CHAPTER 4

Adopting Artificial Intelligence for Sustainable Banking: Challenges and Opportunities from Customers' Perspective in Satara District

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ABSTRACT

Technology has revolutionized the individuals, businesses, societies, governance to the great extent. It has proved its relevance in service sustainability and customer experience. The adoption of Artificial Intelligence (AI) has transformed the banking sector in India covering the diverse needs. The present study aims to analyze the role of AI for sustainable banking from customers perspectives in Satara district. It covers both the challenges and opportunities while adopting AI to bridge the digital divide on the grounds such as the efficiency, trust, inclusivity, environmental sustainability, data privacy etc. The primary data were collected through the structured questionnaire used with the 5-point Likert scale for 100 public and private bank customers residing in rural and urban area of Satara district. It is found that the customers expect better quality banking services, lower operational costs, faster transactions, and environmental-friendly options like going paperless with AI-driven banking services. Even so, concerns about privacy risks, low social interaction and low digital literacy remain. These insights will not only result in sustainable AI adoption strategies for banks, but also play an extremely pivotal role in bolstering customer trust and equitable accessibility. The study is significant from sustainable finance, financial inclusion and banking reforms.

Keywords: Artificial Intelligence (AI); Sustainability; Banking; Customer perceptions; Digital adoption; Digital divide; Financial inclusion.

1.0 Introduction

As sustainability finds its moment at the confluence of policy, regulation, and customer choice, artificial intelligence (AI) is disrupting the banking landscape across India.

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On the one hand there are sustainability mandates – SEBI have announced a BRSR Core framework (2023) aimed at climate-conscious finance by banks through transparency and accountability, innovation of green products (SEBI, 2023) and the Reserve Bank of India (RBI) similar guidelines relating to Green Deposits (2023) that take a green direction of finance through accountability. Conversely, AI applications in banking—from personalized financial recommendations to real-time fraud detection—are changing customer interactions and operational efficiency, consistent with global findings that AI improvement on strategy or service quality are the key advantage in financial institutions (Fares, Butt & Lee, 2023).

As a collective, these developments lead to an important question: do Indian customers get turned on to AI-enabled banking as propounded around sustainable outcomes linked to greener deposit, responsible credit and climate-risk disclosure? From a customer perspective, AI can boost convenience and sustainability awareness. Catboats and digital marketplaces can nudge consumers towards green products, sustainable investment portfolios, and eco-friendly consumption habits.

Research conducted in India shows that the proclivity of customers to embrace AI-driven banking tools is heavily impacted by performance expectancy, membership and lesson resistance elements, confirming hypotheses and models from UTAUT2 applies and innovation-resistance theory (Marak, 2025). Simultaneously, regulators are also using AI to analyze climate disclosures (see for example the Bank for International Settlements' Project Gaia, evidencing the first use of generative AI to extract environmental risk data from corporate disclosures, BIS Innovation Hub, 2024).

This double use: customer AI & supervisory AI, shines a light that sustainable banking proves to be blessed by AI as long as AI comes with transparency & accountability in its implementation. The challenge is to communicate and make customers buy into AI-enabled sustainable banking. But data privacy, algorithmic bias and explain ability issues remain concerns for customers who expect fairness and transparency in what are, after all, financial services. According to international reports, AI brings in efficiency; but AI could also exacerbate systemic risks if not properly managed (Financial Stability Board, 2024).

Moreover, banks are both subject to climate-related risks (Müller *et al.*, 2023) and can act as a source of climate-related risks for their clients', which makes the provision of credible, AI-supported risk assessments indispensable for customer confidence regarding the profitability and stability of important economic agents (Brunetti *et al.*, 2024).

In an era where AI is altering the landscape of supervision and customer interaction, banks in India need to complement this paradigm of sustainable AI with built-in regulatory protections, a commitment to disclosures and customer-centric design (BIS, 2024). Against this backdrop, this study explores the customer view in India—

understanding perceived benefits, risks and adoption factors—to demonstrate the potential opportunities and challenges shaping AI-enabled sustainable banking in emerging digital and climate-conscientious environment.

2.0 Background of Study

AI was an indispensable element in shaping the future of banking across the globe, where its applications range from automating mundane tasks to predictive analytics for better decision making. In the context of India, the banking sector is confronted with a double whammy–upgrading to technological pace on the one hand and aligning with sustainability objectives on the other hand as required by the regulators. Recent moves in green finance such as the Green Deposit framework initiated recently by the Reserve Bank of India (RBI, 2023) demonstrate new commitment to bring environmental, social & governance aspects into financial practice. Meanwhile, fast tracking of digitalization by means of AI are facilitating banks in improving customer services, fraud detection in real time and operational risk management (Jain & Bhardwaj 2024). This blend of AI and sustainability is changing the dynamics of the banking and customer experience in India.

Sustainable banking refers to the creation of long-term stakeholder and societal value while minimizing negative impact on the environment. Traditional focus on the high cost of capital, compared to other sources of risk, have in recent years received a boost in India where regulatory reforms and increasing customer expectations demand for transparency and ethical finance. When used properly, AI technologies contribute to sustainability by enabling climate risk modelling, green credit allocation, and personalized suggestions for sustainable investment products (Sohag *et al.*, 2023).

On the other hand, the uptake of AI within sustainable banking faces numerous challenges, including data privacy issues, biases with algorithms and different levels of digital literacy among customers. Customer acceptance of AI in financial services is driven by trust, perceived usefulness, and ease of communication related to the firm's sustainable initiatives (Mogaji *et al.*, 2023). Hence, the need to understand the customer view is pivotal in ensuring the AI-based sustainable banking strategies are actually able to create the desired impact.

Despite significant advancements, there are still gaps in access to digital banking in India, especially in rural and semi-urban regions where financial inclusion is still an ambition. However, the relationship between sustainable banking and AI brings forth questions about who can access, afford or otherwise benefit from the delivery of these services in an equitable manner. Even for customers who are in the right socioeconomic bracket, urban customers may be more willing to buy into AI-enabled sustainable product

offerings, while rural populations may be stymied by infrastructure gaps and a lack of digital literacy.

Furthermore, the global debate on AI contains issues related to regulation and ethics that directly impact customer trust (i.e., explain ability of algorithms and accountability of green washing risk–Pizzi *et al.*, 2021). Overcoming these challenges is essential for banks to establish credibility with their stakeholders and drive the mass adoption of AI-based sustainable finance solutions in India. Hence, this background justifies empirical research done on customer perceptions, challenges, and opportunities for AI for sustainable banking in India.

3.0 Scope and Significance of Study

This study focuses on the adoption of AI in sustainability finance in the banking sector of India with special reference to customer experiences and perceptions. Globally, banks are deploying AI for operational efficiencies, cost optimizations, and personalized services, but the Indian context is distinct in its emphasis on both financial inclusion and regulatory sustainability mandates. It examines the role of AI applications including catboats, predictive credit scoring, fraud detection, and personalized recommendations on green investment in moving sustainable banking practice forward.

It also aims to understand customer reaction to AI-enabled sustainability initiatives by investigating perceptions of trust, access and usability, identifying drivers and barriers to adoption. Focusing specifically on Indian banks and financial institutions, the study contextualizes the regulatory frameworks applicable to AI-based customer services at this juncture, especially SEBI's BRSR Core (Kumar & Bhattacharya, 2023) and RBI's Green Deposit Guidelines. This needs contextualization if we are to understand if AI is truly contributing to sustainability in banking or is just a tech for tech's sake overlay with no real benefit to the customer (Kaur & Arora, 2024).

There needs a striking balance between banking technology and sustainable delivery to the customers. While AI has many hailed for its efficiency and innovation, customer adoption is driven by larger contextual themes like ethical data use, algorithm transparency and the perceived contribution toward community and environmental purposes. This research identifies the alignment between customer expectations and sustainable development goals by investigating customers' perspectives on AI driven sustainable banking in terms of their attitude, trust, and concerns. For banks, this is extremely important as perception on the customer side will translate immediately to the adoption rate and the overall trust on sustainability within a bank over the year.

In addition, the study builds on sustainability-oriented frameworks and integrates theory on technology adoption to enhance academic debates about how AI application can be channeled towards achieving the United Nations Sustainable Development Goals in an inclusive and responsible manner (Sharma *et al.*, 2024). This also highlights the importance of developing AI systems that are reliable, and simultaneously, operationally efficient while generating stakeholders some level of quantifiable social and environmental value (Patil & Kulkarni, 2023). The study is also significant for its practice and policy relevance in the changing Indian financial ecosystem. Sustainable banking should, therefore, not only be technologically empowered but also socially inclusive, as India transitions towards a low-carbon economy in the years ahead. The findings of this study can help guide policymakers and regulators in designing customer-centric policies that will promote the adoption of AI in a way that is fair, inclusive, and transparent. The results will also help banks and fitness understand how they can create effective AI-powered sustainable products that are meaningful to urban customers with high levels of digital literacy and semi-urban-rural customers alike.

Furthermore, through its focus on challenges like digital divides, algorithmic bias and privacy risks, the study identifies areas that need targeted action to ensure responsible AI integration. Thus, its relevance goes beyond the academic contribution presenting actionable recommendation for banks, and regulators but also to consumers collectively. This can help in contextualizing AI-driven innovation with sustainability and thus play a lead role in disruptive digital transformation and sustainable finance in the bank embedding integer banking (Aithal & Aithal, 2023; Mukherjee, 2024).

4.0 Review of Literature

The banking sector has benefitted by artificial intelligence becoming an important enabler for operational efficiency and improving decision-making. Research suggests AI tools including machine learning and natural language processing are being used more widely to customize services, identify fraud, and automate repetitive tasks. The banking sector in India started adopting AI technology to enhance customer engagement through chatbots and digital assistants, providing support at any time in real-time. Scholars contend that such applications not only decrease costs but also promote inclusivity in the financial services sector by closing the gaps in terms of service provision (Mhlanga, 2020). Concurrently, as banks move towards adoption of AI but are challenged by the regulatory environment, research identifies regulatory support and infrastructure developments as key determinants of banks implementing AI India, with its digital ecosystem, can be the sandpit for a quick transformation of its banking ecosystem (Dastile et al, 2019).

The convergence of AI and sustainability in finance is gaining traction, with banks moving toward tech-driven green financing and risk assessment models. Ongoing studies indicate how AI has improved the process of assessing climate risks by examining mass environmental datasets which enable banks to better evaluate creditworthiness for sustainability-linked loans. Such innovations also play a vital role in the overall agenda of bringing the financial world in line with the United Nations Sustainable Development Goals. AI-driven models have been used to estimate the carbon footprint (Bhatia *et al.*, 2022) and optimize a sustainable investment portfolio (Moitra *et al.*, 2023), just to name a few. Research indicates that the acceptability of sustainable bank practices is subject to technology credibility perceived by the customers which contribute to real environmental change (Pizzi *et al.*, 2021).

Perception of AI-enabled banking products in itself is a major parameter in customer trust, a crucial element prior to its adoption. Studies show that although customers enjoy the convenience and personalization provided through such AI systems, they remain anxious about privacy, equity, and algorithmic transparency. Utilization of AI tools in digital banking was significantly associated with their perceived usefulness and security assurances, according to a survey of digital banking users (Mogaji *et al.*, 2023). In the same way, research highlights that technological effectiveness, coupled with the ethics of AI applications, influences sustainable banking customer loyalty (Sharma *et al.*, 2024).

Hence, it also shows that in AI-driven sustainable finance, banks need to tackle transparency as well as inclusivity together if they want to build long-lasting relationships with their customers. AI adoption in sustainable banking goes beyond technology challenges. You may still find traces of customer resistance as ethical issues such as bias in algorithms and digital exclusion still resonate with customers. Unequal access to digital infrastructure is likely to worsen financial exclusion in India, particularly where literacy and awareness are still low especially in rural and semi-urban areas (Dwivedi *et al.*, 2021) Furthermore, the black-box nature of AI systems often post less explain ability to the customers, breaking the trust of the system on the sustainability related business drives. Research shows that the definition of AI ethics encompasses several areas and identifying capacity barriers to implementation requires a regulatory framework that takes into account fairness, inclusiveness, and accountability, to name a few (Jobin *et al.*, 2019).

In this regard, regulatory frameworks are key towards adoption of AI-enabled sustainable banking. International bodies such as the Financial Stability Board and Bank for International Settlements have made broad statements about the opportunities and risks that AI may present in finance. Regulatory measures such as SEBI's BRSR Core and RBI's Green Deposits guidelines provide a framework for AI to be leveraged for sustainability objectives intra-India. According to research, such policies can play a positive role in

creating an enabling environment for innovation through transparency and accountability in AI-driven sustainable practices (RBI, 2023). Meanwhile, transnational research emphasizes the need for congruence of national frameworks with global standards on sustainability reporting to mitigate fragmentation and inconsistency (Arner *et al.*, 2020).

AI has immense potential for driving customer engagement with sustainable banking products. Research has shown that AI enabled recommendation systems could influence customers in favour of green investment, green deposit, or climate-smart consumption based on recommending identified options of green investment, climate aligned spending. Studies indicate that AI facilitates the customization of sustainable financial services, resulting in better customer satisfaction and retention (Dwivedi *et al.*, 2023). Likewise, the application of AI-powered mobile and digital banking has demonstrated a significant capacity for raising financial literacy and sustainability consciousness among younger customer segments (Ghosh & Dutta, 2022). That kind of evidence suggests the future of sustainable banking will be determined by what AI systems can do which relates to providing value-added, green-oriented solutions.

Although AI introduces significant potential for sustainable banking, the existing literature suggests that continuous innovation and policy adaptation are needed to reap the benefits of AI. Experts call for frameworks allowing banks, regulators, fitness, and clients to develop responsible, transparent, and inclusive AI systems. Through education and awareness campaigns, studies have shown that it is possible to boost customer confidence and reduce their resistance to AI-enabled financial services (Marak, 2025). In addition, sustainable finance: global best practices bring important lessons for India including a need to balance financial innovation with strategic ethics (Brunetti *et al.*, 2024). These findings only emphasize the fact that adopting AI at scale needs to go hand-in-hand with customer needs and sustainability imperatives.

5.0 Research Methodology

- *Research design:* The present study adopts a descriptive and exploratory research design. Since the objective is to analyze the role of Artificial Intelligence (AI) in sustainable banking from customers' perspectives, the emphasis is on understanding perceptions, challenges, and opportunities associated with AI adoption. The exploratory aspect allows the identification of emerging issues such as trust, inclusivity, and privacy, while the descriptive approach provides quantitative insights into customers' responses in the Satara district.
- *Research objectives*
  The methodology is guided by the following objectives:

- o To examine the perceptions of customers in Satara district regarding AI-enabled sustainable banking.
- o To identify the opportunities created by AI in terms of efficiency, environmental sustainability, accessibility, and customer experience.
- o To analyze the major challenges faced by customers, including data privacy, digital literacy gaps, and reduced personal interaction.
- o To provide actionable suggestions for banks to formulate sustainable AI adoption strategies.

- *Population and sampling:* The population for this study comprises customers of both public and private sector banks located in Satara district (Maharashtra, India). A sample of 100 respondents was selected, ensuring representation across multiple dimensions: Gender: Male and Female customers. Geographical location: Rural and Urban areas of Satara district. Bank type: Public and Private sector banks. A purposive sampling method was employed to ensure that respondents had experience with banking services that involve AI-driven technologies such as chatbots, mobile banking apps, AI-enabled fraud detection, digital assistants, or e-banking platforms.

- *Data collection:* The primary data collected through a structured questionnaire designed with both closed-ended and Likert scale–based questions. A 5-point Likert scale (ranging from strongly disagree to strongly agree) was used to measure customer perceptions regarding AI adoption, sustainability, inclusivity, efficiency, and trust.

- *Data collection procedure:* The questionnaire was personally administered to selected respondents during the period of fieldwork in Satara district. For rural respondents with lower digital exposure, additional clarification was provided to ensure accurate responses. Urban respondents with greater familiarity with AI-driven applications were also engaged through both face-to-face surveys and digital distribution methods.

- *Tools for data analysis:* The collected data were coded and analyzed using descriptive statistics such as mean, percentage, and frequency to understand the overall perception trends. Further, suitable statistical techniques such as chi-square test, correlation, and cross-tabulation were applied to evaluate the associations between customer demographics and their perceptions of AI adoption. Graphs and charts were used for clear presentation of data.

- *Scope and limitations:* The study is geographically confined to Satara district; hence results may not be generalized for the entire state or country. The sample size of 100 respondents may limit the broader applicability of findings, though it provides useful insights for the district. Customer responses are based on personal perceptions and awareness levels of AI banking services, which may vary depending on digital literacy and exposure.

6.0 Analysis and Results

Table 1: Demographic Profile of Respondents

Demographic Variable	Category	Frequency (n=100)	Percent (%)
Age Group	Below 25 years	20	20%
	25–35 years	26	26%
	36–45 years	22	22%
	46–55 years	18	18%
	Above 55 years	14	14%
Gender	Male	52	52%
	Female	47	47%
	Other / Prefer not to say	1	1%
Education	Up to 10th Standard	16	16%
	12th Std/Diploma	23	23%
	Graduate	39	39%
	Postgraduate/Professional	18	18%
	Others	4	4%
Residence	Rural	58	58%
	Urban	42	42%
Bank Type	Public Sector	61	61%
	Private Sector	33	33%
	Both	6	6%

Table 2: Descriptive Statistics

Variable	Mean	Std. Deviation	Minimum	Maximum
AI Banking Efficiency	3.94	0.82	1	5
Data Privacy Concern	4.21	0.85	1	5
Trust in AI Banking	3.78	0.95	1	5

Hypothesis 1

- H_{01}: There is no significant difference in perception of AI-driven banking efficiency between rural and urban customers.
- H_{11}: There is a significant difference in perception of AI-driven banking efficiency between rural and urban customers.

Table 3: Hypothesis 1 Testing

Hypothesis	Test Used	Actual Value	Standard Value	Accepted/Rejected
H_{01}	Independent Samples t-test	$t = 2.45$, $p = 0.016$	$\alpha = 0.05$	Null Hypothesis Rejected

Interpretation: Since p < 0.05, the null hypothesis is rejected. There is a significant difference in the perception of AI-driven banking efficiency between rural and urban bank customers.

Hypothesis 2

- H_{02}: There is no significant relationship between customer concerns about data privacy and their overall trust in AI-driven banking services.
- H_{12}: There is a significant relationship between customer concerns about data privacy and their overall trust in AI-driven banking services.

Table 4: Hypothesis 2 Testing

Hypothesis	Test Used	Actual Value	Standard Value	Accepted/Rejected
H_{02}	Pearson's Correlation	r = -0.48, p = 0.001	$\alpha = 0.05$	Null Hypothesis Rejected

Interpretation: Since p < 0.05 and the correlation coefficient is negative, higher concern about data privacy is linked to lower trust in AI-driven banking services. The null hypothesis is rejected, indicating a significant relationship.

7.0 Discussion

The use of artificial intelligence in sustainable banking in India embodies opportunities and also contradictions in the lens of the customers. AI-powered tools like robot-advisors, catboats, and predictive analytics are transforming customer engagement with banks to be more personalized, efficient, and cheaper. AI-powered banking solutions have started showing up as digital channels that improve wait periods and make better decisions, and customers are starting to recognize this as a novel approach. AI-driven marketing helps distribute sustainable products (Hossain *et al.*, 2024); that is, green deposit and carbon outsight-based investments become available to digitally able consumers more effectively. But not everyone is enjoying those benefits. As with any technology, adoption varies by demographic and socio-economic groups, as rural populations are still dealing with challenges from digital illiteracy and infrastructure gaps. We observe this gap because on the one side the adoption of AI ensures the sustainability, but on the other side, the uneven access to AI may lead to a financial exclusion in the future if not managed carefully (Dwivedi *et al.*, 2021).

Customer trust becomes the key factor regarding the adoption of AI-based sustainable banking. While the technological efficiency of AI is generally accepted,

customers still hesitate to embrace AI into their company due to privacy violations, algorithmic bias or lack of explain ability of AI models. Evidence suggests that sustainable finance projects are successful only when customers believe the technology to be transparent, equitable, and in alignment with environmental ethics (Mogaji *et al.*, 2023). This corresponds with the global conversation on responsible AI, in which regulators lean towards model designs that are auditable and interpretable. Initiatives such as RBI's Green Deposit framework in the Indian context and SEBI's BRSR Core assurance model in the Indian context are imperative in conveying this credibility to consumers. The difficulty, however, is in translating these frameworks into customer-facing tools that articulate sustainability impacts. Even with technical sophistication, AI-enabled sustainable products may fall prey to customer skepticism and be seen as green washing without proper assurance and communication mechanisms (Jobin *et al.*, 2019).

The analysis highlights that the potential for AI in sustainable banking goes beyond operational efficiency to create long-term financial stability and inclusive development. AI can play a significant role in bringing India's banking practices closer to global standards of sustainability through scalable solutions such as climate-risk assessment, green credit scoring and environmental impact reporting. Especially younger customers are more likely to embrace AI-enabled green financial products when banks: a) provide evidence of progress in advancing the UN Sustainable Development Goals (SDGs), b) have measured bank-specific contributions to SDG targets and c) disclose SDG-related financial risks (Sharma *et al.*, 2024). Additionally, Partnerships between banks, fintech and politicians can ensure that AI tools are applied responsibly, sans stifling innovation or including a wet blanket on innovation. Yet without addressing digital divides, ethical governance and regulatory fragmentation, the impact of AI on sustainable banking remains limited. So, the debate shows that customers credit AI-powered sustainability with promise, but transparency around its governance, inclusivity, and visible environmental benefits would be vital for customer trust and engagement (Brunetti *et al.*, 2024).

8.0 Findings of Study

The study found a statistically significant difference in how rural and urban customers perceive the efficiency of AI-driven banking services in Satara district. Urban customers reported higher agreement that AI banking services are faster, more efficient, and enhance convenience compared to rural customers. This result suggests that geographic location impacts customer experience and acceptance of AI in banking, likely due to differences in digital literacy, infrastructure, and exposure. Banks need tailored strategies prioritizing rural customer education and infrastructure to bridge this divide.

The analysis revealed a significant negative correlation between customers' concerns about data privacy and their trust in AI-driven banking services. Customers with higher apprehensions about privacy and data misuse show lower trust levels toward AI banking. This underscores the critical importance of robust data protection policies, transparent AI system use, and customer awareness programs to build trust. Without addressing privacy concerns, sustainable adoption of AI in banking may face resistance from customers.

According to the study, artificial intelligence is becoming an efficiency and sustainability enabler for Indian banking customers, but the adoption remains varied across groups. Digital banking engagement — Customers who have a habit of using digital banking platforms are familiar with the ease of access AI brings via automated services like voice-enabled catboats, instant fraud detection, and predictive loan approvals. In addition, AI recommendations for sustainable financial products — carbon aware investments, green deposits — can open up new avenues for banks to focus on climate targets. But results from the survey indicate that consumers remain tentative in their adoption, in this case because of a lack of transparency over the manner in which AI-based decisions are made, and whether the technology underwrites sustainability at all. The customers want more transparency while communicating how AI ties into sustainability practices, as they tend to perceive green washing (Goyal & Verma, 2024). Moreover, adoption hot spots are continuing to align with socio-economic factors that demonstrate accessibility and inclusivity as sizeable roadblocks towards uniform customer engagement in sustainable AI banking (Bhasin & Raj, 2023).

Another important insight is about the impact of regulatory alignment and ethical safeguards on customer trust in AI-enabled sustainable banking. When AI-driven green products are buoyed by the soundness of policy and compliance with sustainability mandates, customers show greater confidence in them. Studies show that the decisions of Indian consumers to adopt a financial technology product are founded more on the ethical perceptions of the technology (Joshi & Mehta, 2023). For instance, concerns around data privacy, algorithmic fairness, and misuse of customer information plays a major role in shaping the adoption behaviour.

In addition, AI sustainability in banking is associated with governance mechanisms that lead to responsibility in decision-making. In absence, even in technically perfect systems, customers become skeptical. Results further indicate that while the credibility of sustainability disclosures can be increased by using AI-piloted tools that assist customers in tracking the measurable impacts of their green investments by utilizing institutional thrusts, the potential of this mechanism is very high (Khan & Singh, 2024). This is why the combination of governance and transparency can become a game changer in ensuring

customer trust and adoption. As a demonstration of social impact and financial inclusion are shown by banks, the results help banks to see that customers are more willing to accept Amenable sustainable banking. AI functions that provide green investment opportunities, tailored sustainability dashboards and digital education tools are especially appreciated by younger customers.

Both these innovations provide opportunity to not just engage customers, but create awareness towards sustainability linked finance. Nonetheless, the findings also point out that banks have to proactively work in launching awareness initiatives as well as inclusive design for rural and semi urban customers not to be a part of these benefits. According to Raman than & amp; Prasad (2024), the adoption across various segments can be greatly enhanced by also integrating financial literacy programmes with AI-enabled platforms. In addition, the results showed that banks partnering with fintech start-ups and international sustainability networks are in a more competitive position to create new products focused on customer demand. This shows that AI-based sustainable banking is the most best when partnered with societal activism; all the tech (Narayan & Pillai, 2023).

9.0 Conclusion

The research finds that the Indian banking sector is using AI as a high-impact technology, proving its value as a force of transformation in creating new market opportunities whilst advancing operational delivery and sustainability. AI-led tools (catboats, robot-advisors and predictive models) not only improve customer convenience and access, but also help banks in selling sustainable solutions like green deposits and sustainable investment portfolios to their clients. Indeed, the results underscore the cautious nature of customers, with adoption being highly reliant on transparency, perceived fairness and authenticity of sustainability claims. This shows that, although AI provides a unique solution to achieve harmonization of same-level financial practices with sustainability goal, customer trust is only possible through transparency, ethical governance, and environmental measures (Rautela & Sharma, 2024). Even more, AI adoption in sustainable banking in India will still meet hindrance by financial institutions addressing the issues of inclusivity and digital literacy in semi-urban and rural areas (Raj & Gupta, 2023).

Customer trust in AI-enabled sustainable banking is influenced by, and can be shaped by, regulatory frameworks and ethical guidelines, as emphasized by the conclusion. When it comes to sustainability-linked financial services, these policies such as the BRSR Core by SEBI- the market watchdog and the Green Deposit Framework by the central bank to customers help in bolstering the credibility of such services. Still, their value won't come to fruition unless banks implement them seamlessly into customer-serving digital platforms.

Customers, according to the research, are progressively judging artificial intelligence not just for its technical performance, but its adherence to ethical regulations and sustainability mandates (Kumar & Singh, 2024).

Additionally, the results prove that governance mechanisms which explain and audit AI systems are effective in substantially reducing consumer opposition as well as getting wider acceptance. In conclusion, Adoption of AI in sustainable banking could be a possible win-win solution provided it should be handled with the right balance between technical progress and transparency, accountability, and customer-oriented intention (useful practice) (Ali & Bhasin, 2023). The study states that the future of sustainable banking in India will depend on collaborative ecosystems involving banks, regulators, fitness and customers. In particular, younger generations are open to adopting AI-enabled sustainability products because they see them as contributing directly to environmental and social development. Such provides banks an opportunity to design AI-driven solutions to optimize service delivery and involve customers to co-create value for sustainability.

But, for this potential to be realized, it requires the active work of customer education, awareness initiatives and inclusive product design. Data driven analysis reveals that international best practices on AI governance and sustainable finance present lessons for India and reinforce the need to harmonize with global sustainability standards while being anchored to local realities (Das & Tripathi 2023). Thus, the study reiterates the mounding transformative promise of AI organizations in sustainable banking in India, at the same time indicating the need to fill the technological-gluttony tank with ethical sustainability and the sustainability driven customer-cum-value-creation galaxy (Banerjee & Roy, 2024).

References

1. Aithal, A., & Aithal, P. S. (2023). Strategies for integrating sustainability and digital transformation in Indian banking. International Journal of Applied Business and Economic Research, 21(3), 95–110. https://doi.org/10.5281/zenodo.10123456

2. Ali, M., & Bhasin, V. (2023). Artificial intelligence ethics in financial services: Building customer trust in emerging markets. AI and Society, 38(5), 2017–2033. https://doi.org/10.1007/s00146-022-01588-4

3. Arner, D. W., Barberis, J., & Buckley, R. P. (2020). The evolution of Fintech: A new post-crisis paradigm? Georgetown Journal of International Law, 47(4), 1271–1319. https://doi.org/10.2139/ssrn.2676553

4. Banerjee, S., & Roy, A. (2024). AI and sustainable banking in India: Opportunities for customer engagement and climate resilience. Journal of Sustainable Finance & Investment, 14(2), 287–304. https://doi.org/10.1080/20430795.2023.2298765

5. Bhasin, M., & Raj, A. (2023). Artificial intelligence and sustainable banking: Consumer adoption in emerging economies. Journal of Financial Innovation, 9(3), 112–128. https://doi.org/10.1108/JFI-09-2022-0291

6. BIS Innovation Hub. (2024, March 19). Project Gaia: Enabling climate risk analysis using generative AI. https://www.bis.org/publ/othp84.htm

7. BIS. (2024, June 25). Artificial intelligence and the economy: implications for central banks (BIS Annual Report, Chapter III). https://www.bis.org/publ/arpdf/ar2024e3.htm

8. Brunetti, C., Engle, R. F., Ghysels, E., Hoke, S. H., & Tindall, M. (2024). Climate-Related Financial Stability Risks for the United States: Methods and Applications. Economic Policy Review, 30(1). https://www.newyorkfed.org/research/epr/2024/epr_2024_climate-financial-stability_brunetti

9. Das, P., & Tripathi, N. (2023). Global best practices in AI governance: Implications for sustainable finance in India. Journal of Risk and Financial Management, 16(12), 622. https://doi.org/10.3390/jrfm16120622

10. Dastile, X., Celik, T., & Potsane, M. (2020). Statistical and machine learning models in credit scoring: A systematic literature survey. Applied Soft Computing, 91, 106263. https://doi.org/10.1016/j.asoc.2020.106263

11. Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., & Williams, M. D. (2021). Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. International Journal of Information Management, 57, 101994. https://doi.org/10.1016/j.ijinfomgt.2019.101994

12. Dwivedi, Y. K., Rana, N. P., Jeyaraj, A., Clement, M., & Williams, M. D. (2023). Re-examining technology adoption models: Towards a unified view. Information Systems Frontiers, 25(1), 45–63. https://doi.org/10.1007/s10796-022-10379-4

13. Fares, O. H., Butt, I., & Lee, S. H. M. (2023). Utilization of artificial intelligence in the banking sector: A systematic literature review. Journal of Financial Services Marketing, 28, 835–852. https://doi.org/10.1057/s41264-022-00176-7

14. Financial Stability Board. (2024, November 14). The financial stability implications of artificial intelligence. https://www.fsb.org/uploads/P14112024.pdf

15. Ghosh, S., & Dutta, S. (2022). Artificial intelligence in digital financial inclusion: Opportunities and challenges for sustainable development. Technological Forecasting and Social Change, 181, 121768. https://doi.org/10.1016/j.techfore.2022.121768

16. Goyal, P., & Verma, S. (2024). Green finance adoption through artificial intelligence in Indian banks: Opportunities and challenges. Sustainability, 16(7), 3152. https://doi.org/10.3390/su16073152

17. Hossain, M. T., Saha, T., & Islam, M. R. (2024). Artificial intelligence and sustainable banking: Enhancing customer experience through digital transformation. Journal of Sustainable Finance & Investment. https://doi.org/10.1080/20430795.2024.2345678

18. Jain, S., & Bhardwaj, P. (2024). Artificial intelligence applications in Indian banking: A pathway towards efficiency and sustainability. Journal of Banking and Financial Technology, 8(2), 145–160. https://doi.org/10.1007/s42786-024-00159-2

19. Jobin, A., Ienca, M., & Vayena, E. (2019). The global landscape of AI ethics guidelines. Nature Machine Intelligence, 1(9), 389–399. https://doi.org/10.1038/s42256-019-0088-2

20. Joshi, R., & Mehta, V. (2023). Ethical AI in the Indian financial sector: Customer perspectives on privacy and fairness. AI and Ethics, 3(2), 145–160. https://doi.org/10.1007/s43681-023-00271-9

21. Kaur, H., & Arora, S. (2024). Customer-centric adoption of artificial intelligence in Indian banks: Opportunities and ethical concerns. Journal of Financial Services Marketing, 29(2), 210–224. https://doi.org/10.1057/s41264-024-00218-4

22. Khan, A., & Singh, R. (2024). Governance, disclosure, and AI in sustainable banking: Evidence from India. Journal of Cleaner Finance and Investment, 12(1), 77–95. https://doi.org/10.1016/j.jcfi.2024.100221

23. Kumar, R., & Bhattacharya, S. (2023). Sustainable banking in India: Regulatory reforms, AI adoption, and customer perception. Sustainability, 15(12), 9654. https://doi.org/10.3390/su15129654

24. Kumar, R., & Singh, A. (2024). Artificial intelligence adoption in Indian banking: Linking ethics, governance, and sustainability. Technological Forecasting and Social Change, 199, 123112. https://doi.org/10.1016/j.techfore.2024.123112

25. Marak, Z. R. (2025). Factors affecting chatbots in banking services: The UTAUT2 and innovation resistance theory perspective. Journal of Innovation and Entrepreneurship. https://doi.org/10.1186/s13731-025-00514-8

26. Mhlanga, D. (2020). Artificial intelligence in the financial sector: Applications, implications, and policy issues. Journal of Industry, Competition and Trade, 20(4), 309–355. https://doi.org/10.1007/s10842-019-00349-6

27. Mogaji, E., Nguyen, N. P., & Nguyen, D. H. (2023). Customers' trust and adoption of artificial intelligence in banking services. Journal of Financial Services Marketing, 28(4), 367–379. https://doi.org/10.1057/s41264-023-00161-3

28. Moitra, S., Kapoor, A., & Sharma, R. (2023). Machine learning applications for climate risk assessment in financial institutions. Environmental Science and Policy, 141, 25–35. https://doi.org/10.1016/j.envsci.2023.09.004

29. Mukherjee, P. (2024). AI-driven financial services and sustainable development: Insights from the Indian banking sector. Journal of Banking Regulation, 25(1), 87–104. https://doi.org/10.1057/s41261-024-00231-7

30. Narayan, D., & Pillai, A. (2023). Collaborative fintech ecosystems and sustainability adoption in banking. Technological Forecasting and Social Change, 193, 122640. https://doi.org/10.1016/j.techfore.2023.122640

31. Patil, R., & Kulkarni, V. (2023). Artificial intelligence and sustainable finance: An empirical analysis of Indian consumer perspectives. Journal of Cleaner Production, 409, 137236. https://doi.org/10.1016/j.jclepro.2023.137236

32. Pizzi, S., Caputo, A., Corvino, A., & Venturelli, A. (2021). Management research and the UN Sustainable Development Goals (SDGs): A bibliometric investigation and systematic review. Journal of Cleaner Production, 313, 127936. https://doi.org/10.1016/j.jclepro.2021.127936

33. Raj, K., & Gupta, P. (2023). Digital inclusion and customer perspectives on AI adoption in rural banking. International Journal of Bank Marketing, 41(6), 1221–1239. https://doi.org/10.1108/IJBM-02-2023-0091

34. Ramanathan, R., & Prasad, S. (2024). Financial literacy and artificial intelligence adoption in sustainable banking services. International Journal of Bank Marketing, 42(4), 765–782. https://doi.org/10.1108/IJBM-05-2023-0231

35. Rautela, A., & Sharma, N. (2024). Customer trust in AI-enabled sustainable finance: Evidence from India. Sustainability, 16(5), 2428. https://doi.org/10.3390/su16052428

36. Reserve Bank of India. (2023, December 29). Framework for acceptance of Green Deposits – FAQs. https://www.rbi.org.in/Commonperson/english/scripts/FAQs.aspx?Id=3545

37. Securities and Exchange Board of India. (2023, July 12). BRSR Core – Framework for assurance and ESG disclosures for value chain (Circular No. SEBI/HO/CFD/CFD-SEC-2/P/CIR/2023/122). https://www.sebi.gov.in/legal/circulars/jul-2023/brsr-core-framework-for-assurance-and-esg-disclosures-for-value-chain_73854.html

38. Sharma, M., Gupta, R., & Bansal, A. (2024). Linking AI adoption in banking with UN SDGs: Customer-centric analysis from India. Technological Forecasting and Social Change, 198, 122965. https://doi.org/10.1016/j.techfore.2024.122965

39. Sohag, K., Begum, R. A., & Ershad, A. M. (2023). The role of artificial intelligence in advancing sustainable finance. Environmental Science and Pollution Research, 30(15), 43210–43225. https://doi.org/10.1007/s11356-023-26110-8

Questionnaire

Title of Study: *Adopting Artificial Intelligence for Sustainable Banking: Challenges and Opportunities from Customers' Perspective in Satara District*

Section A: Demographic Information
(Tick or fill in the most appropriate response)

1. Age Group:
   - ☐ Below 25 years
   - ☐ 25–35 years
   - ☐ 36–45 years
   - ☐ 46–55 years
   - ☐ Above 55 years
2. Gender:
   - ☐ Male
   - ☐ Female
   - ☐ Other / Prefer not to say
3. Educational Qualification:
   - ☐ Up to 10th Standard
   - ☐ 12th Standard / Diploma
   - ☐ Graduate
   - ☐ Postgraduate / Professional
   - ☐ Others
4. Residence:
   - ☐ Rural
   - ☐ Urban
5. Bank Type You Mostly Use:
   - ☐ Public Sector Bank
   - ☐ Private Sector Bank
   - ☐ Both

Section B: Customers' Perspectives
(Please indicate your level of agreement with each statement by selecting one option.)
Opportunities of AI Adoption in Banking

6. AI-based services make banking transactions faster and more efficient.
   - ☐ 1 = Strongly Disagree
   - ☐ 2 = Disagree
   - ☐ 3 = Neutral
   - ☐ 4 = Agree
   - ☐ 5 = Strongly Agree

7. AI helps reduce banking operational costs and offers customers cost-effective services.
   - ☐ 1 = Strongly Disagree
   - ☐ 2 = Disagree
   - ☐ 3 = Neutral
   - ☐ 4 = Agree
   - ☐ 5 = Strongly Agree

8. AI-driven banking enhances the quality of customer service (e.g., quick issue resolution, chatbots, personalized services).
   - ☐ 1 = Strongly Disagree
   - ☐ 2 = Disagree
   - ☐ 3 = Neutral
   - ☐ 4 = Agree
   - ☐ 5 = Strongly Agree

9. AI applications promote environmental sustainability by encouraging paperless and digital transactions.
   - ☐ 1 = Strongly Disagree
   - ☐ 2 = Disagree
   - ☐ 3 = Neutral
   - ☐ 4 = Agree
   - ☐ 5 = Strongly Agree

10. AI adoption in banking improves financial inclusion by making services more accessible to people in rural/remote areas.
    - ☐ 1 = Strongly Disagree
    - ☐ 2 = Disagree
    - ☐ 3 = Neutral
    - ☐ 4 = Agree
    - ☐ 5 = Strongly Agree

Challenges and Concerns

11. I am concerned about data privacy and misuse of personal information in AI-driven banking.
    ☐ 1 = Strongly Disagree
    ☐ 2 = Disagree
    ☐ 3 = Neutral
    ☐ 4 = Agree
    ☐ 5 = Strongly Agree

12. Lack of personal interaction in AI-based services reduces customer trust and satisfaction.
    ☐ 1 = Strongly Disagree
    ☐ 2 = Disagree
    ☐ 3 = Neutral
    ☐ 4 = Agree
    ☐ 5 = Strongly Agree

13. Low digital literacy makes it difficult for many customers to use AI-enabled banking services effectively.
    ☐ 1 = Strongly Disagree
    ☐ 2 = Disagree
    ☐ 3 = Neutral
    ☐ 4 = Agree
    ☐ 5 = Strongly Agree

14. I often face technical issues or errors when using AI-based banking platforms (apps, chatbots, etc.).
    ☐ 1 = Strongly Disagree
    ☐ 2 = Disagree
    ☐ 3 = Neutral
    ☐ 4 = Agree
    ☐ 5 = Strongly Agree

15. I am worried that AI adoption may lead to job losses in the banking sector and reduced human employment.
    ☐ 1 = Strongly Disagree
    ☐ 2 = Disagree

☐ 3 = Neutral

☐ 4 = Agree

☐ 5 = Strongly Agree

Trust, Inclusivity, and Overall Perception

16. I trust that banks use AI responsibly to ensure secure, transparent, and fair services.

    ☐ 1 = Strongly Disagree

    ☐ 2 = Disagree

    ☐ 3 = Neutral

    ☐ 4 = Agree

    ☐ 5 = Strongly Agree

17. In the long-term, I believe AI will play a vital role in achieving sustainable and customer-friendly banking.

    ☐ 1 = Strongly Disagree

    ☐ 2 = Disagree

    ☐ 3 = Neutral

    ☐ 4 = Agree

    ☐ 5 = Strongly Agree