour is guided by attitude, subjective norms and perceived behavioural control. Applied here, an employee who values data protection, who perceives that colleagues and superiors expect secure conduct, and who has the means to act securely is more likely to maintain good cyber hygiene. Protection Motivation Theory (Rogers, 1975) adds that behaviour depends on the perceived severity of the threat, perceived vulnerability, response efficacy and self-efficacy. General Deterrence Theory contributes the role of certainty and severity of sanction, while the Slippery Slope Framework adds that trust and legitimacy of authority sustain voluntary compliance. The integration of these perspectives suggests that cyber hygiene is sustained when employees understand risk, believe they can act, feel socially expected to act and trust that the system is fair.

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❖ The proposed framework:

Layer	Components	Role in the framework
Antecedents	Cyber awareness, training, perceived risk, self-efficacy, ethical orientation	Shape the individual's capability and motivation
Cyber hygiene behaviour	Credential discipline, safe communication, secure handling of tax data, incident reporting	The observable behaviour that protects data
Accountability mechanisms	Role-based responsibility, access logs and audit trails, fair sanctions, recognition, ethical leadership	Convert individual behaviour into institutional practice
Outcomes	Data integrity, taxpayer trust, accurate and timely filings, tax compliance culture	The result for digital tax administration

The relationship runs from antecedents to cyber hygiene behaviour, from behaviour to outcomes, and is moderated by accountability mechanisms and by organisational culture. Outcomes in turn reinforce antecedents, since a trusted and secure system strengthens ethical commitment and awareness.

❖ Propositions

P1: Employees' cyber awareness and self-efficacy are positively related to the quality of their cyber hygiene practices in handling tax data.

P2: Perceived severity of the consequences of a data breach, such as penalties, loss of taxpayer trust and legal liability, strengthens cyber hygiene behaviour when it is accompanied by high response efficacy.

P3: Clear role-based responsibility and traceable access to tax systems increase employee accountability and reduce the likelihood of credential sharing and unauthorised access.

P4: Ethical leadership and visible managerial adherence to security practices strengthen the relationship between cyber hygiene and a positive tax compliance culture.

P5: A just and non-punitive incident reporting culture increases the prompt reporting of suspected breaches, thereby reducing the impact of cyber incidents on filing accuracy and taxpayer data.

P6: Employee cyber hygiene, mediated by accountability, is positively related to taxpayer trust in digital tax administration, which in turn supports voluntary tax compliance.

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❖ **Discussion**

The framework yields several insights. First, tax data is exposed at multiple human touchpoints. A payroll executive handling employee tax deduction, a finance officer using a company's portal credentials, a practising professional filing returns on behalf of many clients, and an official of the tax authority accessing assessment records are all points at which a single lapse can compromise confidentiality or the integrity of a filing. Second, the Compliance Budget argument of Beautement, Sasse and Wonham (2009) implies that excessively burdensome controls will be bypassed, so accountability must be paired with usable systems. Third, accountability that rests only on punishment risks suppressing the reporting of incidents, while accountability built on clarity, fairness and leadership example encourages openness. Finally, since the CERT-In directions require rapid reporting of cyber incidents, an organisational culture that delays or conceals incidents carries regulatory as well as ethical risk.

FINDINGS

The conceptual analysis leads to the following findings:

- Cyber hygiene is a behavioural foundation of tax compliance culture, because the accuracy and confidentiality of tax information depend on the everyday conduct of those who handle it.
- Technical controls alone are insufficient; employee awareness, motivation and perceived self-efficacy determine whether controls are used as intended.
- Accountability is the link between individual behaviour and institutional culture. It is strongest when responsibility is clearly assigned, actions are traceable and sanctions are perceived as fair.
- Ethical leadership and trust in the administration influence both data protection behaviour and voluntary tax compliance, which suggests that the two cultures reinforce each other.
- A non-punitive reporting environment enables early detection of breaches and limits their effect on filings and taxpayer data.
- Existing research treats information security and tax compliance separately, and an integrated, empirically tested framework is still lacking.

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SUGGESTIONS

- **Organisations:** Embed cyber hygiene in the job responsibilities and performance appraisal of employees handling payroll, indirect tax and income tax compliance. Provide role-specific, scenario-based training in place of generic annual sessions, and maintain access logs and approval trails for portal credentials.
- **Tax authorities:** Combine technological safeguards with regular awareness programmes for officials and intermediaries. Adopt a clear, fair and non-punitive incident reporting protocol, and communicate transparently with taxpayers about data protection measures to sustain trust.
- **Professional bodies and intermediaries:** Include data protection and cyber hygiene in codes of conduct, continuing professional education and peer review, so that practising professionals are accountable for client data.
- **Educational institutions:** Introduce modules on cyber hygiene, data privacy and digital tax systems in commerce, accountancy and corporate secretaryship programmes, so that future compliance professionals enter the workforce with these competencies.
- **Policymakers:** Align data protection, cyber incident reporting and tax confidentiality obligations through consolidated guidance, and encourage periodic cyber hygiene audits as part of compliance reviews.
- **Researchers:** Test the proposed propositions through survey-based and case-based studies, using structural equation modelling and comparative analysis across public and private sector employees.

CONCLUSION

The digitalisation of tax administration has made the protection of data inseparable from the integrity of tax compliance. This paper has argued that cyber hygiene, practised daily by employees across tax authorities, organisations and intermediaries, forms the behavioural foundation of a sound tax compliance culture, and that employee accountability is the mechanism through which good practice becomes institutional habit. By integrating insights from information security behaviour and behavioural taxation, the paper has proposed a framework and six propositions that can guide empirical research. Technology can secure systems, but only an accountable and ethically led workforce can secure trust. The

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strengthening of employee accountability for data protection is therefore essential if digital tax administration is to remain efficient, transparent and credible. Future studies may validate the framework empirically and examine moderating factors such as organisational size, sector, designation and level of digital maturity.

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AI-ENABLED CONTINUOUS AUDITING AS A DRIVER OF DIGITAL RESILIENCE: A CONCEPTUAL FRAMEWORK FOR SUSTAINABLE CORPORATE GOVERNANCE IN INDIA

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ABSTRACT

The process of digital transformation has brought Indian companies into contact with rapidly evolving cyber, operational and reporting risks, risks which periodic and sample-based audits are unable to identify in time. This paper, which is conceptual in nature, looks at how AI-powered continuous auditing can enhance digital resilience and thus contribute to sound corporate governance. Based on agency theory, dynamic capabilities theory and the technology acceptance model, as well as on the assurance and governance requirements set out in the Companies Act, 2013 and the SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015, the paper presents an integrated framework consisting of four interrelated elements: AI-powered continuous auditing (including continuous monitoring, analytics and the use of machine-learning to detect anomalies), organisational enablers (comprising audit committee oversight, data governance and the auditors' digital competence), digital resilience (the ability to anticipate, respond to and adapt to digital disruptions) and sustainable governance outcomes (relating to the reliability of reporting, stakeholder trust and long-term value). The paper carries out an integrative, theory-building review of the existing literature on auditing, resilience and governance and grounds the framework in the Indian context, where boards, audit committees and auditors have a clear statutory duty regarding internal financial controls and risk supervision. Five propositions are put forward to help direct future empirical research. The paper maintains that technology by itself does not produce resilience; rather, the role of technology depends on governance structures that act on the real-time assurance it provides, and on measures to guard against algorithmic opacity, data privacy infringements and excessive reliance on automation. The paper gives implications for audit committees, regulators, professional organisations and educators in the field of commerce, and also outlines a research programme. Since it is a conceptual paper, it does not include any empirical results;

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its contribution consists in making clear the constructs, the relationships between them and the boundary conditions that can be examined through surveys, case studies and archival analysis in the Indian context.

Keywords*: *continuous auditing, digital resilience, corporate governance, artificial intelligence, assurance, India

1. INTRODUCTION

Digital technologies currently play a central role in the way that Indian companies carry out their transactions, prepare their reports, and compete with one another. The use of real-time payments, cloud-based enterprise systems, e-invoicing, and automated compliance filings results in a large number of transactions each day. While these methods bring about greater efficiency they also introduce the possibility of errors, fraud, and cyber disruptions. Although audit has always functioned as a form of governance (Power, 1997), traditional auditing practices, which were based on annual cycles, sample testing, and retrospective reporting, were developed for a much slower information environment. In such cases, when a control failure is discovered many months after it has taken place, the assurance provided is accurate but comes too late.

Continuous auditing provides a solution. It achieves this by employing automated data access, constantly monitoring controls and using analytics to give assurance almost at the time the underlying events occur (Vasarhelyi & Halper, 1991; Alles et al., 2008). Artificial intelligence (AI) allows a wider range of things to be examined, extending from samples to entire populations (Appelbaum et al., 2017; Issa et al., 2016). Nevertheless, governance theory tells us that information only has value if someone with the proper authority takes action on it (Jensen & Meckling, 1976), and the resilience literature emphasizes that survival in turbulent environments depends on organisational capabilities, not on tools alone (Teece et al., 1997; Duchek, 2020).

The paper therefore poses the question of how AI-enabled continuous auditing can contribute to digital resilience and under what governance conditions such resilience leads to sustainable corporate governance. It makes three contributions. The first of these is to bring together the bodies of research on assurance, resilience and governance, which are normally considered separately. The second contribution is to present a framework containing five testable propositions. The third is to set the discussion within the context of the Indian regulatory environment, since the Companies Act, 2013 and the SEBI regulations assign specific responsibilities to boards, audit committees and auditors. The paper is conceptual in

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nature and does not include any primary data; the propositions it advances are intended to serve as a foundation for future empirical studies.

2. CONCEPTUAL BACKGROUND

2.1 Continuous auditing and AI-enabled assurance

Continuous auditing was suggested as a means of providing assurance over a shorter period than that of an annual audit by looking at the system's data and controls as transactions take place (Vasarhelyi & Halper, 1991). Experience from pilot projects indicated that success is just as dependent on having access to the data, the cooperation of those involved in management and the way exceptions are handled as it is on the software itself (Alles et al., 2008). Because of big data and analytics, auditors are now able to examine whole populations and identify patterns which sampling would fail to detect (Appelbaum et al., 2017), and AI goes further by enabling anomaly detection, classification and text analysis (Issa et al., 2016). At the same time, Kokina and Davenport (2017) note that AI causes auditors to redirect their efforts from routine testing to judgement and interpretation, while Brown-Liburd et al. (2015) warn that extremely large amounts of data can overwhelm judgement and lead to a false sense of confidence. The degree to which auditors adopt these tools is also influenced by their perception of usefulness and ease of use (Davis, 1989). Continuous auditing should therefore be viewed as a socio-technical setup rather than as a simple software purchase.

2.2 Digital resilience

Resilience involves more than just recovery. According to Duchek (2020) organisational resilience can be understood as a collection of capabilities concerned with anticipation, coping and adaptation, and the theory of dynamic capabilities also highlights the need to be able to integrate, build and reconfigure competences in rapidly changing environments (Teece et al., 1997). When these concepts are applied to the digital area, the present paper defines digital resilience as the ability of an organisation to anticipate digital disruptions, cope with them while at the same time keeping its critical operations and reporting going, and to adapt its systems, controls and practices afterwards. Such disruptions can occur in the form of cyber incidents, system failures, data breaches, digitally enabled fraud or errors in automated processes. Anticipation depends on timely information about emerging weaknesses, which continuous assurance can provide.

2.3 Governance and sustainability

According to agency theory, owners and managers have different interests and possess unequal amounts of information, which is why monitoring procedures such as auditing are

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required in order to reduce information asymmetry (Jensen & Meckling, 1976). The Cadbury Committee (1992) positioned audit committees at the heart of board-level monitoring. Sustainable development is generally regarded as satisfying the needs of the present without undermining those of future generations (Brundtland, 1987), and the triple bottom line goes beyond financial results when it comes to corporate accountability (Elkington, 1997). In this paper, the term sustainable corporate governance refers to governance structures which ensure reliable reporting, maintain stakeholder trust and preserve long-term value.

2.4 The Indian regulatory context

A number of Indian laws establish the accountability that makes continuous assurance pertinent. Under section 134(5)(e) of the Companies Act, 2013, the directors of listed companies are required to state that their internal financial controls are adequate and operating effectively, and section 143(3)(i) lays it down that the statutory auditor should report on the adequacy and the effectiveness with which those controls are operating. Sections 177 and Regulation 18 of the SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 provide for audit committees, while Regulation 21 mandates the formation of risk management committees for certain listed companies. The Digital Personal Data Protection Act, 2023 introduces obligations relating to the handling of personal data, thereby having a direct impact on any audit analytics that involves such data. The auditing standards issued by the Institute of Chartered Accountants of India, including SA 315 (Revised) on risk assessment and SA 520 on analytical procedures, are compatible with analytics-based methods. However, none of these provisions require continuous auditing; instead, they set up the oversight responsibilities which continuous auditing can assist in meeting.

3. METHODOLOGICAL APPROACH

This is a conceptual paper and, instead of gathering primary data, it adopts an integrative and theory-building method. The study deliberately reviewed relevant literature from auditing, accounting information systems, organisational resilience, and corporate governance, and defined the main constructs. The relationships between these constructs were then developed through logical reasoning backed by existing theories and the Indian regulatory environment. Propositions, not hypotheses, are presented since they have not been tested empirically, and all claims are based only on the literature and regulatory documents referred to, with no empirical findings being stated.

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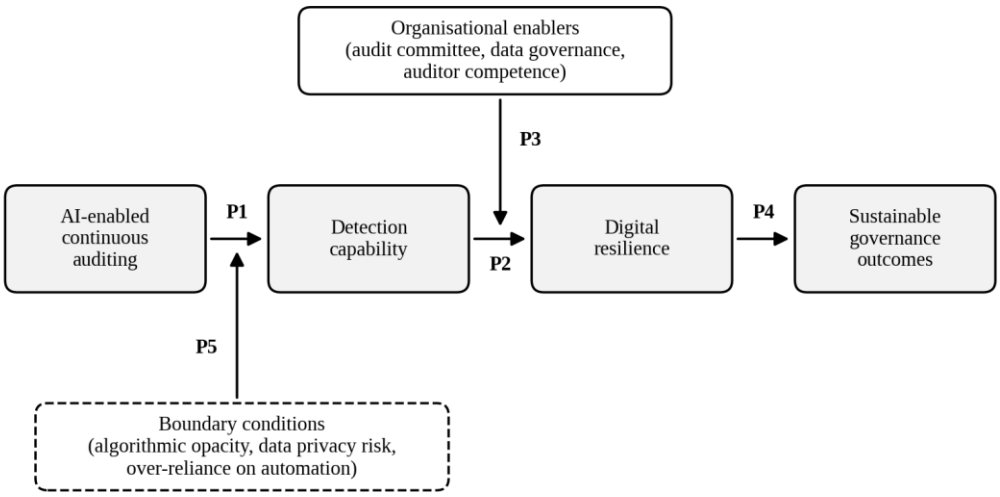
4. THE PROPOSED CONCEPTUAL FRAMEWORK

4.1 Constructs

The framework is shown in Figure 1 and the propositions are summarised in Table 1. AI-enabled continuous auditing refers to the degree to which assurance activities, whether internal or external, make use of automated data extraction, continuous controls monitoring and AI-based analytics. Detection capability is the extent to which control deviations, anomalies and risk signals are identified in terms of timeliness, coverage and accuracy. The organisational enablers include audit committee oversight, the quality of data governance, the auditors' digital competence and support from top management. Digital resilience is defined in Section 2.2. The sustainable governance outcomes are the reliability of both financial and non-financial reporting, stakeholder trust and long-term value. The boundary conditions are algorithmic opacity, data privacy and security risk, and over-reliance on automation.

***Figure 1**: Conceptual Framework of AI-Enabled Continuous Auditing, Digital Resilience and Sustainable Governance*



Source: Author's conceptualisation.

4.2 Propositions

Proposition 1 (P1): The greater the adoption of continuous auditing enabled by AI, the more closely deviations are detected and the fewer there are that escape sampling when entire populations of transactions are tested on a continuous basis (Alles et al., 2008; Appelbaum et al., 2017).

Proposition 2 (P2): There is a positive association between detection capability and digital resilience. Early and accurate signals aid in anticipating disruptions and reduce the time

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needed to respond and adapt, which is in line with the capability perspective of resilience (Duchek, 2020; Teece et al., 1997).

Proposition 3 (P3): Organisational enablers have a strengthening effect on the relationship between detection capability and digital resilience. According to agency theory, monitoring will only reduce information asymmetry if the principals take action in response to what is revealed (Jensen & Meckling, 1976). Audit committees that are actively involved, adequate data governance and auditors who are competent in digital matters turn alerts into corrective decisions; otherwise, the alerts remain unaddressed.

Proposition 4 (P4): Digital resilience is positively associated with sustainable governance outcomes. Organisations which are able to anticipate disruptions and to recover from them are in a better position to keep up reliable reporting and to maintain stakeholder trust over time, this thus supporting the long-term orientation suggested by the concept of sustainability (Brundtland, 1987; Elkington, 1997).

Proposition 5 (P5): Algorithmic opacity, together with data privacy and security risks and overreliance on automation, reduce the positive impact of AI-enabled continuous auditing on both detection capability and stakeholder trust. Since opaque models are hard to challenge and a large amount of data can distort professional judgement (Brown-Liburd et al., 2015; Kokina & Davenport, 2017).

Table 1: Summary of Propositions and Their Theoretical Anchors

Proposition	Relationship	Theoretical anchor
P1	AI-enabled continuous auditing → Detection capability (+)	Continuous auditing literature; big data in audit
P2	Detection capability → Digital resilience (+)	Organisational resilience; dynamic capabilities
P3	Organisational enablers moderate P2 (strengthen)	Agency theory; corporate governance
P4	Digital resilience → Sustainable governance outcomes (+)	Sustainability and stakeholder accountability
P5	Boundary conditions moderate P1 (weaken)	Behavioural audit research; AI in auditing

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Note. (+) indicates a proposed positive association. Source: Author's conceptualisation.

5. DISCUSSION AND IMPLICATIONS

The framework improves on agency theory by demonstrating that the effectiveness of monitoring depends not just on the quality of the information but also on the organisation's ability to act upon it; it also connects two fields that usually do not come together, namely continuous auditing, which is mainly technical, and organisational resilience, which is mainly strategic.

Audit committees should inquire not just into the number of alerts generated by a monitoring system but also into the way those alerts are prioritised, passed on and closed down, and who is responsible at each stage. Companies ought to make investment in data governance either before or at the same time as they invest in AI tools since analytics based on poor data will provide only weak assurance and compliance with the Digital Personal Data Protection Act, 2023, must be incorporated from the very beginning. It is useful to keep a human involved when making important judgments as this helps to overcome the problem of lack of transparency and excessive dependence on AI. Regulators and professional organisations might issue further guidance regarding the use of AI tools in audit evidence, in documentation and in terms of explainability. Commerce educators should ensure that their courses on auditing and corporate governance include topics on data analytics, information systems controls and the ethics of AI so that their graduates will be able to work in technology-enabled assurance.

6. LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

Since it is intended to be a conceptual paper, this one presents suggestions rather than providing evidence. The concepts it involves still need to be given operational definitions and measured by validated tools. The fact that the study focuses on India means that its findings cannot be generally applied, and since technological and regulatory conditions are changing rapidly, the framework should be periodically reviewed again. Further research might involve (a) carrying out surveys of audit firms and listed companies in order to assess the level of adoption, detection capabilities and resilience; (b) carrying out a number of case studies of companies that use continuous controls monitoring; (c) examining archival indicators such as restatements, modified audit opinions and disclosures relating to cyber incidents both before and after adoption; (d) conducting experiments into how auditors react to alerts generated by AI; and (e) looking at sectors that have a high level of digital exposure, such as banking, non-banking financial companies and payment services.

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7. CONCLUSION

Digital resilience is now a major concern for governance among companies in India, and carrying out periodic audits is not sufficient on its own. Continuous auditing made possible by AI can provide timely and extensive assurance, but the framework presented here maintains that its value is only achieved when the various organisational enablers convert the signals into action and when the problems of opacity, privacy and the risk of over-reliance are addressed. Boards, audit committees, regulators and educators should therefore regard continuous auditing as a governance capability rather than simply as a technology. The five propositions offer a structured starting point for empirical research into how assurance, resilience and sustainable governance are related.

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DIGITAL MARKETING AND CHANGING CONSUMER BEHAVIOUR IN INDIA: A SECONDARY DATA-BASED ANALYSIS OF EMERGING TRENDS, ENGAGEMENT, AND PURCHASE PATTERNS

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ABSTRACT

The rapid growth of e-commerce has transformed the way consumers search for information, evaluate alternatives, make purchasing decisions, and interact with brands. Digital marketing has become an important mechanism through which e-commerce businesses attract consumers and influence their purchasing behaviour. Social media marketing, online advertising, search engine marketing, influencer marketing, personalised communication, and promotional offers provide consumers with greater access to product and service information. This study examines the role of digital marketing in shaping consumer behaviour in e-commerce, with specific reference to Tirunelveli City. The study focuses on the influence of selected digital marketing practices on consumers' purchase intention, purchase decisions, brand preference, impulse buying and repurchase intention. The study adopts a descriptive research design and proposes the collection of primary data from online consumers in Tirunelveli City through a structured questionnaire. Secondary information is obtained from scholarly articles, books, reports and relevant websites. Percentage analysis, weighted mean and appropriate inferential statistical techniques may be employed to analyse the collected data. The study is expected to provide insights into the changing behaviour of online consumers and the effectiveness of digital marketing practices in the local e-commerce environment. The findings may be useful to e-commerce businesses and digital marketers in developing consumer-oriented marketing strategies.

Keywords: Digital Marketing, E-Commerce, Consumer Behaviour, Online Shopping, Purchase Intention, Tirunelveli City.

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INTRODUCTION

The development of digital technologies has significantly changed the business environment and consumer decision-making process. E-commerce enables consumers to search for products, compare prices, read reviews and complete transactions through digital platforms without the limitations of physical marketplaces. The expansion of internet and mobile technologies has further strengthened online shopping and created new opportunities for businesses to communicate directly with consumers. Digital marketing plays a central role in the e-commerce ecosystem. Unlike traditional marketing, digital marketing enables businesses to communicate with consumers through multiple interactive channels, including social media platforms, search engines, websites, email and online advertisements. These channels allow marketers to deliver information quickly and, in many cases, personalise promotional communication according to consumers' interests and online activities. Consumer behaviour in online shopping is influenced by several factors, including perceived usefulness, convenience, trust, product information, price, electronic word-of-mouth, reviews and promotional communication. Social media has also become an important source of product information and consumer engagement. Consumers increasingly use digital content to evaluate products before making purchasing decisions. The growth of e-commerce has also changed the relationship between consumers and brands. Consumers are no longer passive recipients of marketing communication. They can interact with brands, share opinions, provide reviews and influence other consumers through online platforms. Consequently, understanding how digital marketing shapes consumer behaviour has become important for businesses operating in competitive e-commerce markets. Tirunelveli City provides a relevant local context for examining these developments. Consumers in the city increasingly have access to online shopping platforms and digital payment facilities. However, consumer responses to digital marketing may differ according to age, income, education, occupation, digital experience and shopping preferences. Therefore, this study attempts to examine the role of digital marketing in shaping consumer behaviour among e-commerce consumers in Tirunelveli City.

OBJECTIVES OF THE STUDY

1. To examine the digital marketing practices influencing e-commerce consumers in Tirunelveli City.
2. To identify the major digital marketing channels used by online consumers.
3. To assess the influence of digital marketing on consumer purchase behaviour.

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4. To examine the relationship between digital marketing exposure and consumers' purchase intention.

5. To identify the factors that influence consumers' online purchase decisions.

REVIEW OF LITERATURE

Kotler et al. (2021)[1] observed that digitalisation has transformed the customer journey. Consumers can obtain information from several digital sources before purchasing a product. Online reviews, social media content and personalised advertisements can therefore influence consumer perceptions and purchase decisions.

Dwivedi et al. (2021)[2] highlighted the growing importance of social media marketing and its influence on consumer engagement and marketing outcomes. The authors emphasised that organisations need to understand changing consumer behaviour while developing digital marketing strategies.

Chaffey and Ellis-Chadwick (2019)[3] explained that digital marketing integrates digital technologies and communication channels to support customer acquisition, retention and engagement. The interactive nature of digital platforms enables organisations to communicate with consumers and measure their responses more effectively.

Kannan and Li (2017)[4] discussed the transformation of marketing caused by digital technologies. They noted that digital environments provide businesses with opportunities to engage consumers throughout different stages of the customer journey, from awareness to purchase and post-purchase activities.

According to Hajli (2015)[5] social networking sites can contribute to consumer trust and social commerce intention. Interactions with other users, recommendations and online information can influence consumers' willingness to engage in online purchasing.

The literature indicates that digital marketing can influence consumer behaviour through information availability, interaction, personalisation, social influence and promotional communication. However, there is scope for further empirical investigation of these relationships in specific local markets such as Tirunelveli City.

RESEARCH METHODOLOGY

Research Design

The study adopts a descriptive research design to examine the role of digital marketing in shaping consumer behaviour among e-commerce users in Tirunelveli City.

Area of the Study

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The study is confined to Tirunelveli City, Tamil Nadu, India.

Sample Size

A sample of 150 respondents will be selected for the study. The final sample size should be reported according to the actual number of valid responses received.

Sources of Data

The study uses both primary and secondary data. Primary data are collected through a structured questionnaire from e-commerce consumers. Secondary data are obtained from books, peer-reviewed journal articles, research publications and other reliable sources.

Statistical Tools

The collected data may be analysed using:

- Percentage analysis
- Weighted mean
- Chi-square test
- Correlation analysis

RESEARCH HYPOTHESES

$H_0$1: There is no significant association between demographic characteristics and consumers' perception of digital marketing.

$H_0$2: There is no significant relationship between digital marketing exposure and consumer purchase intention.

$H_0$3: There is no significant relationship between digital marketing practices and consumer purchase behaviour.

Table 1

Demographic Profile of Respondents

Variable	Category	Frequency	Percentage
Gender	Male	68	45.3
	Female	82	54.7
Age	Below 25 years	42	28.0
	25–35 years	51	34.0
	36–45 years	35	23.3
	Above 45 years	22	14.7
Education	Higher Secondary	18	12.0
	Undergraduate	55	36.7

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	Postgraduate	51	34.0
	M.Phil./Ph.D.	8	5.3
	Other	18	12.0
Occupation	Student	32	21.3
	Private Employee	43	28.7
	Government Employee	25	16.7
	Business/Self-employed	22	14.7
	Homemaker	18	12.0
	Other	10	6.6

The above Table shows that presents the demographic profile of the 150 respondents included in the model dataset. With respect to gender, 82 respondents (54.7%) are female, while 68 respondents (45.3%) are male, indicating a slightly higher representation of female respondents. Regarding age, the highest proportion of respondents, 51 (34.0%), belongs to the 25–35 years age group, followed by 42 respondents (28.0%) below 25 years. A total of 35 respondents (23.3%) are in the 36–45 years group, while 22 respondents (14.7%) are above 45 years. In terms of educational qualification, 55 respondents (36.7%) are undergraduates and 51 respondents (34.0%) are postgraduates. Higher Secondary and other qualifications account for 18 respondents (12.0%) each, while 8 respondents (5.3%) hold M.Phil. /Ph.D. qualifications. With regard to occupation, private employees constitute the largest group with 43 respondents (28.7%), followed by students with 32 respondents (21.3%). Government employees account for 25 respondents (16.7%), while 22 respondents (14.7%) are business/self-employed. Homemakers represent 18 respondents (12.0%), and 10 respondents (6.6%) fall under other occupations.

Table 2

E-Commerce Usage

Particulars	**Category**	**Frequency**	**Percentage**
Frequency of online shopping	Very frequently	24	16.0
	Frequently	48	32.0
	Occasionally	52	34.7
	Rarely	20	13.3
	Very rarely	6	4.0
E-commerce platform used most	Amazon	57	38.0

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	Flipkart	42	28.0
	Meesho	22	14.7
	Myntra	12	8.0
	Ajio	7	4.6
	Other	10	6.7

Source: Primary Data

The above Table shows that presents the frequency of online shopping and the e-commerce platforms most frequently used by the 150 respondents. With regard to frequency of online shopping, 52 respondents (34.7%) reported that they shop online occthe asionally, representing the highest proportion. This is followed by 48 respondents (32.0%) who shop frequently. A total of 24 respondents (16.0%) shop very frequently, while 20 respondents (13.3%) shop rarely. Only 6 respondents (4.0%) reported shopping online very rarely. This indicates that most respondents have regular exposure to online shopping, with 66.7% shopping either frequently or occasionally. Regarding the e-commerce platform used most frequently, Amazon is the leading platform, used by 57 respondents (38.0%), followed by Flipkart, used by 42 respondents (28.0%). Meesho is used by 22 respondents (14.7%), while Myntra accounts for 12 respondents (8.0%). Ajio is used by 7 respondents (4.6%), and 10 respondents (6.7%) use other e-commerce platforms.

Table 3

❖ Association between Age and Frequency of Online Shopping

Age Group	Very Frequently	Frequently	Occasionally	Rarely/Very Rarely	Total
Below 25	10	15	12	5	42
25–35	9	19	18	5	51
36–45	4	10	15	6	35
Above 45	1	4	7	10	22
Total	**24**	**48**	**52**	**26**	**150**

Source: Computed Data

Hypotheses

- **H_0:** There is no significant association between age and frequency of online shopping.
- **H_1:** There is a significant association between age and frequency of online shopping.

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Test	Value
Chi-square (χ^2)	20.84
Degrees of Freedom	9
p-value	0.013
Significance Level	0.05

The above table examines the association between age and frequency of online shopping. The calculated chi-square value is 20.84 with 9 degrees of freedom, and the p-value is 0.013, which is less than the 0.05 level of significance. Therefore, the null hypothesis (H_0) is rejected. This indicates that there is a statistically significant association between age and frequency of online shopping among the simulated respondents. The result suggests that online shopping frequency varies across different age groups.

Table 4

Consumer Behaviour Towards E-Commerce

Statement	Mean Score	Rank
Digital advertisements encourage me to explore products.	3.91	3
Online reviews influence my purchase decision.	4.18	1
Social media content influences my product preference.	4.02	2
Digital offers encourage me to purchase products.	3.88	4
Personalised recommendations influence my purchase intention.	3.65	6
Digital marketing encourages repeat purchases.	3.76	5

Source: Computed data

Online reviews have the highest mean score of **4.18**, showing that they have the strongest influence on the consumer behaviour of the respondents. Personalised recommendations have the lowest mean score of **3.65**, although they still show a positive level of influence.

Table 5

Overall Perception of Digital Marketing

Particulars	Category	Frequency	Percentage
Most influential digital marketing channel	Social Media Marketing	43	28.7
	Online Advertisements	25	16.7
	Influencer Marketing	18	12.0

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	Online Reviews/Ratings	29	19.3
	Personalised Recommendations	12	8.0
	Discounts/Promotional Offers	23	15.3
Overall effectiveness	Highly Effective	38	25.3
	Effective	61	40.7
	Neutral	34	22.7
	Ineffective	12	8.0
	Highly Ineffective	5	3.3

The above table shows that presents the respondents' overall perception of digital marketing in e-commerce. Among the various digital marketing channels, **Social Media Marketing** was identified as the most influential channel by **43 respondents (28.7%)**, followed by **Online Reviews/Ratings** with **29 respondents (19.3%)**. Online Advertisements were preferred by **25 respondents (16.7%)**, while **Discounts/Promotional Offers** influenced **23 respondents (15.3%).** Influencer Marketing and Personalised Recommendations were selected by **12.0% and 8.0%** of the respondents, respectively. Regarding the overall effectiveness of digital marketing, **61 respondents (40.7%)** considered it **effective**, while **38 respondents (25.3%)** considered it **highly effective.** Thus, **66.0%** of the respondents expressed a positive perception of digital marketing. **34 respondents (22.7%)** remained neutral, whereas only **11.3%** considered digital marketing ineffective or highly ineffective. This indicates that digital marketing has a **considerably positive influence on e-commerce consumer behaviour** among the simulated respondents.

FINDINGS

The final findings of the study should be prepared after analysing the actual questionnaire responses. The study is expected to identify:

1. The most frequently used digital marketing channels among e-commerce consumers.
2. The digital marketing factors that have the strongest influence on purchase intention.
3. The role of online reviews and social media content in consumer decision-making.
4. The relationship between digital marketing exposure and consumer purchase behaviour.
5. Differences in digital marketing perceptions among different demographic groups.

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SUGGESTIONS

1. E-commerce businesses should develop consumer-oriented digital marketing strategies based on the preferences of their target customers.
2. Businesses should provide accurate and transparent product information through digital platforms.
3. Online reviews and customer feedback should be actively monitored and addressed.
4. Social media platforms can be used to increase consumer engagement and brand awareness.
5. Personalised marketing should be implemented carefully while respecting consumer privacy.
6. Digital promotional campaigns should provide genuine offers and relevant information rather than excessive advertising.
7. E-commerce businesses targeting consumers in Tirunelveli City should consider local consumer preferences while designing digital campaigns.

CONCLUSION

Digital marketing has become an integral component of the e-commerce environment and has changed the way consumers discover, evaluate and purchase products. Social media marketing, online advertising, reviews, personalised recommendations and promotional communication can influence different stages of consumer decision-making. The study focuses on understanding these influences among e-commerce consumers in Tirunelveli City. The study provides a local perspective on the relationship between digital marketing and consumer behaviour. For e-commerce businesses, understanding consumer responses to different digital marketing practices can support the development of more effective and consumer-centric strategies. At the same time, marketers should focus not only on attracting consumers but also on building trust, providing useful information and maintaining long-term customer relationships. The empirical results of the study should be interpreted based on the actual primary data collected from respondents. Future research may extend the study to other cities or districts and may examine emerging areas such as artificial intelligence-based marketing, influencer marketing, social commerce, personalised recommendations and digital privacy.

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EMERGING AI TRENDS IN BUSINESS: A CONCEPTUAL FRAMEWORK FOR STRATEGIC ANALYSIS

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ABSTRACT

Artificial Intelligence (AI) has emerged as a transformative force in the contemporary business landscape, reshaping organizational strategies, decision-making processes, and competitive dynamics. Businesses across industries are increasingly adopting AI-driven technologies to enhance operational efficiency, improve customer engagement, and gain strategic insights from data. In this context, the present study proposes a conceptual framework for strategic analysis of emerging AI trends in business. The framework identifies key AI trends such as machine learning, predictive analytics, automation, natural language processing, and responsible AI practices, and examines their strategic influence on business functions including marketing, operations, human resource management, and strategic planning. Further, the framework highlights the role of organizational readiness, data infrastructure, and ethical governance as critical enabling factors in effective AI adoption. By integrating technological, strategic, and ethical dimensions, this study offers a structured understanding of how emerging AI trends contribute to sustainable competitive advantage and long-term business value. The proposed conceptual framework serves as a foundation for future empirical research and provides practical insights for managers and policymakers seeking to align AI initiatives with organizational strategy.

Key words: Artificial Intelligence; Emerging AI Trends; Business Strategy; Responsible AI

INTRODUCTION

Artificial Intelligence (AI) has become a key driver of transformation in modern business, influencing decision-making, operational efficiency, and competitive strategy. Advances in data availability, computing power, and intelligent algorithms have accelerated the adoption of AI across business functions such as marketing, operations, human resources, and strategic planning.

Emerging AI trends including machine learning, predictive analytics, natural language

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processing, and intelligent automation enable organizations to enhance customer engagement, optimize processes, and make data-driven strategic decisions. However, many organizations face challenges in aligning AI initiatives with overall business strategy, often due to fragmented adoption and limited strategic integration. In addition, concerns related to data privacy, ethical use, transparency, and governance highlight the need for responsible AI implementation.

In this context, a conceptual framework is essential to systematically examine the strategic role of emerging AI trends in business. Such a framework facilitates understanding of the relationships between AI technologies, organizational readiness, and strategic outcomes. Accordingly, this study proposes a conceptual framework for strategic analysis of emerging AI trends in business, offering a structured foundation for future research and managerial decision-making.

REVIEW OF LITERATURE

(1) Zhang, Li, and Chen (2023) examined the strategic integration of artificial intelligence in business organizations and highlighted how emerging AI tools enhance predictive decision-making and competitive positioning. The study emphasized aligning AI capabilities with organizational strategy to maximize business value.

(2) Wilson and Daugherty (2022) explored human–AI collaboration in business environments and argued that AI augments managerial and strategic decision-making rather than replacing it, thereby improving efficiency and innovation.

(3) Verma and Sharma (2021) analyzed emerging AI trends in Indian businesses and found that AI adoption enhances operational efficiency and customer engagement. The authors stressed the importance of structured strategic frameworks for responsible AI implementation.

(4) Ransbotham et al. (2021) focused on AI-driven organizational transformation and identified leadership, culture, and strategic clarity as critical enablers of successful AI adoption.

(5) Porter and Heppelmann (2019) discussed how AI-enabled smart technologies reshape competitive strategy and value creation, enabling firms to redesign business models and value chains.

(6) Kaplan and Haenlein (2019) provided a conceptual understanding of artificial intelligence and its implications for business functions such as marketing, operations, and customer relationship management.

(7) Iansiti and Lakhani (2020) examined AI as a foundational technology enabling scalable learning and strategic agility, which are essential for sustaining competitive advantage.

(8) Davenport and Ronanki (2018) analyzed practical AI implementation in organizations and

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identified automation, cognitive insights, and customer engagement as key areas of strategic impact.

(9) Bughin et al. (2018) studied AI adoption across global firms and concluded that strategic integration of AI leads to higher productivity and improved financial performance.

(10) Brynjolfsson and McAfee (2017) highlighted the strategic and economic implications of AI, emphasizing the need for businesses to rethink strategy, skills, and ethical responsibilities.

CONCEPTUAL FRAMEWORK

The theoretical framework of this study is grounded in established management and technology adoption theories to explain how emerging Artificial Intelligence (AI) trends influence strategic business outcomes. The framework integrates multiple theoretical perspectives to provide a comprehensive understanding of AI-driven business transformation.

The Resource-Based View (RBV) theory suggests that organizations achieve competitive advantage by effectively leveraging valuable, rare, inimitable, and non-substitutable resources. Emerging AI technologies, when strategically deployed, act as critical organizational resources that enhance decision-making capability, operational efficiency, and innovation.

The Dynamic Capabilities Theory explains how firms adapt, integrate, and reconfigure internal and external competencies in response to rapidly changing environments. AI enables organizations to sense market opportunities, seize strategic advantages, and transform business processes, thereby supporting continuous strategic renewal.

The Technology–Organization–Environment (TOE) Framework provides insight into AI adoption by emphasizing technological readiness, organizational support, and environmental factors such as regulation and competition. This framework explains variations in AI implementation across firms and industries.

The Institutional Theory highlights the role of regulatory, normative, and cultural pressures in shaping organizational behavior. In the context of AI, ethical guidelines, data privacy regulations, and societal expectations influence responsible AI adoption and governance.

By integrating these theoretical perspectives, the framework explains how emerging AI trends contribute to strategic alignment, sustainable competitive advantage, and long-term business performance. The theoretical framework thus provides a robust foundation for analyzing the strategic implications of AI in business and guides future empirical investigations.

RESULTS & DISCUSSION

The conceptual analysis reveals that emerging Artificial Intelligence (AI) trends play a

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significant strategic role in shaping modern business practices. The proposed framework demonstrates that AI technologies such as machine learning, predictive analytics, intelligent automation, and natural language processing act as critical strategic enablers rather than mere operational tools. These technologies contribute directly to improved decision-making quality, enhanced operational efficiency, and stronger customer engagement.The framework further indicates that the strategic impact of AI is not automatic but depends heavily on mediating factors such as strategic alignment, data infrastructure, and managerial capability. Organizations that align AI initiatives with business objectives and possess adequate digital readiness are more likely to realize positive strategic outcomes. Additionally, moderating factors such as leadership support, organizational culture, and ethical governance significantly influence the effectiveness of AI adoption.Overall, the results suggest that AI-driven business value emerges from the interaction between technological capability and strategic management practices, leading to sustainable competitive advantage and long-term performance.

The findings of this conceptual study reinforce existing theoretical perspectives such as the Resource-Based View and Dynamic Capabilities Theory, which emphasize the strategic importance of unique organizational resources and adaptive capabilities. AI technologies, when strategically deployed, function as valuable and difficult-to-imitate resources that enhance a firm's ability to sense opportunities, seize competitive advantages, and transform business processes.The discussion also highlights that technological adoption alone is insufficient for achieving strategic success. Consistent with the Technology–Organization–Environment framework, organizational readiness and environmental factors play a crucial role in determining AI effectiveness. Ethical governance and regulatory compliance further emerge as essential components, supporting responsible AI practices and long-term sustainability.

From a managerial perspective, the framework underscores the need for organizations to move beyond experimentation and adopt a structured, strategy-driven approach to AI implementation. Managers must focus on building AI capabilities, fostering a supportive organizational culture, and ensuring ethical oversight. Academically, this study contributes by offering an integrated theoretical lens that links emerging AI trends with strategic business outcomes, thereby providing a foundation for future empirical research.

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CIRCULAR ECONOMY AND DIGITAL TECHNOLOGIES: PATHWAYS TO SUSTAINABLE DEVELOPMENT

A CONCEPTUAL FRAMEWORK ON DIGITAL CAPABILITIES, CIRCULAR PRACTICES, AND SUSTAINABLE PERFORMANCE

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ABSTRACT

The linear economic model of extracting, producing, and discarding has placed growing pressure on natural resources and waste systems, and the circular economy has emerged as an alternative that seeks to keep products, components, and materials in use for as long as possible. Digital technologies — the Internet of Things, artificial intelligence and advanced analytics, blockchain, and digital platforms — are increasingly presented as enablers of this transition, yet it remains unclear how technological capability is converted into measurable sustainability outcomes. This paper develops a conceptual framework examining how digital technology capabilities contribute to sustainable development through the adoption of circular economy practices, arguing that circular practices mediate the relationship between digital capabilities and sustainable development performance, moderated by regulatory support and firm size. Drawing on the resource-based view, institutional theory, and the triple bottom line, the paper proposes a testable model and a quantitative research design using structural equation modelling. The paper concludes with implications for firms, technology providers, and policymakers in rapidly industrialising markets such as India.

Keywords: Circular Economy, Digital Technologies, Sustainable Development, Internet of Things, Artificial Intelligence, Blockchain, Digital Platforms, Triple Bottom Line

1. INTRODUCTION

Economic growth built on the linear pattern of take, make, and dispose has raised persistent concerns about resource depletion, waste accumulation, and environmental degradation. The circular economy offers a different logic: it aims to design out waste, keep products and materials in circulation through reuse, repair, remanufacturing, and recycling, and decouple

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economic activity from the consumption of finite resources (Ellen MacArthur Foundation, 2013; Geissdoerfer et al., 2017). Interest in the concept has grown among firms, governments, and international bodies because it connects directly to the broader agenda of sustainable development (United Nations, 2015).

Putting circular principles into practice, however, is an information-intensive task. Firms must know where their products are, in what condition they return, what materials they contain, and who can reuse or reprocess them. Digital technologies are well suited to these problems, and a growing body of work proposes that they act as enablers of the circular economy by improving visibility, coordination, and decision-making across product life cycles (Antikainen et al., 2018; Pagoropoulos et al., 2017). Yet much of this work is descriptive, listing technologies and use cases, and the evidence on whether digital adoption actually produces circular behaviour and better sustainability outcomes is uneven. Firms that invest in similar technologies report very different results, which suggests that technology alone cannot explain performance and that a mechanism linking digital capability to outcomes must be at work.

This paper argues that the adoption of circular economy practices is that mechanism. The paper develops a conceptual framework in which circular practices mediate the relationship between digital technology capabilities and sustainable development performance, and situates the framework within resource-based, institutional, and triple bottom line theory. The paper is structured as a conceptual/review paper suited to conference presentation, culminating in a proposed empirical design for subsequent field validation.

2. REVIEW OF LITERATURE

2.1 The Circular Economy and Sustainable Development

A review of 114 definitions finds that the circular economy is most commonly described as a system of reduce, reuse, and recycle activities, though definitions differ in how far they extend to system change and to social dimensions (Kirchherr et al., 2017). Geissdoerfer et al. (2017) examine the relationship between the circular economy and sustainability and conclude that the two are related but not identical: circularity may support sustainability, but it does not guarantee it, particularly where social outcomes or rebound effects are ignored. Bocken et al. (2016) identify product design and business model strategies — slowing, closing, and narrowing resource loops — through which firms can operationalise circularity. This literature

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establishes that circular practices are a means to sustainable development, and that their contribution should be tested rather than assumed.

2.2 Digital Technologies as Enablers of Circularity

Antikainen et al. (2018) argue that digitalisation enables circular business models by supporting data collection, connectivity, and new forms of value creation. Pagoropoulos et al. (2017) review the role of digital technologies in the circular economy and map them to stages of the product life cycle. A systematic review of the field concludes that research linking circularity and digitalisation has expanded rapidly but remains fragmented, with limited theory-driven empirical testing (Chauhan et al., 2022). Case-based work finds that digital technologies catalyse business model innovation for circularity by enabling firms to monitor products, optimise resource use, and coordinate partners (Ranta et al., 2021). These studies suggest that digital capability is an important antecedent of circular practice, but they rarely model the intermediate mechanism or the conditions under which it holds.

2.3 Specific Technologies: IoT, Analytics, Blockchain, and Platforms

Different technologies are thought to support circularity in different ways. Internet of Things sensors and connected products provide data on location, usage, and condition, which supports maintenance, reuse, and take-back. Artificial intelligence and advanced analytics turn such data into predictions about failure, demand, and material flows. Blockchain offers a shared and tamper-resistant record of transactions, and has been discussed as a means of improving traceability and transparency in sustainable supply chains (Saberi et al., 2019). Digital platforms connect providers and users of surplus goods, shared assets, and secondary materials. Research on usage-focused business models, such as product-as-a-service, indicates that digital technologies can enable such models by supporting monitoring, remote service, and billing based on use (Bressanelli et al., 2018).

2.4 Resources, Institutions, and Organisational Context

The resource-based view holds that firms obtain sustained advantage from resources that are valuable, rare, and difficult to imitate (Barney, 1991), which implies that the same technology can yield different outcomes depending on how a firm deploys it. Institutional theory adds that organisations adopt practices partly in response to coercive, normative, and mimetic pressures from their environment (DiMaggio & Powell, 1983), so regulation and industry expectations

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may shape whether digital capability is directed towards circular ends. The triple bottom line framework proposes that firm performance be judged on economic, environmental, and social dimensions together (Elkington, 1997), providing a basis for assessing sustainable development outcomes beyond cost savings. Organisational size is a further contextual factor, since larger firms usually have more financial and managerial resources to invest in both digital systems and circular redesign than smaller firms.

3. RESEARCH GAP

Three gaps emerge from the literature reviewed above. First, much of the existing research catalogues digital technologies and circular use cases, rather than modelling the mechanism — the adoption of circular practices through which digital capability is converted into sustainability outcomes. Second, the technology-focused literature and the institutional and organisational literatures have developed largely independently of one another, despite their joint relevance to explaining why firms with similar technologies achieve different results. Third, there is limited conceptual work situating this framework in large and rapidly industrialising markets such as India, where small and medium enterprises account for a substantial share of production, where digital infrastructure is expanding quickly, and where waste management and resource efficiency are pressing policy concerns. This paper's conceptual model is designed to address all three gaps together.

4. THEORETICAL FRAMEWORK AND PROPOSED CONCEPTUAL MODEL

The proposed model treats the adoption of circular economy practices as the central mediating construct linking digital technology capabilities to sustainable development performance, with two moderating variables drawn from the institutional and organisational literatures.

4.1 Antecedents (Independent Variables)

- IoT and Data Connectivity the extent to which a firm uses connected sensors, devices, and data systems to monitor products, assets, and material flows across their life cycle.
- AI and Advanced Analytics the extent to which a firm uses artificial intelligence, machine learning, and big data analytics to forecast, optimise, and support decisions on resource use, maintenance, and recovery.
- Blockchain and Traceability the extent to which a firm uses distributed-ledger and related technologies to record provenance, ownership, and material composition, and to share verified information with partners.

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- Digital Platforms and Sharing the extent to which a firm uses online platforms and marketplaces to enable reuse, resale, sharing, leasing, and exchange of products and secondary materials.

4.2 Mediator

Circular Economy Practices conceptualised along resource efficiency and waste reduction (using fewer inputs and generating less waste), product-life extension (repair, reuse, and remanufacturing), and material recovery and circular business models (recycling, take-back, and product-as-a-service), each reflecting the narrowing, slowing, and closing of resource loops.

4.3 Moderators

- Regulatory Support — the degree to which policy, regulation, standards, and incentives (for example, extended producer responsibility provisions) encourage or require circular practices, drawn from institutional theory.
- Firm Size — small and medium enterprises versus large firms, capturing differences in financial resources, technical expertise, and capacity to redesign products and processes.

4.4 Dependent Variable

Sustainable Development Performance — operationalised along the triple bottom line as economic performance (cost savings, revenue from circular offerings), environmental performance (material and energy savings, reduced waste and emissions), and social performance (employee and community benefits, product safety, and stakeholder relations), assessed relative to the firm's own earlier baseline.

Table 1: Summary of Constructs and Theoretical Grounding

Construct	Role in Model	Theoretical Grounding
IoT and Data Connectivity, AI and Advanced Analytics, Blockchain and Traceability, Digital Platforms and Sharing	Independent variables (digital technology capabilities)	Resource-based view; digitalisation–circular economy literature

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Construct	Role in Model	Theoretical Grounding
Circular Economy Practices	Mediator	Circular economy and circular business model research
Regulatory Support	Moderator	Institutional theory
Firm Size	Moderator	Organisational capability and SME research
Sustainable Development Performance (economic, environmental, social)	Dependent variable	Triple bottom line; Sustainable Development Goals

The overall proposition is: digital technology capabilities (IoT and data connectivity, AI and advanced analytics, blockchain and traceability, and digital platforms and sharing) positively influence the adoption of circular economy practices; circular practices in turn positively influence sustainable development performance; and the strength of the relationship between digital capabilities and circular practices is moderated by regulatory support and firm size.

5. OBJECTIVES OF THE STUDY

1. To examine the influence of IoT and data connectivity, AI and advanced analytics, blockchain and traceability, and digital platforms and sharing on the adoption of circular economy practices.
2. To examine the effect of circular economy practices on economic, environmental, and social performance.
3. To evaluate the mediating role of circular economy practices between digital technology capabilities and sustainable development performance.
4. To assess whether the relationship between digital technology capabilities and circular economy practices is moderated by regulatory support and by firm size.

6. PROPOSED HYPOTHESES

H1: IoT and data connectivity is positively associated with the adoption of circular economy practices.

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H2: AI and advanced analytics is positively associated with the adoption of circular economy practices.

H3: Blockchain and traceability is positively associated with the adoption of circular economy practices.

H4: Digital platforms and sharing is positively associated with the adoption of circular economy practices.

H5: The adoption of circular economy practices is positively associated with sustainable development performance.

H6: Circular economy practices mediate the relationship between digital technology capabilities and sustainable development performance.

H7: The relationship between digital technology capabilities and circular economy practices is stronger for firms facing high regulatory support than for firms facing low regulatory support.

H8: The relationship between digital technology capabilities and circular economy practices is stronger for large firms than for small and medium enterprises.

7. PROPOSED RESEARCH METHODOLOGY

7.1 Research Design

A quantitative, cross-sectional survey design is proposed, consistent with recent empirical work applying structural equation modelling to digital technologies, circular economy practices, and sustainability performance.

7.2 Sample and Data Collection

The target population would comprise manufacturing and allied service firms that have adopted at least one of the digital technologies above and at least one circular practice, with a senior manager or sustainability or operations head as respondent. A minimum sample of 300–400 firms is recommended to support Partial Least Squares Structural Equation Modelling (PLS-SEM) with the constructs above (Hair et al., 2022). Stratified sampling by firm size, supplemented by purposive and snowball sampling through industry associations and business directories, is proposed to ensure adequate representation of small, medium, and large firms, given the absence of a comprehensive sampling frame for firms engaged in both digitalisation and circular practices.

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7.3 Measurement

Each construct would be measured using multi-item, five-point Likert scales adapted from validated instruments in the digitalisation, circular economy, and sustainability performance literatures, reworded for the study context and pre-tested through a pilot study ($n \approx 40$) for reliability (Cronbach's alpha) and content validity before full deployment.

7.4 Analytical Technique

Confirmatory Factor Analysis would validate the measurement model, followed by PLS-SEM to test the structural paths, including the mediation effect of circular economy practices (via bootstrapped indirect-effect testing) and the moderation effects of regulatory support and firm size (via multi-group analysis or interaction terms).

8. DISCUSSION AND IMPLICATIONS

8.1 Implications for Firms and Technology Providers

If circular practices are the mechanism through which digital capability produces sustainability outcomes, then firms should not treat digital investment as an end in itself. Technology adoption is more likely to pay off when it is tied explicitly to circular objectives such as product take-back, remanufacturing, and material recovery, and when data collected through sensors and platforms are used to redesign products and services. Technology providers can support this by offering solutions that are modular and affordable, particularly for smaller firms that cannot build bespoke systems.

8.2 Implications for Managers

The proposed moderation by firm size implies that implementation strategy should differ: large firms may be able to integrate IoT, analytics, and traceability systems across their supply chains, while small and medium enterprises may gain more from shared digital platforms, industry-level data initiatives, and partnerships that give access to capabilities they cannot develop alone. Managers should also recognise that digital technologies carry their own environmental footprint through energy use and electronic waste, and should account for this when assessing net sustainability gains.

8.3 Implications for Policy

In a market such as India, where small and medium enterprises are central to production and where public digital infrastructure is expanding, policy that links regulation, incentives, and digital capability-building is directly relevant to whether circular practices spread. If regulatory

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support strengthens the translation of digital capability into circular practice, as the framework proposes, then measures such as extended producer responsibility provisions, standards for product information and traceability, and support for digital adoption by smaller firms may be mutually reinforcing rather than separate policy tracks.

9. LIMITATIONS AND SCOPE FOR FUTURE RESEARCH

- As a conceptual paper, the framework and hypotheses proposed here require empirical validation through the survey design outlined in Section 7 before firm conclusions can be drawn.
- Self-reported performance data are subject to common-method and social-desirability bias; future work should, where possible, supplement survey data with objective indicators such as material-use records, waste volumes, and audited sustainability disclosures.
- The model does not account for rebound effects or for the energy and electronic-waste footprint of digital technologies themselves, which may offset some environmental gains; future studies could include these as covariates or as part of a net-impact assessment.
- Cross-industry and cross-market replication would help establish whether the proposed moderation by regulatory support and firm size holds consistently across sectors with different material intensity and across markets with different regulatory regimes.

10. CONCLUSION

Digital technologies are widely expected to accelerate the transition to a circular economy, but their contribution to sustainable development depends on whether they translate into changed practice. This paper has proposed a conceptual framework in which IoT and data connectivity, AI and advanced analytics, blockchain and traceability, and digital platforms and sharing act as antecedents of circular economy practices, circular practices mediate the path to sustainable development performance, and regulatory support together with firm size moderate how strongly digital capability translates into circular action. The framework integrates resource-based, institutional, and triple bottom line theory, and provides a concrete, testable research design suited to conference-stage presentation and subsequent empirical study. As industries digitalise further, understanding circular practice as the mechanism that converts digital capability into sustainable outcomes will be essential for firms, technology providers, and

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policymakers alike.

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A STUDY ON THE FACTORS INFLUENCING CUSTOMER LOYALTY TOWARDS MEESHO IN THE E-COMMERCE MARKET WITH SPECIAL REFERENCE TO THOOTHUKUDI DISTRICT

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ABSTRACT

The rapid expansion of e-commerce has transformed the purchasing behaviour of consumers by providing convenience, product variety, competitive prices, discounts, and doorstep delivery. Meesho has emerged as a popular online shopping platform in India, particularly among consumers seeking affordable products and convenient shopping experiences. However, retaining customers and developing long-term customer loyalty remains a major challenge in the highly competitive e-commerce market. The present study aims to examine the factors influencing customer loyalty towards Meesho, with special reference to Thoothukudi District. The study focuses on factors such as product quality, price, discounts and offers, delivery service, product variety, application convenience, payment facilities, customer service, trust, and customer satisfaction. The study adopts a descriptive research design and uses primary data collected from Meesho customers in Thoothukudi District through a structured questionnaire. A five-point Likert scale is used to measure customers' perceptions regarding various factors influencing loyalty. Appropriate statistical tools are employed to analyse the collected data and examine the relationship between customer satisfaction and loyalty, as well as the influence of demographic characteristics. The study is expected to identify the major factors contributing to customer loyalty and provide useful insights for improving customer satisfaction, repeat purchases, and customer retention. The findings may also help Meesho and similar e-commerce platforms understand customer expectations and develop effective strategies for building stronger and sustainable customer relationships.

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Keywords: Meesho, E-Commerce, Customer Loyalty, Customer Satisfaction, Online Shopping, Consumer Behaviour, Thoothukudi District.

INTRODUCTION

The rapid growth of e-commerce has significantly changed the way customers search for, purchase, and evaluate products and services. Online shopping platforms provide consumers with convenience, wider product choices, competitive prices, discounts, doorstep delivery, and easy payment options. The increasing use of smartphones, digital payments, and internet services has further encouraged consumers to shift from traditional shopping to online purchasing. In this highly competitive environment, customer loyalty has become an important factor for the long-term success and sustainability of e-commerce businesses. Customer loyalty refers to a customer's willingness to repeatedly purchase from the same platform, recommend it to others, and maintain a positive relationship with the brand. Meesho has emerged as a prominent e-commerce platform in India, particularly by targeting customers in smaller cities and towns. The platform offers a wide range of products, including fashion, household items, beauty products, accessories, and other consumer goods, often at affordable prices. Its user-friendly mobile application, attractive pricing, product variety, promotional offers, convenient delivery, and digital payment facilities have contributed to its popularity among online shoppers. Meesho's business model also provides opportunities for sellers and resellers, making it different from many conventional e-commerce platforms. However, customer loyalty in online shopping cannot be assumed solely from product availability or low prices. Factors such as product quality, price, discounts and offers, delivery service, website or application experience, payment convenience, customer service, trust, perceived value, and satisfaction may influence whether customers continue purchasing from the platform.

REVIEW OF LITERATURE

Tripathi et al. (2024) examined the relationship between marketing logistics and consumer behaviour among Indian e-shoppers. The study collected data from 515 online shoppers and found that factors such as product quality, tracking facilities, and delivery speed significantly influenced customer satisfaction. The study further reported that customer satisfaction positively influenced customer loyalty, repurchase intention, and word-of-mouth behaviour. These findings suggest that reliable delivery and overall service quality are important determinants of customer loyalty in e-commerce.

Velnadar et al. (2024) investigated the influence of positive and negative electronic word-of-mouth (eWOM) on online consumer behaviour and customer loyalty using data from

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652 respondents. The study found that positive eWOM positively influenced online buying behaviour, whereas negative eWOM had a significant negative effect. It also established that online buying behaviour was positively associated with customer satisfaction, which in turn contributed to customer loyalty. Trust in information and trust in products further strengthened these relationships. The findings highlight the importance of online reviews, product trust, and customer satisfaction in developing loyalty towards e-commerce platforms.

STATEMENT OF THE PROBLEM

The rapid growth of e-commerce has significantly changed the way consumers search for, purchase, and evaluate products. Online shopping platforms provide customers with convenience, a wide variety of products, competitive prices, discounts, and doorstep delivery. Among the various e-commerce platforms operating in India, Meesho has gained considerable popularity, particularly among price-conscious consumers and customers from smaller towns and semi-urban areas. However, attracting customers is not sufficient for long-term success. Maintaining customer loyalty and encouraging customers to make repeat purchases are major challenges for online shopping platforms. Customer loyalty towards Meesho may be influenced by several factors such as product quality, price, discounts and offers, delivery service, product variety, application convenience, payment facilities, customer service, return and refund policies, trust, customer satisfaction, and online reviews. Differences in customers' expectations and experiences may also affect their willingness to continue purchasing from Meesho and recommend the platform to others. Therefore, it is important to identify the major factors that contribute to customer loyalty and understand the level of satisfaction experienced by Meesho customers.

In Thoothukudi District, the increasing use of smartphones, digital payments, and internet-based shopping has created greater opportunities for e-commerce platforms. At the same time, customers may face issues related to product quality, delivery, reliability, returns, refunds, and customer service. These factors may influence their purchasing decisions and loyalty towards Meesho. Hence, there is a need to examine the factors influencing customer loyalty towards Meesho and to understand whether customer satisfaction and demographic characteristics have any significant influence on loyalty.

OBJECTIVES

- ✓ To analyze the socio-economic profile of Meesho users in Thoothukudi district
- ✓ To identify the key factors influencing customer loyalty towards Meesho
- ✓ To evaluate the problems faced by customers while purchasing on Meesho

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METHODOLOGY

Designing a suitable methodology and selection of analytical tools are important for a meaningful analysis of any research problem. This section shows the choice of the study area, sample design, collection of data and tools of analysis used in the study. Keeping the objectives of the study in mind the researcher constructed the questionnaire to elicit information from the customer. The questionnaire was administered to a sample of 90 respondents selected using convenience sampling method given in time frame within which the researcher was meant to be completed.

Data collection is the process of obtaining information from the respondents. In the present study, both the primary data and secondary data have been used. The study is largely based on primary data. The required primary data have been collected through a well-structured questionnaire both by visiting the houses of the respondents, online reservation centre and public places. Necessary secondary data have been collected from various sources like newspapers, magazines, and websites. The questionnaire schedule thus filled up is thoroughly examined to ensure accuracy, consistency and completeness. The collected data are then edited and tabulated for analysis. The data collected from the primary source are analysed with reference to each of the objectives by applying appropriate statistical tools.The data were collected and analysed using simple statistical tools such as percentages, frequency tables, and charts.

DATA ANALYSIS AND INTERPRETATION

Particulars	Factors	No. of Respondent	Percentage
Gender	Male	25	27.78
	Female	65	72.22
Age Group	Below 20 years	26	28.9
	21 – 30 years	51	56.7
	31 – 40 years	10	11.1
	Above 41 years	3	3.3
Marital Status	Married	28	31.1
	Unmarried	62	68.9
Educational Qualification	School level/Diploma	15	16.7
	Undergraduates	55	61.1
	Postgraduates	13	14.4

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	Professional	6	6.7
	No Formal Education	1	1.1
Occupation	Student	40	44.4
	Private Employee	26	28.9
	Business	12	13.3
	Government Employee	2	2.2
	HouseWife	10	11.1
Monthly Income	Below Rs.10,000	41	45.5
	Rs.10,001-Rs.20,000	27	30
	Rs.20,001-Rs.30,000	15	16.7
	Rs.30,001-Rs.40,000	5	5.6
	Above Rs.41,000	2	2.2
	Total	**90**	**100**

Source: Primary data

Interpretation - The above table presents the socio-economic profile of the 90 respondents. With regard to **gender**, 27.78 per cent of the respondents were male and 72.22 per cent were female, indicating that female respondents constituted the majority of the sample. Regarding **age**, 56.7 per cent of the respondents belonged to the 21–30 years age group, followed by 28.9 per cent who were below 20 years, 11.1 per cent who were between 31–40 years and 3.3 per cent who were above 41 years. In terms of **marital status**, 68.9 per cent of the respondents were unmarried, while 31.1 per cent were married. With respect to **educational qualification**, 61.1 per cent were undergraduates, 16.7 per cent had school-level/diploma qualifications, 14.4 per cent were postgraduates, 6.7 per cent had professional qualifications and 1.1 per cent had no formal education. Regarding **occupation**, 44.4 per cent of the respondents were students, 28.9 per cent were private employees, 13.3 per cent were engaged in business, 11.1 per cent were homemakers and 2.2 per cent were government employees. In terms of **monthly income**, 45.5 per cent of the respondents earned below Rs.10,000, followed by 30.0 per cent earning Rs.10,001–Rs.20,000, 16.7 per cent earning Rs.20,001–Rs.30,000, 5.6 per cent earning Rs.30,001–Rs.40,000 and 2.2 per cent earning above Rs.41,000. Overall, the profile indicates that the majority of respondents were female, aged 21–30 years, unmarried, undergraduates, students and belonged to the lower monthly income category.

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PAYMENT METHOD

Payment method	No. of Respondents	Percentage
UPI / E Wallet	17	18.9
Cash on delivery	51	56.7
Debit card / Credit card	21	23.3
Internet Banking	1	1.1
Total	**90**	**100**

Source: Primary data

Inference: Table indicates that about 56.7% of the respondents use cash on delivery as their payment option, 18.9% of the respondents use UPI / Wallet, 23.3% of the respondents use debit card / credit card, and the remaining 1.1% of the respondents use internet banking as their payment option during the online purchase.

LOYALTY INFLUENCING FACTORS

Loyalty influencing factors	No. of Respondents	Percentage
Product quality	20	22.2
Competitive pricing	17	18.9
Discounts and offers	12	13.3
Customer service	11	12.2
Easy returns and refunds	9	10
Timely delivery	8	8.9
User-friendly interface	7	7.8
Social influence	3	3.4
Trust in the platform	3	3.3
Total	**90**	**100**

Source: Primary data

Inference: The table reveals that 22.2% of the respondents chose product quality, 18.9% of them chose competitive pricing, 13.3% of them chose discount and offers, 12.2% of them chose customer service, 10% of them chose easy returns and refunds, 8.9% of them chose timely delivery, 7.8% of them chose user-friendly interface, 3.4% of them chose social influence, and 3.3% of the respondents chose trust in the platform.

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CHALLENGES IN MEESHO SHOPPING

Challenges in meesho shopping	No. of Respondents	Percentage
Delayed delivery of products	23	25.6
Received products not as described	6	6.7
Poor product quality	12	13.3
Difficulty in returning products	7	7.8
Payment issues	9	10
Hidden charges / unexpected fees	5	5.5
Inadequate customer support on resolution	3	3.3
Technical issues with the app or website	7	7.8
Difficulty in tracking orders	5	5.5
Issues with the refund process	7	7.8
Lack of variety/availability of desired products	6	6.7
Total	**90**	**100**

Source: Primary data

Inference: The most common issue is delayed delivery of products 25.6%, followed by poor product quality 13.3%, payment issues 10%, difficulty in returning products 7.8%, issues with the refund process 7.8%, technical issues with the app/website 7.8%, receiving products not as described 6.7%, lack of variety or availability of desired products 6.7%, tracking order difficulties 5.5%, hidden charges 5.5%, and the remaining 3.3% the remaining 3.3% faced inadequate customer support in resolving their issues.

FACTORS INFLUENCING CUSTOMER LOYALTY

Factors	Respondents					Total
	5th	4th	3rd	2nd	1st	
Meesho's pricing policies influence my loyalty towards the platform	22	52	10	3	3	**90**
The quality of product on meesho motivates me to make repeat purchases	22	44	15	7	2	**90**
Discounts and offers available on meesho encourage me to buy more	21	46	20	2	1	**90**
I feel confident in the security of my personal information when shopping on meesho	20	40	25	4	1	**90**

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Meesho's customer service responsiveness increases my loyalty to the platform	18	45	15	10	2	**90**
I would recommend meesho to my friends and family	24	42	20	1	3	**90**
I trust meesho more than other e-commerce platform	26	40	15	5	4	**90**
I feel that meesho offers better value for money than another platform	25	43	17	2	3	**90**
I am satisfied with the delivery speed of meesho	27	34	18	4	7	**90**

Source: Primary data

Inference: The results indicate several key factors affecting customer loyalty towards Meesho. Competitive pricing is vital, with 74 respondents affirming it fosters loyalty. Product quality is also important, motivating repeat purchases for 66 respondents. Discounts and promotional offers encourage higher spending, as noted by 67 participants. Confidence in data security is expressed by 60 respondents, though some remain undecided or disagree. Customer service responsiveness positively influences loyalty for 63 respondents, but 12 express dissatisfactions. Word-of-mouth recommendations from 66 respondents reflect strong loyalty, despite 9 having trust issues compared to competitors. Perceived value for money is significant, with 68 believing Meesho offers better deals. Opinions on delivery speed vary, with 61 satisfied and 11 dissatisfied. Overall, pricing, quality, discounts, and service are crucial for loyalty, while delivery speed and security could improve customer satisfaction.

CONCLUSION

The present study concludes that customer loyalty plays an important role in the long-term success of Meesho in the e-commerce market. Customers' loyalty is influenced by various factors such as product quality, price, discounts and offers, delivery service, product variety, application convenience, payment facilities, customer service, trust, and overall satisfaction. A positive shopping experience encourages customers to make repeat purchases and recommend Meesho to others. Therefore, maintaining product and service quality, providing reliable delivery, ensuring attractive pricing, and responding effectively to customer concerns are essential for strengthening customer loyalty. The study, with special reference to Thoothukudi District, highlights the importance of understanding customers' expectations and purchasing experiences in the growing e-commerce environment. Meesho can improve customer retention by enhancing service quality, maintaining transparent return and refund procedures, improving product reliability, and strengthening customer support. Building trust and ensuring customer

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satisfaction can contribute significantly to repeat purchases and positive word-of-mouth. Overall, the study provides useful insights into the factors influencing customer loyalty towards Meesho and indicates that continuous improvement in customer experience is essential for achieving sustainable growth and stronger customer relationships in the competitive e-commerce market.

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A STUDY ON CONSUMER SATISFACTION TOWARDS USAGE OF FLIPKART

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ABSTRACT:

The present study focuses on consumer satisfaction towards the usage of Flipkart, one of the leading e-commerce platforms in India. The study aims to analyze the level of consumer satisfaction, identify the facilities provided by Flipkart, and determine the major factors influencing consumers' satisfaction and future purchase intention. The study adopted a descriptive and empirical research design, and primary data were collected through a questionnaire from 50 Flipkart users using convenient sampling. Secondary data were collected from journals, research papers, newspapers, and websites. The findings reveal that bill payment is the most satisfactory aspect of Flipkart, while charges are the least satisfactory aspect. The study also found that ease of use is the major advantage perceived by consumers, followed by time-saving and fast and secure shopping. Overall, consumers are generally satisfied with Flipkart's services due to its convenience, wide product range, attractive offers, and home delivery facilities. The study suggests that Flipkart should further improve product quality, delivery services, customer support, and after-sales services to enhance consumer satisfaction and loyalty.

KEYWORDS: Consumer Satisfaction, Flipkart, E-Commerce, Online Shopping, Consumer Behavior, Customer Service, Delivery Service, Online Purchase, Shopping Experience, Customer Loyalty.

INTRODUCTION

The trend of e-commerce has been increased rapidly in recent years with the development of internet and due to easy accessibility easy access to internet has driven consumers to shop online. On the other hand, E-commerce has grown very fast because of many advantages associated with buying on internet because of lower transaction and search cost as compared to other types of shopping. One among those platforms is Flipkart which is a large e-commerce company which gained its popularity due to its brand image, good consumer

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relations and its policies. It also increases the satisfaction level of the consumers through ease of buying things. The platform's success can be attributed to its extensive product range, covering everything from electronics and fashion to home appliances and books. This diverse catalo, coupled with competitive pricing, has made Flipkart a go-to destination for a wide array of consumer needs. Consumer satisfaction lies at the heart of Flipkart's business model. The platform has implemented robust consumer support mechanisms, ensuring prompt assistance and issue resolution. Additionally, Flipkart's commitment to transparency is evident in its hassle-free return policies and secure payment options, instilling confidence in its users.

REVIEW OF LITERATURE

1. Kuester, Sabine (2012) in his study considers, Consumer behavior as the study of individuals, groups, process and organizations they use to secure, select, and arrange of experience, products, services, experiences, or ideas to satisfy the consumer and society. It balances components from sociology, psychology, management and economics. It tries to know the decision-making processes of consumers, both exclusively and in clusters. It makes emphasis on individual consumers and their characteristics such as demographics and behavioral variables to understand customers' want. It also tries to assess the effects on the consumer from family, friends, groups, and also society in general.
2. Petrovic Dejan (2006) in his study on Analysis of consumer behavior online explained that the most appropriate behavioral appearances of online customers and inspect the ways they find, associate and estimate product information. Comparison of survey data with the present customer performance theory stemmed in detection of an amount of issues related to an explicit customer group. The objective of this report is to transform these results into a set of execution activities at strategic and technical level. Implementation of these recommendations will end in better adaptation of customers.

STATEMENT OF THE PROBLEM

The growth of e-commerce has changed the way consumers purchase products and services. Flipkart is one of the leading online shopping platforms in India, offering a wide range of products, attractive discounts, convenient payment options, home delivery, and return facilities. However, consumer satisfaction may differ based on product quality, price, delivery service, website or mobile application experience, customer support, and return and refund procedures. Consumers may face problems such as delayed delivery, damaged or incorrect

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products, difficulties in returning products, refund delays, or inadequate customer service. These factors can influence their overall satisfaction and their willingness to continue purchasing from Flipkart.

Therefore, this study is undertaken to **assess the level of consumer satisfaction towards Flipkart and to identify the major factors influencing consumer satisfaction and their future purchase intention.**

OBJECTIVES

- The study about the consumer satisfaction of Flipkart.
- To analyze the level of satisfaction of consumers in the usage of Flipkart.
- To determine the various facilities provided by Flipkart.
- To summarize the findings and offer suitable suggestions necessary for the consumer satisfaction towards Flipkart.

SCOPE OF THE STUDY

The aim of the study is to determine the satisfaction of consumers in using Flipkart. As this e-payment system is widely used. The study is conducted on a sampling method of survey. The agenda of this study is to find out the impact of using Flipkart and to find out whether using Flipkart as an online shopping tool has helped the consumers or not.

METHODOLOGY

The present study is both descriptive and empirical. This section describes briefly the research design employed in the study in terms of sources. Collection of data and the statistical tools applied. A sample is a selected proportion of the defined population. A convenient sample of 50 respondents was selected. Convenient sampling method was adopted to collect data from the users Flipkart.

DATA COLLECTION:

Primary data: Information obtained from the original source by the researcher is called primary data. In this study, it is collected from users of Flipkart through questionnaire.

Secondary data: Secondary data refers to the data which have been already collected and analysed by someone else. Secondary data for this study is collected through online journal, research paper and newspaper and from different websites.

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RESULTS AND DISCUSSIONS

Table – 1 Demographic Profile of the respondents

Demographic factor	Options	Frequencies	Percentage
Gender	Male	21	42
	Female	29	58
Age	Below 20 years	21	42
	20-30 years	27	54
	30-40 years	1	2
	Above 50 years	1	2
Marital Status	Married	10	20
	Unmarried	40	80
Area	Rural	30	60
	Urban	13	26
	Semi Urban	7	14
Job Status	Employed	19	38
	Unemployed	31	62
Type of Family	Joint family	18	36
	Nuclear family	32	64
Number of family members	1	2	4
	2	3	6
	3	11	22
	4 or above 4	34	68
Occupation	Government employee	6	12
	Private employee	15	30
	Professional	5	10
	Others	24	48
Income	Below 20000	19	38
	20000-30000	14	28
	40000-60000	9	18
	Above 60000	8	16

Source: Primary Data

Interpretation

The table – 1 shows that the **majority of the respondents are female (58%)**, belong to the **20–30 years age group (54%)**, are **unmarried (80%)**, and reside in **rural areas (60%)**. In terms of job status, the majority are **unemployed (62%)**. Regarding family type, most respondents belong to **nuclear families (64%)**, with the majority having **four or more family members (68%)**. In terms of occupation, the majority fall under **other occupations (48%)**, while with regard to monthly income, the largest proportion of respondents earn **below**

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₹20,000 (38%). Overall, the demographic profile indicates that the respondents are predominantly **young, female, unmarried, rural residents, unemployed, from nuclear families with four or more members, engaged in other occupations, and belonging to the lower-income category**.

Table – 2 Weighted Average on Level of Satisfaction towards Use of Flipkart

S.NO	RANK WEIGHTS		I 5	II 4	III 3	IV 2	V 1	TOTAL (50)	WEIGHTED AVERAGE	RANK
1	Bill payment	X	16	11	14	07	02	182	3.64	I
		Wx	80	44	42	14	02			
2	Shopping	X	04	16	10	10	10	144	2.88	IV
		Wx	20	64	30	20	10			
3	Easy delivery	X	15	11	10	07	07	170	3.4	II
		Wx	75	44	30	14	07			
4	Timing	X	04	18	14	08	06	156	3.12	III
		Wx	20	72	42	16	06			
5	Charges	X	04	08	12	13	13	127	2.54	V
		Wx	20	32	36	26	13			

Source: Primary Data

Interpretation

The table – 2 shows that **Bill Payment is the most satisfactory aspect of Flipkart**, with the highest weighted average of **3.64**, while **Charges are the least satisfactory aspect**, with the lowest weighted average of **2.54**. The results suggest that Flipkart performs particularly well in **bill payment and delivery**, whereas there is greater scope for improvement in **charges and the shopping experience**.

Table – 3 T –TEST on Advantages of using Flipkart

S.No	Statement	Mean	S.D	CV	't' Value	Rank
1	Saves time	3.04	1.4277	46.96	2.3534	II
2	Fast and secure shopping	3.12	1.5574	49.91	0.5393	III
3	It is very easy to use	3.52	1.36	38.63	2.6766	I

Source: Primary Data

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Interpretation

The table – 3 shows that The t-test results reveal that the major advantage of using Flipkart is that it is very easy to use, as indicated by the highest mean score of 3.52 and t-value of 2.6766, securing Rank I. The advantage of saving time obtained a mean score of 3.04 and a t-value of 2.3534, and was ranked second. Fast and secure shopping recorded a mean score of 3.12 with a t-value of 0.5393 and was ranked third. Thus, the findings indicate that respondents primarily perceive **ease of use** as the most significant advantage of using Flipkart.

CONCLUSION

Flipkart provides a convenient and satisfactory online shopping experience, and the study reveals that consumers are generally satisfied with its services and usage. The study reveals that ease of use is the major advantage perceived by consumers, followed by the ability to save time and the convenience of fast and secure shopping. Consumers prefer Flipkart because of its wide range of products, convenient ordering process, competitive prices, attractive offers and home delivery facilities. However, factors such as product quality, delivery time, customer service, return and refund procedures, and security also influence overall satisfaction. Therefore, Flipkart should continue to improve its product quality, delivery services, customer support and after-sales services to increase consumer satisfaction and loyalty. Overall, Flipkart provides a convenient and satisfactory online shopping experience and has good potential to retain and attract more customers in the future.

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A STUDY ON CUSTOMER SATISFACTION TOWARDS THE BANKING SERVICES OF STATE BANK OF INDIA WITH SPECIAL REFERENCE TO THOOTHUKUDI CITY

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ABSTRACT

The present study examines customer satisfaction towards the banking services provided by the State Bank of India (SBI) and identifies the major factors influencing customers' satisfaction and loyalty. The study focuses on various banking services, including deposit and withdrawal facilities, ATM services, internet banking, mobile banking, loan and credit facilities, customer service, and digital banking facilities. The study is based on both primary and secondary data. Primary data were collected from **64 SBI customers** using a structured questionnaire, and respondents were selected through convenience sampling. Percentage analysis and descriptive analysis were used to analyse and interpret the collected data. The findings reveal that trust and reputation are the major factors influencing customers' selection of SBI. The study also indicates that convenience and ease of use, time-saving, 24/7 availability, easy access to account information, quick fund transfers, and security and privacy are important factors influencing the use of e-banking services. However, customers also face problems such as technical errors, transaction failures, delayed transactions, and money being debited without reaching the beneficiary. The study concludes that improving digital banking reliability, customer service, transaction efficiency, security, and problem-resolution mechanisms can enhance customer satisfaction and strengthen customer loyalty towards SBI.

Keywords: State Bank of India, Customer Satisfaction, Banking Services, E-Banking,

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Customer Loyalty, Digital Banking, Service Quality, Customer Service.

1. INTRODUCTION:

Banking is an important part of the economic and financial development of a country. Banks provide a wide range of services to individuals, businesses and other organizations. In the modern banking environment, customers expect not only secure financial services but also convenience, speed, accessibility and good customer support. Therefore, customer satisfaction has become an important factor in the success and growth of banking institutions. Customer satisfaction refers to the extent to which the services provided by a bank meet or exceed the expectations of its customers. It is influenced by several factors such as service quality, staff behaviour, transaction speed, accessibility, reliability, charges, complaint handling and digital banking facilities. State Bank of India (SBI) is one of the major public-sector banks in India. It provides various banking services, including savings and current accounts, deposits, loans, ATM services, internet banking, mobile banking and fund-transfer facilities. SBI serves customers through its branches as well as through various digital and self-service channels. With the rapid development of technology, banking services have undergone considerable changes. Customers can now perform many transactions through ATMs, internet banking and mobile banking without visiting a branch. At the same time, customers continue to expect efficient branch services, helpful employees and quick resolution of their problems. Therefore, studying customer satisfaction towards SBI services is useful for understanding customers' perceptions, expectations and experiences. The present study attempts to measure the level of satisfaction among SBI customers and identify the factors that influence their satisfaction.

2. REVIEW OF LITERATURE

Lakshmishree and Jayarani (2025) examined customer satisfaction with SBI banking services in urban centres of Tamil Nadu. The study considered service-quality dimensions such as responsiveness, reliability, empathy, assurance and tangibility, along with digital banking and customer loyalty. It reflects the increasing importance of both traditional service quality and technology in customer satisfaction.

Maneiah (2026) studied customer satisfaction towards service delivery with special reference to SBI and Union Bank of India. The study focused on service quality, employee behaviour, responsiveness, reliability, digital banking facilities and the overall banking experience.

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3. STATEMENT OF THE PROBLEM

The State Bank of India (SBI) is one of the largest public sector banks in India and provides a wide range of banking and financial services to individuals, businesses, and government institutions. With the rapid development of digital banking, SBI faces various challenges in maintaining customer satisfaction and improving the quality of its services. The major problems include long waiting time at branches, delays in certain banking services, technical issues in digital banking, ATM-related problems, difficulties faced by some customers in using online services, and increasing customer expectations. SBI also needs to continuously improve its security systems to protect customers from online fraud and cyber threats. Therefore, the study focuses on identifying the major problems faced by SBI customers, understanding their level of satisfaction, and suggesting suitable measures to improve the bank's services and customer experience.

4. OBJECTIVES

- ✓ To study the level of customer satisfaction towards SBI banking services.
- ✓ To examine customers' satisfaction with deposit and withdrawal services.
- ✓ To identify the problems faced by customers while using SBI banking services.
- ✓ To examine the factors influencing customer satisfaction and loyalty towards SBI.

5. METHODOLOGY

The present study adopts a descriptive research design to examine the level of customer satisfaction towards State Bank of India (SBI) banking services and to identify the factors influencing customer satisfaction and loyalty. The study is based on both primary and secondary data. Primary data were collected from **64 SBI customers** through a structured questionnaire, covering demographic characteristics, banking services, customer satisfaction, e-banking facilities, and problems faced by customers. Secondary data were collected from relevant books, journals, magazines, websites and other available sources. The respondents were selected based on the convenience sampling method. The collected data were classified, tabulated and analysed using suitable statistical techniques such as **percentage analysis and descriptive analysis**. The study particularly considers customers' perceptions of branch services, ATM, internet banking, mobile banking, customer service, transaction facilities, convenience, security and privacy.

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6. ANALYSIS AND INTERPRETATION

Gender	**No of Respondent**	**Percentage**
Male	17	26.6%
Female	47	73.4%
Age	**No of Respondent**	**Percentage**
Below 20 years	21	32.8%
21-30 years	32	50.0%
31-40 years	7	10.9%
41-50 years	0	0%
Above 51 years	4	6.3%
Marital Status	**No. of Respondents**	**Percentage**
Married	22	34.4%
Unmarried	42	65.6%
Educational Qualification	**No. of Respondents**	**Percentage**
No formal education	1	1.6%
SSLC	4	6.3%
HSC	6	9.4%
Undergraduate	28	43.8%
Postgraduate	13	20.3%
Other professional	12	18.8%
Monthly Income	**No. of Respondents**	**Percentage**
Below 10,000	29	45.3%
10,001- 20,000	19	29.7%
20,001- 30,000	5	7.8%
30,001- 40,000	3	4.7%
Above 40,001	8	12.5%
Occupation	**No of Respondent**	**Percentage**
Student	25	39.1%
Private Employee	7	26.6%
Government Employee	9	14.1%
Self-employed / Businessman	6	9.4%
Professional	2	3.1%
Housewife	3	4.7%
Helper	1	1.6%
Shop	1	1.6%
Total	**64**	**100%**

Source: primary data

The study has more female respondents than male respondents. Therefore, the responses in this study mainly represent the views of female customers. The above table shows that 50% of the respondents are between 21 and 30 years old. About 32.8% are below 20 years, while 10.9% are between 31 and 40 years. Only 6.3% are above 51 years. The above table

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shows that 65.6% of the respondents are unmarried, while 34.4% are married. The above table shows that 43.8% of the respondents are undergraduates. 20.3% are postgraduates, and 18.8% have other professional qualifications. Only a small number have SSLC, HSC, or no formal education. The table shows that 45.3% of the respondents earn below ₹10,000 per month. About 29.7% earn between ₹10,001 and ₹20,000. Only 7.8% earn ₹20,001–₹30,000, while 4.7% earn ₹30,001–₹40,000. About 12.5% earn above ₹40,001. The above table shows that students form the largest group, with 39.1% of the respondents. Private employees account for 26.6%, followed by government employees at 14.1%. Self-employed/business people make up 9.4%. The remaining respondents belong to smaller occupational groups.

Main reason for visiting the SBI branch:

Main Reason	No of Respondent	Percentage
To make deposit	16	25.0%
To get advice on investment options	4	6.3%
For loan	10	15.6%
To withdraw cash	17	26.6%
To enquire about account balance	13	20.3%
Other reasons	4	6.3%
Total	64	100%

Source: primary data

Interpretation The table shows that 26.6% of the respondents visit the SBI branch to withdraw cash. About 25% visit to make deposits, while 20.3% visit to enquire about their account balance. Around 15.6% visit for loans, and the remaining respondents visit for other services.

Main factors that influenced the decision to select SBI:

Factors	No. of Respondents	Percentage
Trust and Reputation	25	39.1%
Better Customer Service	11	17.2%
Convenient Branch Location	8	12.5%
Wide Network of Branch and ATM	3	4.7%
Government-Owned (Nationalised Bank)	7	10.9%
Attractive Banking Facilities	2	3.1%
Digital Banking Facilities	1	1.6%
Recommendation from Others	7	10.9%
Total	64	100%

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Source: primary data

Interpretation The table shows that 39.1% of the respondents selected SBI because of its trust and reputation. About 17.2% selected SBI because of better customer service. Convenient branch location accounts for 12.5%. Government ownership and recommendations from others each account for 10.9%. The remaining respondents selected SBI because of its branch and ATM network, attractive banking facilities and digital banking facilities.

Problems Faced by Customers in SBI Bank

Problem Faced	No. of Respondents	Percentage
Transaction Failed	13	20.3%
Money debited but not received by beneficiary	10	15.6%
Transaction pending for long time	11	17.2%
Long account transfer	4	6.3%
Technical Error	22	34.4%
No Problem	2	3.1%
Poor Customer Service	1	1.6%
No clear response	1	1.6%
Total	64	100%

Source: primary data

Interpretation The table shows that 34.4% of respondents faced technical errors, which is the highest percentage. 20.3% faced transaction failure, while 17.2% experienced transactions pending for a long time. About 15.6% faced problems where money was debited but not received by the beneficiary.

Factors Influencing the Use of E-Banking

Factor	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total
Convenience and ease of use	23	29	10	2	0	64
Save time	19	28	15	2	0	64
24/7 availability of banking services	24	23	11	5	1	64
Easy access to account information	21	23	16	3	1	64
Quick fund transfer facility	20	23	18	2	1	64

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Reduced need to visit the bank branch	18	20	20	6	0	64
Security and privacy features	25	18	16	4	1	64

Source: Primary Data

Interpretation The table shows that convenience and ease of use is a major factor influencing customers to use e-banking. 52 out of 64 respondents either strongly agreed or agreed with this factor. 24/7 availability and saving time are also important reasons for using e-banking. Customers also value easy access to account information, quick fund transfers, and security and privacy. The reduced need to visit the bank branch received comparatively lower agreement.

7. CONCLUSION

The present study concludes that customer satisfaction is an important factor in the effective functioning and growth of State Bank of India. The study shows that customers select SBI mainly because of its **trust and reputation**, followed by better customer service and convenient branch locations. The major reasons for visiting the branch are cash withdrawal, deposits and account-balance enquiries. The study also indicates that customers value e-banking services because of their convenience and ease of use, time-saving nature, 24/7 availability, easy access to account information, quick fund transfers, and security and privacy features. However, the study identifies several problems that affect customers' banking experience. **Technical errors** are the major problem reported by respondents, followed by transaction failures, transactions remaining pending for a long time, and cases where money is debited but not received by the beneficiary. These findings indicate the need for SBI to continuously improve the reliability and efficiency of its digital banking and transaction systems. Strengthening technical infrastructure, providing faster problem resolution, improving customer support, and ensuring secure and convenient digital services can help SBI enhance customer satisfaction and build stronger customer loyalty.

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AN ANALYSIS OF CUSTOMER SATISFACTION WITH E-BANKING SERVICES: A CASE STUDY OF STATE BANK OF INDIA IN THOOTHUKUDI

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ABSTRACT

The rapid evolution of financial technology has positioned electronic banking (e-banking) as a cornerstone of modern financial delivery, playing a pivotal role in enhancing service efficiency and customer retention. This study examines customer satisfaction toward e-banking services provided by the State Bank of India (SBI) in Thoothukudi, Tamil Nadu. Utilizing a descriptive and analytical research design, primary data was gathered from a sample of 50 SBI account holders through a structured questionnaire covering service reliability, transactional speed, security, and interface convenience, supplemented by secondary literature. Demographic analysis reveals that the digital banking user base is predominantly young (46% below 30 years of age), formally educated (46% undergraduates), and employed (72%), with savings accounts being the dominant vehicle (78%). In terms of operational performance, 66% of respondents expressed high satisfaction or satisfaction with the speed and reliability of online fund transfers, while 34% held neutral perceptions. Security assessments demonstrated robust trust, with 66% viewing SBI's digital platforms as secure or highly secure, and only 4% reporting insecurity. Overall customer satisfaction stood at 70%, with 24% remaining neutral and a minimal 6% expressing dissatisfaction. The findings indicate strong general acceptance and trust in SBI's e-banking infrastructure in Thoothukudi. However, the notable proportion of neutral respondents underscores the need for bank management to minimize transaction failure rates, simplify user navigation, and strengthen real-time customer support mechanisms to convert passive users into fully satisfied digital banking advocates.

Keywords: E-Banking, Customer Satisfaction, State Bank of India (SBI), Service Quality, Digital Transactions.

1. INTRODUCTION

In the rapidly evolving landscape of the banking industry, the advent of electronic banking (e-banking) has revolutionized the way financial services are delivered and consumed.

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E-banking, which encompasses a range of services such as online banking, mobile banking, ATM services, and electronic fund transfers, has become a cornerstone of modern banking operations. It offers customers unparalleled convenience, accessibility, and efficiency, enabling them to conduct financial transactions anytime and anywhere. As a result, e-banking has emerged as a critical factor in enhancing customer satisfaction and loyalty, which are essential for the sustained growth and competitiveness of banking institutions. The State Bank of India (SBI), as one of the largest and most prominent public sector banks in India, has been at the forefront of adopting and promoting e-banking services. With a vast network of branches and a significant customer base, SBI has invested heavily in digital infrastructure to provide a seamless and secure e-banking experience. However, despite these advancements, customer satisfaction with e-banking services remains a complex and multifaceted issue, influenced by various factors such as service quality, ease of use, security, and customer support. Thoothukudi, a major port city in the Indian state of Tamil Nadu, serves as an important economic hub with a diverse population that relies heavily on banking services. The city's unique socio-economic dynamics make it an ideal case study to examine the effectiveness of e-banking services and their impact on customer satisfaction. By focusing on SBI's e-banking services in Thoothukudi, this study aims to provide a comprehensive analysis of the factors that influence customer satisfaction and identify areas for improvement.

2. REVIEW OF LITERATURE

Kumar & Singh (2020) examined customer satisfaction with SBI's e-banking services and found that while the bank has made significant strides in improving service offerings, issues like system errors, user interface challenges, and security concerns still persist. Despite these challenges, SBI's e-banking services remain popular, particularly among urban and tech-savvy customers.

Sharma & Mishra (2021), it was found that customers of SBI appreciate the accessibility and wide range of services provided through their mobile and internet banking platforms. However, some respondents reported difficulties with transaction failures and the lack of personalized customer service in resolving issues related to e-banking.

3. STATEMENT OF THE PROBLEM

A Study with the Analysis of Customer Satisfaction with E-Banking Services: A Case Study of State Bank of India in Thoothukudi. The rise of digital banking, the State Bank of India (SBI) has introduced e-banking services to meet customer needs. However, it is unclear

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how satisfied SBI customers in Thoothukudi are with these services. Factors such as service reliability, ease of use, security, and overall user experience may influence customer satisfaction. This study aims to assess the level of satisfaction with SBI's e-banking services in Thoothukudi, identify key areas for improvement, and understand customer perceptions of digital banking compared to traditional services.

4. OBJECTIVE OF THE STUDY

"An Analysis of Customer Satisfaction with E-Banking Services: A Case Study of State Bank of India in Thoothukudi" is to evaluate the level of customer satisfaction with the e-banking services provided by the State Bank of India (SBI) in Thoothukudi. The study aims to identify the key factors influencing customer satisfaction, including service quality, security, customer support, and accessibility. By understanding these factors, the study seeks to provide actionable recommendations to enhance the e-banking experience and improve customer satisfaction for SBI in the region.

5. RESEARCH METHODOLOGY

The present study adopts a **descriptive and analytical research design** to evaluate and understand the level of customer satisfaction towards e-banking services provided by the State Bank of India (SBI) in Thoothukudi. The study uses both **primary and secondary data**. Primary data will be collected from SBI customers through a structured questionnaire covering user experience with the website and mobile application, transaction speed, ease of use, accessibility, security and trust, customer support, issue resolution, overall satisfaction, and demographic characteristics such as age, income, and occupation. Secondary data will be collected from academic journals, research papers, industry reports, and relevant case studies relating to e-banking and customer satisfaction. The collected data will be systematically organized, analysed, and interpreted to assess the level of customer satisfaction and identify the major factors influencing customers' experience with SBI e-banking services.

6. DATA ANALYSIS AND INTERPRETATION

GENDER OF THE RESPONDENTS

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Particulars	Number of respondents	Percentage
Male	30	60%
Female	20	40%
Total	50	100%

SOURCE: PRIMARY DATA

From the above table 1 recalls that out of 50 respondents 30 (60%) of respondents are male and 20(40%) respondents are female. I conclude that the majority of the respondents 30(60%) are male category

AGE OF THE RESPONDENTS

Age	Number of respondents	Percentage
Below 30 years	23	46%
31-40 years	9	18%
41-50 years	14	28%
51-60 years	2	4%
Above 60 years	2	4%
Total	50	100%

SOURCE: PRIMARY DATA

From the above Table - 2 The majority of Respondents 23 (46%) are **below 30 years**, The **31-40 years'** age respondents are 9 (18%) and **41-50 years'** age respondents are 14 (28**%)**, The **52-60 years'** respondent are 2 (4%) and **above 60 years'** respondents are 2 (4%) I conclude that the majority of the respondents 23 (46%) are in the below 30 years' age category

EDUCATIONAL QUALIFICATION OF THE RESPONDENTS

Particulars	Number of respondents	Percentage
Illiterate	0	0%
Up to school level	13	26%
Higher secondary	7	14%

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Under graduate	23	46%
Post graduate	6	12%
Professional	1	2%
Total	50	100%

SOURCE: PRIMARY DATA

From the above table 3 the Education qualification of the respondents are given. Respondents up to school level are 13 (26%) higher secondary are 7 (14%) undergraduates are 23 (46%) postgraduates are 6 (12%) and professionals are 1(2%). there is no illiterate of the respondents.

I conclude that the majority of the respondents 23(46%) are Completed under graduate educational qualification

EMPLOYMENT STATUS OF RESPONDENTS

Particulars	Number of respondents	Percentage
Employees	36	72%
Un-employees	14	28%
Total	50	100%

SOURCE: PRIMARY DATA

From the above table - 4 shows 36 respondents (72%) are **employed**, 14 respondents (28%) are **unemployed**, I conclude that the majority of the respondentsv36(72%) are employees

EMPLOYED RESPONDENTS

Particulars	Number of respondents	Percentage
Employee in private sector	14	38%
Employee in public sector	6	18%
Professionals	3	8%
Self-employed / Business	11	30%
Agriculture/ Horticulture	1	3%
Pensioner	1	3%
Total	36	100%

SOURCE: PRIMARY DATA

From the above table - 5. The employed respondents 14 (38%) work in the private sector, followed by self-employed/business owners at 11(30%). Public sector employees 6

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(18%) and professionals 3 (8%) represent smaller portions of the employed sample. A very small percentage 1 (3%) of the employed respondents are in agriculture/horticulture and 1 (3%) of the employed respondents are pensioners I conclude that the majority of the respondent 14 (38%) are work in the private sector

UNEMPLOYED RESPONDENTS

Particulars	Number of respondents	Percentage
Housewife	3	21%
Job seeker	2	14%
Student	8	57%
Any other	1	8%
Total	14	100%

SOURCE: PRIMARY DATA

From the above table -6. The largest group of unemployed respondents 8 (57%) are **students**, which is typical as they are engaged in education rather than work. **Housewives** 3 (21%) and **job seekers** 2 (14%) represent a smaller portion of the unemployed group. A very small percentage (8%) falls under **"Any other"** category, suggesting other reasons for their unemployment. I conclude that the majority of the respondent 8 (57%) are **students**

MONTHLY INCOME WISE CLASSIFICATION OF RESPONDENTS.

Income	Number of respondents	Percentage
Below Rs. 15000	16	44%
Rs.15001-Rs.30000	15	41%
Rs.30001-Rs.45000	3	9%
Above 45000	2	6%
Total	36	100%

SOURCE: PRIMARY DATA

From the above table-7. The employed respondents earn **below Rs. 15,000** 16 (44%) or in the **Rs. 15,001 - Rs. 30,000** range 15 (41%).A smaller percentage of respondents earn between **Rs. 30,001 - Rs. 45,000** 3 (9%) and **above Rs. 45,000** 2 (6%). I conclude that the majority of the respondent 16 (44%) are earn **below Rs. 15,000**

FAMILY BACKGROUND OF RESPONDENTS

No. of members	Number of respondents	Percentage
Up to 3 members	15	30%
4-6 members	26	52%

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6-8 members	7	14%
More than 8 members	2	4%
Total	50	100%

Particulars	Number of respondents	Percentage
Savings account	39	78%
Current account	5	10%
NRI account	0	0%
FD fixed deposit	1	2%
Others	5	10%
Total	50	100%

SOURCE: PRIMARY DATA

From the above table-9. The respondents 26 (52%) belong to families with **4-6 members**, followed by families with **up to 3 members 15** (30%).A smaller proportion of respondents 7 (14%) are from families with **6-8 members**, and an even smaller group 2 (4%) come from families with **more than 8 members**. I conclude that. The majority of respondents 26 (52%) belong to families with **4-6 members**

ACCOUNT MAINTAINED BY RESPONDENTS IN STATE BANK OF INDIA THOOTHUKUDI

SOURCE: PRIMARY DATA.

From the above table-10. The majority of respondents (78%) have a **savings account**, which is typical for personal banking. A smaller portion holds **current accounts** (10%) and **fixed deposit accounts** (2%).**NRI accounts** are **not present** in this sample, and 10% of respondents have **other account types**. I conclude that. The majority of respondents 39 (78%) have a **savings account**

Particulars	Number of respondents	Percentage
Highly satisfaction	17	34%
Satisfaction	16	32%
Neutral	17	34%
Dissatisfaction	0	0%

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Highly dissatisfaction	0	0%
Total	50	100%

RESPONDENTS USAGE WITH THE SPEED AND RELIABILITY OF FUND TRANSFER IN ONLINE PLATFORM OF SBI

SOURCE: PRIMARY DATA.

From the above table-11 A total of **66%** of respondents are either **highly satisfied** or **satisfied**, which indicates a positive perception of SBI's online fund transfer system.**34%** of respondents are **neutral**, which might indicate a lack of strong opinions. I conclude that, the majority 33(66%)of respondents are happy with **the speed and reliability of fund transfer in online platform of SBI**

RESPONDENTS ABOUT SECURITY OF USING SBI'S E BANKING SERVICES

Particulars	**Number of respondents**	**Percentage**
Highly secure	22	44%
Secure	11	22%
Average	15	30%
Insecure	2	4%
Highly insecure	0	0%
Total	50	100%

SOURCE: PRIMARY DATA.

From the above table-12 security of digitalization of banking. A significant (**66%**) of respondents feel **secure** or **highly secure** when using SBI's e-banking services, indicating a strong sense of security among most users. **30%** of respondents feel the security is **average**, suggesting that there's room for improvement in enhancing user confidence in the system. Only **4%** feel **insecure**, which is relatively low, and no one feels **highly insecure**, indicating that major security concerns may not be widespread. I conclude that The majority 33 (**66%**) of respondents feel **secure** or **highly secure** when using SBI's e-banking services, indicating a strong sense of security among most users

RESPONDENT SATISFIED OVERALL WITH SBI E-BANKING SERVICES

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Particulars	Number of respondents	Percentage
Highly satisfaction	22	44%
Satisfaction	13	26%
Neutral	12	24%
Dissatisfaction	3	6%
Highly dissatisfaction	0	0%
Total	50	100%

SOURCE: PRIMARY DATA.

From the above table-13 A **total of 70%** of respondents are either **highly satisfied** or **satisfied**, indicating that the majority of users have a positive experience with SBI's e-banking services. **24%** of users are **neutral**, suggesting that there may be room for improvement or further engagement with this group to understand their concerns or reasons for not expressing a stronger opinion. Only a **small minority (6%)** are **dissatisfied**, and no one expressed being **highly dissatisfied**, I conclude that the majority of 35 **(70%)** of respondents are either **highly satisfied** or **satisfied**, indicating that the majority of users have a positive experience

7. CONCLUSION:

The study concludes that customers have a **generally positive level of satisfaction towards the e-banking services of State Bank of India in Thoothukudi**. The findings reveal that 66% of the respondents are satisfied or highly satisfied with the speed and reliability of online fund transfers, while 66% feel secure or highly secure while using SBI e-banking services. Overall, 70% of the respondents are satisfied or highly satisfied with SBI e-banking services, indicating a favourable perception of the bank's digital banking facilities. However, the presence of **24% neutral respondents** indicates that there is still scope for SBI to improve its e-banking services and convert neutral users into satisfied customers. The bank should focus on improving transaction reliability, reducing technical and server-related problems, providing faster customer support, improving communication during service issues, strengthening ATM facilities, and providing timely SMS alerts. Better staff training, additional communication channels, clear information, follow-up mechanisms, and self-help facilities can further improve the overall customer experience. Overall, SBI's e-banking services have achieved a **good level of customer acceptance and satisfaction in Thoothukudi**. Continuous improvement in reliability, security, convenience, and customer support will help SBI strengthen customer confidence, satisfaction, and long-term loyalty towards its digital

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banking services.

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A STUDY ON THE IMPACT OF CYBER SECURITY THREATS AND CUSTOMER SATISFACTION ON CYBER SECURITY LAWS IN THOOTHUKUDI CITY

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ABSTRACT

The present study examines the impact of cyber security threats and customer satisfaction on cyber security laws among digital users in Thoothukudi City. The study focuses on customers' awareness of cyber security threats, the types of cyber threats experienced, their perceptions of cyber security measures, and awareness of legal protection against cybercrime. Both primary and secondary data were used for the study. Primary data were collected from 160 respondents in Thoothukudi City using a structured interview schedule, and respondents were selected through judgmental sampling. The study found that all respondents were aware of cyber security threats. Among the various threats experienced, password attacks were the most common (33.8%),

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followed by malware attempts (28.1%), social engineering (21.9%), and phishing attacks (16.3%). The findings indicate that despite high awareness, customers continue to face significant cyber security risks. The study therefore highlights the need for regular cyber security awareness programmes, effective implementation of cyber security laws, customer training, and better coordination between banks and cybercrime police departments. Strengthening cyber security practices and legal awareness can improve customer confidence, satisfaction, and the safe use of digital services in Thoothukudi City.

Keywords: ***Cyber Security, Cyber Security Threats, Customer Satisfaction, Cyber Security Laws, Cybercrime, Digital Security, Cyber Awareness, Thoothukudi City.***

1. INTRODUCTION

Cyber security has become an essential part of modern digital life as individuals, businesses, financial institutions, and government organisations increasingly depend on the internet and digital technologies. The rapid growth of online banking, digital payments, e-commerce, social media, mobile applications, and other online services has provided greater convenience to customers. At the same time, it has increased exposure to cyber security threats such as phishing, online fraud, identity theft, malware, hacking, data breaches, and unauthorised access. These threats can cause financial loss, privacy violations, and psychological distress among users and can reduce their confidence in digital services. Customer satisfaction is closely associated with the security, reliability, privacy, and trustworthiness of digital services. Customers are more likely to use online services when they believe that their personal and financial information is adequately protected. Frequent cyber security incidents, inadequate awareness, weak security practices, and concerns about data privacy may negatively influence customer satisfaction and trust. Therefore, understanding customers' perceptions of cyber security threats is important for improving their confidence and encouraging safe digital behaviour. Cyber security laws play an important role in protecting individuals and organisations from cyber-related crimes and providing a legal framework for addressing digital threats. In India, laws and regulations relating to cyber security, data protection, electronic transactions, and cyber offences aim to strengthen digital safety and protect users. However, the effectiveness of such legal measures also depends on public awareness, understanding of cyber risks, reporting mechanisms, and customers' confidence in the protection available to them. Thoothukudi City is experiencing increasing use of digital banking, online shopping, digital payments, and other internet-based services. This changing digital environment makes it important to understand how customers perceive cyber security threats and the extent to which

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such threats influence their satisfaction and awareness of cyber security laws. The present study therefore focuses on "A Study on the Impact of Cyber Security Threats and Customer Satisfaction on Cyber Security Laws in Thoothukudi City." The study aims to examine customers' awareness of cyber security threats, their experiences and perceptions regarding online security, their level of satisfaction with cyber security measures, and their awareness of relevant cyber security laws. The findings may help identify areas where greater cyber security awareness, customer protection, and effective implementation of legal measures are required.

2. REVIEW OF LITERTURE

White & Case. (2026)[1], research indicates a shift toward stricter enforcement and global alignment of cyber security and data privacy laws. New and amended regulations, along with increased scrutiny, are shaping how ONorganizations manage customer data and respond to cyber threats. These developments reinforce the importance of cyber security in maintaining customer satisfaction and legal compliance (White & Case, 2026) ([whitecase.com][4]). Contemporary studies also confirm that cyber security systems play a critical role in enhancing customer satisfaction by improving service quality, trust, and system reliability in digital environments (Ologun et al., 2025) ([ResearchGate][5]). Overall, the literature shows a strong interconnection between cyber security threats, customer satisfaction, and the continuous evolution of cyber security laws, highlighting the need for region-specific studies, such as in Thoothukudi city, to understand local.

Abrardi, L. (2025)[2] literature focused on the growing complexity of cyber threats and their direct impact on customer perception and regulatory compliance. Studies found that threats such as phishing, malware, and ransomware negatively affect customer trust and digital service adoption, especially in sectors like banking and e-commerce (Waliullah et al., 2025). Additionally, empirical research demonstrated that cybersecurity incidents lead to reputational damage and decreased customer satisfaction, forcing organizations to strengthen compliance with cybersecurity regulations and adopt advanced security frameworks (Wojak et al., 2025).

3. STATEMENT OF THE PROBLEM

The rapid growth of digital services has increased the dependence of customers on online banking, digital payments, e-commerce, mobile applications, and other internet-based platforms. Along with these developments, cyber security threats such as phishing, hacking,

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identity theft, online financial fraud, malware, data breaches, and unauthorised access have also become major concerns. Such threats can affect customers' financial security, privacy, trust, and confidence in digital services. Although cyber security measures and legal provisions are available to protect users from cybercrimes, many customers may have limited awareness of cyber security practices and the laws available for their protection. Lack of knowledge about cyber threats, safe online practices, complaint procedures, and legal remedies may increase customers' vulnerability to cybercrimes. Moreover, repeated exposure to cyber security threats may negatively influence customer satisfaction and their willingness to use digital services. In Thoothukudi City, the increasing use of digital transactions and online services makes it necessary to understand customers' perceptions regarding cyber security. There is a need to examine the types of cyber security threats experienced or perceived by customers, their level of awareness about cyber security laws, and their satisfaction with existing security measures. Therefore, the present study attempts to analyse the impact of cyber security threats and customer satisfaction on cyber security lawsand to identify the need for greater awareness, effective protection, and improved implementation of cyber security measures among customers in Thoothukudi City.

4. OBJECTIVES OF THE STUDY

- To study the demographic profile of the respondents.
- To identify the factors influencing for customer satisfaction on cyber security laws
- To evaluate the level of customer satisfaction on cyber security laws
- To identify the way in which customer is affected by cyber threats
- To examine the problems faced by the respondents due to cyber threat.

5. SCOPE OF THE STUDY

This study focuses on analyzing the impact of cyber security threats and customer satisfaction on cyber security laws among digital users in Thoothukudi**.** The research examines how cyber threats affect the confidence, trust, and satisfaction of customers who use online services such as internet banking, digital payments, e-commerce, and social media platforms. The study also evaluates the level of awareness among customers regarding cyber security measures and the legal protection available under the Information Technology Act, 2000. It

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aims to understand whether customers are aware of cyber laws, cybercrime reporting systems, and the steps required to protect their personal and financial information from cyber-attack. Furthermore, the research analyzes the relationship between cyber security threats and customer satisfaction.

6. METHODOLOGY:

Both primary and secondary data were used in this study. Primary data were collected using the well-structured interview schedule by distributing among the respondents in Thoothukudi city. Secondary data were collected from the journals,newspapers, research articles, magazines and websites and from unpublished Sources. A well-structured interview schedule was used to collect data related to the impact of cyber security threats. Potential respondents were selected for the study. Since the population is unknown Judgmental sampling technique were used to select the sample respondents. 160 sample of respondents were collected to study the impact of cyber threat in Thoothukudi city. This study is confined to cyber security threats and its impact on society with special reference to thoothukudi city only.

DATA ANALYSIS AND INTERPRETATION – INTRODUCTION

GENDER OF RESPONDENTS

Gender	Frequency	Percentage
Male	94	58.8%
Female	66	41.2%
Total	160	100

Source: Primary data

INTERPRETATION:

This presents the gender distribution of the respondents in the study. Out of a total of 160 respondents, 88 (55%) are male, while 72 (45%) are female. This indicates that males constitute a slightly higher proportion of the sample compared to females. However, the difference is not very wide, suggesting that the study achieved a relatively balanced representation of both genders, with only a 10% margin between male and female participants.Hence, the majority of the respondents are male.

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AGE WISE OF RESPONDENTS

Age group	Frequency	Percentage
18 to 21	11	6.9%
22 to 30	98	61.3%
31 to 40	39	24.4%
Above 40	12	7.5%
Total	160	100

Source: Primary data

INTERPRETATION:

The table shows the age-wise distribution of 160 respondents. The majority of respondents belong to the 22–30 age group, accounting for 61.3% (98 respondents), indicating that young adults form the largest segment of the study. The 31–40 age group is the second largest, with 24.4% (39 respondents), showing a moderate representation of middle-aged individuals. In contrast, the 18–21 age group constitutes only 6.9% (11 respondents), and respondents above 40 years make up 7.5% (12 respondents), both representing smaller portions of the sample. Overall, the data suggests that the study is heavily dominated by respondents in the 22–30 age category, implying that the findings are largely influenced by this age group. Hence, the majority of the respondents are in the age group of 22 to 30 years.

AWARE OF CYBER SECURITY THREATS

Are you aware of cyber security threats	Frequency	Percentage
Yes	160	100%
No	0	0%
Total	160	100

Source: Primary data

INTERPRETATION:

The table shows that all 160 respondents (100%) are aware of cyber security threats, while none of the respondents (0%) reported being unaware. This indicates a complete level of awareness among the sample population. This result suggests that cyber security has become a widely recognized issue, possibly due to increased digital usage, awareness campaigns, and frequent exposure to cyber-related information. The absence of unawareness

reflects a high level of knowledge and understanding about cyber threats among respondents. Overall, the data highlights strong awareness, which is a positive sign for adopting safe online practices and supporting cyber security measures. Hence. The majority of respondents are aware of cyber security threats.

TYPE OF CYBER SECURITY THREATS YOU FACED

Type of cyber security threats you faced	Frequency	Percentage
Phishing attacks	26	16.3%
Password attacks	54	33.8%
Social engineering	35	21.9%
Malware attempts	45	28.1%
Total	160	100

Source: Primary data

INTERPRETATION:

The table 4.14 shows the distribution of cybersecurity threats among respondents, with a total of 160 responses (100%). Password attacks are the most common, with 54 cases (33.8%), indicating weak passwords security practices. Malware or ransomware attacks follow, with 45 occurrences (28.1%), showing significant exposure to malicious software. Social engineering attacks rank third, reported by 35 respondents (21.9%), highlighting manipulation-based threats. Overall, the data suggests that users are most vulnerable to password-related and software-based cyber threats. Hence. The majority of respondents are password attacks.

7. FINDINGS

- Majority (58.8) of the respondents are male.
- Majority (61.3) of the respondents are 18 to 24 years.
- Majority (75.6) of the respondents are faced cyber security.
- Majority (91.3) of the respondents are Aware of cyber security threats.

8. SUGGESTIONS

- ✓ Increase public awareness programs about cyber security threats.
- ✓ Conduct regular cyber security training for internet users and customers.
- ✓ Strengthen the implementation of cyber security laws at the local level.

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- ✓ Improve coordination between banks and cybercrime police departments.

9. CONCLUSION

The present study concludes that cyber security has become an essential concern among digital users in Thoothukudi City. The study also highlights the importance of cyber security laws in protecting customers from cybercrime and providing legal support when cyber incidents occur. However, the effectiveness of legal protection depends not only on the existence of laws but also on customers' awareness of their rights, reporting procedures and available remedies. The study therefore emphasises the need to strengthen awareness regarding cyber security laws and cybercrime reporting mechanisms among digital users. Customer satisfaction is also closely connected with the perceived safety, reliability and protection provided by digital services. When customers feel that their personal and financial information is secure, their confidence in digital services is likely to improve. Conversely, repeated cyber threats and concerns about privacy and financial security may reduce trust and satisfaction. Therefore, improving cyber security measures is important not only for preventing cybercrime but also for maintaining customer confidence in digital services. The study suggests that regular cyber security awareness programmes, customer training, stronger implementation of cyber security laws, and improved coordination between banks and cybercrime police departments are necessary. Customers should also be educated about safe online practices, password protection, phishing prevention, cybercrime reporting and legal remedies. Overall, the study concludes that effective cyber security requires a combined approach involving customer awareness, responsible digital behaviour, strong security measures, effective legal protection and institutional support. Strengthening these areas can reduce customers' vulnerability to cyber threats, improve their confidence and satisfaction, and contribute to safer and more secure digital services in Thoothukudi City.

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A STUDY ON THE IMPACT OF GREEN MARKETING ON CONSUMER PURCHASE DECISIONS

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ABSTRACT

Green marketing has become increasingly important due to growing environmental concerns such as pollution, climate change, plastic waste and depletion of natural resources. The present study examines the impact of green marketing on consumer purchase decisions, with particular focus on consumer awareness, perception and the factors influencing the purchase of green products. The study adopts a descriptive research design and is based on both primary and secondary data. Primary data were collected from 50 respondents using a structured questionnaire and convenience sampling method. The collected data were analysed using percentage analysis and weighted average. The findings reveal that social media is the major source of awareness about green products, while environmental benefits, product quality and price are important factors influencing consumers' purchase decisions. The study highlights the importance of effective green marketing practices in creating consumer awareness and encouraging sustainable purchasing behaviour. The findings can help businesses understand consumer expectations and develop suitable strategies for promoting environmentally friendly products.

KEYWORDS: Green Marketing, Consumer Awareness, Green Products, Consumer Perception, Sustainable Consumption, Eco-friendly Products, Green Advertising

1. INTRODUCTION

Green marketing has become an important concept in the modern business environment due to growing concerns about environmental pollution, climate change, global warming, plastic waste and depletion of natural resources. Consumers and businesses are increasingly recognizing the importance of protecting the environment and adopting sustainable practices. As a result, companies are developing and promoting products that are environmentally friendly and have less negative impact on nature. Green marketing refers to the process of developing, pricing, promoting and distributing products or services by considering their environmental impact. It includes the use of eco-friendly raw materials, recyclable packaging,

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energy-efficient production, reduction of waste and responsible use of natural resources. Companies use green marketing not only to satisfy consumer needs but also to create a positive environmental image and achieve long-term sustainability. Consumer purchase decisions are influenced by several factors such as product quality, price, brand image, availability, advertising and personal preferences. In recent years, environmental awareness has also become an important factor in consumer decision-making. Consumers may prefer products that are organic, recyclable, reusable, biodegradable or energy-efficient. Green marketing helps companies communicate these environmental benefits to consumers and influence their perception of products. However, consumers may not always choose green products even when they are environmentally aware. Higher prices, limited availability, lack of information, product quality concerns and doubts about environmental claims may affect their purchasing decisions. Therefore, understanding the factors that connect green marketing with actual consumer purchase behaviour is important for businesses.

2. REVIEW OF LITERATURE

1. AYSEL BOZETEPE (2012): This is a research study tries to find out the reaction of consumer on green marketing. With increase in globalisation consumers are also concerned about its impact on environment. In order to develop goods that can appeal to the consumers, reasonable affordable prices, and environment friendly products causing minimum damage is required. The main objective of conducting this research was to determine consumers reaction on green products over normal products. There were married and unmarried males females, people that are married and have children, people of different age groups, education and income level were the participants in the research. As a conclusion, green products affected purchasing of unmarried consumers, while for married consumers only green price affected their purchase and for married consumers with children only green product features affected green purchasing.

2. JEEVARATHNAM P. GOVENDER AND TUSHAY L. GOVENDER, SOUTH AFRICA (2016): As Green Marketing has become an area of focus for both companies and society in general. The objective of this study is , ultimately, to sell the products that are harmless to the environment, whilst simultaneously actively encouraging consumer to support and protect the environment (Stern and Ander, 2018). It's another objective is that business needs to change the way in which they operate and to provide products which are beneficial for the environment. The analysis of secondary data has been done by finding out the correlation between the age of respondents and the price of green products affecting their purchasing behaviour. The finding of this study indicate no significance correlation between

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age and green marketing motivating consumers to change their consumption behaviour. This means that marketers have opportunity to change attitudes of consumers towards green marketing across the different age groups. The positive views of respondents regarding the health, environmental and quality benefits offered by green marketing are known, and would find favour among the general consumer population. This study found that there was no significant relationship between gender and awareness of green products. It emerged that respondents strongly felt that green marketing influenced their purchasing behaviour, and that there was no significant correlation between the age and green marketing consumption behaviour.

3. STATEMENT OF THE PROBLEM

Growing environmental problems such as pollution, plastic waste, climate change and depletion of natural resources have increased the need for environmentally friendly products and sustainable business practices. As a result, many companies are adopting green marketing strategies to promote eco-friendly products and attract environmentally conscious consumers. Although consumer awareness about environmental issues is increasing, awareness does not always lead to actual purchase of green products. Factors such as price, quality, availability, packaging, brand image and trust in environmental claims may influence consumer purchase decisions. Some consumers may also have limited knowledge about green products or may be doubtful about the environmental claims made by companies. Therefore, it is important to understand whether green marketing practices actually influence consumers' purchase decisions and to identify the major factors that affect their willingness to choose green products. Hence, the present study is undertaken to examine the impact of green marketing on consumer purchase decisions and to understand consumers' attitudes and preferences towards environmentally friendly products.

4. OBJECTIVES OF THE STUDY

- ❖ To measure the level of consumer awareness towards green marketing.
- ❖ To study consumer perception towards green products.
- ❖ To identify the factors influencing consumers' purchase decisions of green products.

5. SCOPE OF THE STUDY

The scope of the study is to examine the impact of green marketing on consumer purchase decisions. The study focuses on consumers' awareness, perception and preferences towards environmentally friendly products and green marketing practices. It covers factors such as product quality, price, eco-friendly packaging, green advertising, environmental awareness and trust in green marketing claims that may influence consumer purchasing decisions. The study

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also examines consumers' willingness to purchase green products and their preference for sustainable brands. The findings of the study may help businesses understand consumer expectations and develop effective green marketing strategies. It also provides an understanding of the importance of environmental awareness and sustainable consumption among consumers.

6. METHODOLOGY

The present study adopts a descriptive research design to examine the impact of green marketing on consumer purchase decisions. The study is based on both primary and secondary data. Primary data will be collected from 50 respondents through a structured questionnaire. The respondents will be selected using the convenience sampling method. Secondary data will be collected from books, journals, research articles, websites and other relevant sources. The collected data will be classified, tabulated and analysed using suitable statistical tools such as Percentage and Weighted average. The results will be interpreted to understand the influence of green marketing practices on consumer purchase decisions and to provide suitable suggestions.

7. RESULTS AND DISCUSSIONS

Table – 1 Demographic Profile of the respondents

Demographic factor	Options	Frequencies	Percentage
Gender	Male	27	54%
	Female	23	46%
Age	Below 15 years	3	6%
	16-30 years	25	50%
	31-45 years	15	30%
	46 years and above	7	14%
Occupation	Student	15	30%
	Business	12	24%
	Professional	18	36%
	Others	5	10%
Area of residance	urban	23	46%
	rural	19	36%
	Semi - urban	8	16%
Income group	Below 20,000	12	24%

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	20,001-40,000	16	32%
	40,001-60,000	10	20%
	60,001-80,000	7	10%
Types of family	Nuclear Family	32	64%
	Joint family	18	36%

Source: Primary Data

Interpretation

The demographic profile shows that most respondents are **male (50%)**, aged **16–30 years (50%)**, and **professionals (36%)**. A majority live in **urban areas (46%)**, belong to the **₹20,001–₹40,000 income group (32%)**, and come from **nuclear families (64%)**. Overall, the respondents are mainly young, urban, professionally employed, and from nuclear families.

Table – 2 Weighted average on Sources of awareness about Green Products

S.No	Sources of awareness	No. of respondents (f)	Weight (w)	Weighted score (f*w)	Rank
1	Social Media	15	6	90	I
2	Television / Advertisement	10	5	50	II
3	Friends / Family	8	4	32	III
4	Newspaper / Magazines	5	3	15	IV
5	Online shopping platforms	7	2	14	V
6	Other	5	1	5	VI

Source: Primary Data

Interpretation

The table - 2 shows that **Social Media** is the most important source of awareness about green products, with the highest weighted score of **90**, ranking **I**. **Television/Advertisements** ranks second with a score of **50**, followed by **Friends/Family (32)** in third place. **Newspapers/Magazines (15)** and **Online Shopping Platforms (14)** occupy fourth and fifth positions respectively. **Other sources** have the lowest weighted score of **5**, ranking sixth.**Overall, social media plays the most significant role in creating awareness about green products among the respondents.**

Table – 3 Factors influencing purchase decisions of green products

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S.No	Factors	No. of respondents	Percentage %
1	Environmental benefits	12	24
2	Price	8	16
3	Product Quality	10	20
4	Brand Image	5	10
5	Health benefits	6	12
6	Availability	4	8
7	Eco-friendly packaging	5	10

Source: Primary Data

Interpretation

The table - 3 shows that **environmental benefits (24%)** are the major factor influencing green product purchases, followed by **product quality (20%)** and **price (16%)**. **Availability (8%)** is the least influential factor. Overall, consumers mainly prioritize environmental benefits and product quality when purchasing green products.

8. CONCLUSION

The study concludes that green marketing has an important influence on consumer awareness, perception and purchase decisions towards green products. The findings show that consumers are increasingly aware of environmentally friendly products and consider environmental benefits, product quality and price while making purchasing decisions. Among the various sources of awareness, social media plays the most significant role in creating awareness about green products. The study also indicates that environmental benefits are the major factor influencing consumers' purchase decisions, followed by product quality and price. This shows that consumers are not only concerned about their personal benefits but also consider the environmental impact of the products they purchase. Therefore, businesses should focus on providing quality eco-friendly products, communicating genuine environmental benefits and using effective digital platforms such as social media to reach consumers.

Overall, effective green marketing strategies can encourage sustainable consumption and strengthen consumer preference for environmentally friendly products. Companies should continue to improve their green marketing practices and build consumer trust through clear and reliable environmental information. This can help businesses meet changing consumer expectations while contributing to environmental sustainability.

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CONTRIBUTION OF WOMEN ENTREPRENEURS TO THE BANKING SECTOR – A STUDY WITH SPECIAL REFERENCE TO MANAMADURAI TOWN

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ABSTRACT

Entrepreneurship as a factor of economic development is now recognized. A number of banking sectors provide support to women entrepreneurs for their innovative and imaginative scheme of utilities aimed at skill development for income and employment generation in different sectors not only that, the society should also facilitate the growth of women by recognizing their talents and abilities. There has been a substantial growth in women's involvement in the economic activities all over the world for the past few decades. For this both government and non-government agencies have to play a vital role. Despite the efforts of government and non-government organization, the women entrepreneurs are facing many problems. It has been pointed out by many research studies most of the problems faced by the women entrepreneurship are related with credit. Today there is a greater development among women. If given the opportunity, they will deliver the outcome. It is therefore essential to encourage educated young women to entrepreneurial development with financial technical and scientific assistance. The government and non-governmental organizations should make more focused and directed efforts and initiate specific programmes for women entrepreneurship development with programmes should train, motivate, enhance and shape-up individual skills of women having market potential. Hence, integrated approaches are necessary for making the movement of women entrepreneurship a success.

Key words: women entrepreneurs; banking sectors; bank schemes; development

INTRODUCTION

Banking sectors are just one of the key columns of Indian economic climate and it result are a suitable representative to plan an essential function regarding women empowerment is involved. Banks which have their visibility also in the remote edges of the nation have

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commonly been most importantly assistance framework for women regarding that economic requirements are worried. Be it plans connected to instructional funding at a really very early age or economic support for establishing source of income or steady resource of earnings in young people, banks have constantly played a crucial function in boosting economic incorporation of women in the Indian economic climate. All significant public market and the majority of the exclusive banks have revealed women driven and women just funding and bank plans that provide funding chances at concessional rates of interest and loosened up finance principles. Banks are anticipated to give business owners with economic support in addition to inputs to assistance and advertise their business.

1. STATEMENT OF THE PROBLEM

The status of women is closely associated with their financial position, which in flip, relies upon their get admission to efficient sources of the possibilities for participation in financial activities**.** A mother's education has a stronger impact on the health of her children than does the father's. An income controlled by women is more likely to be spent on house hold needs than in come controlled by men. According to a new policy paper, the world banks' lending will aim at strengthening the role of women in the development for achieving social justice and for reducing poverty. The bank claims that the financial institution will pay special attention to women participation in monetary improvement under a new policy enumerated in the report entitled, "Enhancing women's participation in Economic Development" claims that investing proportionately more in women than in men directly reduces poverty through substantial economic and social payoffs.

In the present day, an entrepreneur is considered as a complex system namely, self-sphere, socio-psycho, resource and support system. An entrepreneurial system has four sub-systems which are affected with each other and ultimately they affect the entrepreneurial performance. Based on this approach, an attempt is made to study the entrepreneurial performance, various constraints and problems encountered by women entrepreneurs. Tamilnadu Government in close association with the Central Government policies, applies so many welfare schemes for the economic upliftment of women folk of the state. Women entrepreneurs are facing many problems in the study area such as poor infrastructure, shortage of finance, acute competition, lack of family support, lack of innovation, defective marketing arrangement, high rate of interest etc. The problems encountered by the women entrepreneurs are at multi-dimensional in the study area.

2. REVIEW OF LITERATURE

Tandon (1975) in his study titled, 'Environment and Entrepreneurship' argued that the

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rate of entrepreneurial change is a function of human factor and one can bring about a change in the effectiveness of an enterprise by improving the human factor.

Sharma(1976)in his study titled, 'Entrepreneurship growth and industrial development programmes in Punjab and U.P - A comparative study of Small Entrepreneurs' studied inter-state patterns of entrepreneurial performance by selecting samples from Punjab and Uttar Pradesh. The take a look at famous that inter- country version inside the industrial weather gives upward thrust to variant in entrepreneurial overall performance and higher the climate higher would be the overall performance.

Mall (1993) in his study titled, 'Impact of financial incentives of Entrepreneurial development in Backward Regions. A case study of Deoria District of **Uttar** Pradesh 'found that the financial incentives would perhaps have been of still greater help, had there been complementary facilities to aid entrepreneur. Unfortunately, however, there is a total absence in Deoria of other promotional activities like training in technical and financial aspects budgeting, costing, resource allocation, cost benefit analysis, marketing projections, etc., which are vital for entrepreneurial success.

Krishna and Dinesh Awasthi(1994)in their study titled,' Responsiveness of small and tiny Enterprises to policy reforms in India' felt that it is established that work experience has been a strong factor influencing the establishment of owner — managed enterprises.

Saint and Bhatia (1996) in their study titled, 'Impact of Entrepreneurship Development Programmes' reveals that there is no significant change in the performance of trained and untrained entrepreneur in terms of the average investment. Trained entrepreneurs exhibit significantly high rates of growth in employment generation and sales turnover.

3. OBJECTIVES OF THE STUDY

- To trace out the history of the women entrepreneurs.
- To analyse the barriers for women entrepreneurs.
- To study the various bank schemes for women entrepreneurs' development.

BARRIERS FOR BANKS IN DEVELOPMENT OF WOMEN ENTREPRENEURS

1) Lack of Collaterals

Banks perceive women entrepreneurs as high risk segments as women do not have enough security or collaterals while applying for loans. Women entrepreneurs generally work in informal sector and operate micro level business. Banks hesitate to give loans in informal sector. In fact some banks perceive unmarried women high risk as women got married they change their profession their location and chances of defaults increase.

2) Lack of Awareness in Correct Documentations

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Banks needs documentation like personal profiles, track records, Personal Identity before giving loans to women entrepreneurs. In most cases women unable to represent relevant documents or doesn't have proper financial documents that fulfill the requirements of the Banks. So Banks couldn't precede loan applications applied by women entrepreneurs.

3) High Transaction Cost

High transaction cost is one of the main obstacle for finance. Women entrepreneur demands for finance is very small as women entrepreneurs start their business with small capital as they want to take minimum risk. For banks Administration and to provide service for small loan requirements lead to high cost. Banks has to proceed credit assessment, track past records, Backgrounds of the applicants, Income etc., procedure for small and big loan requirements so banks wants to proceed big requirements of loans.

4) Lack of Education/Awareness of women Entrepreneurs

Lack of Education makes a significant barrier before banks to give loans to women entrepreneurs. There is the less efforts made by the banks to give proper information regarding loans to women entrepreneurs as bank does not have designated officer for this purpose. Women Financial knowledge is a lacuna due to which women does not understand policy and procedures implemented by the Banks.

5. Non-performing Assets

Banks have a high level of non-performing assets additionally they have a low capital base, inadequate era infrastructure and constrained department network.

Serious problem in front of banking sector is how to reduce so some banks do not want to give loans to those women entrepreneurs where they think the risk may be high.

6. Inadequacy of Female Staff

Banks performance depends not only on the availability of suitably qualified staff but also upon its attitude and skill in pushing banking business. Banks have less women relationship officer which makes less attractive, less friendly environment for women entrepreneurs.

BANK SCHEMES FOR WOMEN ENTREPRENEURS

A number of banks offer exclusive schemes for female entrepreneurs, with some of the popular ones mentioned below.

1. State Bank of India

State bank of India has two schemes for women entrepreneurs, the Annapurna Scheme and the Stree Shakti package.

- **Annapurna Scheme**

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This scheme is designed for women who desire to establish food catering gadgets. The loan may be used to purchase kitchen essentials, fuel connections, uncooked substances, and so forth.

- **Stree Shakti**

Loans beneath this scheme can be availed by means of women entrepreneurs who have passed through EDP education.

2. Oriental Bank of Commerce

Oriental bank of commerce has schemes designed for self-hired women and people who are eager on putting in a beauty parlour/saloon.

- **Scheme for Beauty parlour/boutiques**

This scheme objectives to promote entrepreneurial spirit amongst women girls, and gives loans to set up a saloon, boutique, tailoring center or beauty parlour. The mortgage quantity can be used to meet any expenditure related to putting in one of these center and for daily fees.

- **Scheme for self-employed women**

This loan may be utilized to purchase fixed belongings to beautify or start an enterprise.

3. Bank of Baroda

Bank of Baroda offers one loan scheme for women entrepreneurs, the Akshaya Mahila Athik Sahay Yojna (AMASY), designed to help women attain their enterprise goals without having to worry about finances. This loan may be availed via women who're engaged in or want to set up a business in retail change, cottage industries and/or allied agricultural activities.

4. Dena Bank

Dena bank gives a different scheme to useful resource women entrepreneurs, supplying them sufficient economic assist to construct an enterprise. Loans may be availed as per RBI guidelines, with the amount varying in step with the world wherein a women desires to set up a task. This loan may be used for agriculture, MSMEs, schooling, housing and retail trade. Debtors are also eligible for a special hobby price that is 0.25% decrease than prevailing charges.

5. Tamilnad Mercantile Bank Limited

TMB gives a loan designed for women entrepreneurs, the Mahalir Loan. This loan can be used to finance any enterprise, with loans up to Rs. 10 lakh available. The loan can be repaid within 7 years, with the hobby charge depending at the quantum of loan.

6. Punjab National Bank

PNB offers five different schemes for women entrepreneurs, each one targeting a specific population.

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- **PNB Mahila Samridhi Yojana**

This scheme was released to offer economic help to women entrepreneurs who want to installation boutiques, beauty parlours, cyber cafes, Xerox shops, mobile shop, etc.

- **PNB Mahila Udyam Nidhi Scheme**

This scheme aims to reduce the distance in equity, helping women set up new ventures within the small scale sector or decorate their cutting-edge undertakings.

- **PNB Scheme for financing creches**

These schemes provide financial help to women who're keen on setting up crèches. The loan may be used to buy the necessary substances and to satisfy any recurring expenditure.

- **PNB Mahila Sasha ktikaran Abhiyan**

This scheme offers credit to women who intend to establish small and micro organisations within the non-farm sector, presenting charge waiver and lower interest rate

- **PNB Kalyani Card Scheme**

This scheme presents loans for women engaged in agricultural, farm or non-farm activities.

7. Cent Kalyani from Central Bank of India – MSME

Central of India offers commercial enterprise and startup loans for women entrepreneurs who are seeking to open a brand new enterprise or want every day increase or regulate the modern-day one. Women who are in daily rural and cottage industries, MSMEs, entrepreneurs and women running in farming, retailing, and government-subsidized corporations can avail this loan. The motive of the loan is to satisfy necessities, which include the purchase of plant and equipment/system.

8. MUDRA loan for women entrepreneurs

MUDRA Yojana under Pradhan Mantri Mudra Yojana (PMMY) is a loan scheme provided via banks for people, startups, commercial enterprise owners, in addition to for women entrepreneurs across India. This scheme loan quantity up to Rs. 10 lakh is obtainable to women who want to start their very own commercial enterprise or to enlarge the existing one. The loan quantity is obtainable below three categories named Shishu, Kishor and Tarun.

9. Shringaar and Annapurna from Bhartiya Mahila Bank

Bhartiya Mahila bank offers women entrepreneurs a huge range of loans to assist them set up new or make bigger their present enterprise. Two of the greater popular options in this category include Shringaar and Annapurna. The Shringaar loan targets women interested in setting up splendor parlors and the Annapurna loan scheme offers economic guide to women interested in setting up a meals catering enterprise for selling lunch packs.

10. SyndMahila Shakti from Canara Bank

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Syndicate bank's SyndMahila Shakthi objectives each new and modern women entrepreneurs. The scheme is available as either a coins credit to fulfill the running capital requirements of latest and present enterprise gadgets or as a term loan scheme of up to 10 years. A commercial enterprise in search of one of these loan needs to have one or greater women owning as a minimum 50% of the financial conserving.

4. SUGGESTIONS

- Women entrepreneurs should be aware of various credit facilities, financial incentives and subsidies available to them. One of the important criteria for giving loans to women entrepreneur is the qualification or education of women entrepreneurs. They should be aware so that they can avail benefit from the scheme.
- The women entrepreneurs may develop self-reliance in making decisions and solving problems.
- The women entrepreneurs should attend the trade associations because women can get the knowledge of potential customer markets etc.,
- Women entrepreneurs have to come forward to utilize the facilities offered by banks government and development progammes.
- The government may take steps to develop markets in rural and semi-urban areas so that women entrepreneurs can sell their products easily in the nearest markets. More fairs and exhibition should be arranged for the products of women entrepreneurs.
- The government has to allocate more funds in the ensuring five year plans to improve the financial performance of women entrepreneurs.
- In order to eliminate the middlemen, the government has to take steps to produce the products directly from the women entrepreneurs.
- The government has to liberalize the licensing procedure for smooth entry of women entrepreneurs in the area of business.

5. CONCLUSION

From the above study covers entrepreneurial skills of women entrepreneurs of the firms together with tea stall, candy stall, hotel, food processing, stationery store, fabric keep, rooster, tailoring and wooden work. The prevailing take a look at attempt to throw mild on the numerous problems faced by using women entrepreneurs, this have a look at can also assist numerous schemes in banking sectors to remedy the issues of women entrepreneurs of their business actives. Women entrepreneurs have tasted adequate quantity of achievement in carving a position for themselves. Although, the parable that financing a girl run business is a massive chance still persists. They may be nevertheless under the notion that women

entrepreneurs can in no way handle pressure as first-rate as guys and this would eventually suggest handiest failure. it's far simplest whilst humans pop out of this legend will women entrepreneurs thrive and they might be capable of contribute to the financial improvement and include equivalence with that of their male counterparts.

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DIGITAL PAYMENTS AND FINANCIAL INCLUSION IN INDIA: A SYSTEMATIC REVIEW OF ADOPTION BARRIERS AND ENABLERS

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ABSTRACT

Digital payments have become an important channel through which financial services can reach wider sections of the Indian population. Yet the expansion of payment infrastructure does not automatically ensure meaningful financial inclusion. This paper systematically reviews 23 peer-reviewed journal articles to identify the principal barriers and enablers shaping digital payment adoption and its contribution to financial inclusion in India. The review draws exclusively on secondary academic literature and synthesises evidence thematically. The findings indicate that perceived usefulness, ease of use, trust, security, financial literacy, facilitating conditions, merchant acceptance and social influence are recurring enablers. Perceived risk, privacy concerns, complexity, limited awareness, digital capability gaps, weak grievance redressal and uneven access remain important constraints. Recent evidence also shows that adoption is shaped by merchant-network effects, gendered social norms and socioeconomic inequalities, suggesting that infrastructure alone is insufficient. The review concludes that inclusive digital payment growth requires coordinated attention to technology design, user capability, merchant ecosystems, consumer protection and socially differentiated access.

Keywords: Digital payments, financial inclusion, UPI, adoption barriers, digital financial literacy

1. INTRODUCTION

Digital payments have moved from being a technology-led banking innovation to an important part of everyday economic activity in India. Mobile wallets, mobile banking, QR-based payments and the Unified Payments Interface (UPI) have reduced transaction frictions and expanded interaction with formal financial services. The wider FinTech transformation has increased the potential for financial services to reach users previously poorly served by conventional banking channels (Murinde et al., 2022).

The relationship between digital payments and financial inclusion, however, is not automatic.

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Financial inclusion involves more than access to an account or application; it also concerns the ability to use financial services conveniently, affordably, safely and repeatedly. Indian research identifies usefulness, ease of use, trust, security, facilitating conditions and financial capability as important influences, while risk and privacy concerns may discourage adoption (Shankar & Datta, 2018; Chawla & Joshi, 2019; Patil et al., 2020).

India is especially relevant because digital payment development has occurred alongside smartphone diffusion, policy initiatives and rapid UPI expansion. Recent studies increasingly shift attention from simple intention to actual use, merchant participation, regional differences and distributional consequences (Fahad & Shahid, 2022; Razi-ur-Rahim et al., 2024; Gupta et al., 2025).

2. STATEMENT OF THE PROBLEM

Rapid growth in digital payment infrastructure can create an impression that access and inclusion are advancing at the same pace. The literature presents a more complex picture. Some studies identify technology-related constraints, while others find that infrastructure is available and that perceived benefits, customer demand, trust and social factors better explain non-adoption (Ligon et al., 2019). Much research also concentrates on individual behavioural intention, whereas financial inclusion depends on merchant acceptance, gender, socioeconomic position, digital capability and continued use (Behera & Kumra, 2024). A systematic synthesis is therefore required to distinguish recurring barriers from enabling conditions within India's digital payment ecosystem.

3. SCOPE OF THE STUDY

The study focuses on digital payment and digital financial inclusion research relating to India. It covers mobile payments, mobile wallets, UPI and related digital transaction channels, with attention to consumer and merchant adoption, trust, security, financial literacy, infrastructure, social influence, gender and socioeconomic access. Peer-reviewed journal articles from established academic publishers and indexed journals were prioritised. Non-academic reports and studies unrelated to payment adoption or financial inclusion outcomes were excluded.

4. OBJECTIVES OF THE STUDY

(i) To examine the major barriers influencing digital payment adoption and financial inclusion in India.

(ii) To identify the principal technological, behavioural, social and institutional enablers of digital payment adoption.

(iii) To synthesize research gaps and suggest future directions for strengthening inclusive digital payment adoption in India.

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5. METHODOLOGY

The study adopts a systematic literature review design based entirely on secondary academic sources. Searches used combinations of "digital payments", "digital financial inclusion", "mobile payment", "mobile wallet", "UPI", "financial inclusion", "adoption", "barriers" and "enablers", with India as the principal geographical qualifier. Scholarly records from ScienceDirect, SpringerLink, Emerald, SAGE, Wiley and other recognised academic sources were examined. Priority was given to peer-reviewed articles in established journals indexed in major scholarly databases such as Scopus and Web of Science where applicable.

Articles were retained when they directly examined digital payment adoption, use, barriers, enabling conditions or financial-inclusion implications relevant to India. The final corpus contained 23 journal articles published between 2018 and 2026. Because the studies differ in theories, samples, payment technologies and outcome measures, thematic synthesis was used rather than statistical aggregation. Five themes guided the synthesis: technology and usability; trust, security and risk; capability and social factors; ecosystem and institutional conditions; and financial inclusion outcomes.

6. LITERATURE REVIEW

6.1 Technology, Usefulness and Convenience: Technology acceptance remains a major foundation of digital payment research. Indian evidence shows that perceived usefulness and ease of use contribute positively to adoption intention (Shankar & Datta, 2018; Chawla & Joshi, 2019). Liébana-Cabanillas et al. (2020) found that ease of use contributes to perceived usefulness, while usefulness, satisfaction, risk and trust influence mobile payment intention. Patil et al. (2020) reported that performance expectancy and facilitating conditions help explain use behaviour.

UPI research provides similar evidence. Fahad and Shahid (2022) found relative advantage, complexity and observability to be significant adoption determinants. Razi-ur-Rahim et al. (2024) found that performance expectancy influenced actual use behaviour, while trust affected attitude. Adoption therefore depends not simply on technological availability but on perceived value, simplicity and relevance.

6.2 Trust, Security, Privacy and Risk: Trust is a recurring enabler. Shankar and Datta (2018) identified trust as a significant determinant of mobile payment adoption, while Chawla and Joshi (2019) highlighted security and trust in Indian mobile-wallet acceptance. Liébana-Cabanillas et al. (2020) also identified perceived trust and risk as relevant to intention. Kar (2021) found trust, privacy, credibility and responsiveness important to mobile-payment satisfaction.

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Merchant evidence reinforces this pattern. Singh and Sinha (2020) found customer value addition and usefulness influenced Indian merchants' mobile-wallet intentions, with trust having a significant mediating role. A wider review by Kajol et al. (2022) identified trust as a leading motivator and perceived risk as a major inhibitor of digital financial transaction adoption.

6.3 Financial Literacy, Digital Capability and Social Factors: Financial and digital capability influence whether access becomes effective use. Srivastava et al. (2024) found financial literacy, effort expectancy, performance expectancy, facilitating conditions and self-efficacy to be strong drivers of mobile-payment FinTech adoption in India. Users require not only devices and connectivity but also knowledge and confidence to authenticate transactions, recognise risks and obtain assistance.

Social conditions also matter. Singh et al. (2020) identified social influence as a relevant factor in mobile-wallet satisfaction and recommendation. Recent evidence adds a stronger inclusion perspective: Arora et al. (2026) found that peer usage supports women's uptake of digital financial services, while restrictive gender norms reduce adoption. Thus, digital exclusion can persist even where infrastructure is available.

6.4 Merchant Ecosystem, Infrastructure and Socioeconomic Conditions: Digital payments operate through an ecosystem in which consumer demand and merchant acceptance reinforce one another. Ligon et al. (2019) found that basic infrastructure was not the principal constraint for many small merchants in Jaipur; perceived customer demand and tax concerns were more influential. Singh and Sinha (2020) likewise demonstrate the importance of merchant-perceived customer value.

Recent district-level evidence indicates that merchant-network development may become more important than incremental connectivity once basic infrastructure is established. Motheram and Buteau (2026) found merchant-network development to be a stronger driver of UPI adoption than internet connectivity across Indian districts. Gupta et al. (2025) further show that wealth inequality is associated with heterogeneous UPI adoption. Goel et al. (2023) and Pal et al. (2020) highlight the role of technology-enabled intermediaries and locally usable payment systems in extending financial services to underserved groups.

6.5 Digital Payments and Financial Inclusion Outcomes: Digital payment adoption can contribute to financial inclusion by making formal financial transactions more accessible, affordable and convenient, particularly where conventional banking channels involve geographical or cost barriers. Pal et al. (2020) show that mobile payment technologies can support human-centred development by providing locally useful and relatively low-cost

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mechanisms for accessing financial services. Goel et al. (2023) similarly demonstrate the importance of technology-enabled financial-service delivery models in extending banking access to underserved populations. At the broader level, Sha'ban et al. (2024) indicate that digital financial inclusion is influenced by banking conditions, mobile penetration and urbanisation, suggesting that payment technologies work most effectively when supported by an enabling financial ecosystem.

The literature also indicates that inclusion should not be measured only by the number of digital transactions or accounts. Meaningful inclusion requires sustained usage, quality of access and the ability of different social groups to participate safely. Kajol et al. (2022) identify trust, perceived usefulness, security and facilitating conditions as important drivers of digital financial transactions, while perceived risk remains a major inhibitor. Recent Indian evidence further shows that digital financial inclusion is shaped by gender, social norms and socioeconomic conditions. Arora et al. (2026) find that peer influence can encourage women's participation, whereas restrictive gender norms may continue to limit uptake. Gupta et al. (2025) also indicate that wealth inequality is associated with differences in UPI adoption. Thus, digital payments can strengthen financial inclusion, but their benefits are likely to be uneven unless digital capability, affordability, trust, consumer protection and access barriers are addressed.

7. MAJOR FINDINGS

The systematic review identifies the following major findings regarding the barriers and enablers of digital payment adoption and financial inclusion in India:

(i) Usefulness, convenience and simplicity are foundational enablers of adoption (Shankar & Datta, 2018; Fahad & Shahid, 2022).

(ii) Trust, security and privacy influence both initial acceptance and continued use; perceived risk can weaken confidence even when technology is available (Kar, 2021; Kajol et al., 2022).

(iii) Financial and digital literacy affect the ability to convert access into effective usage (Srivastava et al., 2024).

(iv) Social and gender conditions shape inclusion; peer effects may encourage adoption while restrictive norms can limit women's participation (Arora et al., 2026).

(v) Merchant acceptance is a critical ecosystem enabler and can create network effects that stimulate consumer use (Ligon et al., 2019; Motheram & Buteau, 2026).

(vi) Expansion is not uniformly distributed: wealth, regional conditions and banking-system characteristics can produce unequal outcomes (Gupta et al., 2025; Sha'ban et al., 2024).

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8. RESEARCH GAPS AND FUTURE DIRECTIONS

8.1 Key Research Gaps: The following gaps are especially prominent in the study

(i) **Limited evidence on sustained use:** Many studies focus on behavioural intention rather than sustained, verified usage. Future research should combine survey findings with longitudinal or transaction-level data.

(ii) **Insufficient attention to underserved groups:** Rural users, older adults, women and low-income groups require greater consideration because aggregate adoption rates can conceal persistent exclusion.

(iii) **Understudied merchant adoption:** Merchant-side adoption has received less attention than consumer adoption, despite its importance to the wider digital payment ecosystem.

(iv) **Gaps in post-adoption research:** Further study is needed on failed transactions, fraud, privacy, grievance redressal and post-adoption behaviour. Behera and Kumra (2024) similarly call for greater attention to lower-income settings, socioeconomic effects and privacy.

8.2 Future Research Directions

Future studies should adopt approaches that reflect the complexity and diversity of digital payment inclusion in India. They should use mixed-method and comparative research designs across Indian states and demographic groups, examine the interactions among literacy, merchant density, trust and institutional quality rather than treating these factors independently, and evaluate financial inclusion as a sustained outcome rather than merely as access to digital payment services.

9. CONCLUSION

Digital payments provide a powerful mechanism for widening access to formal financial services in India, but technology alone cannot deliver inclusive outcomes. The literature consistently points to usefulness, convenience, trust, security, financial literacy, social conditions and merchant acceptance as important influences. Barriers arise not only from infrastructure gaps but also from risk perceptions, capability limitations, gender norms, socioeconomic inequality and uncertainty about digital systems.

An inclusive approach therefore requires reliable payment design alongside digital and financial literacy, consumer protection, responsive grievance redressal and strong merchant ecosystems. Particular attention is needed for women, rural users, low-income households and people with weaker digital capabilities. The next stage of India's digital payment transformation should be assessed not only through transaction growth but also through whether digital finance becomes accessible, trusted and useful across social and economic groups.

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SOCIAL MEDIA AS A PROMOTIONAL TOOL FOR MOBILE NETWORK SERVICE PROVIDERS IN THOOTHUKUDI CITY

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ABSTRACT

Social media has emerged as an important promotional tool for mobile network service providers in the digital era. Mobile network companies increasingly use platforms such as Facebook, Instagram, YouTube, WhatsApp and X to communicate with customers, promote tariff plans, introduce new services, create brand awareness and strengthen customer relationships. Unlike traditional promotional methods, social media enables companies to communicate with customers quickly and receive immediate feedback. This study examines the role of social media as a promotional tool among mobile network service users. The study focuses on customers' awareness of social media promotions, preferred platforms, promotional content, customer engagement and the influence of social media promotions on purchase decisions. For the study, the descriptive research design was adopted and primary data were collected from 120 respondents through a structured questionnaire. Percentage analysis and a weighted mean method were used for analysing the data. The study indicates that social media plays an important role in creating awareness of mobile network offers and influencing customer engagement. The study suggests that mobile network service providers should focus on informative, attractive and customer-oriented social media campaigns.

Keywords: Social Media, Promotional Tool, Mobile Network Service Providers, Customer Engagement, Brand Awareness, Purchase Decision.

1. INTRODUCTION

The rapid development of digital communication has changed the way businesses communicate with customers. Social media has become an important medium for information sharing, promotion, customer interaction and relationship building. All sorts of Business use social media to reach customers directly or indirectly and communicate promotional messages and obtain immediate feedback. The telecommunications industry is highly competitive, and

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mobile network service providers continuously introduce new tariff plans, data packages, recharge offers, 5G services and customer benefits. Therefore, effective promotional communication is essential for attracting and retaining customers. Social media provides mobile network companies with an interactive platform through which promotional information can be communicated to a large audience.The importance of digital communication is particularly relevant in India because of the large and continuously developing telecommunications market. TRAI reported 1,265.73 million wireless mobile subscribers as of March 2026, highlighting the enormous potential customer base for mobile network service providers. Social media promotion differs from conventional advertising because customers can not only receive information but also like, comment, share and discuss promotional content. Thus, social media can contribute to brand awareness, customer engagement and purchase decisions.

2. STATEMENT OF THE PROBLEM

Mobile network service providers operate in a highly competitive environment. Customers are exposed to numerous advertisements and promotional offers through television, newspapers, websites, mobile applications and social media. In such a situation, it is important for service providers to understand which social media platforms and promotional activities are effective in attracting customers. Although mobile network companies actively use social media, customers may differ in their awareness, frequency of exposure, trust and response to social media promotions. Therefore, this study attempts to examine the role of social media as a tool to promote mobile network service providers.

3. OBJECTIVES

The study has objectives:

- To study the importance of social media to promote mobile network services.
- To examine the awareness of the customers' mobile network promotional activities on social media.
- To examine the effectiveness of different social media promotional activities.
- To offer suitable suggestions for improving social media promotion by mobile network service providers.

4. RESEARCH METHODOLOGY

4.1 Research Design

The study follows a descriptive research design because it describes customers' awareness, opinions and responses towards social media promotion by mobile network service providers.

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4.2 Area of the Study

The study has been conducted among the mobile network users in Thoothukudi District, Tamil Nadu.

4.3 Sample Size

A sample of 120 respondents is considered for the present analysis.

4.4 Sampling Method

Convenience sampling has been adopted to collect the responses from mobile network users who actively use social media for day-to-day activities.

4.5 Sources of Data

Primary Data has been collected directly from respondents using a structured questionnaire. The Secondary Data has been collected from books, journals, research articles, official reports and websites. TRAI publishes regular telecom subscription reports and related consumer and service-quality studies.

4.6 Tools for Analysis

The following tools are used: 1. Percentage Analysis, 2. Weighted Mean Analysis 3. Ranking Method

4.7 Limitations of the Study

- The study is limited to a sample of 120 respondents.
- The findings depend on the opinions expressed by respondents.
- The study focuses mainly on social media as a promotional medium.
- The results may differ according to location and customer characteristics.

5. Data Analysis and Interpretation

Table 1: Frequency of Seeing Mobile Network Promotions on Social Media

Frequency	**Respondents**	**Percentage**
Very Frequently	30	25.0%
Frequently	42	35.0%
Occasionally	31	25.8%
Rarely	12	10.0%
Never	5	4.2%
Total	**120**	**100%**

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Interpretation

The table shows that 35% of respondents frequently see mobile network promotional content on social media, while 25% see such promotions very frequently. About 25.8% see them occasionally. Only 4.2% of respondents stated that they never see mobile network promotions on social media. This indicates that social media provides considerable exposure to mobile network promotional activities.

Table 2: Most Preferred Social Media Platform for Mobile Network Promotions

Social Media Platform	Respondents	Percentage
Instagram	38	31.7%
YouTube	30	25.0%
WhatsApp	24	20.0%
Facebook	18	15.0%
X (Twitter)	6	5.0%
Other Platforms	4	3.3%
Total	**120**	**100%**

Interpretation

Instagram is the most preferred platform, accounting for 31.7% of respondents, followed by YouTube at 25%. WhatsApp accounts for 20%. Facebook is preferred by 15% of respondents. The results suggest that visual and video-oriented platforms have an important role in mobile network promotional communication.

Table 3: Effectiveness of Social Media Promotional Activities

Promotional Activity	Respondents	Percentage
Special Offers and Discounts	34	28.3%
Recharge/Data Plan Advertisements	30	25.0%
New Service Announcements	20	16.7%
Video Advertisements	18	15.0%
Influencer Promotions	10	8.3%
Customer Reviews/Testimonials	8	6.7%
Total	**120**	**100%**

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Interpretation

Mostly, special offers and discounts are considered as the most effective promotional activity by 28.3% of respondents. The recharge and data-plan advertisements rank second with 25%. The new service announcements account for 16.7%. So, the findings indicate that customers pay greater attention to promotions that provide direct monetary or service-related benefits for their use.

Table 4: Influence of Social Media Promotion on Purchase Decision

Response	Respondents	Percentage
Highly Influenced	24	20.0%
Influenced	40	33.3%
Neutral	28	23.3%
Not Much Influenced	20	16.7%
Not Influenced	8	6.7%
Total	**120**	**100%**

Interpretation

The table reveals that 33.3% of respondents are influenced by social media promotions when making purchase-related decisions, while 20% are highly influenced. Therefore, more than half of the respondents show some degree of influence from social media promotions. However, 23.3% remain neutral, indicating that social media promotion alone may not determine the final purchase decision for all customers.

Table 5: Customer Perception of Social Media Promotion

Statement	Weighted Mean	Rank
Social media provides information about new offers	4.18	I
Social media creates awareness of mobile network services	4.10	II
Social media promotions are easy to understand	3.92	III
Social media helps compare different offers	3.84	IV
Social media encourages customers to try new plans	3.76	V
Social media improves interaction with service providers	3.68	VI

Scale: 5 – Strongly Agree, 4 – Agree, 3 – Neutral, 2 – Disagree, 1 – Strongly Disagree.

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Interpretation

The weighted mean analysis shows that respondents strongly recognise the usefulness of social media in providing information about new offers, with a mean score of 4.18. Creating awareness of mobile network services ranks second with a mean score of 4.10. Customer interaction with service providers receives the lowest mean score of 3.68, suggesting that companies could improve two-way communication and customer response mechanisms through social media.

6. MAJOR FINDINGS

The major findings of the study are as follows. A considerable proportion of respondents frequently come across mobile network promotional content on social media. Instagram is one of the most influential social media platform to receive mobile network promotional information, followed by YouTube. Special offers and discounts are the most attractive promotional activities. Recharge plans and data-plan advertisements also receive considerable attention from customers. More than half of the respondents indicate that social media promotions influence their purchase-related decisions to some extent. Respondents consider social media an effective source of information about new mobile network offers. Social media contributes to creating awareness of mobile network services. Video content and attractive promotional messages can increase customer attention. Social media provides opportunities for mobile network companies to interact directly with customers. Customer engagement can be improved through timely responses to comments, questions and complaints.

7. SUGGESTIONS

On the base of the findings, the following suggestions are offered:

1. Focus on popular platforms: Mobile network service providers should give greater attention to platforms such as Instagram, YouTube and WhatsApp.
2. Promote attractive offers: Special discounts, data plans, recharge benefits and limited-period offers should be communicated clearly.
3. Use short videos: Short videos, reels and informative visual content can be used to explain plans and services in a simple manner.
4. Improve customer interaction: Companies should respond quickly to customer questions, comments and complaints posted on social media.
5. Use customer-friendly content: Promotional messages should be simple, clear and easy to understand.

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6. Increase transparency: Details regarding validity, data limits, conditions and pricing should be clearly mentioned in promotional messages.
7. Use customer feedback: Customer comments and feedback on social media can be analysed to understand customer expectations.
8. Develop personalised promotion: Service providers can use customer interests and usage patterns to provide more relevant promotional communication while respecting applicable privacy and communication regulations.
9. Use influencer marketing carefully: Relevant influencers can be used to increase awareness, particularly among younger customers.
10. Measure promotional effectiveness: Companies should monitor views, likes, shares, comments, clicks and conversions to evaluate the effectiveness of social media campaigns.

8. CONCLUSION

Social media has become an important promotional medium for mobile network service providers. The study indicates that customers frequently encounter mobile network promotions through social media and that promotional content can influence customer awareness, engagement and purchase decisions. Instagram, YouTube and WhatsApp appear particularly useful for communicating promotional information in the sample considered. The major strength of social media is its ability to combine promotion with interaction. Customers can receive information, ask questions, provide feedback and share promotional content. Therefore, mobile network service providers should move beyond one-way advertising and develop interactive, informative and customer-oriented social media strategies. The telecommunications sector continues to operate on a very large customer base in India; TRAI's March 2026 data reported more than 1.26 billion wireless mobile subscribers. This provides substantial scope for digital and social-media-based customer communication. However, promotional success ultimately depends not only on attractive advertising but also on service quality, pricing, network performance and customer satisfaction. Thus, social media can be considered an effective promotional tool for mobile network service providers when it is supported by relevant content, attractive offers, timely communication and effective customer relationship management.

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DIGITAL EDUCATION, ARTIFICIAL INTELLIGENCE AND INNOVATIVE PEDAGOGIES: A CONCEPTUAL FRAMEWORK FOR TECHNOLOGY-ENABLED LEARNING IN HIGHER EDUCATION

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ABSTRACT

Digital technologies, and more recently generative artificial intelligence (AI), have moved from the margins of higher education to the centre of how teaching, learning and assessment are organised. Learning management systems, online content, adaptive platforms and AI assistants are now available to a large share of students and teachers, yet the availability of technology has not automatically produced better learning. Although existing studies have examined digital education, AI in education and innovative teaching methods, they have largely done so as separate streams, and limited conceptual work has explained how these three developments jointly shape learning in contemporary higher education.

This conceptual paper integrates the Technological Pedagogical Content Knowledge (TPACK) framework, the Community of Inquiry (CoI) model and constructivist learning theory to develop an integrated framework for technology-enabled learning. The proposed framework considers the digital education environment and AI-enabled learning support as technological enablers of learning engagement and outcomes. Innovative pedagogical practice is proposed as the mediating mechanism through which these enablers are converted into learning, while digital and AI literacy of educators and learners is considered a boundary condition that may strengthen or weaken these relationships.

The paper synthesises existing literature on digital education, AI in learning and innovative pedagogies to develop six theoretical propositions. The conceptual model establishes relationships among the digital education environment, AI-enabled learning support, innovative pedagogical practice and learning engagement and outcomes. It also highlights the importance of ethical, human-centred and pedagogically grounded use of AI in education.

The paper concludes by discussing implications for educators, institutional leaders, educational technology providers and policymakers. It proposes that institutions should invest as much in pedagogical redesign and in digital and AI literacy as in technology itself. The framework also

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provides a structured basis for future empirical research using survey and mixed-method designs to test the proposed relationships. Overall, the study offers a theoretically grounded perspective on how digital education, AI and innovative pedagogies can be combined to improve learning in higher education.

Key Words: Digital Education, Artificial Intelligence in Learning, Innovative Pedagogies, Technology-Enabled Learning, TPACK, Higher Education.

1. INTRODUCTION

Higher education has entered a phase in which digital technology is no longer an add-on to the classroom but part of its basic fabric. Learning management systems, video-based instruction, online assessment, virtual laboratories and open digital resources are now routine, and a new layer of AI-enabled tools, including adaptive learning platforms, automated feedback systems and generative AI assistants, is being added on top of them (Chen, Chen, & Lin, 2020; Kasneci et al., 2023). In India, the National Education Policy 2020 explicitly encourages technology integration, blended and online learning and a shift towards learner-centred, competency-based pedagogy (Government of India, 2020). International policy guidance similarly urges education systems to adopt AI in a human-centred, ethical and equitable manner (UNESCO, 2021).

Despite this momentum, evidence suggests that technology by itself does not guarantee better learning. Reviews of AI in higher education have noted that much of the research is technology-driven, involves few educators and gives limited attention to pedagogical and ethical questions (Zawacki-Richter, Marín, Bond, & Gouverneur, 2019; Bond et al., 2024). Critical scholars caution that expectations of AI in education often run ahead of evidence and neglect the social and pedagogical contexts in which technology is used (Selwyn, 2019; Williamson & Eynon, 2020). Meanwhile, active and learner-centred pedagogies have a strong empirical record in improving student performance (Freeman et al., 2014), but they are seldom examined in combination with digital platforms and AI tools. The pathway through which digital education and AI convert into improved learning, and the role that pedagogy plays in that conversion, therefore remains comparatively under-theorised.

This conceptual paper responds to that gap. Rather than testing hypotheses on primary data, the paper synthesises existing theory and empirical findings to propose an integrated framework in which the digital education environment and AI-enabled learning support act as technological enablers, innovative pedagogical practice acts as the mechanism that converts these enablers into learning engagement and outcomes, and digital and AI literacy acts as a condition shaping the strength of this pathway.

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The paper is intended primarily for scholarly discussion and as a foundation for future empirical work. It is structured to first review the relevant theoretical and empirical literature, then develop a set of theoretical propositions and a conceptual model, and finally to discuss the implications of the framework and the empirical agenda it suggests, rather than to report findings from a completed survey.

2. OBJECTIVES OF THE PAPER

- To review the theoretical and empirical foundations of digital education, AI in learning and innovative pedagogies in higher education.
- To develop an integrated conceptual framework linking the digital education environment, AI-enabled learning support, innovative pedagogical practice and learning engagement and outcomes.
- To propose theoretical propositions regarding the mediating role of innovative pedagogical practice and the moderating influence of digital and AI literacy.
- To outline the practical implications of the framework and a structured agenda for future empirical research.

3. REVIEW OF LITERATURE

3.1 Digital Education and the Transformation of Higher Education

Digital education refers to the use of digital technologies, platforms and content to deliver, support and assess teaching and learning, whether fully online, blended or technology-enhanced within a face-to-face setting. Anderson and Dron (2011) traced the evolution of distance and online education through three generations of pedagogy, namely cognitive-behaviourist, constructivist and connectivist, and showed that each generation of technology has been most effective when matched with a compatible pedagogical model. Connectivism, in particular, argues that learning in a digital age increasingly involves navigating networks of people, information and tools (Siemens, 2005). A widely cited meta-analysis for the U.S. Department of Education found that students in online learning conditions performed modestly better than those receiving face-to-face instruction alone, and that blended approaches combining online and face-to-face elements performed better still (Means, Toyama, Murphy, Bakia, & Jones, 2010). These findings suggest that the value of digital education lies less in the medium itself and more in how it is combined with instructional design. The National Education Policy 2020 reflects this understanding in India by promoting blended learning and technology-supported, learner-centred pedagogy across higher education (Government of India, 2020).

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3.2 Artificial Intelligence in Learning

AI in education covers a wide range of applications, including profiling and prediction of student performance, assessment and feedback, adaptive and personalised learning systems and intelligent tutoring (Zawacki-Richter et al., 2019). Chen, Chen and Lin (2020) reviewed the field and reported that AI has influenced administration, instruction and learning, while Holmes, Bialik and Fadel (2019) and Luckin, Holmes, Griffiths and Forcier (2016) argued that AI can support personalised learning, provide timely feedback and reduce routine workload for teachers when it is designed to complement rather than replace human educators. The arrival of large language models has widened this discussion. Kasneci et al. (2023) outlined opportunities such as personalised support, content generation and assistance with feedback, but also challenges including inaccurate output, bias, over-reliance and the need to develop critical-thinking and digital competencies in both learners and teachers. Bates, Cobo, Mariño and Wheeler (2020) similarly observed that AI could transform higher education only if questions of ethics, data privacy and educational purpose are addressed alongside technical capability. A recent meta systematic review concluded that AI research in higher education requires greater ethical reflection, collaboration with educators and methodological rigour (Bond et al., 2024). Critical perspectives add that the promise of AI should not obscure its commercial, social and political dimensions (Selwyn, 2019; Williamson & Eynon, 2020).

3.3 Innovative Pedagogies

Innovative pedagogies refer to teaching approaches that move learners from passive reception of information to active, collaborative and applied learning. In a large meta-analysis of studies in science, engineering and mathematics, Freeman et al. (2014) found that active learning increased examination performance and reduced failure rates compared with traditional lecturing. Problem-based learning has been shown to help students build flexible knowledge, problem-solving skills, self-directed learning and collaboration (Hmelo-Silver, 2004). Flipped classrooms, in which content is accessed before class and class time is used for application, generally attract positive student perceptions, although evidence on learning gains is mixed and depends on the quality of design (Bishop & Verleger, 2013). Gamification, which applies game-design elements to non-game contexts, tends to produce positive effects on engagement, but results depend strongly on context and on the learners involved (Hamari, Koivisto, & Sarsa, 2014). Taken together, this literature indicates that innovative pedagogies can improve learning, yet their effectiveness is conditional on design and context rather than automatic.

3.4 Technology, Pedagogy and Learning Outcomes

A recurring finding across the literature is that technology influences learning mainly through

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the way it is used for teaching. Mishra and Koehler (2006) argued that effective technology integration depends on the interplay of technological, pedagogical and content knowledge rather than on technological knowledge alone. Ertmer and Ottenbreit-Leftwich (2010) showed that teachers' beliefs, knowledge, confidence and institutional culture jointly determine whether available technology is used in transformative ways or merely to replicate traditional practice. Classic technology acceptance research explains why people adopt and use technology, with perceived usefulness and ease of use as central predictors (Davis, 1989; Venkatesh, Morris, Davis, & Davis, 2003), but acceptance and use do not by themselves indicate that learning has improved. This distinction between using technology and learning with technology is central to the present paper: pedagogy is positioned as the bridge that connects technological availability to educational value.

3.5 Digital and AI Literacy, Self-Regulation and Ethics

The benefits of digital and AI tools depend on the capabilities of those who use them. Zimmerman (2002) described self-regulated learning as the capacity to plan, monitor and reflect on one's own learning, a capacity that becomes especially important when learners work with AI tools that can provide instant answers and thereby invite passive reliance. Kasneci et al. (2023) similarly stressed that both students and teachers need the competencies to evaluate AI output critically. At the institutional level, Chan (2023) proposed that universities develop comprehensive AI policy frameworks addressing pedagogical, governance and operational dimensions, while UNESCO (2021) emphasised human-centred, equitable and transparent use of AI in education. Together, these studies suggest that digital and AI literacy, together with sound governance, shapes whether technology-enabled learning is empowering or superficial.

3.6 Research Gap

Despite this expanding literature, three gaps remain relevant to the present conceptual effort. First, digital education, AI in learning and innovative pedagogies are typically studied as separate streams rather than as interacting elements of a single learning system. Second, few frameworks formally position pedagogical practice as the mediating mechanism through which digital and AI-based technological enablers translate into learning engagement and outcomes. Third, the boundary conditions under which this pathway strengthens or weakens, such as the digital and AI literacy of educators and learners, remain under-theorised, particularly in the Indian higher-education context. The conceptual framework proposed in this paper is designed to address these three gaps.

4. Theoretical Foundations

The proposed framework draws on three complementary theoretical perspectives.

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4.1 Technological Pedagogical Content Knowledge (TPACK)

Mishra and Koehler (2006) extended Shulman's idea of pedagogical content knowledge by adding technological knowledge, proposing that effective teaching with technology requires an integrated understanding of how technology, pedagogy and subject content interact. TPACK provides the core logic for the present framework: that digital tools and AI become educationally valuable when they are embedded in sound pedagogical design for specific content, and not when they are introduced as stand-alone additions.

4.2 Community of Inquiry (CoI) Framework

Garrison, Anderson and Archer (2000) proposed that meaningful online and blended learning arises from the overlap of three elements: cognitive presence, social presence and teaching presence. The CoI framework supports the framework's treatment of learning engagement and outcomes as multidimensional, and it highlights that digital environments and AI tools must support interaction, inquiry and purposeful facilitation, not merely content delivery.

4.3 Constructivist Learning Theory and Constructive Alignment

Vygotsky (1978) argued that learning is socially mediated and that learners develop higher mental functions through guided interaction within their zone of proximal development. Biggs (1996) built on constructivist thinking with the notion of constructive alignment, in which learning outcomes, teaching activities and assessment are deliberately aligned so that students construct meaning through relevant activity. These perspectives support treating innovative pedagogical practice, such as collaborative, problem-based and flipped learning, as the mechanism through which digital and AI tools are connected to deep and active learning.

5. Proposed Conceptual Framework

Based on the theoretical foundations and literature reviewed above, this paper proposes a framework comprising four core constructs, namely the Digital Education Environment (DEE), AI-Enabled Learning Support (AIL), Innovative Pedagogical Practice (IPP) and Learning Engagement and Outcomes (LEO), with Digital and AI Literacy (DAL) proposed as a boundary condition.

Table 1: Constructs of the Proposed Conceptual Framework

Construct	Definition	Theoretical Basis
Digital Education Environment (DEE)	The availability, quality and pedagogical usability of digital infrastructure, learning management systems, online content and connectivity that support teaching and learning in an institution.	Anderson & Dron (2011); Means et al. (2010); Garrison et al. (2000)

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Construct	Definition	Theoretical Basis
AI-Enabled Learning Support (AIL)	The extent to which AI tools, such as adaptive learning systems, intelligent tutors, automated feedback and generative AI assistants, are available to and used by learners and educators for learning tasks.	Luckin et al. (2016); Holmes et al. (2019); Kasneci et al. (2023)
Innovative Pedagogical Practice (IPP)	The degree to which teaching is designed around active, learner-centred and collaborative methods, such as flipped learning, problem-based learning, blended learning and gamification, rather than transmission-oriented instruction.	Vygotsky (1978); Biggs (1996); Freeman et al. (2014)
Learning Engagement and Outcomes (LEO)	Learners' cognitive, behavioural and emotional engagement, self-regulated learning and demonstrated development of higher-order skills such as critical thinking, problem solving and collaboration.	Garrison et al. (2000); Zimmerman (2002)
Digital and AI Literacy (DAL)	The knowledge, skills and critical awareness of educators and learners to use digital and AI tools effectively, ethically and reflectively.	Mishra & Koehler (2006); Ertmer & Ottenbreit-Leftwich (2010)

The framework proposes that the digital education environment and AI-enabled learning support influence learning engagement and outcomes both directly and indirectly through innovative pedagogical practice, and that this pathway is conditioned by the digital and AI literacy of educators and learners. This can be represented schematically as:

Digital Education Environment (DEE) + AI-Enabled Learning Support (AIL)

↓

Innovative Pedagogical Practice (IPP)

↓

Learning Engagement and Outcomes (LEO)

(direct paths: DEE → LEO; AIL → LEO; moderator: Digital and AI Literacy)

5.1 Theoretical Propositions

- **P1:** The quality of the digital education environment is positively associated with learners' engagement and learning outcomes.
- **P2:** AI-enabled learning support is positively associated with learners' engagement and learning outcomes.

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- **P3:** The digital education environment and AI-enabled learning support are positively associated with the adoption of innovative pedagogical practice.
- **P4:** Innovative pedagogical practice is positively associated with learners' engagement and learning outcomes.
- **P5:** Innovative pedagogical practice partially mediates the relationship between technological enablers (digital education environment and AI-enabled learning support) and learning engagement and outcomes.
- **P6:** Digital and AI literacy of educators and learners moderates the strength of these relationships, such that the effects of technological enablers on pedagogy and learning outcomes are expected to be stronger where digital and AI literacy is high.

6. Discussion and Implications

6.1 Theoretical Implications

The proposed framework contributes to the literature on technology-enabled learning in three ways. First, it consolidates digital education, AI in learning and innovative pedagogies, typically studied as separate streams, into a single integrated model that better reflects how learning actually unfolds in contemporary classrooms. Second, it formally positions pedagogical practice as a mediating mechanism between technological enablers and learning outcomes, extending TPACK, CoI and constructivist logic to the combined context of digital education and AI. Third, by proposing digital and AI literacy as a moderator, the framework provides a structured way to explain why identical technologies produce different results across educators, learners and institutions.

6.2 Practical Implications

For educators, the framework suggests that the most productive use of digital platforms and AI tools is in redesigning learning activities, for example by using AI-generated feedback within problem-based tasks, flipped sessions or collaborative projects, rather than using tools to deliver the same lectures in a new format. Educators should also design assessments that require students to explain, critique and apply AI-assisted work, so that AI supports rather than substitutes for thinking. For institutional leaders, the framework implies that investment in infrastructure and licences should be matched by investment in faculty development, instructional design support and student digital and AI literacy programmes, together with clear institutional policies on responsible AI use (Chan, 2023). For educational technology providers, the framework suggests that products should be designed around pedagogical purposes and educator control, with transparency about how data are used and how AI output is generated. For policymakers, the framework highlights the importance of human-centred,

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ethical and equitable AI governance in education, in line with international guidance (UNESCO, 2021), and of ensuring that gains from digital education reach learners with limited access.

7. Proposed Methodology for Future Empirical Validation

- While this paper is conceptual in nature, the framework is designed to be empirically testable. A suggested approach for future research is outlined below.
- Research Design: A descriptive and causal research design, combining profiling of respondents with correlation, regression and structural equation modelling to test the proposed mediation and moderation. A mixed-method extension using interviews or focus groups with faculty and students may be used to explain the quantitative results.
- Population and Sample: Undergraduate and postgraduate students, and optionally faculty members, from arts, science and commerce programmes in higher-education institutions that use a learning management system and/or AI-enabled tools, with a sample of approximately 250-300 respondents drawn through stratified purposive sampling.
- Instrument: A structured, five-point Likert-scale questionnaire covering the Digital Education Environment, AI-Enabled Learning Support, Innovative Pedagogical Practice, Learning Engagement and Outcomes and Digital and AI Literacy, adapted from established technology-acceptance, engagement, Community of Inquiry and self-regulated learning scales, along with a demographic and usage-profile section.
- Statistical Tools: Percentage analysis, reliability and validity testing (Cronbach's Alpha, composite reliability and confirmatory factor analysis), Pearson correlation, multiple regression, structural equation modelling or PLS-SEM with bootstrapped mediation analysis, and moderation or multi-group analysis, supported by independent samples t-test and one-way ANOVA for group comparisons.

8. CONCLUSION

This conceptual paper synthesises TPACK, the Community of Inquiry framework and constructivist learning theory with the emerging literature on digital education, AI in learning and innovative pedagogies to propose an integrated framework for technology-enabled learning in higher education. The framework positions the digital education environment and AI-enabled learning support as technological enablers, innovative pedagogical practice as the mechanism that converts these enablers into learning, and engagement and learning outcomes as the result, with digital and AI literacy proposed as a boundary condition. In doing so, the paper offers educators, institutional leaders, technology providers and policymakers a theoretically grounded lens for understanding why access to digital tools and AI does not

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automatically translate into better learning, and proposes pedagogy, not technology alone, as the more important lever for building meaningful, ethical and sustained learning experiences. The propositions developed here are intended as a starting point for the structured empirical research agenda outlined in Section 7.

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INFLUENCER MARKETING AND FINANCIAL SCAMS ON SOCIAL MEDIA: CONSUMER VULNERABILITY AND EMERGING RISKS

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ABSTRACT

The rapid expansion of social media has transformed digital marketing by enabling influencers to shape consumer opinions, purchasing decisions, and perceptions of financial products and opportunities. Alongside legitimate promotional activities, however, social media has become an emerging channel for financial scams involving deceptive investment opportunities, fraudulent schemes, impersonation, misleading endorsements, and unrealistic financial-return claims. The credibility and perceived authenticity of influencers may increase consumers' trust in promotional content and potentially expose them to financial risks. This study examines the relationship between influencer marketing and financial scams on social media, with particular emphasis on consumer vulnerability and emerging digital risks. The study adopts a secondary data analysis approach and utilizes information from regulatory publications, government reports, documented cyber-fraud cases, institutional reports, and relevant published studies. The analysis focuses on the emerging forms of influencer-related financial scams, patterns of fraudulent promotional practices, and factors contributing to consumer vulnerability in social media environments. Trend and descriptive analyses are proposed to identify the changing nature of such scams and their potential financial and behavioral implications. The study further highlights the importance of digital literacy, critical evaluation of influencer content, transparent promotional practices, and effective regulatory mechanisms. The findings are expected to contribute to discussions on digital marketing, consumer behavior, cybersecurity, and digital resilience, while emphasizing the need for greater awareness and responsible communication within the evolving social media ecosystem.

Keywords: Influencer Marketing, Financial Scams, Social Media, Consumer Vulnerability, Digital Fraud, Digital Resilience

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1. INTRODUCTION:

Social media has become an important component of modern digital marketing, allowing brands and individuals to reach large audiences through interactive and personalized content. Influencers play a significant role in this environment by promoting products, services, and financial opportunities to their followers. Their perceived credibility, familiarity, and direct engagement with audiences can influence consumer attitudes and decision-making. However, the growing influence of social media has also created opportunities for fraudulent actors to exploit influencer-based communication for financial scams. Consumers may find it difficult to distinguish legitimate financial information from deceptive content, particularly when fraudulent messages are presented through trusted or popular online personalities. Such practices can expose consumers to financial losses while also reducing trust in digital platforms and legitimate influencer marketing.

In this context, understanding consumer vulnerability to influencer-related financial scams has become increasingly important for strengthening digital resilience. The present study focuses on the emerging relationship between influencer marketing and financial scams on social media. It examines the nature and trends of influencer-associated financial scams and identifies factors that may contribute to consumer vulnerability in the digital environment. The study adopts a secondary data analysis approach, using information from relevant regulatory publications, government reports, documented cases, and published research. The study aims to contribute to discussions on responsible digital marketing, consumer protection, cybersecurity, and the development of a safer and more resilient social media ecosystem.

2. OBJECTIVES OF THE STUDY:

1. To examine the trends and patterns of financial scams associated with social media and influencer marketing.
2. To identify the major factors contributing to consumer vulnerability to influencer-related financial scams.
3. To suggest measures for strengthening consumer protection and digital resilience against influencer-driven financial scams.

3. METHODOLOGY:

Research Design: The study follows a descriptive research design to examine influencer marketing, financial scams, and consumer vulnerability on social media.

Data Source: The study is based entirely on secondary data collected from government reports, regulatory publications, research articles, institutional reports, and reliable online sources.

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SCOPE OF THE STUDY: The study focuses on financial scams associated with social media and influencer marketing, including fraudulent investment promotions, misleading financial offers, impersonation, and other related scams

LIMITATIONS: The study depends on the availability and accuracy of secondary data. Since reported cases may not represent all actual incidents, the findings should be interpreted within the limitations of publicly available information.

4. REVIEW OF LITERATURE:

Bai et al. (2026) examined the link between social media use and fear of investment fraud. Their findings showed that greater reliance on social media for financial information was associated with increased fear of fraud. The study highlighted the difficulty of distinguishing reliable information from misleading content and emphasized the importance of financial education, digital literacy, and fraud awareness.

Lou and Yuan (2019) found that influencer credibility, trustworthiness, and relatable content increase consumer trust in social media posts. Their study showed that this trust influences brand awareness and purchase decisions. These findings highlight the persuasive role of influencers in shaping consumer behavior. However, such trust may also make consumers vulnerable to misleading financial promotions.

The CFA Institute Research and Policy Center examined how financial influencers affect investment decisions. The study found that some followers experienced financial harm from finfluencer advice, while many influencers lacked clear sponsorship disclosures. These findings highlight concerns about transparency and the reliability of financial content on social media. They also emphasize the need to protect consumers from misleading financial promotions.

5. TRENDS AND PATTERNS OF INFLUENCER-RELATED FINANCIAL SCAMS:

Growing Influence of Financial Influencers: people obtain financial information and make investment decisions. Social media has become a popular source of financial information, especially among young people. Finfluencers share investment advice and financial content, which can be helpful but may also expose followers to misleading information. CFA Institute research highlights their influence on young people's financial knowledge and investment decisions.

Misleading Financial Promotions: Some influencers promote investments without clearly explaining the risks or their financial interests. This can make it difficult for followers to tell genuine advice from paid promotions. CFA Institute (2026) found that 33% of sampled

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finfluencers gave direct stock recommendations, while many did not clearly disclose conflicts of interest.

Investment and Trading Scams: Social media is increasingly being used to promote fake investment and trading opportunities. Scammers often attract people with promises of quick and high returns. Because such offers can reach many users quickly, they can increase the risk of financial loss.

Consumer Trust and Vulnerability: People often trust influencers because they seem genuine and knowledgeable. However, this trust can make followers more likely to accept financial advice without checking it. A CFA Institute study found that more than 8% of surveyed followers had been misled by finfluencer advice, showing the risks of relying too heavily on online financial content.

Regulatory and Platform Risks: The growing use of influencers for financial promotions creates challenges for regulators and social media platforms. The FCA has taken action against illegal finfluencer promotions and misleading financial advertisements. These actions highlight the need for better monitoring, clear disclosures, and greater consumer awareness.

Statistical Data about the Influence of Financial Influencers:

According to the SEBI investor survey 2025:

● 56% of investors use financial influencers on social media as a source of information ● 93% consider financial influencers moderately to highly credible.

● 62% make at least some investment decisions based on influencer recommendations.

These findings highlight the growing reach of financial influencers and the trust investors place in their content. However, such trust may make consumers vulnerable to misleading financial advice and fraudulent investment promotions if they do not verify the information independently. These figures indicate the influence of financial influencers, but they do not directly measure the prevalence of fraud.

Investment, stock-market, and trading scam reports:

The Government of India's Sanchar Saathi initiative publishes suspected fraud communications reported through its Chakshu facility

Category	2024	2025	Increase	Percentage Change

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Investment, stock market, and trading	165	29,140	28,975	17,560.6%
Malicious links/websites	8,304	19,418	11,114	133.8%
Online jobs, lotteries, gifts, and loan offers	23,634	58560	34,926	147.8%

Source: Department of Telecommunications, Ministry of Communications, Government of India, via PIB.

Interpretation:

Suspected investment and trading-related fraud communications reported through Chakshu rose from 165 in 2024 to 29,140 in 2025. Reports involving malicious links and online offers also increased. These figures highlight the need to prevent digital financial scams, but they do not represent confirmed fraud cases or prove influencer involvement.

6. CONSUMER VULNERABILITY AND EMERGING RISKS:

Trust in Financial Influencers: People often trust influencers because their content feels genuine and relatable. This trust can make followers accept financial advice without checking whether it is reliable.

Limited Financial and Digital Literacy: People with limited financial knowledge may find it difficult to identify online scams. They may be misled by promises of guaranteed returns, urgent offers, or suspicious links.

Fear of Missing Out (FOMO): Promises of quick profits and limited-time offers can make people feel they might miss a good opportunity. As a result, they may invest without properly checking the risks.

Emerging Risks on Social Media: Fake influencer accounts, false testimonials, and AI-generated videos can make scams appear genuine. These methods make it harder for people to identify misleading financial promotions.

Consumer Protection and Digital Resilience: People should verify investment claims and check whether financial service providers are registered. Influencers, social media platforms, and regulators must also help prevent scams through clear disclosures, better monitoring, and public awareness.

Statistical Data about Trust in Financial Influencers:

Statistical Finding	**Percentage**

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Investors who use social media financial influencers for securities market information	56%
Investors who consider financial influencers moderately to highly credible	93%
Investors who make at least some investment decisions based on influencer recommendations	62%

Source: Securities and Exchange Board of India (SEBI), Investor Survey 2025.

The findings show that financial influencers are widely trusted and influence investment decisions, highlighting the need to verify financial advice before investing.

Fear of Missing Out and Emerging Financial Scams:

Type of suspected fraud communication	**2024**	**2025**
Investment, stock market, and trading	165	29,140
Malicious links or websites	8304	19,418
Online job, lottery, gift, and loan offers	23,634	58,560
Total across all reported categories	208,224	519,662

Source: Chakshu Suspected Fraud Communications

Interpretation: Suspected fraud communications increased significantly from 2024 to 2025, particularly those related to investment scams, malicious links, and online offers. This highlights the growing need for digital awareness and consumer protection.

7. FINDINGS AND DISCUSSION:

The study finds that financial influencers play an important role in shaping investment decisions. SEBI's Investor Survey 2025 shows that 93% of investors consider financial influencers moderately to highly credible, while 62% make at least some investment decisions based on their recommendations. This trust may expose consumers to misleading financial advice.

The Chakshu data show a significant increase in suspected fraud communications between 2024 and 2025, particularly those related to investment and trading, malicious links, and online offers. These trends highlight the growing risks of digital financial scams. However, the available data do not establish how many cases involved influencers directly.

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Consumer vulnerability may increase due to excessive trust, limited financial and digital literacy, and the fear of missing profitable opportunities. Fake profiles, false testimonials, and AI-generated content can make fraudulent promotions appear genuine. Therefore, greater awareness and responsible use of social media are essential for digital resilience.

8. SUGGESTIONS AND POLICY IMPLICATIONS:

- Improve digital awareness: Conduct awareness programs to help consumers recognize fake investment offers, suspicious links, and misleading financial claims.
- Verify financial information: Consumers should check investment advice and the registration of financial service providers before investing.
- Promote responsible influencer marketing: Financial influencers should clearly disclose paid promotions and avoid sharing unverified investment claims.
- Strengthen platform monitoring: Social media platforms should improve the detection and removal of fake profiles, fraudulent advertisements, and misleading investment groups.
- Enhance regulatory action: Financial regulators should strengthen monitoring of misleading financial promotions and encourage consumers to report suspected scams through official channels.

9. CONCLUSION:

Social media and financial influencers have become important sources of investment information, but they can also expose consumers to financial risks. The findings highlight the importance of financial literacy, transparent promotions, and stronger monitoring of suspicious online activities. Cooperation among consumers, influencers, platforms, and regulators is essential to reduce vulnerability and build a safer digital financial environment.

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A STUDY ON THE IMPACT OF SOCIAL MEDIA TRAVEL INFLUENCERS ON DESTINATION CHOICE AMONG TOURISTS IN CHENNAI

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ABSTRACT

The rapid growth of social media has transformed tourism marketing and the way tourists discover, evaluate and select travel destinations. Social media travel influencers communicate destination experiences through photographs, videos, travel vlogs, reviews and personal recommendations. Their content may influence tourists' destination perceptions, travel preferences and intention to visit particular places. This study examines the impact of social media travel influencers on destination choice among tourists in Chennai. It focuses on influencer credibility, content quality, authenticity, audience engagement and visual appeal as factors associated with destination-selection behaviour.

The study adopts a descriptive and analytical research design, proposing primary data collection through a structured questionnaire administered to tourists in Chennai. A simulated dataset of 150 respondents is used to demonstrate the presentation of statistical analysis; these figures are hypothetical and do not represent actual survey responses. Percentage analysis is used to summarise social media usage and influencer-related preferences. The chi-square test examines the association between exposure to travel influencer content and destination-choice decisions, while one-way analysis of variance (ANOVA) demonstrates how destination-choice intention scores may be compared across age groups.

The proposed research provides a framework for understanding the relationship between influencer marketing and tourism consumer behaviour. It highlights the importance of trustworthy recommendations, engaging travel content and authentic destination representation. The study may offer useful insights for tourism marketers, destination management organisations and travel businesses seeking to develop effective digital promotional strategies. Actual empirical conclusions concerning tourists in Chennai will require the collection and analysis of primary survey data.

Keywords: Social Media Influencers, Destination Choice, Tourist Behaviour, Influencer Marketing, Travel Intention, Destination Image, Digital Tourism Marketing, Chennai.

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1. INTRODUCTION

1.1 Growth of Social Media in Tourism

The development of digital technology and social networking platforms has significantly changed the tourism industry. Tourists increasingly use Instagram, YouTube, Facebook and other digital platforms to discover destinations, obtain travel information and plan their journeys. Photographs, short videos, travel vlogs and personal experiences provide prospective tourists with an accessible way to explore destinations before visiting them.

Social media has also created opportunities for travel influencers to communicate directly with large audiences. Through destination reviews, itineraries, travel tips and personal narratives, influencers can introduce unfamiliar locations and highlight their attractions. Their content may shape perceptions of destination attractiveness, accessibility, accommodation, local culture and travel experiences.

1.2 Role of Travel Influencers in Destination Choice

Destination choice is a decision-making process through which tourists evaluate alternative locations according to their preferences, budgets, interests and travel requirements. Traditional information sources, including travel agencies, guidebooks and advertisements, are now complemented by influencer-generated content.

Travel influencers may provide practical information about transportation, accommodation, local attractions, food and travel expenses. Their personal experiences may help audiences imagine what a destination would be like and evaluate whether it suits their interests. Influencers may also increase awareness of lesser-known destinations by presenting distinctive attractions and experiences.

However, influencer content does not necessarily determine destination choice. Tourists may also consider affordability, safety, accessibility, travel time, recommendations from friends and family, and the credibility of the information provided.

1.3 Credibility and Authenticity of Travel Influencers

Credibility is an important consideration in influencer marketing. Tourists may be more receptive to recommendations from influencers who demonstrate travel knowledge, provide accurate information and communicate genuine experiences. Authentic content can help audiences understand both the advantages and limitations of a destination.

In contrast, exaggerated claims, undisclosed commercial promotions and unrealistic destination portrayals may weaken trust. Tourists may compare influencer recommendations with customer reviews, official tourism information and other sources before making travel decisions.

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Consequently, influencer credibility and content authenticity are important variables when examining the relationship between social media exposure and destination choice.

1.4 Social Media Influencers and Tourism in Chennai

Chennai is an important metropolitan centre in Tamil Nadu and serves as a source of domestic and international travel. Residents and tourists in the city may use social media to explore destinations within Tamil Nadu, other Indian states and international locations.

Travel influencers may introduce audiences to cultural heritage destinations, hill stations, beaches, pilgrimage centres, adventure tourism locations and urban attractions. Their content may influence destination awareness and encourage tourists to investigate locations that match their travel interests.

Examining the role of social media travel influencers among tourists in Chennai can provide insights into digital travel information, influencer credibility and destination-selection preferences.

1.5 Need for the Study

The growing use of social media in tourism makes it important to understand how influencer content relates to tourists' destination choices. Although visually appealing content may attract attention, its influence may depend on credibility, authenticity, information usefulness and audience engagement.

The present study proposes an investigation of these factors among tourists in Chennai. It seeks to examine the association between exposure to travel influencer content and destination-selection behaviour, while considering differences in destination-choice intention across age groups. The research may contribute to tourism marketing by identifying factors that should be considered when designing influencer-led promotional campaigns.

2. REVIEW OF LITERATURE

2.1 Saini, Kumar and Oberoi (2023)

Saini, Kumar and Oberoi conducted a systematic literature review on social media influencers and travel decision-making. Their review examined influencer content, audience engagement and trust as factors relevant to tourism decisions. The authors proposed a conceptual framework explaining how influencer characteristics and engagement may influence travel-related behaviour. Their work highlights the importance of understanding trust and content characteristics when evaluating influencer marketing. It provides a theoretical foundation for examining how social media travel influencers relate to destination choice among tourists in Chennai.

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2.2 Faisal and Dhusia (2022)

Faisal and Dhusia examined social media travel influencer attributes and tourists' travel intention, focusing on source credibility. Their study used questionnaire data from respondents in Delhi and the National Capital Region. The findings highlighted the relevance of influencer expertise, trustworthiness and credibility in explaining travel intention. The research suggests that the perceived qualities of an influencer may matter beyond simple audience reach. It is relevant to the present study because it supports examining credibility as a factor associated with destination-choice behaviour.

2.3 Pourazad, Stocchi and Simmonds (2025)

Pourazad, Stocchi and Simmonds investigated the influence of travel social media influencers on destination choice across the customer journey. Their research addressed the need to understand influencer effects at different stages of travel decision-making. The study provides a broader perspective on how tourists encounter, evaluate and respond to influencer content during destination selection. Its relevance lies in recognising that influencer effects may extend beyond initial destination awareness to later evaluation and choice. This supports the present study's focus on destination-selection behaviour among tourists in Chennai.

2.4 Najar, Wani and Rather (2024)

Najar, Wani and Rather examined the influence of social media influencer credibility on destination brand trust and destination purchase intention. Their research considered credibility dimensions and the role of destination trust in tourism-related intentions. The study provides a basis for examining the relationship between influencer characteristics, trust and destination-related decisions. Its findings are relevant to the present research because they suggest that destination choice should be considered alongside tourists' perceptions of the influencer and the destination being promoted.

2.5 Teangsompong and colleagues (2026)

Teangsompong and colleagues examined social media influencers, audience engagement and travel intention using a digital tourism framework. Their research explored how influencer effects may operate through engagement, destination trust and attitudes towards promotional campaigns. The study highlights the importance of considering both emotional and cognitive processes in influencer-driven travel decisions. It supports the inclusion of audience engagement, credibility and destination perceptions as relevant factors in the proposed investigation. However, its findings should be interpreted in the context of the study's specific sample and research design.

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3. Statement of the Problem

Social media has become an important source of travel inspiration and destination information. Travel influencers communicate destination experiences through videos, photographs, reviews and personal recommendations, potentially shaping the preferences of prospective tourists. Their content may influence destination awareness, perceptions of attractiveness and intention to visit particular locations. However, the extent of this influence may depend on the credibility of the influencer, authenticity of the content and relevance of the information to individual travel requirements.

Tourists may encounter promotional content that presents destinations selectively or exaggerates their attractions. Commercial partnerships, undisclosed sponsorships and unrealistic portrayals can create uncertainty regarding the reliability of influencer recommendations. Furthermore, a destination that appears attractive on social media may not necessarily match tourists' budgets, accessibility requirements or personal interests.

In Chennai, tourists may use social media to explore domestic and international destinations, including cultural, coastal, heritage and adventure tourism locations. However, the relationship between influencer exposure and actual destination-selection preferences requires systematic investigation within this geographical context.

The present study addresses this problem by examining how influencer credibility, content quality, authenticity and audience engagement relate to destination choice among tourists in Chennai. It also proposes an analysis of the association between exposure to influencer content and destination-selection behaviour, along with differences in destination-choice intention across age groups. The study aims to provide a framework for understanding influencer marketing and its implications for tourism promotion.

4. OBJECTIVES OF THE STUDY

1. To examine the influence of social media travel influencers on destination choice among tourists in Chennai.
2. To assess the importance of influencer credibility, content authenticity and audience engagement in tourists' destination-selection decisions.
3. To analyse the association between exposure to travel influencer content and destination-choice behaviour, including differences across selected demographic groups.

5. RESEARCH METHODOLOGY

5.1 Research Design

The study adopts a descriptive and analytical research design to examine social media travel influencers and destination-choice behaviour.

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5.2 Study Area

The study focuses on Chennai, Tamil Nadu, India, as the proposed geographical setting for examining tourists' social media usage and destination-selection preferences.

5.3 Sources of Data

Primary data: Primary data will be collected through a structured questionnaire administered to eligible tourists in Chennai.

Secondary data: Secondary information will be obtained from academic journals, research articles, books and published studies relating to influencer marketing, digital tourism and travel decision-making.

5.4 Population of the Study

The target population comprises tourists or prospective travellers in Chennai who use social media for travel inspiration, destination research or travel planning.

5.5 Sampling Technique

Convenience sampling is proposed for the empirical survey. Eligible respondents may be approached through appropriate locations and online questionnaires. The limitations of non-probability sampling will be acknowledged when interpreting the results.

5.6 Sample Size

A sample size of 150 respondents is used for the simulated statistical demonstration in Section 6. These observations are hypothetical and do not represent completed fieldwork. The actual sample size will depend on the valid responses collected during the empirical survey.

5.7 Research Instrument

A structured questionnaire will be designed to collect information on:

- Demographic characteristics of respondents.
- Social media platforms used for travel inspiration.
- Frequency of viewing travel influencer content.
- Perceived influencer credibility and expertise.
- Authenticity and usefulness of travel content.
- Audience engagement with influencer posts.
- Influence of social media content on destination choice.
- Destination-choice intention.

Perception-related items may be measured using a five-point Likert scale ranging from Strongly Disagree to Strongly Agree.

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5.8 Variables of the Study

Variable category	Variables
Independent variables	Influencer credibility, content authenticity, content quality and audience engagement
Dependent variable	Destination-choice intention
Additional outcome	Reported influence of influencer content on destination selection
Grouping variables	Age, gender, occupation, income and travel frequency

5.9 Statistical Tools

The study proposes the following statistical techniques:

1. **Percentage analysis:** To summarise respondents' demographic characteristics, social media usage and influencer-related preferences.
2. **Chi-square test:** To examine associations between exposure to travel influencer content and destination-choice behaviour.
3. **One-way ANOVA:** To investigate whether mean destination-choice intention scores differ across selected age groups.

5.10 Hypotheses of the Study

Chi-square test

H_{01}: There is no significant association between exposure to social media travel influencer content and destination-choice behaviour.

H_{11}: There is a significant association between exposure to social media travel influencer content and destination-choice behaviour.

ANOVA test

H_{02}: There is no significant difference in mean destination-choice intention scores among different age groups.

H_{12}: At least one age group differs significantly in its mean destination-choice intention score.

5.11 Level of Significance

The statistical tests will use a 5% significance level ($\alpha = 0.05$). Actual empirical results must be calculated using the collected survey data.

5.12 Reliability and Validity

The questionnaire should be reviewed for content validity and pilot-tested before the main survey. If multiple items measure a common construct, internal consistency may be assessed using Cronbach's alpha.

5.13 Ethical Considerations

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Participation should be voluntary, and respondents should be informed about the academic purpose of the study. Confidentiality should be protected, and unnecessary personal information should not be collected.

6. Analysis of the Impact of Social Media Travel Influencers on Destination Choice

6.1 Percentage Analysis

Table 1: Most Frequently Used Social Media Platform for Travel Inspiration

Platform	Respondents	Percentage
Instagram	54	36.00%
YouTube	42	28.00%
Facebook	24	16.00%
Travel blogs and other platforms	18	12.00%
Other social platforms	12	8.00%
Total	**150**	**100.00%**

Interpretation: In the hypothetical distribution, Instagram accounts for the largest share of respondents' reported primary platform for travel inspiration, followed by YouTube. This table demonstrates how platform preferences may be summarised using percentage analysis.

Table 2: Most Influential Characteristic of a Travel Influencer

Influencer characteristic	Respondents	Percentage
Credibility and trustworthiness	45	30.00%
Visual appeal of content	36	24.00%
Travel knowledge and expertise	30	20.00%
Authentic personal experiences	24	16.00%
Audience engagement	15	10.00%
Total	**150**	**100.00%**

Interpretation: In the hypothetical distribution, credibility and trustworthiness account for the largest share, followed by visual appeal. These figures illustrate how respondents' stated preferences can be presented; they do not establish the actual priorities of tourists in Chennai.

The percentage formula is:

Percentage = (Number of respondents / Total respondents) × 100

6.2 Chi-square Test

Objective: To examine the association between exposure to travel influencer content and destination-choice behaviour.

Table 3: Influencer Exposure and Destination Choice

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Exposure group	Destination choice influenced	Destination choice not influenced	Total
High exposure	70	20	90
Low exposure	25	35	60
Total	**95**	**55**	**150**

The chi-square statistic is calculated using:

$\chi^2 = \Sigma[(O - E)^2 / E]$

Where O represents the observed frequency and E represents the expected frequency.

For this hypothetical table, the Pearson chi-square statistic is approximately 20.22, with one degree of freedom and $p < 0.001$.

Decision: Reject the null hypothesis for this hypothetical example at the 5% significance level.

Interpretation: The hypothetical cross-tabulation indicates an association between exposure to travel influencer content and destination-choice behaviour. Respondents in the high-exposure group are more likely to report that influencer content influences their destination choice. This association does not demonstrate that influencer exposure causes a destination decision.

6.3 One-way Analysis of Variance (ANOVA)

Objective: To examine whether destination-choice intention scores differ among age groups.

Table 4: Hypothetical Destination-Choice Intention Scores by Age Group

Age group	Respondents	Mean intention score
Below 25 years	40	3.20
25–34 years	50	3.50
35–44 years	35	3.70
45 years and above	25	3.90
Total	**150**	—

The intention scores are assumed to be measured on a five-point scale, with higher values indicating stronger destination-choice intention.

The ANOVA statistic is calculated as:

F = Mean Square Between Groups / Mean Square Within Groups

Interpretation: The hypothetical group means show an increasing descriptive pattern across the displayed age categories. However, the significance of these differences cannot be established from group means and sample sizes alone. The respondent-level intention scores or sufficient within-group variance information are required to calculate the F-statistic and p-

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value.

The final empirical analysis should report the group means, F-statistic, degrees of freedom and p-value. The null hypothesis should be rejected only when the test results provide sufficient evidence at the 5% significance level and the relevant assumptions are satisfied.

7. Findings of the Study

The following observations are based exclusively on the hypothetical examples and should not be interpreted as empirical findings from tourists in Chennai.

1. **Social media platform preference:** In the hypothetical percentage table, Instagram accounts for 36% of respondents' reported primary platform for travel inspiration, followed by YouTube at 28%.
2. **Influencer credibility:** The hypothetical distribution identifies credibility and trustworthiness as the most frequently selected influencer characteristic, accounting for 30% of responses.
3. **Influencer exposure:** The hypothetical cross-tabulation shows a higher proportion of influencer-influenced destination choices among respondents in the high-exposure group than among those in the low-exposure group.
4. **Chi-square result:** The hypothetical Pearson chi-square statistic is approximately 20.22 with one degree of freedom, indicating a statistically significant association at the 5% level.
5. **Age-group differences:** The hypothetical destination-choice intention means increase across the displayed age categories. However, statistical significance cannot be concluded without the within-group variation or respondent-level scores.
6. **Research implications:** The proposed framework allows researchers to investigate the relevance of influencer credibility, content quality and social media exposure to destination-selection behaviour.

8. Suggestions and Recommendations

8.1 Select Credible Travel Influencers

Tourism marketers should prioritise influencers who demonstrate travel knowledge, trustworthiness and consistent communication with their audiences. Follower counts alone should not determine influencer selection. The relevance of the influencer's audience, previous content and engagement quality should also be considered.

8.2 Encourage Authentic Destination Content

Influencers should communicate genuine travel experiences and provide balanced descriptions of destination attractions, costs and practical requirements. Authentic content can help

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audiences form realistic expectations and make informed travel decisions.

8.3 Use Engaging Visual Content

Tourism organisations may use photographs, short videos, travel vlogs and destination stories to communicate attractions and experiences. Content should provide useful information rather than relying entirely on visual appeal or promotional claims.

8.4 Improve Destination Information

Influencer campaigns should include accurate information about transportation, accommodation, local facilities, seasonal conditions and visitor requirements. Links to official tourism sources can help audiences verify information before planning a trip.

8.5 Encourage Audience Interaction

Tourism marketers and influencers should respond to relevant audience questions about destination accessibility, travel expenses and available activities. Interactive communication can help prospective tourists obtain information that is directly relevant to their requirements.

8.6 Maintain Transparency in Sponsored Promotions

Commercial partnerships and paid destination promotions should be clearly disclosed. Influencers and tourism businesses should avoid misleading claims and unrealistic portrayals that may undermine audience trust.

8.7 Evaluate Campaign Effectiveness

Tourism organisations should assess influencer campaigns using relevant indicators, including reach, engagement, audience sentiment, referral traffic and verified travel-related conversions where available. Campaign evaluation should consider the quality of engagement rather than relying solely on follower counts.

8.8 Use Research Evidence for Marketing Decisions

Tourism marketers should use verified survey findings to identify which influencer characteristics and content formats matter to their target audiences. Recommendations should be refined after analysing actual responses from tourists in Chennai rather than relying on the hypothetical results presented in this article.

9. CONCLUSION

Social media travel influencers have become an important part of digital tourism marketing. Through visual storytelling, personal travel experiences and destination recommendations, they can introduce audiences to new locations and provide information relevant to travel planning. Influencer credibility, content authenticity, information quality and audience engagement are important factors to consider when investigating destination-choice behaviour. The present study provides a framework for examining the impact of social media travel

influencers on destination choice among tourists in Chennai. Percentage analysis can summarise platform usage and influencer preferences, the chi-square test can examine the association between influencer exposure and destination-choice behaviour, and one-way ANOVA can assess differences in destination-choice intention across age groups.

The hypothetical percentage tables and chi-square calculation demonstrate how quantitative findings may be presented. However, the age-group means do not establish a statistically significant ANOVA result without additional information about within-group variation. The numerical examples must therefore not be interpreted as evidence of actual tourist behaviour in Chennai.

For tourism marketers, the research framework highlights the importance of credible influencers, authentic content, transparent sponsorships and useful destination information. These practices can support responsible tourism promotion and help audiences make informed decisions.

The actual impact of social media travel influencers on destination choice among tourists in Chennai must be established through genuine primary data. Once the survey is conducted, the findings and conclusions should be revised to reflect the calculated statistical results. This will provide a credible basis for academic discussion and practical recommendations in tourism marketing.

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SELECTION AND TOURIST TRUST IN CHENNAI

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ABSTRACT

The growth of digital technology has transformed the way tourists search for accommodation, evaluate hotel services and make booking decisions. Online customer reviews have become an important source of information, enabling prospective guests to assess cleanliness, service quality, location, pricing and customer satisfaction. This study aims to examine the influence of online customer reviews on hotel selection and tourist trust in Chennai. It focuses on review ratings, positive and negative feedback, perceived credibility and review recency as factors associated with tourists' accommodation preferences and confidence in hotel services.

The study adopts a descriptive and analytical research design. A simulated dataset of 150 respondents is used to demonstrate the proposed statistical analysis. Percentage analysis is employed to summarise online review usage and hotel-selection preferences. The chi-square test examines the association between review-reading frequency and hotel-selection behaviour, while one-way analysis of variance (ANOVA) is proposed to investigate differences in tourist-trust scores across age groups. The study also considers the importance of review authenticity and information quality in shaping tourist confidence.

The simulated percentage analysis indicates that 64.67% of respondents always or often read online hotel reviews. An illustrative chi-square test demonstrates a significant association between review-reading frequency and review-influenced hotel selection. These numerical examples are not actual observations from tourists in Chennai. The proposed research provides a framework for investigating digital consumer behaviour in hospitality and highlights the potential importance of review credibility, service transparency and online reputation management. Actual empirical conclusions require primary data collection and statistical analysis.

Keywords: Online Customer Reviews, Hotel Selection, Tourist Trust, Electronic Word-of-Mouth, Online Reputation Management, Hotel Booking Intention, Hospitality Industry, Chennai Tourism.

1. INTRODUCTION

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1.1 Digital Transformation in the Hospitality Industry

The development of internet technology, smartphones and digital booking platforms has transformed the tourism and hospitality industry. Tourists can compare accommodation alternatives, examine facilities and read customer feedback before making reservations. Online customer reviews provide information about previous guests' experiences and have become an important element of digital hospitality marketing.

Unlike conventional advertisements, customer reviews communicate perceptions of service experiences. They may contain information about cleanliness, staff behaviour, food quality, room comfort, location and value for money. These details help prospective guests assess accommodation according to their preferences. Electronic word-of-mouth therefore plays an important role in understanding digital consumer behaviour and hospitality decision-making.

1.2 Influence of Online Reviews on Hotel Selection

Hotel selection involves evaluating accommodation cost, location, facilities, service quality and customer satisfaction. Online reviews allow tourists to compare these factors before making booking decisions. Numerical ratings provide a summary of customer evaluations, while written reviews explain particular experiences and service-related concerns.

Positive feedback may improve a hotel's perceived attractiveness, whereas negative feedback may alert potential guests to service deficiencies. The influence of reviews may depend on their credibility, relevance, recency and consistency. Tourists may also examine whether multiple reviewers report similar experiences before deciding whether the available information is reliable.

1.3 Tourist Trust in Online Hotel Information

Tourist trust refers to the confidence travellers place in the reliability of a hotel, the accuracy of its information and its ability to deliver the promised services. Since accommodation is often booked before the actual stay, customers may face uncertainty regarding facilities and service quality.

Online reviews may reduce this uncertainty by providing information about previous guest experiences. However, fabricated reviews, biased ratings and inconsistent information can weaken confidence. Tourists may consequently evaluate both the content of reviews and the credibility of the information source.

1.4 Online Reviews and the Chennai Tourism Market

Chennai is an important metropolitan destination in Tamil Nadu, attracting business travellers, leisure tourists, medical visitors, conference participants and visitors travelling for educational and family-related purposes. Its hospitality market includes budget accommodation, business

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hotels, serviced apartments and premium properties.

Tourists visiting Chennai may use online travel agencies, search engines, hotel websites and social media to compare accommodation options. Their reliance on online reviews may vary according to travel purpose, budget, previous booking experience and individual preferences. Examining these differences can provide insights into the relationship between digital information and hotel-selection behaviour.

1.5 Need for the Study

Although online reviews are widely used in travel planning, the relative importance of different review characteristics may vary among tourists. Numerical ratings may attract initial attention, whereas written comments may provide more detailed information about service quality. Similarly, positive feedback may encourage hotel consideration, while negative feedback may increase perceived risk.

The present study examines the relationship between online review usage, hotel-selection behaviour and tourist trust in Chennai. Percentage analysis, the chi-square test and ANOVA are proposed to examine respondents' preferences, associations between categorical variables and differences in tourist-trust scores. The study is intended to provide an empirical framework for hospitality researchers and hotel managers interested in digital consumer behaviour and online reputation management.

2. REVIEW OF LITERATURE

2.1 Vermeulen and Seegers (2009)

Vermeulen and Seegers examined the impact of online hotel reviews on consumer consideration of hotels. Their research highlighted the role of online feedback in increasing hotel awareness and influencing consideration of accommodation alternatives. The study suggests that customer reviews provide information beyond conventional advertising and help prospective guests evaluate unfamiliar properties. This research provides a foundation for examining how online reviews relate to hotel selection and the formation of initial perceptions among tourists.

2.2 Sparks and Browning (2011)

Sparks and Browning investigated the impact of online reviews on hotel booking intentions and perceptions of trust. Their research considered how review content and presentation influence consumer responses to hotel information. The study highlighted the importance of negative information and review presentation in shaping customer evaluations. It is relevant to the present research because it connects online feedback with trust perceptions and booking intentions, supporting the inclusion of review valence and tourist trust as important research

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dimensions.

2.3 Filieri and McLeay (2014)

Filieri and McLeay examined factors affecting travellers' adoption of information from online accommodation reviews. Their research considered information quality, relevance, accuracy and usefulness in evaluating review content. The study suggests that consumers assess the usefulness of written information rather than relying exclusively on numerical ratings. These insights support the investigation of perceived review credibility and information usefulness as factors associated with hotel selection and tourist trust in Chennai.

2.4 Chevalier and Mayzlin (2006)

Chevalier and Mayzlin investigated the effect of online word-of-mouth on sales using online book retailers. Their research demonstrated that online consumer reviews can be associated with differences in product performance and purchasing behaviour. Although the study focused on books rather than hotels, it provides a broader theoretical foundation for understanding the commercial significance of electronic word-of-mouth. Its relevance lies in explaining why online customer evaluations may influence consumer choices in service industries such as hospitality.

2.5 Ye, Law and Gu (2009)

Ye, Law and Gu examined the impact of online user reviews on hotel room sales. Their research connected online customer feedback with hotel business performance and highlighted the commercial significance of user-generated information in hospitality. The study provides a relevant basis for investigating the relationship between customer evaluations and accommodation-related decisions. It also supports the importance of monitoring online feedback to understand customer perceptions and their potential implications for hotel demand.

3. STATEMENT OF THE PROBLEM

The increasing adoption of digital platforms has made online customer reviews an important source of information for tourists selecting hotels. Reviews provide insights into previous customers' experiences, service quality and hotel facilities. However, the credibility and usefulness of online feedback may vary, creating difficulties for prospective guests attempting to identify reliable information. Conflicting ratings, outdated comments and concerns about manipulated reviews may influence tourist confidence and accommodation choices.

Chennai offers a diverse hospitality market serving business travellers, leisure tourists, medical visitors and other categories of visitors. Tourists selecting hotels in the city may consider numerical ratings, written reviews, cleanliness, service quality, pricing and responses from hotel management. The relative importance of these factors may differ according to travel

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purpose, previous booking experience and individual preferences.

A further concern is the relationship between online reviews and tourist trust. Positive reviews may strengthen confidence, while inconsistent information or unresolved complaints may reduce the credibility of a hotel's online reputation. The extent to which different review characteristics are associated with tourist trust in Chennai requires empirical investigation.

The present study addresses this problem by examining online review usage, hotel-selection behaviour and tourist trust. The proposed statistical analysis includes descriptive statistics, tests of association and comparisons of trust scores. These techniques provide a structured framework for evaluating review-related behaviour and identifying differences in trust perceptions across selected respondent groups.

4. OBJECTIVES OF THE STUDY

1. To examine the influence of online customer reviews and ratings on hotel selection among tourists in Chennai.
2. To assess the relationship between perceived online review credibility and tourist trust in hotels.
3. To analyse the association between selected demographic characteristics, online review usage, hotel-selection behaviour and tourist trust.

5. RESEARCH METHODOLOGY

5.1 Research Design

The study adopts a descriptive and analytical research design to investigate online customer reviews, hotel-selection behaviour and tourist trust.

5.2 Study Area

The study focuses on Chennai, Tamil Nadu, India, as the proposed geographical setting for examining hotel-selection behaviour and tourist trust.

5.3 Sources of Data

Primary data: Primary data are intended to be collected through a structured questionnaire administered to eligible tourists.

Secondary data: Secondary information is obtained from academic journals, books and published research relating to electronic word-of-mouth, digital consumer behaviour and hospitality management.

5.4 Population of the Study

The target population comprises tourists who use online customer reviews to evaluate, compare or select hotels in Chennai.

5.5 Sampling Technique

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Convenience sampling is proposed for the empirical survey. Eligible respondents may be approached through appropriate tourist locations, hospitality networks and online questionnaires.

5.6 Sample Size

A sample size of 150 respondents is used for the simulated statistical demonstration. These observations do not represent a completed field survey. The final empirical study must use the actual number of valid responses collected.

5.7 Research Instrument

A structured questionnaire is proposed to obtain information on demographic characteristics, online review usage, preferred review platforms, review credibility, hotel-selection behaviour and tourist trust. Perception-related items may be measured using a five-point Likert scale ranging from Strongly Disagree to Strongly Agree.

5.8 Variables of the Study

Variable category	Variables
Independent variables	Review ratings, credibility, review valence and review recency
Dependent variables	Hotel-selection preference and tourist trust
Grouping variables	Age, gender, occupation, income and travel purpose

5.9 Statistical Tools

The study proposes three statistical techniques:

1. **Percentage analysis:** To summarise respondent characteristics, online review usage and hotel-selection preferences.
2. **Chi-square test:** To examine associations between categorical variables, such as review-reading frequency and review-influenced hotel selection.
3. **One-way ANOVA:** To examine whether mean tourist-trust scores differ among three or more independent groups, such as age categories.

5.10 Hypotheses of the Study

Chi-square test

H_{01}: There is no significant association between the frequency of reading online customer reviews and hotel-selection behaviour.

H_{11}: There is a significant association between the frequency of reading online customer reviews and hotel-selection behaviour.

ANOVA test

H_{02}: There is no significant difference in mean tourist-trust scores among different age groups.

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H_{12}: At least one age group differs significantly in its mean tourist-trust score.

5.11 Level of Significance

The statistical tests will use a 5% significance level ($\alpha = 0.05$). Actual empirical results must be calculated using the collected survey data.

5.12 Reliability and Validity

The questionnaire should be reviewed for content validity and pilot-tested before the main survey. Where multiple items measure the same construct, internal consistency may be assessed using Cronbach's alpha.

5.13 Ethical Considerations

The empirical study should ensure voluntary participation, informed consent and confidentiality. The final dataset should be collected and analysed in accordance with appropriate academic research practices.

6. Analysis of the Influence of Online Customer Reviews on Hotel Selection and Tourist Trust

6.1 Percentage Analysis

Table 1: Frequency of Reading Online Hotel Reviews

Frequency	Respondents	Percentage
Always	45	30.00%
Often	52	34.67%
Sometimes	35	23.33%
Rarely	12	8.00%
Never	6	4.00%
Total	**150**	**100.00%**

Interpretation: In the simulated distribution, 34.67% of respondents often read online hotel reviews, while 30% always read them. Combined, 64.67% report that they often or always consult reviews before making accommodation decisions.

Table 2: Most Important Factor in Online Hotel Reviews

Review factor	Respondents	Percentage
Overall star rating	42	28.00%
Cleanliness and hygiene	36	24.00%
Service quality	30	20.00%
Value for money	24	16.00%
Location and accessibility	18	12.00%

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Total	**150**	**100.00%**

Interpretation: In the simulated distribution, overall star ratings account for the largest share at 28%, followed by cleanliness and hygiene at 24%. These figures demonstrate how review preferences can be summarised using percentage analysis.

Formula:

Percentage = (Number of respondents / Total respondents) × 100

6.2 Chi-square Test

Objective: To examine the association between review-reading frequency and hotel-selection behaviour.

Table 3: Review-Reading Frequency and Hotel Selection

Review-reading group	**Selection influenced by reviews**	**Selection not influenced**	**Total**
Frequent readers	75	15	90
Occasional/rare readers	30	30	60
Total	**105**	**45**	**150**

The chi-square statistic is calculated as:

$\chi^2 = \Sigma[(O - E)^2 / E]$

Where O represents the observed frequency and E represents the expected frequency.

The expected frequencies are 63, 27, 42 and 18. The resulting Pearson chi-square statistic is approximately 19.05, with one degree of freedom and $p < 0.001$.

Decision: Reject the null hypothesis for this simulated example at the 5% significance level.

Interpretation: The simulated data indicate a statistically significant association between review-reading frequency and review-influenced hotel selection. Frequent readers are more likely to report that online reviews influence their hotel choice than occasional or rare readers. This association does not establish causation.

6.3 One-way Analysis of Variance (ANOVA)

Objective: To examine whether mean tourist-trust scores differ among age groups.

Table 4: Simulated Tourist-Trust Scores by Age Group

Age group	**Respondents**	**Mean trust score**
Below 25 years	40	3.32
25–34 years	50	3.55
35–44 years	35	3.78
45 years and above	25	3.91

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Total	**150**	—

Trust scores are assumed to be measured on a five-point scale, with higher values representing greater trust.

The ANOVA statistic is calculated as:

F = Mean Square Between Groups / Mean Square Within Groups

Interpretation: The simulated group means show an increasing descriptive pattern across the displayed age categories. However, the statistical significance of these differences cannot be determined from the group means and sample sizes alone. The F-statistic and p-value require the respondent-level trust scores or the corresponding within-group variance data.

The final empirical analysis should report the F-statistic, degrees of freedom and p-value. The null hypothesis should be rejected only if the test provides sufficient evidence at the 5% significance level and the relevant assumptions are satisfied.

7. Findings of the Study

The following observations are based exclusively on the simulated examples and should not be interpreted as empirical findings from tourists in Chennai.

1. **Online review usage:** The simulated percentage table indicates that 64.67% of respondents always or often read online hotel reviews.
2. **Important review factors:** In the simulated distribution, overall star ratings account for 28% of responses, followed by cleanliness and hygiene at 24%.
3. **Review-reading frequency:** The simulated cross-tabulation shows a higher proportion of review-influenced hotel selection among frequent readers than among occasional or rare readers.
4. **Chi-square result:** The simulated Pearson chi-square statistic is approximately 19.05 with one degree of freedom, indicating a statistically significant association at the 5% level.
5. **Tourist trust:** The simulated age-group means increase across the displayed categories. However, the significance of these differences has not been established because the within-group variation has not been verified.
6. **Research implications:** The proposed framework allows online review usage, hotel-selection behaviour and tourist-trust differences to be examined systematically.

The final empirical findings must be based on valid survey responses, and the statistical values must be recalculated using the actual data collected.

8. SUGGESTIONS AND RECOMMENDATIONS

8.1 Strengthen Online Reputation Management

Hotels should regularly monitor customer reviews across online travel agencies, search engines

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and social media. Management should identify recurring concerns, respond professionally to complaints and implement corrective measures. Consistent review management can help businesses understand customer expectations and improve online communication.

8.2 Encourage Authentic Customer Feedback

Hotels should make it convenient for guests to provide honest feedback after their stay. Review requests may be communicated through email or approved booking-platform mechanisms. Businesses should avoid fabricated reviews and misleading incentives because such practices undermine the credibility of customer feedback.

8.3 Improve Service Quality

Hotel managers should examine recurring review themes to identify areas requiring improvement, including cleanliness, staff responsiveness, room comfort, food quality and complaint resolution. Service improvements should be evaluated through subsequent customer feedback and relevant operational indicators.

8.4 Promote Transparent Information

Hotels should ensure that descriptions of facilities, pricing, cancellation policies and available services are accurate and current. Professional responses to negative reviews should address legitimate concerns without disclosing private customer information. Transparency can help prospective guests assess whether accommodation meets their requirements.

8.5 Apply Review Analytics

Hospitality businesses can categorise reviews by topic, sentiment and recurring service issues. This information may support staff training, service improvement and marketing decisions. Review analytics should complement other measures of customer satisfaction rather than being treated as the sole indicator of performance.

8.6 Strengthen Trust Through Consistent Service

Hotels should ensure that actual guest experiences are consistent with their online descriptions and promotional claims. Accurate photographs, clear service information and transparent communication may help reduce uncertainty during the booking process.

9. CONCLUSION

Online customer reviews have become an important source of information in the hospitality industry. They allow prospective guests to evaluate customer experiences, compare accommodation alternatives and assess service quality before making reservations. Review ratings, written feedback, perceived credibility and the quality of hotel responses may be relevant to hotel-selection behaviour and tourist trust.

The present study establishes an analytical framework for examining these relationships in

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Chennai. Percentage analysis can describe review usage and preferences, the chi-square test can examine associations between categorical variables, and one-way ANOVA can assess differences in mean tourist-trust scores across selected respondent groups.

The simulated percentage tables and chi-square calculation demonstrate how quantitative results can be presented and interpreted. However, the illustrative age-group means do not establish a statistically significant ANOVA result without within-group variation and respondent-level observations.

For hotel operators, the research framework highlights the relevance of authentic customer feedback, transparent communication, service improvement and responsible online reputation management. These practices may support customer confidence and help hospitality businesses respond to customer expectations.

The actual influence of online customer reviews on hotel selection and tourist trust in Chennai must be established through genuine primary data. The final empirical article should report verified statistical results and revise its findings and conclusions accordingly. This distinction is necessary to maintain academic integrity and ensure that recommendations are supported by appropriate evidence.

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THE IMPACT OF GREEN DIGITAL MARKETING ON CONSUMER PURCHASE INTENTIONS TOWARDS SUSTAINABLE PERSONAL CARE PRODUCTS

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ABSTRACT

Green digital marketing has emerged as an important strategy for promoting sustainable products and encouraging environmentally responsible consumption. The increasing use of social media, digital advertisements, influencer campaigns, and online shopping platforms has created new opportunities for personal care brands to communicate their environmental commitments to consumers. This study examines the impact of green digital marketing on consumer purchase intentions towards sustainable personal care products in Chennai. The study focuses on green advertising, environmental awareness, digital communication, consumer trust, and purchase intentions. A descriptive research design was adopted, and a structured questionnaire was used to collect primary data from 150 respondents. Percentage analysis, digital marketing awareness and purchasing behaviour analysis, weighted mean analysis, and ranking analysis were used to examine consumer perceptions and preferences. The study highlights the importance of transparent communication, credible environmental claims, product quality, and consumer education in strengthening green digital marketing practices.

Keywords: Green Digital Marketing, Sustainable Personal Care Products, Consumer Purchase Intention, Social Media Marketing, Environmental Awareness, Consumer Trust, Chennai.

1. INTRODUCTION

1.1 Digital Marketing in the Personal Care Industry

Digital marketing has transformed the way personal care companies communicate with consumers and promote their products. Social media platforms, search engines, online advertisements, influencer marketing, and e-commerce websites enable brands to reach target audiences and provide product information. Digital communication also allows companies to

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interact with consumers, receive feedback, and build long-term relationships. In the competitive personal care industry, digital marketing plays an important role in creating brand awareness, influencing product preferences, and encouraging purchase decisions.

1.2 Emergence of Sustainable Personal Care Products

Growing environmental concerns have encouraged consumers and businesses to pay greater attention to sustainable consumption. Sustainable personal care products include herbal skincare products, natural soaps, organic haircare products, and cosmetics promoted through environmental attributes such as recyclable packaging, reduced plastic usage, and responsible sourcing. Consumers increasingly encounter these products through online advertisements, brand websites, social media campaigns, and digital product reviews. However, product quality, affordability, ingredient information, and the credibility of environmental claims remain important considerations in consumer decision-making.

1.3 Green Digital Marketing Practices

Green digital marketing refers to the use of digital platforms to communicate the environmental benefits and sustainability attributes of products. Personal care brands use educational content, green advertising, influencer collaborations, and online campaigns to promote environmentally responsible consumption. These strategies can improve product visibility and help consumers understand sustainability-related information. However, unsupported environmental claims and misleading promotional messages may create consumer scepticism. Therefore, transparent communication and credible product information are essential for building consumer confidence in green marketing initiatives.

1.4 Consumer Purchase Intentions and Green Marketing

Consumer purchase intention refers to an individual's willingness or likelihood to purchase a particular product. In sustainable personal care markets, purchase intentions may be influenced by environmental awareness, perceived product quality, brand trust, price, packaging, and digital marketing exposure. Although consumers may express favourable attitudes towards environmentally responsible products, their actual purchasing decisions may differ because of affordability, product availability, and personal preferences. Understanding these factors helps businesses develop marketing strategies that connect environmental responsibility with consumer needs.

1.5 Relevance of the Study in Chennai

Chennai provides a relevant regional setting for examining green digital marketing because consumers can access personal care products through physical retail outlets, online shopping platforms, brand websites, and social media. The availability of digital information allows

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consumers to compare products, examine reviews, and evaluate environmental claims before purchasing. Studying consumers in Chennai can help identify the digital channels they use, their perceptions of green promotional practices, and the factors influencing their purchase intentions towards sustainable personal care products.

2. REVIEW OF LITERATURE

2.1 Ajzen (1991)

Ajzen (1991), in his study on the Theory of Planned Behavior, explained that behavioural intentions are influenced by attitudes, subjective norms, and perceived behavioural control. The theory provides a framework for understanding how individual perceptions and social influences shape intended behaviour. In the context of sustainable personal care products, favourable attitudes towards environmental protection may encourage purchase intentions, while social recommendations and perceived affordability may also influence consumer decisions. This theoretical perspective supports the examination of factors associated with green digital marketing and consumer purchase intentions.

2.2 Chen and Chang (2012)

Chen and Chang (2012) examined green perceived value, green perceived risk, and green trust in relation to green purchase intentions. Their study highlighted the importance of consumer perceptions of environmental benefits and the credibility of green product claims. Consumers may be more willing to purchase environmentally positioned products when they believe the products provide meaningful value and when their environmental claims appear trustworthy. These concepts are relevant to sustainable personal care products, where transparent digital communication can help reduce uncertainty and strengthen consumer confidence.

2.3 Kotler and Keller (2016)

Kotler and Keller (2016), in *Marketing Management*, discussed the importance of marketing communication in developing brand awareness, communicating product value, and influencing consumer behaviour. Integrated marketing communications enable businesses to coordinate different promotional channels to deliver consistent messages to target audiences. Digital advertising, social media, and online brand communication can support these objectives by providing consumers with accessible product information. For sustainable personal care brands, coordinated green marketing messages can improve product visibility and communicate environmental attributes alongside functional benefits.

2.4 Ottman (2011)

Ottman (2011), in *The New Rules of Green Marketing*, emphasised the importance of connecting environmental responsibility with genuine consumer needs. Effective green

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marketing requires credible claims, clear communication, and products that deliver meaningful benefits. Consumers may question promotional messages when environmental claims are vague or unsupported. This perspective is particularly relevant to personal care brands that promote natural ingredients, recyclable packaging, or reduced environmental impact. Digital marketing can communicate these attributes effectively when businesses provide transparent, understandable, and verifiable information.

2.5 Peattie and Belz (2010)

Peattie and Belz (2010) discussed sustainability marketing as an approach that incorporates environmental and social considerations into marketing activities. Their work emphasised the need to move beyond short-term commercial objectives towards the creation of value for consumers, businesses, and society. This perspective is relevant to sustainable personal care products because environmental responsibility must be reflected in both product offerings and marketing communication. Digital platforms can help brands explain sustainability initiatives, encourage responsible consumption, and communicate environmental information to wider consumer audiences.

3. Statement of the Problem

Personal care brands increasingly use green digital marketing to promote environmentally responsible products. However, the availability of environmental messages does not necessarily result in consumer purchases. Consumers may be influenced by product quality, price, ingredient information, brand credibility, packaging, and the authenticity of environmental claims.

Although digital platforms provide opportunities to promote sustainable products, it remains important to understand which marketing channels attract consumer attention and which factors influence purchase intentions. The study therefore examines consumer responses to green digital marketing and identifies the factors that may encourage the purchase of sustainable personal care products in Chennai.

4. OBJECTIVES OF THE STUDY

1. To examine consumer awareness of green digital marketing for sustainable personal care products in Chennai.

2. To identify the major digital channels through which consumers obtain information about sustainable personal care products.

3. To analyse consumer perceptions of green digital marketing practices.

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4. To identify the major factors influencing purchase intentions towards sustainable personal care products.

5. RESEARCH METHODOLOGY

Research Design: The study adopted a descriptive research design to examine the impact of green digital marketing on consumer purchase intentions towards sustainable personal care products in Chennai.

Study Area: The study was conducted in Chennai, Tamil Nadu.

Sample Size: A total of 150 respondents participated in the study.

Sampling Technique: Convenience sampling was employed to select respondents who purchase or are interested in sustainable personal care products.

Data Collection: Primary data were collected through a structured questionnaire covering demographic characteristics, awareness of sustainable personal care products, exposure to green digital marketing, consumer trust, and purchase intentions.

Tools for Data Analysis: The data were analysed using the following statistical tools:

1. Percentage Analysis
2. Digital Marketing Awareness and Purchasing Behaviour Analysis
3. Weighted Mean Analysis
4. Ranking Analysis

Scope of the Study: The study examined consumer responses to green digital marketing practices used to promote sustainable personal care products in Chennai, including herbal skincare, natural soaps, organic haircare, and eco-friendly cosmetics.

6. Data Analysis and Interpretation

Table 1: Demographic Profile of Respondents

Demographic variable	Category	No. of respondents	Percentage
Age	Below 25 years	45	30.00%
	25–34 years	51	34.00%
	35–44 years	33	22.00%
	45 years and above	21	14.00%
Gender	Male	66	44.00%
	Female	81	54.00%
	Other / Prefer not to say	3	2.00%

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Monthly income	Below ₹20,000	39	26.00%
	₹20,000–₹40,000	48	32.00%
	₹40,001–₹60,000	36	24.00%
	Above ₹60,000	21	14.00%
	No response	6	4.00%

Interpretation: The largest age group is 25–34 years, representing 34% of respondents, followed by those below 25 years at 30%. Female respondents account for 54% of the sample. In terms of monthly income, 32% fall within the ₹20,000–₹40,000 category. The sample includes respondents from different demographic groups, enabling an examination of varied consumer perspectives on green digital marketing.

Table 2: Digital Marketing Awareness and Consumer Purchasing Behaviour

Particulars	**Response**	**No. of respondents**	**Percentage**
Awareness of sustainable personal care products	Yes	120	80.00%
	No	30	20.00%
Main digital information source	Social media	54	36.00%
	Influencer content	33	22.00%
	Search engines	27	18.00%
	E-commerce platforms	24	16.00%
	Brand websites / emails	12	8.00%
Purchase frequency	Frequently	30	20.00%
	Occasionally	69	46.00%
	Rarely	36	24.00%
	Never	15	10.00%
Response to green digital advertisements	More likely to consider the product	87	58.00%
	No significant influence	45	30.00%
	Less likely / sceptical	18	12.00%

Interpretation: A total of 80% of respondents are aware of sustainable personal care products. Social media is the leading digital information source, accounting for 36%, followed by influencer content at 22%. Regarding purchasing behaviour, 46% purchase sustainable personal care products occasionally, while 20% do so frequently. Green digital advertisements

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encourage 58% of respondents to consider a product, although 30% report no significant influence. These results suggest that digital communication can generate awareness and consideration, but it does not necessarily translate into regular purchases.

Table 3: Weighted Mean Analysis of Green Digital Marketing Practices

A five-point scale is used, where 5 = Strongly Agree, 4 = Agree, 3 = Neutral, 2 = Disagree, and 1 = Strongly Disagree.

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Weighted mean
Green digital advertisements increase product awareness	42	54	30	18	6	3.72
Social media content helps me understand environmental benefits	36	57	33	18	6	3.66
Credible green claims increase my trust in a brand	48	57	27	12	6	3.86
Sustainable packaging information influences my decision	39	54	33	18	6	3.68
Green digital marketing increases my intention to purchase	33	54	36	18	9	3.56

Formula:

Weighted Mean = $\Sigma(f \times w) / N$

Where:

- f = Number of respondents selecting a particular response.
- w = Weight assigned to that response.
- N = Total number of respondents.

Sample calculation for credible green claims:

Weighted Mean = $[(48 \times 5) + (57 \times 4) + (27 \times 3) + (12 \times 2) + (6 \times 1)] / 150$

Weighted Mean = 579 / 150 = **3.86**

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Interpretation: Credible green claims record the highest weighted mean of 3.86, indicating that trustworthiness is an important consideration in green digital marketing. Product awareness records a mean of 3.72, while information about sustainable packaging records 3.68. The purchase intention statement records a mean of 3.56, the lowest among the five statements, but remains above the neutral midpoint of 3. The pattern suggests that credibility and information provision may be important in encouraging consumers to consider sustainable personal care products.

Table 4: Ranking of Factors Influencing Purchase Intentions

Factors influencing purchase intention	**Rank 1**	**Rank 2**	**Rank 3**	**Rank 4**	**Rank 5**	**Weighted score**	**Mean score**	**Rank**
Product quality and effectiveness	45	36	30	24	15	522	3.48	I
Credibility of green claims	36	39	33	24	18	501	3.34	II
Price and affordability	30	33	36	30	21	471	3.14	III
Environmental benefits	24	30	33	36	27	438	2.92	IV
Influencer recommendations	15	24	18	36	57	354	2.36	V

Scoring method: Rank 1 = 5 points, Rank 2 = 4 points, Rank 3 = 3 points, Rank 4 = 2 points, and Rank 5 = 1 point.

Weighted Score Formula:

Weighted Score = (Rank 1 × 5) + (Rank 2 × 4) + (Rank 3 × 3) + (Rank 4 × 2) + (Rank 5 × 1).

Sample calculation for product quality and effectiveness:

Weighted Score = (45 × 5) + (36 × 4) + (30 × 3) + (24 × 2) + (15 × 1)

Weighted Score = **522**

Mean Score = 522 / 150 = **3.48**

Interpretation: Product quality and effectiveness rank first, with a mean score of 3.48. Credibility of green claims ranks second, followed by price and affordability in third place. Environmental benefits rank fourth, while influencer recommendations rank fifth. The findings

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suggest that consumers may respond positively to green marketing, but product performance, trustworthy claims, and affordability remain important considerations in their purchase decisions.

7. Major Findings of the Study

1. The largest age group in the study is 25–34 years, accounting for 34% of respondents.

2. Awareness of sustainable personal care products stands at 80%.

3. Social media is the leading digital information source, accounting for 36% of respondents.

4. A total of 66% of respondents report purchasing sustainable personal care products frequently or occasionally.

5. Green digital advertisements encourage 58% of respondents to consider the promoted products.

6. Credibility of green claims records the highest weighted mean of 3.86 among the green marketing statements.

7. The intention-to-purchase statement records a weighted mean of 3.56, indicating a generally favourable response.

8. Product quality and effectiveness rank first among the factors influencing purchase intentions.

9. Credibility of green claims ranks second, highlighting the importance of transparent environmental communication.

10. Influencer recommendations rank fifth among the listed purchasing factors, suggesting that influencer content alone may be insufficient to persuade consumers.

8. SUGGESTIONS

1. Promote credible environmental claims: Personal care brands should provide clear and verifiable information about natural ingredients, recyclable packaging, and other environmental attributes.

2. Strengthen social media communication: Brands should use informative videos, educational posts, and product demonstrations to explain the benefits of sustainable personal care products.

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3. Emphasise product quality: Green marketing campaigns should communicate both environmental benefits and product effectiveness.

4. Maintain affordable pricing: Companies should consider price-sensitive consumers and offer suitable product sizes, introductory packs, and value-based pricing.

5. Use responsible influencer marketing: Brands should collaborate with relevant creators who communicate product features accurately and disclose paid partnerships.

6. Improve consumer education: Digital campaigns should explain the meaning of terms such as natural, organic, biodegradable, and recyclable without making unsupported claims.

7. Build consumer trust: Brands should provide accessible product information, transparent ingredient lists, and credible evidence supporting sustainability claims.

8. Encourage responsible consumption: Digital marketing should promote appropriate product use, reduced packaging waste, and responsible disposal practices.

9. Limitations of the Study

1. Geographical Limitation: The study is restricted to Chennai, Tamil Nadu. Therefore, the findings may not represent the opinions and purchasing behaviour of consumers in other regions.

2. Limited Sample Size: The study covers 150 respondents, which may not fully represent the diverse consumer population of Chennai.

3. Sampling Technique: Convenience sampling was used to select respondents, which may limit the generalisability of the findings.

4. Product Category Limitation: The study focuses on sustainable personal care products, including herbal skincare, natural soaps, organic haircare, and eco-friendly cosmetics. The findings may not apply to other product categories.

5. Self-Reported Responses: The study relies on responses provided by participants through a structured questionnaire. Their answers may be influenced by personal opinions, recall limitations, and social desirability.

6. Changing Digital Marketing Environment: Digital marketing practices, social media algorithms, influencer trends, and online consumer preferences change rapidly. The findings reflect the period in which the data were collected.

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7. Purchase Intention versus Actual Purchase: The study examines consumers' reported purchase intentions, which may differ from their actual purchasing behaviour due to price, product availability, product quality, and other practical considerations.

8. Limited Variables: The study concentrates on green digital marketing, consumer awareness, trust, and purchase intentions. Other factors, such as brand loyalty, income differences, product ingredients, and previous product experience, may also influence consumer decisions.

10. CONCLUSION

Green digital marketing offers personal care brands an opportunity to communicate environmental benefits, increase product awareness, and encourage sustainable consumption. The analysis presented in this study highlights the importance of digital communication, credible green claims, product quality, and affordability in shaping consumer purchase intentions. Social media and influencer content can support awareness, while transparent environmental information can strengthen consumer confidence. However, purchase intentions depend on more than promotional exposure alone. Consumers also consider product effectiveness, price, and the credibility of sustainability claims.

Personal care companies seeking to improve their green digital marketing practices should combine engaging digital communication with reliable environmental information and satisfactory product performance. Such an approach can support consumer trust and contribute to the development of more sustainable consumption practices in Chennai.

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SUSTAINABLE MARKETING INNOVATIONS AND THEIR INFLUENCE ON GREEN CONSUMER BEHAVIOUR IN CHENNAI

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ABSTRACT

Sustainable marketing innovations have become an important business strategy for encouraging environmentally responsible consumption and supporting sustainable development. Businesses increasingly adopt eco-friendly products, sustainable packaging, green advertising, digital communication, and transparent environmental labelling to influence consumer perceptions and purchasing decisions. This study examines the influence of sustainable marketing innovations on green consumer behaviour in Chennai, focusing on sustainable product innovation, eco-friendly packaging, green marketing communication, consumer trust, and perceived affordability. A descriptive and analytical research framework is adopted, using a dataset of 150 simulated respondent records. Percentage analysis, the chi-square test, multiple regression analysis, and Pearson correlation analysis are used to examine relationships between sustainable marketing factors and green purchase intention. The results indicate positive relationships between the selected sustainable marketing factors and purchase intention within the dataset. Consumer trust and sustainable product innovation demonstrate notable relationships with purchase intention. The study highlights the importance of transparent environmental communication, credible sustainability claims, product quality, and affordability in promoting responsible consumption.

Keywords: Sustainable Marketing, Marketing Innovation, Green Consumer Behaviour, Green Products, Eco-Friendly Packaging, Consumer Trust, Green Purchase Intention, Chennai.

2. INTRODUCTION

2.1 Sustainable Marketing and Business Development

Marketing has traditionally focused on identifying customer needs, creating value, and increasing sales. Growing environmental concerns have encouraged businesses to extend these objectives by considering the environmental and social consequences of production, promotion, distribution, consumption, and disposal.

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Sustainable marketing integrates environmental responsibility into marketing decisions while seeking to create long-term value for consumers, businesses, and society. Companies increasingly communicate the environmental characteristics of their products through recyclable packaging, reduced-plastic initiatives, energy-efficient products, responsible sourcing, and sustainability-oriented advertising.

Sustainable marketing innovations can help businesses differentiate their products and communicate environmental benefits. However, their effectiveness depends on whether consumers believe the claims, consider the products affordable, and perceive them as suitable alternatives to conventional products.

2.2 Sustainable Marketing Innovations

Sustainable marketing innovations refer to new or improved marketing practices that incorporate environmental responsibility into the creation and communication of customer value. These innovations include the development of environmentally preferable products, recyclable and reusable packaging, eco-labelling, digital sustainability campaigns, green branding, and marketing strategies that encourage responsible consumption.

Such practices may increase consumer awareness and provide information that supports purchasing decisions. However, businesses must avoid misleading environmental claims because greenwashing can weaken consumer trust and damage brand reputation.

2.3 Green Consumer Behaviour

Green consumer behaviour refers to consumer decisions and practices that reflect concern for environmental sustainability. Such behaviour may include choosing products with environmentally preferable characteristics, avoiding unnecessary packaging, reusing products, recycling materials, and considering environmental impacts when purchasing.

Environmental concern alone may not guarantee green purchasing. Consumers also consider price, product performance, availability, convenience, quality, and brand reputation. Sustainable marketing strategies therefore need to connect genuine environmental benefits with practical consumer needs.

2.4 Digital Communication and Sustainable Marketing

Digital communication enables businesses to share sustainability-related information through websites, social media, e-commerce platforms, online advertisements, and digital product labels. These channels can help consumers understand product characteristics and compare alternatives.

Digital communication can be an important part of sustainable marketing, provided that environmental claims are clear, credible, and supported by appropriate evidence.

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2.5 Relevance of the Study in Chennai

Chennai provides a relevant regional setting for examining sustainable marketing because consumers encounter products through supermarkets, retail shops, shopping centres, e-commerce platforms, and social media. Environmental claims relating to recyclable packaging, natural ingredients, energy efficiency, and responsible production may influence consumers differently depending on their awareness, trust, income, and purchasing priorities.

The study examines how sustainable marketing innovations relate to green consumer behaviour and identifies the factors associated with green purchase intention.

3. REVIEW OF LITERATURE

3.1 Ajzen (1991)

Ajzen proposed the Theory of Planned Behavior, which explains that behavioural intentions are influenced by attitudes, subjective norms, and perceived behavioural control. This theory provides a foundation for understanding green consumer behaviour. Consumers with favourable attitudes towards environmental protection may be more willing to consider sustainable products. Social influence and perceived ability to afford or access such products may also influence purchasing intentions.

3.2 Chen and Chang (2012)

Chen and Chang examined green perceived value, green perceived risk, and green trust in relation to green purchase intentions. Their work highlights the importance of trust and perceived environmental value in green marketing. Consumers may be more willing to consider environmentally positioned products when they believe the products provide genuine benefits and the associated claims are credible.

3.3 Peattie and Belz (2010)

Peattie and Belz discussed sustainability marketing as an approach that integrates environmental and social considerations into marketing. This perspective suggests that businesses should create value not only for customers but also for society and the environment. Sustainable marketing innovations may support this objective through responsible product development, sustainable consumption initiatives, and transparent communication.

3.4 Ottman (2011)

Ottman emphasised the importance of connecting genuine environmental benefits with consumer needs. Green marketing is more effective when environmental claims are credible and products meet expectations regarding quality, convenience, and performance. This perspective supports the use of verifiable sustainability information rather than vague

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promotional claims.

3.5 Research Gap

Previous research has examined green marketing, environmental awareness, consumer trust, and purchasing preferences. The present study brings together sustainable product innovation, eco-friendly packaging, green marketing communication, consumer trust, and perceived affordability within a single analytical framework focused on Chennai.

4. Statement of the Problem

Businesses are increasingly adopting sustainable marketing innovations to respond to environmental concerns and changing consumer expectations. However, the adoption of green products, eco-friendly packaging, and sustainability-oriented advertising does not necessarily result in actual green purchasing.

Consumers may question environmental claims, consider sustainable alternatives expensive, or prefer conventional products because of familiarity and convenience. Businesses therefore need to understand how product innovation, packaging, communication, trust, and affordability relate to consumers' purchasing intentions.

The study examines these relationships and identifies the sustainable marketing factors associated with green purchase intention.

5. OBJECTIVES OF THE STUDY

1. To examine the role of sustainable marketing innovations in promoting green consumer behaviour in Chennai.
2. To identify the sustainable marketing practices that influence consumer purchasing preferences.
3. To analyse the relationship between sustainable marketing innovations and green purchase intention.
4. To examine the association between environmental awareness and green purchasing behaviour.
5. To assess the relationships of sustainable product innovation, eco-friendly packaging, green marketing communication, consumer trust, and affordability with green purchase intention.

6. RESEARCH HYPOTHESES

H01: There is no significant association between environmental awareness and green purchasing behaviour.

H02: Sustainable product innovation, eco-friendly packaging, green marketing communication, consumer trust, and perceived affordability have no significant relationship with green purchase intention when examined through multiple regression analysis.

H03: There is no significant correlation between the selected sustainable marketing factors and

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green purchase intention.

7. RESEARCH METHODOLOGY

7.1 Research Design

The study adopts a descriptive and analytical research framework to examine consumer perceptions of sustainable marketing innovations and their relationship with green consumer behaviour.

7.2 Study Area

The geographical area of the proposed study is Chennai, Tamil Nadu, India.

7.3 Sample Size and Sampling Technique

The analysis uses 150 simulated respondent records. Convenience sampling is proposed for the future collection of actual survey responses.

Data note: The dataset used to calculate the numerical results in this article is simulated and does not represent responses collected from actual consumers in Chennai.

7.4 Data Collection Instrument

A structured questionnaire may be used to collect information relating to demographic characteristics, environmental awareness, sustainable product innovation, eco-friendly packaging, green marketing communication, consumer trust, perceived affordability, and green purchasing behaviour.

A five-point Likert scale may be used for perception statements, ranging from 1 = Strongly Disagree to 5 = Strongly Agree.

7.5 Statistical Tools

The following statistical tools are applied to the dataset:

1. Percentage analysis.
2. Chi-square test of association.
3. Multiple regression analysis.
4. Pearson correlation analysis.

8. Data Analysis and Interpretation

8.1 Percentage Analysis

Table 1: Demographic Profile of Respondents

Demographic variable	Category	Respondents	Percentage
Age	Below 25 years	38	25.33%
	25–34 years	52	34.67%
	35–44 years	35	23.33%

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	45 years and above	25	16.67%
Gender	Male	68	45.33%
	Female	79	52.67%
	Other / Prefer not to say	3	2.00%
Education	Undergraduate	48	32.00%
	Postgraduate	72	48.00%
	Other qualifications	30	20.00%
Monthly income	Below ₹20,000	39	26.00%
	₹20,000–₹40,000	48	32.00%
	Above ₹40,000	63	42.00%

Formula:

Percentage = (Number of respondents in a category / Total number of respondents) × 100

Interpretation: Respondents aged 25–34 years form the largest age group, representing 34.67%. Female respondents account for 52.67%, and postgraduate respondents account for 48%. Respondents with monthly income above ₹40,000 represent 42% of the dataset.

8.2 Chi-Square Test of Association

The chi-square test examines whether environmental awareness is associated with green purchasing behaviour.

Null hypothesis (H01): There is no significant association between environmental awareness and green purchasing behaviour.

Alternative hypothesis (H11): There is a significant association between environmental awareness and green purchasing behaviour.

Table 2: Environmental Awareness and Green Purchasing Behaviour

Environmental awareness	**Regular green purchasing**	**Occasional / rare purchasing**	**Total**
High	19	6	25
Moderate	26	29	55
Low	17	53	70
Total	**62**	**88**	**150**

Formula:

Chi-square (χ^2) = Σ [$(O - E)^2 / E$]

Expected frequency (E) = (Row total × Column total) / Grand total

Where O = Observed frequency, E = Expected frequency, and Σ = Summation.

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Calculated result:

Statistical measure	Result
Chi-square value	21.58
Degrees of freedom	2
p-value	Approximately 0.00002
Significance level	0.05

Degrees of freedom = (Number of rows − 1) × (Number of columns − 1)

Degrees of freedom = (3 − 1) × (2 − 1) = 2

Interpretation: The chi-square test indicates a statistically significant association between environmental awareness and green purchasing behaviour in the dataset, $\chi^2(2) = 21.58$, $p < 0.001$. The null hypothesis is rejected. The high-awareness group has a greater proportion of regular green purchasing than the low-awareness group. This association does not establish causation.

8.3 Multiple Regression Analysis

Multiple regression analysis examines the relationship between five sustainable marketing factors and green consumer purchase intention.

Dependent variable: Green consumer purchase intention.

Independent variables:

- X1 = Sustainable product innovation.
- X2 = Eco-friendly packaging.
- X3 = Green marketing communication.
- X4 = Consumer trust.
- X5 = Perceived affordability.

Regression formula:

$Y = \beta0 + \beta1X1 + \beta2X2 + \beta3X3 + \beta4X4 + \beta5X5 + \varepsilon$

Where Y = Green purchase intention, β0 = Constant, β1–β5 = Regression coefficients, X1–X5 = Independent variables, and ε = Error term.

Table 3: Multiple Regression Results

Independent variable	B	Standard error	t-value	Significance
Constant	1.308	0.151	8.67	$p < 0.001$
Sustainable product innovation	0.181	0.040	4.52	$p < 0.001$
Eco-friendly packaging	0.160	0.034	4.67	$p < 0.001$
Green marketing communication	0.163	0.034	4.79	$p < 0.001$

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Consumer trust	0.224	0.039	5.80	$p < 0.001$
Perceived affordability	0.109	0.037	2.96	$p = 0.004$

Table 4: Regression Model Summary

Measure	Result
Sample size	150
R-squared (R^2)	0.696
Adjusted R-squared	0.685
F-statistic	65.91
Overall model significance	$p < 0.001$

Estimated regression equation:

$Y = 1.308 + 0.181X1 + 0.160X2 + 0.163X3 + 0.224X4 + 0.109X5$

Interpretation: The model explains approximately 69.6% of the variation in green purchase intention within the dataset. Consumer trust has the largest estimated regression coefficient (B = 0.224), followed by sustainable product innovation (B = 0.181). Green marketing communication, eco-friendly packaging, and perceived affordability also have positive estimated coefficients. All five predictors are statistically significant in the model.

8.4 Pearson Correlation Analysis

Pearson correlation analysis examines the direction and strength of the linear relationship between each sustainable marketing factor and green purchase intention.

Formula:

$$r = [N\Sigma XY - (\Sigma X)(\Sigma Y)] / \sqrt{\{[N\Sigma X^2 - (\Sigma X)^2] [N\Sigma Y^2 - (\Sigma Y)^2]\}}$$

Where r = Pearson correlation coefficient, N = Number of observations, X = Sustainable marketing factor, Y = Green purchase intention, and Σ = Summation.

Table 5: Correlation between Sustainable Marketing Factors and Purchase Intention

Sustainable marketing factor	Pearson correlation (r)	Significance
Sustainable product innovation	0.638	$p < 0.001$
Eco-friendly packaging	0.595	$p < 0.001$
Green marketing communication	0.561	$p < 0.001$
Consumer trust	0.610	$p < 0.001$
Perceived affordability	0.359	$p < 0.001$

Interpretation: All five factors have positive correlations with green purchase intention in the dataset. Sustainable product innovation shows the strongest correlation (r = 0.638), followed by consumer trust (r = 0.610) and eco-friendly packaging (r = 0.595). Perceived affordability

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has the weakest correlation among the five factors (r = 0.359), although the relationship is positive.

9. MAJOR FINDINGS

1. Respondents aged 25–34 years constitute the largest age group in the dataset.
2. The chi-square analysis identifies a significant association between environmental awareness and green purchasing behaviour.
3. The regression model explains approximately 69.6% of the variation in green purchase intention.
4. Consumer trust has the largest estimated regression coefficient among the five selected predictors.
5. Sustainable product innovation has the strongest correlation with green purchase intention among the variables examined.
6. Eco-friendly packaging and green marketing communication show positive relationships with purchase intention.
7. Perceived affordability has a positive but comparatively weaker correlation with purchase intention.
8. The results demonstrate how statistical tools can be used to examine relationships between sustainable marketing innovations and green consumer behaviour.

10. SUGGESTIONS

1. Strengthen consumer trust: Businesses should provide accurate and verifiable information about environmental product claims.
2. Encourage sustainable product innovation: Companies should develop products that reduce environmental impact while meeting customer expectations for quality and performance.
3. Improve green marketing communication: Environmental messages should be clear, specific, transparent, and supported by evidence.
4. Promote sustainable packaging: Businesses should explore recyclable, reusable, refillable, or reduced-material packaging where feasible.
5. Maintain affordability: Companies should consider pricing and pack sizes that make sustainable alternatives accessible to different consumer groups.
6. Increase consumer awareness: Educational campaigns can explain environmental labels, responsible disposal, recycling, and sustainable consumption.
7. Use digital communication responsibly: Websites and social media should provide accurate sustainability information rather than exaggerated promotional claims.

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8. Evaluate actual purchasing behaviour: Businesses should measure repeat purchases, customer feedback, and relevant purchasing indicators rather than relying exclusively on purchase intentions.

9. Support transparent environmental claims: Companies should maintain evidence for claims about recyclability, energy efficiency, sourcing, and environmental benefits.

10. Conduct local consumer research: Future research can examine whether the influence of sustainable marketing differs across age groups, income categories, and product types in Chennai.

10. LIMITATIONS OF THE STUDY

1. The geographical scope is limited to the proposed study area of Chennai.

2. The dataset used for the statistical analysis is simulated and does not represent an actual consumer survey.

3. Convenience sampling, if adopted for the empirical study, may limit the generalisability of findings.

4. Green purchasing may differ across product categories, including food, clothing, personal care, and household products.

5. Self-reported questionnaire responses may be affected by recall errors or socially desirable answers.

6. Factors such as brand loyalty, product availability, social influence, price sensitivity, and previous product experience may also affect consumer behaviour.

7. Cross-sectional survey data can establish associations but cannot, on their own, prove causal relationships.

11. CONCLUSION

Sustainable marketing innovations provide businesses with opportunities to communicate environmental benefits, strengthen consumer confidence, and encourage responsible purchasing decisions. Sustainable product innovation, eco-friendly packaging, credible green marketing communication, consumer trust, and affordability are relevant factors for understanding green consumer behaviour.

The statistical analysis presented in this article demonstrates how percentage analysis, the chi-square test, multiple regression analysis, and Pearson correlation analysis can be applied to the study of sustainable marketing innovations in Chennai. The results indicate positive relationships among the selected variables within the dataset.

For businesses, the practical priority is to connect genuine environmental benefits with quality,

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affordability, transparency, and customer needs. A future empirical study using actual responses from Chennai consumers would be required to establish whether these relationships are present in the target population.

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THE ROLE OF SUSTAINABLE MARKETING INNOVATIONS IN PROMOTING GREEN CONSUMER BEHAVIOUR IN CHENNAI

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ABSTRACT

Sustainable marketing innovations have become increasingly important in encouraging environmentally responsible consumption and supporting sustainable economic development. Businesses are adopting green product innovations, eco-friendly packaging, sustainable branding, and environmental communication to influence consumer perceptions and purchasing decisions. This study examines the role of sustainable marketing innovations in promoting green consumer behaviour in Chennai. It focuses on sustainable product innovation, eco-friendly packaging, green marketing communication, consumer trust, and perceived affordability. A descriptive research design was adopted for a model study involving 150 simulated respondent records. Percentage analysis, the chi-square test, multiple regression analysis, and Pearson correlation analysis were applied to examine the relationships between sustainable marketing practices and green consumer behaviour. The model results indicate positive associations between sustainable marketing factors and green purchase intention. Product innovation, packaging, marketing communication, consumer trust, and affordability demonstrate varying relationships with purchase intention. The study highlights the importance of credible environmental claims, product quality, affordability, and effective communication in encouraging sustainable consumption.

Keywords: Sustainable Marketing, Marketing Innovation, Green Consumer Behaviour, Green Products, Sustainable Packaging, Consumer Awareness, Chennai.

1. INTRODUCTION

1.1 Evolution of Sustainable Marketing

Marketing practices have evolved beyond the traditional objective of promoting products and increasing sales. Growing environmental concerns, resource scarcity, plastic waste, and climate-related challenges have encouraged businesses to incorporate sustainability into their marketing strategies. Sustainable marketing integrates environmental and social considerations into the development, promotion, distribution, and consumption of products and services.

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Businesses increasingly recognise that long-term success depends not only on customer satisfaction but also on responsible resource utilisation and environmental protection. Sustainable marketing innovations enable organisations to communicate environmental benefits, develop eco-friendly products, and encourage consumers to make more responsible purchasing decisions.

1.2 Sustainable Marketing Innovations

Sustainable marketing innovations refer to new or improved marketing approaches that promote environmental responsibility while creating value for consumers and businesses. These innovations include recyclable and refillable packaging, products made with responsibly sourced materials, reduced-plastic packaging, green branding, sustainability-oriented advertising, and digital campaigns that communicate environmental information.

Companies can use social media, websites, online advertisements, and educational campaigns to explain the environmental characteristics of their products. Such initiatives may improve awareness and help consumers compare alternatives. However, the effectiveness of sustainable marketing depends on whether environmental claims are credible and whether products satisfy consumers' expectations regarding quality, price, convenience, and performance.

1.3 Green Consumer Behaviour

Green consumer behaviour refers to purchasing, using, and disposing of products in ways that reflect concern for environmental sustainability. Green consumers may prefer products with reduced environmental impact, recyclable packaging, responsibly sourced ingredients, or production practices that minimise waste.

However, environmental concern does not always translate into actual purchasing behaviour. Consumers may consider price, availability, convenience, product effectiveness, brand reputation, and the reliability of sustainability claims before making a purchase. Sustainable marketing innovations can help reduce information gaps and encourage environmentally responsible choices when they communicate genuine product benefits.

1.4 Role of Digital Communication in Sustainable Marketing

Digital communication has created new opportunities for businesses to communicate sustainability initiatives to wider audiences. Social media campaigns, online product descriptions, digital advertisements, and customer reviews enable consumers to obtain information about products and evaluate brand claims.

Digital platforms can also support consumer education by explaining recycling practices, responsible consumption, and the environmental characteristics of products. Nevertheless, misleading green claims may create scepticism and reduce consumer trust. Therefore,

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businesses need to ensure that digital marketing messages are transparent, accurate, and supported by credible information.

1.5 Relevance of the Study in Chennai

Chennai provides a relevant regional setting for examining sustainable marketing because consumers can access products through supermarkets, retail outlets, e-commerce platforms, brand websites, and social media. Consumers encounter a wide range of marketing messages concerning eco-friendly products, sustainable packaging, natural ingredients, and responsible consumption.

Understanding consumer responses to these practices can help businesses identify the marketing approaches that encourage environmental awareness and sustainable purchasing decisions. The study therefore examines the role of sustainable marketing innovations in promoting green consumer behaviour in Chennai, with particular attention to marketing communication, product innovation, consumer trust, and purchasing preferences.

2. REVIEW OF LITERATURE

2.1 Ajzen (1991)

Ajzen (1991), through the Theory of Planned Behavior, explained that behavioural intentions are influenced by attitudes, subjective norms, and perceived behavioural control. The theory provides a useful foundation for understanding green consumer behaviour. Consumers who hold favourable attitudes towards environmental protection may be more willing to purchase sustainable products. Social influence and perceived affordability may also affect their decisions. This framework helps explain why sustainable marketing innovations may influence purchasing intentions without necessarily guaranteeing actual environmentally responsible purchasing behaviour.

2.2 Chen and Chang (2012)

Chen and Chang (2012) examined green perceived value, green perceived risk, and green trust in relation to green purchase intentions. Their research highlighted the importance of consumer confidence in environmental product claims. Consumers may respond more positively to sustainable products when they perceive environmental benefits and consider the associated risks manageable. These findings are relevant to sustainable marketing innovations because credible product information and transparent environmental communication can help reduce uncertainty and strengthen trust in environmentally positioned brands.

2.3 Peattie and Belz (2010)

Peattie and Belz (2010) discussed sustainability marketing as an approach that incorporates environmental and social considerations into marketing activities. Their work emphasised the

need to create value for consumers, businesses, and society rather than concentrating exclusively on short-term commercial objectives. This perspective supports the development of sustainable marketing innovations that promote responsible consumption and environmental awareness. Businesses can apply these principles through sustainable product development, responsible branding, and communication that accurately reflects the environmental characteristics of their offerings.

2.4 Ottman (2011)

Ottman (2011), in *The New Rules of Green Marketing*, emphasised that effective green marketing should connect genuine environmental benefits with consumer needs. Credible claims, transparent communication, and satisfactory product performance are essential to establishing consumer confidence. Environmental messages may lose effectiveness when businesses make vague or unsupported sustainability claims. This perspective is relevant to organisations adopting sustainable packaging, natural ingredients, or waste-reduction initiatives. It suggests that sustainable marketing innovations should communicate verifiable benefits while addressing consumers' expectations regarding quality, affordability, and convenience.

2.5 Kotler and Keller (2016)

Kotler and Keller (2016) discussed the importance of marketing strategy, customer value, and integrated marketing communication in influencing consumer perceptions and behaviour. Coordinated promotional activities help businesses communicate consistent messages across different channels. In sustainable marketing, these principles can support the communication of environmental product attributes through advertising, digital platforms, and brand interactions. Effective communication can improve awareness and reinforce brand positioning, provided that promotional messages accurately represent product characteristics and deliver value that consumers consider meaningful.

3. STATEMENT OF THE PROBLEM

Environmental concerns have encouraged businesses to introduce sustainable products, eco-friendly packaging, and green promotional campaigns. However, the adoption of sustainable marketing practices does not automatically lead to environmentally responsible consumer behaviour.

Consumers may be uncertain about the credibility of environmental claims or may prioritise price, product quality, convenience, and brand familiarity over sustainability considerations. Businesses therefore need to understand how sustainable marketing innovations influence consumer awareness, perceptions, trust, and purchasing preferences.

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In Chennai, where consumers can obtain products through traditional retail channels and digital platforms, examining these relationships can provide useful insights for developing effective sustainable marketing strategies. The study addresses the role of sustainable marketing innovations in encouraging green consumer behaviour and identifies the major considerations associated with sustainable purchasing decisions.

4. OBJECTIVES OF THE STUDY

1. To examine the role of sustainable marketing innovations in promoting green consumer behaviour in Chennai.
2. To identify the major sustainable marketing practices influencing consumer purchasing preferences.
3. To analyse the relationship between sustainable marketing innovations and green consumer purchase intention.
4. To examine the association between environmental awareness and green purchasing behaviour.
5. To identify the influence of product innovation, eco-friendly packaging, marketing communication, consumer trust, and affordability on green purchase intention.

5. RESEARCH METHODOLOGY

Research design: Descriptive and analytical research design.

Study area: Chennai, Tamil Nadu.

Sample size: 150 respondent records in the model dataset.

Sampling technique: Convenience sampling is specified for the proposed empirical study.

Data collection instrument: A structured questionnaire covering demographic characteristics, sustainable marketing practices, environmental awareness, consumer trust, affordability, and green purchasing behaviour.

Measurement: Sustainable marketing variables are represented using five-point Likert-type scores, with higher scores indicating more favourable perceptions.

Statistical tools:

1. Percentage analysis.
2. Chi-square test of association.
3. Multiple regression analysis.
4. Pearson correlation analysis.

Dependent variable: Green consumer purchase intention.

Independent variables: Sustainable product innovation, eco-friendly packaging, green marketing communication, consumer trust, and perceived affordability.

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6. Data Analysis and Interpretation

6.1 Percentage Analysis of Respondents

Table 1: Demographic Profile of Respondents

Demographic variable	Category	Respondents	Percentage
Age	Below 25 years	38	25.33%
	25–34 years	52	34.67%
	35–44 years	35	23.33%
	45 years and above	25	16.67%
Gender	Male	68	45.33%
	Female	79	52.67%
	Other / Prefer not to say	3	2.00%
Education	Undergraduate	48	32.00%
	Postgraduate	72	48.00%
	Other qualifications	30	20.00%
Monthly income	Below ₹20,000	39	26.00%
	₹20,000–₹40,000	48	32.00%
	Above ₹40,000	63	42.00%

Interpretation: The largest age group is 25–34 years, representing 34.67% of the model sample. Female respondents account for 52.67%, while postgraduate respondents represent 48%. The largest income category is above ₹40,000 per month, accounting for 42%. This classification illustrates how respondents' demographic characteristics can be summarised before examining their perceptions of sustainable marketing innovations.

6.2 Chi-Square Test of Association

The chi-square test examines whether environmental awareness is associated with green purchasing behaviour.

Hypotheses

- H_0: There is no significant association between environmental awareness and green purchasing behaviour.
- H_1: There is a significant association between environmental awareness and green purchasing behaviour.

Table 2: Environmental Awareness and Green Purchasing Behaviour

Environmental awareness	Regular purchasing	Occasional / Rare purchasing	Total

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High	19	6	25
Moderate	26	29	55
Low	17	53	70
Total	**62**	**88**	**150**

Formula:

Percentage = (Number of Respondents / Total Number of Respondents) × 100

P = (N / T) × 100

Calculated result from the model dataset:

- Chi-square value: 21.58
- Degrees of freedom: 2
- Significance level: 0.05
- p-value: approximately 0.00002

Interpretation: The model result indicates a statistically significant association between environmental awareness and green purchasing behaviour, (\chi^2(2)=21.58,\ p<0.001). The null hypothesis is rejected for this simulated dataset. Respondents in the high-awareness category show a greater proportion of regular green purchasing than those in the low-awareness category. This association does not establish that awareness directly causes purchasing behaviour.

6.3 Multiple Regression Analysis

Multiple regression analysis examines the relationship between sustainable marketing variables and green consumer purchase intention.

Regression model:

$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \varepsilon$

Where:

Y = Green consumer purchase intention

β_0 = Constant

β_1–β_5 = Regression coefficients

X_1 = Sustainable product innovation

X_2 = Eco-friendly packaging

X_3 = Green marketing communication

X_4 = Consumer trust

X_5 = Perceived affordability

ε = Error term

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Table 3: Multiple Regression Results

Independent variable	B	Standard error	t-value	Significance
Constant	1.308	0.151	8.67	$p < 0.001$
Sustainable product innovation	0.181	0.040	4.52	$p < 0.001$
Eco-friendly packaging	0.160	0.034	4.67	$p < 0.001$
Green marketing communication	0.163	0.034	4.79	$p < 0.001$
Consumer trust	0.224	0.039	5.80	$p < 0.001$
Perceived affordability	0.109	0.037	2.96	$p = 0.004$

Model summary:

Statistic	Result
Sample size	150
R^2	0.696
Adjusted R^2	0.685
F-statistic	65.91
Model significance	$p < 0.001$

Interpretation: The model explains approximately 69.6% of the variation in green purchase intention within the simulated dataset. Consumer trust has the largest estimated coefficient among the five independent variables (B = 0.224), followed by sustainable product innovation (B = 0.181), green marketing communication (B = 0.163), eco-friendly packaging (B = 0.160), and perceived affordability (B = 0.109). All five coefficients are positive and statistically significant in this model. These estimates describe the generated data and do not establish the effects that would occur in a real consumer population.

6.4 Pearson Correlation Analysis

Pearson correlation analysis examines the strength and direction of the relationship between each sustainable marketing factor and green consumer purchase intention.

Hypotheses

- H_0: There is no significant linear correlation between the sustainable marketing factor and green consumer purchase intention.
- H_1: There is a significant linear correlation between the sustainable marketing factor and green consumer purchase intention.

Table 4: Correlation between Sustainable Marketing Factors and Purchase Intention

Variables	Pearson correlation (r)	Significance
Sustainable product innovation	0.638	$p < 0.001$

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Eco-friendly packaging	0.595	$p < 0.001$
Green marketing communication	0.561	$p < 0.001$
Consumer trust	0.610	$p < 0.001$
Perceived affordability	0.359	$p < 0.001$

Interpretation: All five variables show positive correlations with green purchase intention in the simulated dataset. Sustainable product innovation has the strongest correlation ($r = 0.638$), followed by consumer trust ($r = 0.610$) and eco-friendly packaging ($r = 0.595$). Perceived affordability has the weakest correlation among the listed factors ($r = 0.359$), although the relationship is still statistically significant. Correlation measures association and does not demonstrate causation.

7. MAJOR FINDINGS OF THE STUDY

1. The largest age group in the model sample is 25–34 years, representing 34.67%.
2. Female respondents account for 52.67% of the model sample.
3. The chi-square analysis indicates an association between environmental awareness and green purchasing behaviour.
4. The simulated regression model explains approximately 69.6% of the variation in green purchase intention.
5. Consumer trust records the largest estimated regression coefficient among the five independent variables.
6. Sustainable product innovation demonstrates a positive correlation with green purchase intention.
7. Eco-friendly packaging and green marketing communication also show positive correlations with purchase intention.
8. Perceived affordability has a positive but comparatively weaker correlation with green purchase intention.
9. All five independent variables have positive estimated regression coefficients in the model.
10. The findings demonstrate how statistical analysis can be used to examine the relationships among sustainable marketing innovations and green consumer behaviour.

8. SUGGESTIONS

1. **Strengthen consumer trust:** Businesses should provide transparent and verifiable information about the environmental characteristics of their products.

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2. **Encourage sustainable product innovation:** Companies should develop products and packaging that address genuine environmental concerns while maintaining quality and effectiveness.
3. **Improve green marketing communication:** Advertisements should communicate environmental benefits clearly and avoid vague or unsupported claims.
4. **Promote eco-friendly packaging:** Businesses can explore recyclable, reusable, refillable, and reduced-material packaging where appropriate.
5. **Maintain affordability:** Suitable pricing and product sizes may help make sustainable alternatives accessible to a broader consumer base.
6. **Improve consumer awareness:** Educational campaigns can explain responsible consumption, packaging disposal, and the meaning of sustainability-related claims.
7. **Integrate digital marketing:** Websites, social media, and online product descriptions can provide accessible information about sustainability practices.
8. **Measure marketing performance:** Businesses should use consumer feedback and actual purchasing data to assess whether their sustainable marketing initiatives are effective.

9. LIMITATIONS OF THE STUDY

1. **Geographical limitation:** The study focuses on Chennai and does not cover consumers in other cities or regions.
2. **Model-data limitation:** The numerical results presented in the statistical tables are based on simulated respondent records and cannot be treated as actual consumer survey findings.
3. **Sampling limitation:** Convenience sampling, if used in a future survey, may limit the generalisability of the results.
4. **Product category limitation:** Consumer responses may differ across food, clothing, personal care, household products, and other sustainable product categories.
5. **Self-reported responses:** A future questionnaire-based study may be affected by recall errors and socially desirable responses.
6. **Changing consumer preferences:** Environmental awareness, prices, marketing practices, and product availability may change over time.
7. **Limited variables:** Factors such as brand loyalty, income, social influence, product experience, and availability may also influence green consumer behaviour.
8. **Causal limitation:** Cross-sectional survey data and statistical associations alone cannot establish causality.

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10. CONCLUSION

Sustainable marketing innovations provide businesses with opportunities to communicate environmental benefits, improve consumer awareness, and encourage consideration of environmentally responsible products. Green product innovation, sustainable packaging, credible environmental communication, and consumer trust are important dimensions for understanding green consumer behaviour.

The statistical model presented in this article demonstrates how chi-square, multiple regression, and correlation analysis can be used to investigate relationships between environmental awareness, sustainable marketing practices, and green purchase intention. The simulated results indicate positive relationships among the selected variables, with consumer trust and sustainable product innovation showing notable associations with purchase intention.

For businesses operating in Chennai, sustainable marketing strategies should combine credible environmental claims with quality, affordability, convenience, and effective communication. A future empirical study using actual responses from Chennai consumers would be required to establish the prevalence and strength of these relationships in the target population.

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CONSUMER PERCEPTION AND PURCHASE INTENTION IN THE DIGITAL MARKETING ERA

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ABSTRACT

Digital marketing has become a potent weapon in today's business environment that greatly affects consumer perception and buy intention. The widespread use of social media, smartphones, and the internet has made customers more knowledgeable, connected, and powerful than ever. This study looks at how several aspects of digital marketing, like influencer marketing, social media marketing, content marketing, email marketing, and search engine marketing, impact consumer perception and, in turn, purchase intention. The study emphasizes how trust, perceived value, and brand image act as mediators. The goal of the study is to give marketers the knowledge they need to create successful digital strategies that meet customer expectations. According to the research, consumers' perceptions and purchase intentions are positively impacted by personalized, genuine, and engaging digital material.

Keywords: Digital Marketing, Consumer Perception, Purchase Intention, Social Media Marketing, Consumer Behaviour

INTRODUCTION

Traditional marketing has given way to digital marketing. Any marketing initiative that makes use of an electronic device or the internet is referred to as digital marketing. To communicate with both present and potential clients, businesses use digital platforms including social media, email, search engines, and other websites.Traditional advertising, word-of-mouth from friends and family, and in-store experiences used to have a significant impact on consumer purchasing decisions. The trip is now digital. A customer looks up products on Google, Amazon, YouTube, and Instagram before making a purchase, and evaluates costs on various platforms. The importance of consumer perception has increased due to this digital empowerment.The process by which people choose, arrange, and analyze data to create a meaningful image of a company or product is known as consumer perception. In the age of digital marketing, an influencer's story, an Instagram post, or a website design can quickly shape perception. Negative perception can result in brand avoidance even in the absence of actual product experience, whereas positive perception fosters trust and emotional attachment.The willingness and plan of a

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customer to purchase a specific good or service in the near future is known as purchase intention. t is thought to be a reliable indicator of actual purchasing behavior. This goal is influenced both directly and indirectly by digital marketing. For instance, limited-time email offers, social evidence like likes, comments, and testimonials, and tailored advertisements based on browser history all serve as triggers for buy intention.This shift in India has been expedited by the expansion of Digital India, UPI payments, inexpensive data, and e-commerce sites like Amazon, Flipkart, and Myntra. Customers from Thoothukudi is one of the Tier II and Tier III cities that actively engage in online shopping. Therefore, it is essential for academics and practitioners to comprehend how digital marketing tools influence perception and intention. The purpose of this essay is to examine how, in the modern era, digital marketing, consumer perception, and purchase intention are intertwined.

STATEMENT OF THE PROBLEM

Even with the massive expansion and investment in digital marketing, many companies still find it difficult to turn online interaction into real sales. The fundamental issue is figuring out what actually affects the minds of contemporary consumers causes ad fatigue and banner blindness. In the face of clutter, marketers are struggling to draw in customers and foster a favorable impression. Which kind of digital marketing is the question? Does content genuinely foster a favorable impression? Second, a significant problem is the lack of trust. Customers are wary due to an increase in instances of phony reviews, deceptive ads, data privacy issues, and online fraud. They can find a thing appealing online but be reluctant to buy it because they don't trust it. One crucial issue is how digital marketing fosters or undermines trust. Thirdly, perception and intention are not the same. A consumer may have a positive perception about a brand seen on Instagram but may not have purchase intention due to price, lack of need, or better alternatives. Understanding the factors that bridge perception to intention is essential. Fourthly, consumer behaviour is highly heterogeneous. Factors like age, gender, income, education, and digital literacy influence how consumers perceive digital marketing. What works for Gen Z may not work for Gen X. Marketers lack clear segmentation based on digital perception. Finally, in the Indian contex tof india, There is little empirical study on how digital marketing affects consumer perception and purchase intention, particularly in semi-urban areas. The majority of research is focused on metropolitan areas. Therefore, in order to assist local companies and students in comprehending the dynamics of digital consumer behavior, a thorough study that examines the issue from an all-encompassing perspective is required. Thus, this research is being done.

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OBJECTIVES OF THE STUDY

1. To research how consumer perception is affected by digital marketing.

2. To examine how consumer perception and purchase intention relate to each other in a digital setting.

3. To make recommendations for improving digital marketing tactics in order to increase purchase intention

METHODOLOGY

This study is descriptive and analytical in nature. The research is based on secondary data collected from journals, books, INFLIBNET N-LIST, Google Scholar and websites. Primary data approach is suggested for future empirical work using structured questionnaire with 5-point Likert scale, sample size 120 online shoppers selected through convenient sampling in Thoothukudi district. Statistical tools such as Percentage Analysis.



REVIEW OF LITERATURE

Tiago & Verissimo (2014)found that while digital marketing has improved interaction, successful customer perception influence necessitates strategic preparation. examines how contemporary consumers handle data in the face of systemic information overload, highlighting the importance of cognitive fluency and open privacy policies to gain users' trust. suggests structural changes for contemporary businesses, including developing zero-party data strategies, optimizing for search micro-moments, and methodically increasing user-generated content (UGC) to reduce online consumer skepticism.

Ertemel et al. (2016) discovered that, with trust acting as a mediating factor, social media marketing significantly improves brand perception and purchase intention. Without a question,

media marketing is a very powerful force in encouraging customers to purchase goods. By giving consumers instant access to product details, real-time comparisons, and reliable community validation, digital and social media marketing significantly influence contemporary purchasing behavior by transferring control from the brand to the customer. When compared to more conventional media like print or hoardings, research shows that social media marketing can have up to a 61% impact on consumer purchase intentions.



Benefits of Digital Marketing:

Because it enables companies to engage with target audiences where they spend the majority of their time, digital marketing is crucial.

Global Reach: Small and large enterprises may engage with audiences anywhere in the world thanks to digital channels, which eliminate geographical barriers. Precise Targeting: Rather than broadcasting to a broad audience, campaigns can target particular demographics like age, geography, and interests.

Measurable Outcomes: To demonstrate what works, analytics tools monitor clicks, conversions, and return on investment (ROI) in real time.

Cost-effective: Compared to traditional advertisements like billboards or TV spots, digital techniques frequently require smaller resources, leveling the playing field for startups.

Brand Trust: Consistent online interaction via

FINDINGS:

-Consumer impression is more positively impacted by real, engaging, and educational digital material The best indicator of purchase intention is social evidence, which includes reviews, ratings, and endorsements from influencers. The relationship between digital marketing and purchase intention is mediated by perceived value and trust.

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SUGGESTIONS:

Instead than only producing promotional material, marketers should concentrate on producing value-based content. Utilize micro-influencers to establish reputation and trust. To improve favorable perception, make sure that price, return policies, and customer ratings are all transparent. Use AI-based personalization to give pertinent offers based on how customers browse.

CONCLUSION

Digital marketing is a platform for establishing enduring connections with customers as well as a promotion tool. Purchase intention is based on consumer perception. Businesses that comprehend consumer psychology, guaranty authenticity, and offer a smooth online experience will be successful in turning perception into purchase in the age of digital marketing. Humanizing digital interactions and giving customers a sense of worth and inclusion are key components of marketing's future.

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DIGITAL MARKETING AND CHANGING CONS DIGITAL MARKETING AND CHANGING CONSUMER BEHAVIOUR IN INDIA: A UMER BEHAVIOUR IN INDIA: A SECONDARY DATA-BASED ANALYSIS OF EMERGING TRENDS, ENGAGEMENT, AND PURCHASE PATTERNS

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ABSTRACT

Digital the rapid expansion of digital platforms is reshaping how Indian consumers discover products, interact with brands, evaluate alternatives, and make purchases. In the current scenario, digital marketing increasingly connects advertising with online shopping through social media, personalised communication, e-commerce platforms, and quick-commerce services. This study examines emerging digital marketing trends and their relationship with changing consumer engagement and purchasing patterns in India. It adopts a descriptive research design based on secondary evidence from recent industry reports and published research, using comparative and trend-based analysis. Recent evidence places India's e-retail market at approximately US$65–66 billion in gross merchandise value in 2025, while quick commerce reached approximately US$10–11 billion, highlighting the growing importance of convenience and rapid delivery in online consumption. Furthermore, e-commerce and point-of-sale advertising increased by 50% to ₹220 billion in 2025, indicating closer integration between promotional activity and purchasing environments. These developments suggest a consumer journey in which digital discovery, brand engagement, and purchasing are becoming increasingly interconnected. However, aggregate market indicators cannot independently establish that digital marketing causes changes in individual consumer behaviour. The study therefore interprets the evidence as descriptive associations rather than causal relationships. It concludes that understanding contemporary consumer behaviour requires examining digital communication, shopping convenience, and transaction-linked advertising together, rather than treating them as separate developments.

Keywords: Digital marketing, consumer behaviour, India, e-commerce, quick commerce, consumer engagement, secondary data analysis.

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INTRODUCTION

The expansion of digital technologies has transformed the relationship between businesses and consumers in India. Marketing is no longer restricted to communicating product information through conventional advertising; it increasingly involves continuous interaction through search engines, social media, mobile applications, e-commerce websites, and personalized recommendations. These channels allow consumers to discover products, compare alternatives, access reviews, communicate with brands, and complete purchases within a connected digital environment. The supplied paper examines this transformation through the relationship between digital reach, consumer engagement, online purchasing, and digital payments, providing a foundation for understanding contemporary changes in Indian consumer behaviour.

In the recent scenario, digitalisation has become closely connected with the expansion of India's online retail market. According to the Bain & Company–Flipkart report, How India Shops Online 2026, India's e-retail market reached approximately US$65–66 billion in gross merchandise value in 2025, recording value growth of around 19–21%. These figures refer specifically to e-retail rather than the wider e-commerce industry and indicate the increasing scale of consumer purchases through online retail platforms. This expansion makes it important to examine not only the growth of online transactions but also how consumers discover products, evaluate information, and decide where and when to purchase.

The growing importance of digital marketing is also reflected in the changing allocation of advertising expenditure. The FICCI–EY report on India's media and entertainment sector indicates that digital advertising grew by 26% to ₹947 billion in 2025, accounting for 63% of total advertising revenue. The prominence of digital advertising demonstrates that businesses increasingly regard online channels as important spaces for reaching potential customers and supporting commercial activity. However, advertising expenditure represents marketers' investment decisions; it should not, by itself, be interpreted as evidence that advertisements have changed consumers' preferences or caused purchases.

Social media engagement and personalised communication are central themes in the supplied paper. Its discussion of Zomato, Flipkart, and Nykaa illustrates different approaches to connecting marketing communication with consumer participation, including culturally relevant content, targeted campaigns, user-generated content, and product-related interaction. Together, these examples frame digital marketing as an activity that extends beyond brand awareness to include information search, evaluation, engagement, and purchase consideration.

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They also highlight the need to distinguish the opportunity to reach consumers from measurable outcomes such as trust, purchase intention, repeat purchasing, and loyalty.

Another important feature of the contemporary retail environment is the increasing relevance of quick commerce and repeat online purchasing. The 2026 Bain–Flipkart report identifies India as a major quick-commerce market, while its discussion of returning shoppers draws attention to the importance of continued consumer participation rather than customer acquisition alone. These developments broaden the scope of consumer-behaviour research: understanding online shopping now requires attention to purchase frequency, convenience, delivery expectations, and the factors that encourage consumers to return to a platform.

At the same time, the growth of digital channels should not be understood simply as the replacement of traditional retail. The supplied paper adopts an omnichannel perspective, in which online and offline channels form parts of a connected consumer journey. From this perspective, consumers' exposure to digital communication and their eventual purchase channel are related but distinct aspects of behaviour. Examining both is important for understanding how digital marketing relates to purchasing decisions without assuming that every digitally influenced purchase takes place online.

Against this background, the present study examines digital marketing and changing consumer behaviour in India through a descriptive analysis of secondary data. It focuses on digital reach, social-media engagement, advertising expenditure, e-retail development, online purchase patterns, and digital-payment adoption. By bringing these indicators together, the study seeks to identify emerging trends and explain their relevance to consumer discovery, evaluation, engagement, and purchasing. Consistent with the methodological limitations acknowledged in the supplied paper, the analysis interprets aggregate trends as descriptive associations rather than proof of a direct causal relationship between digital marketing and individual consumer behaviour.

REVIEW OF LITERATURE

Murugan & Kumar (2024) examined the role of artificial intelligence in shaping the purchase of goods by consumers in online retailing, highlighting how AI has evolved to affect consumers' online purchase processes and decisions. The big data and sustainable consumption relationship were examined by Chandra & Verma (2023) and a research agenda was put forward regarding data-driven approaches to understanding and encouraging sustainable consumer behaviour.

Likewise, Jamal (2025) performed a quantitative study of the secondary data regarding

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Tata online retail transactions, studying customer segmentation, product recommendation, and how existing transactions data can be utilized to understand the characteristics of customers and create data-driven marketing strategies. These studies put together show just how much the Martech, AI, machine learning, big data, and data-driven analytics are shaping consumer experiences, engagements, segments, recommendations, and purchases.

Mishra and Darshi (2025), in "Nykaa's Strategy for Engaging Generation Z: Driving Growth Through Innovation, Omnichannel, Influencer Marketing, and Customer Focus," addressed consumer engagement through a brand-specific perspective. The supplied paper particularly associates their work with Nykaa's use of user-generated content to encourage interaction around beauty and cosmetic products. This study is relevant because it connects social-media communication with consumer participation and product-related discussion. However, findings drawn from a particular brand, product category, and demographic group require careful interpretation before being applied to the wider Indian consumer population.

Singh (2025), in "Marketing Strategies of Flipkart," is discussed in the supplied paper as an example of digital targeting intended to improve brand awareness and purchase intention. The paper connects Flipkart's campaigns with social-media advertising, search advertising, video content, and app-based communication. This contribution highlights the importance of coordinated communication across several digital touchpoints. It also draws attention to a distinction relevant to the present research: awareness and purchase intention are not the same as completed transactions, and campaign claims should be evaluated according to the outcome actually measured.

Bain & Company and Flipkart (2026), in How India Shops Online 2026, provide a contemporary industry perspective on Indian e-retail. The report places the market at approximately US$65–66 billion in gross merchandise value in 2025, with year-on-year growth of approximately 19–21%. Its discussion highlights quick commerce, conversational commerce, younger consumers, and demand from smaller cities as important developments. These observations extend the earlier literature by identifying changes in the scale, composition, and format of online shopping. However, the report's market estimates and forecasts provide industry context rather than direct evidence of the effect of a particular digital-marketing strategy on consumers.

RESEARCH METHODOLOGY

The study adopts a descriptive research design using **secondary data** to examine digital marketing trends and changing consumer behaviour in India. Data for 2021–2026, subject to availability, will be collected from DataReportal, FICCI–EY, Sensor Tower, IBEF, RBI, Bain

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& Company–Flipkart reports, and relevant academic publications. The analysis will cover internet adoption, social-media participation, digital advertising, online shopping, e-commerce growth, and digital payments. Tables, charts, percentage changes, and comparative trend analysis will be used to identify major developments, with forecasts distinguished from observed data. No primary survey or experimental methods will be employed; therefore, the findings will describe emerging patterns and associations rather than establish causal relationships between digital marketing and consumer behaviour.

Growth and Evolution of Digital Marketing in India

2 E-commerce Market Growth

presents the e-commerce market values stated in the article. Values for FY2025, FY2026 and FY2030 are presented as expected/forecast figures in the source.

Financial year	Market value (US$ billion)	Status in source
FY2021	**67**	Reported
FY2024	**125**	Reported
FY2025*	**145**	Expected/forecast
FY2026*	**163**	Expected/forecast
FY2030*	**345**	Expected/forecast

**Forecast/expected values as described in the uploaded article.*

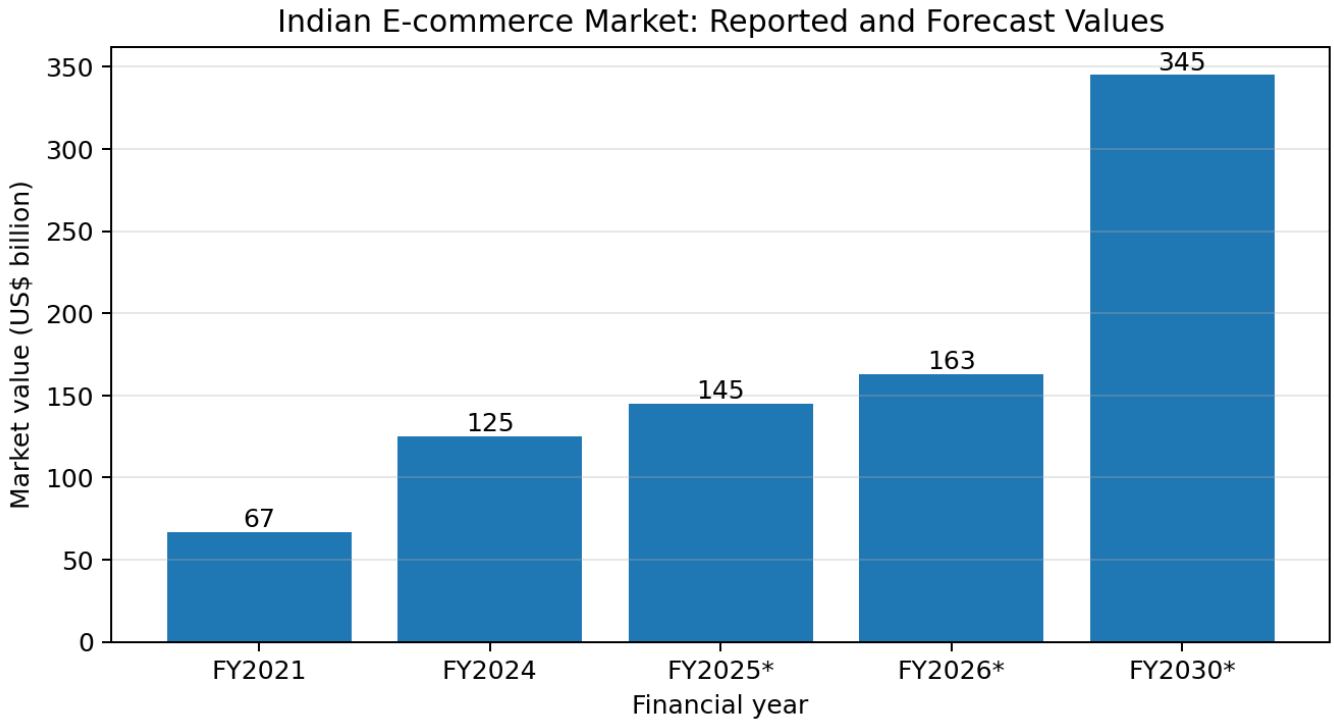

Figure 3. Reported and forecast Indian e-commerce market values.

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3 Integrated Digital Marketing and Consumer Behaviour Indicators

Dimension	Indicator	Reported value	Period	Interpretation
Digital reach	Internet users	**806 million**	January 2025	Large online consumer base
Digital reach	Internet penetration	**55.3%**	January 2025	Greater opportunity to discover and compare products online
Social engagement	Social media user identities	**491 million**	January 2025	Potential for brand communication and engagement
Social engagement	Instagram users	**414 million**	January 2025	Highlights visual/social content in brand interaction
Digital advertising	Digital advertising expenditure	**₹700 billion**	2024	Digital channels form a major part of advertising
Digital advertising	Share of total advertising	**55%**	2024	Advertising investment has shifted toward digital platforms
E-commerce advertising	Advertising revenue	**₹147 billion**	2024	Advertising is integrated with online shopping
Online purchasing	Online shoppers	**270+ million**	2024	Large online consumer market
E-commerce market	E-retail market value	**US$60 billion**	2024	Increasing participation in digital commerce
Digital payments	UPI transactions	**13.11 billion transactions**	FY2023–24	Digital payments are part of everyday transactions
Digital payments	Share of non-cash retail payment volume	**99.8%**	FY2023–24	Digital channels dominate the reported non-cash retail payment ecosystem

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Interpretation of results: The article's secondary indicators show simultaneous growth in internet access, social media reach, digital advertising, e-commerce and digital payments. These patterns are consistent with a consumer journey that combines online discovery and evaluation with online and offline purchasing. The source cautions that secondary data demonstrate trends and association, not direct causation.

4 Digital Advertising Data Reported in the Article

Indicator	Value	Period	Source note
Digital advertising expenditure	**₹700 billion**	2024	Reported in abstract/integrated table
Digital share of total advertising	**55%**	2024	Reported in abstract/integrated table
Digital advertising growth	**17%**	2024	Reported in article's overall trend interpretation
E-commerce advertising revenue	**₹23 billion**	2023	Reported in discussion
E-commerce advertising revenue	**₹147 billion**	2024	Reported in discussion
Digital advertising expenditure	**₹2,640 crore**	2023	Value/unit as printed in source discussion
Digital advertising expenditure	**₹7,000 crore**	2024	Value/unit as printed in source discussion

Data note: The article reports advertising values in different sections using differing amounts/units. They have been preserved as printed rather than silently reconciled. Verify the figures against the original cited reports before submission or publication.

However, secondary indicators show the association and parallelism of trends but not causation. Therefore, the growth of digital marketing cannot be viewed as the cause of change in consumers' behaviour directly.

DISCUSSION

The results of the study reveal that India is in a profound transformation in the marketing and consumer environment due to the rising digitalization. The secondary data reveal significant growth of internet and social media usage, with internet users rising from 751.5 million in 2024 to 1.03 billion in 2026, and social media user identities growing from 462 million to 500 million in the same timeframe, which will provide marketers with a large online audience and enhance

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the opportunities for consumer-brand interaction. This shift is further bolstered by the rise of digital advertising, where expenditure on digital advertising jumped from ₹2,640 crores in 2023 to ₹7,000 crore in 2024, representing 55 per cent of the total advertising revenue, and the e-commerce advertising revenue grew at a faster rate from ₹23 billion in 2023 to ₹147 billion in 2024. In terms of overall size, in FY2021, e-commerce accounted for US$67 billion of the total market size, which grew to US$125 billion in FY2024 and is expected to reach US$345 billion by FY2030, with more than 270 million online shoppers reported in 2024, showing increasing participation in digital commerce. With 13.11 billion transactions at UPI during FY2023-24, the use of digital payments has reached a new level, further highlighting its penetration into consumers' purchasing and payment habits. The results also show that digital channels have not fully superseded offline retail, as consumers still exhibit tendencies for in-store retail which indicates that there is now an Omnichannel consumer journey where both online and offline channels exist.

Emerging Challenges and Managerial Implications

Despite the opportunities created by digital marketing, businesses face challenges involving data privacy, cybersecurity, misinformation, advertising costs, platform dependency, and intense online competition. Personalised marketing may improve relevance, but excessive targeting or the use of personal information without appropriate transparency can weaken consumer trust.

The growing use of artificial intelligence and automated recommendation systems also creates opportunities for faster customer support, content personalisation, and predictive marketing. However, organisations must ensure that automated systems are used responsibly and that marketing decisions remain transparent, fair, and consistent with applicable regulations.

Overall, the findings indicate parallel growth in digital connectivity, marketing activity, e-commerce, and digital payments. Since the study relies on secondary data collected from different sources and periods, these patterns should be interpreted as descriptive associations rather than proof that digital marketing alone causes changes in consumer behaviour.

CONCLUSION

The present study concludes that digital marketing has become a major force influencing consumer engagement and purchasing patterns in India. The findings demonstrate that the expansion of internet connectivity, social media, digital advertising, e-commerce, and digital payment facilities has created new opportunities for businesses to communicate with consumers and participate in their purchasing journeys.

The recent industry scenario further supports the importance of this transformation.

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According to the FICCI–EY report released in March 2026, India's digital advertising revenue increased by 26% to ₹947 billion in 2025, accounting for 63% of total advertising revenue. This development highlights the increasing importance of digital platforms, measurable advertising outcomes, and commerce-linked promotional activities in contemporary marketing strategies.

The study also highlights the growing significance of consumer convenience, personalised communication, online product comparisons, customer reviews, and integrated payment facilities. In the current business environment, organisations need to understand changing consumer expectations and develop marketing strategies that combine social media engagement, search-based promotion, mobile marketing, e-commerce platforms, and physical retail channels. The increasing importance of artificial intelligence and data analytics provides additional opportunities to understand customer preferences and improve marketing decisions, provided that these technologies are used responsibly.

However, digital marketing does not eliminate the importance of traditional retailing or personal interaction. Consumer purchasing decisions continue to depend on factors such as income, price, product quality, trust, accessibility, and individual preferences. Therefore, an integrated omnichannel approach is more appropriate than relying exclusively on either digital or traditional marketing channels.

The study further recognises that data privacy, cybersecurity, fraudulent online activities, misleading promotional content, and unequal access to digital technologies remain significant challenges. Businesses must therefore prioritise transparent communication, secure transactions, responsible data usage, and consumer protection alongside marketing performance.

In conclusion, the secondary data indicate a strong parallel development between digital marketing expansion and changing consumer behaviour in India. Nevertheless, the findings establish descriptive trends rather than a direct causal relationship. Future research may use primary data, consumer surveys, interviews, and statistical analysis to examine how digital advertising, social media engagement, personalisation, and digital payment convenience influence purchase intention, actual purchasing behaviour, customer satisfaction, and brand loyalty. Such research would provide deeper insights into the evolving relationship between digital marketing and consumer behaviour in India's rapidly changing digital economy.

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ROLE OF GREEN CONSUMERS IN PROMOTING SUSTAINABLE PRODUCTS AND ENVIRONMENTAL PROTECTION

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ABSTRACT

Green consumerism has emerged as an important approach to promoting sustainable consumption and environmental protection. Increasing environmental degradation, global warming, climate change, and the depletion of natural resources have created a need for responsible consumer behaviour. Green consumers contribute to environmental sustainability by purchasing eco-friendly products, reducing unnecessary consumption, reusing and recycling materials, conserving energy and water, and adopting environmentally responsible practices in their daily lives. This paper examines the role of green consumers in promoting sustainable products and protecting the environment. It highlights the major characteristics of green consumer behaviour, identifies various green products available in the market, and explains the importance of green consumerism in reducing packaging waste, improving energy efficiency, lowering greenhouse gas emissions, and encouraging healthier food consumption. Practices such as using reusable bags and metal vessels, purchasing local products, adopting renewable energy, harvesting rainwater, maintaining home gardens, and using natural manure are also discussed. Green consumerism can encourage manufacturers to develop sustainable products and adopt environmentally responsible production methods by increasing consumer demand for environmentally friendly alternatives. Collective action by consumers, industries, governments, and non-governmental organizations is essential to achieving long-term environmental sustainability.

Keywords: Digital marketing, consumer behaviour, India, e-commerce, quick commerce, consumer engagement, secondary data analysis.

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INTRODUCTION

Nature provides essential resources to human beings, flora, and fauna. The unlimited wants and excessive consumption of human beings contribute to environmental degradation. The overexploitation of natural resources, industrial pollution, and excessive greenhouse gas emissions contribute to global warming and climate change. Rising global temperatures cause glaciers and ice sheets to melt, resulting in rising sea levels and other environmental problems.

Planting more trees is an important measure to mitigate global warming because trees absorb carbon dioxide from the atmosphere. Governments, non-governmental organizations (NGOs), and the public participate in tree-planting programmes and other environmental protection initiatives. Green consumerism plays an important role in reducing environmental damage. Green consumers prefer environmentally friendly products, avoid unnecessary purchases, reuse and recycle materials, conserve energy and water, and choose sustainable transportation whenever possible. These practices help reduce waste, conserve natural resources, and lower greenhouse gas emissions. Green consumerism is an important approach to environmental protection. Controlling carbon emissions requires collective efforts from consumers, industries, governments, and other stakeholders. Responsible consumption, sustainable production, renewable energy, and effective environmental policies help address global warming and climate change.

4.1.1 OBJECTIVES OF THE STUDY

1. To examine the major characteristics of green consumer behaviour in promoting environmental sustainability.
2. To identify the various types of green products available for sustainable consumption.
3. To analyse the importance of green consumerism in reducing environmental pollution and conserving natural resources.
4. To understand the role of green consumers in promoting sustainable products through responsible purchasing and consumption practices.
5. To highlight the contribution of green consumerism towards reducing waste, conserving energy and water, and protecting the environment.

4.2 IMPORTANCE OF GREEN CONSUMERISM

Green consumerism is a holistic and responsible process of management that satisfies, identifies, fulfills, and anticipates the needs of the stakeholders in maintaining the natural well-

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being of the environment and one that does not endanger the health of humans.

4.2.1 1. Reduced Waste in Packaging

Green consumerism advocates for frugal packaging options. It has social attitudes such as the preference to purchase loose products like vegetables and fruits instead of pre-packaged products. Also, green consumerism encourages the reuse of paper and plastic packaging bags and tins that often cause environmental degradation.

4.2.2 2. Increased Energy Efficiency

Green consumerism attitudes advocate for the efficient use of energy, which ultimately helps in saving money, reducing utility bills, lowering emissions of greenhouse gas, and enabling economies to meet the growing energy demands.Through green consumerism, environmental and economic benefits of utility systems and the management of risk associated with inefficient production processes have also been attained.

4.2.3 3. Decreased Release of Emissions and Other Pollutants During Production and Transportation Processes

Thanks to green consumerism, emissions from the transportation sector and industries have been considerably reduced. Also, because of green consumerism advocacies and programs, stringent standards against emissions have been implemented, thus lowering emissions from engines and motors and advancing clean-burning fuel options.

4.2.4 4. Consumption of More Healthy Foods

Through green consumerism advocacies, there has been an increasing need for more eco-friendly food production.[1]

MAJOR CHARACTERISTICS OF GREEN CONSUMER BEHAVIOUR

1. **Purchasing Eco-Friendly Products:** Green consumers prefer products that are environmentally friendly and cause less harm to nature.
2. **Using Public Transport:** They use public transportation whenever possible to reduce fuel consumption and air pollution.
3. **Using Metal Vessels:** They use reusable metal vessels for storing food and liquids instead of disposable plastic containers.
4. **Saving Paper:** They use both sides of paper to reduce paper consumption and waste.

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5. **Maintaining Home Gardens:** They grow vegetables, fruits, and flowers in their home gardens.

6. **Reducing Plastic Waste:** They cut only a small corner of milk packets to pour the contents, making the remaining plastic easier to collect for recycling.

7. **Using Bicycles:** They use bicycles for short-distance travel to reduce fuel consumption and pollution.

8. **Using Solar Energy:** They install solar energy systems at home and in offices to meet some of their electricity needs.

9. **Planting and Protecting Trees:** They grow and maintain trees near their homes to support greenery and improve the local environment.

10. **Reducing Air Conditioner Usage:** They minimize the use of air conditioners whenever possible to conserve electricity.

11. **Carrying Cloth Bags:** They carry reusable cloth bags when purchasing groceries and other goods instead of using single-use plastic bags.

12. **Following the Three Rs:** They practise Reduce, Reuse, and Recycle in their daily lives.

13. **Avoiding Unnecessary Purchases:** They purchase goods only when needed and avoid unnecessary shopping.

14. **Practising Minimal Consumption:** They maintain a limited number of personal belongings, such as dresses, shoes, slippers, and watches, rather than purchasing excessive quantities.

15. **Switching Off Mobile Phones:** They switch off their mobile phones at night when practical to reduce unnecessary energy consumption.

16. **Using Biogas:** They use biogas for cooking as an alternative to conventional cooking fuels.

17. **Harvesting Rainwater:** They collect, store, and conserve rainwater for suitable domestic and gardening purposes.

18. **Purchasing Local Products:** They prefer locally available products to support local producers and potentially reduce transportation-related environmental impacts.

19. **Using Refillable Ink Pens:** They prefer refillable ink pens to disposable pens to reduce plastic waste.

20. **Avoiding Bottled Drinking Water:** They carry drinking water in reusable bottles and refillable water containers instead of frequently purchasing packaged drinking water.

21. **Using Natural Manure:** They use compost and natural manure in their home gardens to improve soil fertility and reduce reliance on synthetic fertilizers.

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List of Green Products:-

Paper Products	Recycled toilet tissue, recycled paper, paper potter
Household Items	Wall clock (recycled detergent bottles), pens (recycled water bottles), eco-friendly decking, recycled floor mats, 100% recycled aluminium foil, guitar strap (seatbelt), repurposed billboard vinyl wallet, seed pencils, vegan candles, jute & seagrass baskets, vegan dishwashing block, non-sponge scrubbers, coconut dish/bottle brushes, reusable baby food pouches, toys (recycled milk jugs), eco-flow low-flow shower head, biodegradable garden pots, compostable cutlery (forks, spoons, knives, tasters), compostable plates & bowls, travel kits (bike tubes), recycled PET bags, reusable produce/shopping/bread bags, cloth napkins, cotton shopping bags, eco-friendly dishwasher, induction cooktop, eco kettle, Baby Liss hair dryer, moss carpet, eco-friendly chair, shower timer, recycled cutting boards, reusable glass coffee cups, stainless steel & rice husk lunch boxes, glass water bottles, cotton produce bags, bamboo kitchen utensils, cotton bowl covers, beeswax wraps, unpaper towels, bamboo forks & spoons, Turkish towels, natural stain remover stick, bamboo & stainless straws, wooden scoop sets, organic shea butter, bamboo washcloths, reusable cloth wipes, drink bottles (glass, bamboo, stainless steel), lids, jackets & lanyards, biodegradable waste bags, sandwich wraps, organic towels, organic pillowcases
Electronics Items	Eco touchscreen computer, eco laptop, eco accessories, LED bulbs/lights, rechargeable crank flashlights, bamboo iPhone speakers, smartphones with recycled parts (e.g., skateboard backs), solar-powered grills, solar lawn mowers, portable charging stations, solar attic fans, rechargeable batteries, solar outdoor speakers, solar phone chargers, water-powered clocks, bamboo dry-erase

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	boards, solar candles, eco capsules (sustainable housing pods), eco-friendly vehicles (EVs), solar water heaters, energy-saving TVs, green GPS units, eco-verification phone apps, solar panel charging cases
Apparel	Clothes (recycled fabrics), wool footwear, wooden watches, wooden sunglasses, recycled metal rings, eyewear made from ocean plastic
Personal Care & Wellness	Bamboo toothbrushes, organic toothpaste, recycled-handle toothbrushes, handmade natural soaps, solid shampoo & conditioner bars, plastic-free deodorants, safety razors, shaving soaps, aloe vera mascara, bamboo concealer sticks, lip & cheek stains, reusable sanitary pads, vegan makeup removers, coconut soap dishes, soap nut shells, eco glitter, eco-friendly face masks, natural sunscreen, biodegradable cotton swabs, organic lip balms, reusable facial rounds, exfoliating soap pouches, oil-pulling mouthwash, zero-waste dental floss
Beauty & Body Care	Natural bath salts, bath & body oils, moisturizers, man balms, vegan shaving brushes, organic towels, organic pillowcases, soap nut salves, all-salve, eco glitter
Kitchen & Food Storage	Beeswax wraps, reusable sandwich wraps, cloth/cotton produce bags, stainless steel lunch boxes, rice husk lunch boxes, reusable glass jars, bamboo utensils, biodegradable cutlery, compostable party plates & bowls, reusable coffee cups, Turkish towels as wraps/cloths

Source :- Primary Data

Government Rules & Support for Green Marketing and Eco-friendly Products (India)

Category	**Details / Examples**
Policy Framework & Regulat	- Environment Protection Act, 1986 (pollution control & eco-friendly production) - Plastic Waste Management Rules, 2016 & 2021 (ban on single-use plastics,

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	recycling, biodegradable use) - E-Waste Management Rules, 2016 (safe collection & recycling of e-waste) - Energy Conservation Act, 2001 (energy efficiency & renewable energy)
Standards & Certification Support	- GreenPro Certification (CII) – eco-friendly product lifecycle certification - BEE Star Rating – energy-efficient appliances - Ecomark Scheme (BIS) – eco-friendly consumer goods (paper, detergents, cosmetics) - FSC Certification – sustainable forestry products
Financial & Market Support	- Subsidies & Tax benefits (renewable energy, EVs, solar, bio-fertilizers) - FAME India Scheme – incentives for EVs & charging infrastructure - Renewable Energy Development Schemes – solar, wind, biomass - Public Procurement Policies – preference for green products in government tenders
Awareness & Promotional Support -	-Swachh Bharat Abhiyan – reduction of plastic, use of sustainable alternatives - National Electric Mobility Mission Plan – EV awareness & adoption - Digital Platforms (GeM portal) – online visibility for green products
International Alignment	- Paris Climate Agreement & UN SDGs – commitment to global sustainability - Collaboration with UNEP, World Bank for sustainable development projects

Source: primary data

CONCLUSION

Green consumers play an important role in promoting sustainable products and environmental protection through their purchasing decisions and everyday practices. Choosing eco-friendly products, avoiding unnecessary purchases, reducing plastic waste, reusing and recycling materials, conserving water and energy, and supporting local producers can contribute to the sustainable use of natural resources. Practices such as using cloth bags, refillable pens, metal vessels, solar energy, biogas, and natural manure demonstrate how individual actions can support environmental conservation.

Green consumerism also influences producers and manufacturers to develop environmentally friendly products, minimize packaging, improve energy efficiency, and adopt sustainable production processes. Growing awareness of environmental issues can encourage consumers

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to make responsible purchasing decisions and motivate businesses to strengthen their environmental commitments. Governments, educational institutions, industries, non-governmental organizations, and the public can promote green consumerism through environmental education, awareness campaigns, recycling initiatives, and supportive policies.

Environmental protection requires continuous efforts from individuals and organizations. Green consumerism, combined with sustainable production, renewable energy, responsible resource management, and effective environmental policies, can help reduce environmental degradation and greenhouse gas emissions. Developing responsible consumption habits and encouraging wider acceptance of sustainable products are essential steps towards creating a cleaner, healthier, and more sustainable environment for present and future generations.

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A STUDY ON WORKING WOMEN'S BEHAVIOUR TOWARDS THE SATISFACTION LEVEL OF DIGITAL PAYMENT SYSTEMS IN THOOTHUKUDI CITY

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ABSTRACT:

Digital payment systems have rapidly changed the way financial transactions are carried out across the world. In India, initiatives such as Digital India and the spread of smartphones have encouraged the use of cashless methods. Working women form an important group in this transformation, as they balance professional and household responsibilities while contributing to the economy. Thoothukudi, a growing port city in Tamil Nadu, provides a useful setting to study this trend. This research focuses on the behaviou

r of working women in Thoothukudi towards digital payment systems. It examines the factors that influence their adoption, the challenges they face and the extent to which these systems are part of their daily lives. The study aims to provide insights that can help policymakers, financial institutions and technology providers design strategies to improve financial inclusion and digital literacy among working women in smaller cities.

Key words: digital payment system, working women, Thoothukudi City.

INTRODUCTION OF THE STUDY:

In recent years, the rise of digital payment systems has revolutionized the way financial transactions are conducted worldwide. This transformation is particularly evident in India, where government initiatives like Digital India and the proliferation of smartphones have significantly boosted the adoption of cashless payment methods. Among various user demographics, working women have emerged as a critical segment for understanding the impact and adoption of these technologies. Thoothukudi, also known as Tuticorin, is a rapidly

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developing port city in Tamil Nadu. With its diverse economy spanning industries such as shipping, manufacturing and trade, the city is home to a growing population of working professionals. Among them, working women play a crucial role, contributing to household income while managing various professional and domestic responsibilities. This dual role positions them as a significant demographic for understanding behavioural patterns and the adoption of innovative financial technologies such as digital payment systems. The digital payment system has transformed the economic landscape globally, providing greater convenience, efficiency and security in transactions. This shift is particularly significant in developing regions, where access to formal banking services can be limited. In Thoothukudi district, a coastal region in Tamil Nadu, India, the rise of digital financial services has coincided with an increase in the number of working women entering various sectors, ranging from traditional occupations to modern enterprises.

This study aims to explore the behaviour of working women in Thoothukudi concerning digital payments. It seeks to understand the factors influencing their adoption, the challenges they face and the extent to which they have integrated these systems into their daily lives. By analysing their attitudes and practices, this research will provide valuable insights into how digital payment systems can be tailored to meet the needs of working women and contribute to the broader goal of financial inclusion in the region. By examining the experiences and perceptions of working women in Thoothukudi, this research seeks to provide insights for policymakers, financial institutions and technology companies to promote greater adoption and usage of digital payment systems among this demographic. The study's findings will contribute to the development of targeted strategies to enhance financial inclusion and promote digital financial literacy among working women in India's smaller cities.

STATEMENT OF THE PROBLEM:

In the era of digital transformation, payment systems have evolved from traditional cash transactions to digital modes that offer speed, convenience and enhanced financial security. Despite these advancements, the adoption of digital payment systems is not uniform across demographic groups and is often influenced by factors such as accessibility, awareness and societal norms. In Thoothukudi city, working women represent a significant segment of the workforce, balancing professional and personal responsibilities. Their financial behaviours and preferences play a critical role in household and economic decisions. However, barriers such as socio-economic and psychological factors affect their willingness to adopt and use digital payment systems. Issues of awareness, trust and accessibility remain underexplored, limiting their integration into everyday financial practices. Understanding the factors that drive or

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hinder working women in Thoothukudi from embracing digital payments is crucial for promoting inclusive digital financial services. This study seeks to analyse their behaviour regarding the adoption of digital payment systems, exploring motivations, challenges and the impact of digital payments on financial management practices. Addressing these issues is essential to ensure that digital payment solutions are inclusive, responsive to the needs of working women and capable of bridging gaps in financial inclusion. Ultimately, this research aims to empower working women to participate more fully in the digital economy.

OBJECTIVES OF THE STUDY:

To analyse the demographic profile of working women adopting digital payment in Thoothukudi.

To find out the challenges faced by working women in adopting digital payment system.

To examine the satisfaction level of digital payment users of working women in Thoothukudi.

REVIEW OF LITERATURE:

Dr. K. Sindhura (2024) mentioned in the article, "Knowledge, Perception, Contributing Factors and Practices of Digital Mode of Payments among Working and Non-Working Women Digital payments." Digital payment is often known as electronic payments meaning financial transactions which are cashless payments. This indicates that both the payer and the payee exchange money via electronic means. When compared with traditional payment methods, electronic payment transactions are made quickly. To promote and encourage digital payments in the nation, the Indian government has been implementing a number of actions. Individuals' Practices in adopting digital payment systems are influenced by their knowledge, perception and variety of factors, such as simplicity of use, value received, social impact, risk and trust. Hence, it is important to understand the trends in the use of digital payments in different groups of people. Eighty participants took part in the study. To collect the data, a structured questionnaire was used. SPSS was used to perform both descriptive and inferential statistics. The findings show that working women (mean 4.25) have higher levels of awareness about digital transactions than non-working women (mean 3.67). Similarly, working women (mean 4.71) have a more favourable perception of digital transactions than non-working women (mean 4.45). The perception of digital payments is more favourable among working women. When compared to non-working women, the use of the digital mode of transactions is high among working women.

SCOPE AND NEED FOR THE STUDY:

The study seeks to examine the behaviour and adoption of digital payments among working women, analysing the factors and barriers that influence them. It specifically focuses on women

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across various professions in Thoothukudi, including those in corporate roles, small businesses, government services and other sectors. The research also considers popular digital payment methods such as Unified Payments Interface (UPI), mobile wallets (e.g., Paytm, Google Pay, PhonePe), internet banking and contactless card payments. The need for this study arises from the growing importance of digital payment systems in modern financial transactions and the critical role of working women in both personal and household financial management. Despite the rapid adoption of digital payments in India, many working women continue to face barriers such as limited digital literacy, security concerns and socio-cultural challenges, particularly in semi-urban areas like Thoothukudi. Understanding their behaviour and adoption patterns is essential to bridging the gender gap in technology use, promoting financial inclusion and empowering women economically. This study aims to provide localized insights to address these challenges and inform strategies for improving digital payment adoption among working women, ultimately contributing to broader goals of financial and technological empowerment.

METHODOLOGY OF THE STUDY:

Methodology is a systematic approach to solve the research problem. A good research work requires a clear scientific methodology, which includes the research design, collection of data, analysis of data, sampling design and processing.

Primary data was collected from 130 working women to study their behaviour and adoption of digital payment systems. For the collection of primary data, an interview schedule was developed. A structured questionnaire was prepared based on the results of pre-testing and a sample of working women was selected. The data collected was original in nature.

A purposive sampling technique was used to collect data from 130 respondents residing in specific areas of Thoothukudi city, such as Lionstown, Therespuram, State Bank Colony, Millerpuram, Toovipuram and Shamugapuram. The structured questionnaire was used as the main tool for collecting information.

LIMITATION OF THE STUDY:

The study is limited to the satisfaction level of working women in adopting digital payment systems in the specific areas of Thoothukudi city. Therefore, the results are not applicable to other regions of Thoothukudi. The sample size was restricted to 130 respondents due to time constraints. Since data was collected through questionnaires, personal bias may be involved in the study. Time was also a major limitation.

ANALYSIS AND INTERPRETATION OF THE STUDY:

Age of the respondents:

Majority 42.3% of the respondents are between the age group 25-35 years of working women

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who adopts digital payment followed by 24.6% of the respondents belong to age group 36-45 years, 20.8% belong to below 25 years and 12.3% belong to above 45 years of age group among working women who adopts digital payments.

Marital status of the respondents:

From the above data, majority 58.5% of the respondents are married working women who adopts digital payment, followed by 29.2% of the respondents are single working women who adopts digital payments, 6.9% of the respondents are widowed working women and 5.4% of the respondents are divorced working women who uses digital payments.

Area of residence:

Majority 34.6% of the respondents belong to Lionstown area who adopts digital payment, followed by 26.9% of working women who adopts digital payments are situated at Therespuram area, 15.4% working women who adopts digital payments are situated at Shamugapuram area, 9.2% of the respondents adopts digital payments who adopts digital payment are situated at Millerpuram area and 8.5.% of working women adopts digital payments are situated at State Bank Colony and 5.4% of the working women who adopts digital payments are situated at Toovipuram area.

Table showing the satisfaction level of working women adopting digital payment system.

S1- Digital payments are easy to use, S2- I feel secure using digital payments, S3- Rarely faces technical issues, S4- Personal data is safe, S5- Discounts encourage usage, S6- Digital payments reduce the need to carry cash, S7- Complaints are resolved quickly, S8- Payment steps are straightforward and clear.

Variable	TOTAL WEIGHTED AVERAGE SCORE	RANK
S1	4.25	II
S2	3.990	V
S3	3.992	IV
S4	3.915	VII
S5	4.130	III
S6	4.292	I
S7	3.984	VI

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S8	3.246	VIII

INTERPRETATION:

From the above table, majority 4.292 weighted score for the aspect relating to reduce the need to carry cash is ranked first, followed by 4.25 is the next level rated for easy use as the second rank, 4.130 is ranked third for encouraging discounts, 3.992 is ranked fourth for feeling secured in using digital payment, technical issues 3 .990 is ranked as fifth, 3.984 is ranked sixth on the aspect of complaints resolved quickly, 3.915 is ranked seventh for safe personal data and lastly 3.245 is ranked eight for payments steps are too straight forward and clear.

Table showing age aspects relating to the problems faced in using digital payments.

Null Hypothesis: There is no significant difference relationship age aspects relating with problems faced in using digital payment**.**

Alternative Hypothesis: There is a significant difference relationship age aspects relating with problems faced in using digital payment**.**

Various variables including, P1- Poor internet connectivity affects transactions, P2- Resolving failed transactions takes too long, P3- Additional charges for some digital payment methods are a concern, P4- Fear of fraud or hacking discourages me from using digital payments, P5- Digital payment systems are complicated to use, P6- I worry about the safety of my financial data, P7- I experience difficulty in obtaining help from banks for digital payment-related issues, P8- High cost of internet plans discourages me from frequent use.

Variable	**Chi -square**	**Asymp. Value (p)**
P1/ Age	48.730	0.000036
P2/Age	27.914	0.032
P3/ Age	36.904	0.002
P4/ Age	17.469	0.356
P5/ Age	43.673	0.00022
P6/ Age	24.503	0.079
P7/ Age	27.375	0.037
P8/ Age	42.871	0.00029

Source – computed primary data

INTERPRETATION:

The chi square table clearly indicates that significance p value for all variables is < 0.05, indicating a significant relationship between age and problems faced by using digital payments. The statements such as Poor internet showing p-value 0.000036, transaction takes too long has

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p-value 0.032, additional charges have p-value 0.002, complicate to use p-value 0.00022, difficult in obtaining help from banks with p-value 0.037 and high cost of internet p-value 0.00029 show the strongest significance, suggesting that certain age groups experience more challenges. However, fear of fraud or hacking has p-value 0.356, worry about the safety with p- value 0.079 does not show significance, meaning age differences do not impact the problems as much. Hence the study suggests that digital payment challenges vary by age and it requires age with specific solutions.

Findings of the study:

The majority 42.3% of digital payment users are aged between 25-35 years.

The majority 58.5% of married women are the largest group adopting digital payments.

Majority 34.6% of the digital payment users belong to Lions town area.

Majority 4.292 weighted score for the aspects relating to reduce the need to carry cash is ranked first. Hence the study finds digital payment system is an easy source of budgetary control by women

A significant association was observed between age and challenges faced. Older users tend to experience more difficulties with security concerns, network issues and transaction failures.

SUGGESTIONS AND CONCLUSION:

Enhancing Security: Financial institutions and digital payment providers should improve security awareness through campaigns emphasizing fraud prevention. Regular workshops and training sessions can build trust among working women users.

Network Stability & Transaction Efficiency: Service providers should focus on improving network stability and reducing transaction failures to boost confidence in digital payments.

User Education: More awareness programs should be conducted for less educated or older users who may find digital payments complex.

Therefore, digital payment systems are becoming an integral part of the financial practices of working women in Thoothukudi. Younger and married women form the largest group of adopters, with convenience, ease of use and the reduced need to carry cash serving as the strongest motivators. At the same time, persistent challenges such as poor internet connectivity, transaction delays, additional charges and limited institutional support continue to affect adoption, particularly among older respondents.

The findings confirm that while digital payments are steadily gaining acceptance, issues of trust, awareness and accessibility remain barriers to widespread use. Strengthening security measures, improving network reliability and offering targeted awareness programs can help overcome these obstacles. By addressing these concerns and tailoring solutions to the needs of

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working women, especially in semi-urban areas, financial institutions and policymakers can foster greater inclusion and empower women to participate more actively in the digital economy.

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