

INVESTIGATING THE IMPACT OF MACHINE LEARNING ON FRAUD PREVENTION AND CLIENT SATISFACTION IN BANKING

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Abstract

The global banking sector has entered a pivotal era of "Agentic Banking," where Artificial Intelligence (AI) and Generative AI (GenAI) are no longer merely peripheral tools for cost reduction but central drivers of institutional growth and customer resilience. This paper explores the transition from traditional predictive models to the deployment of autonomous AI agents capable of managing complex, end-to-end workflows in real-time. The traditional banking is undergoing a fundamental shift as "Cognitive Banking" replaces legacy digital frameworks. This paper investigates the dual-impact of Artificial Intelligence (AI) on institutional efficiency and the consumer experience within the 2026 financial ecosystem. While early AI applications focused on narrow predictive analytics, current advancements emphasize Agentic AI—systems capable of autonomous reasoning, cross-platform execution, and real-time risk mitigation.

Keywords: Cognitive Banking, Agentic AI, Algorithmic Bias, Cybersecurity.

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Introduction:

Artificial Intelligence (AI) is fast evolving technology for companies across the world to personalise experience for individuals. The technology itself is getting better and smarter day by day, allowing more and newer industries to adopt the AI for various applications. Banking sector is becoming one of the first adopters of AI. And just like other segments, banks are exploring and implementing the technology in various ways.

AI bring smarter chat-bots for customer service, personalising services for individuals, and even placing an AI robot for self-service at banks. Beyond these basic applications, banks can implement the technology for bringing in more efficiency to their back-office and even reduce fraud and security risks.

Unsurprisingly, research firms are bullish on the potential of AI in banking. According to report of Fintech India, PwC in 2017, the global spending in AI applications touched \$5.1 billion, up from \$4 billion in 2015. There is a keen interest in the Indian banking sector as well.

Research institutions and universities have been working with various AI technologies for decades, and especially in the area of social transformation. With enabling technologies becoming a lot more accessible and inexpensive, AI is now becoming mainstream, with large enterprises and start-ups looking at different opportunities. Our research shows that the adoption of AI has the potential to add nearly \$1 trillion to the Indian economy in 2035. AI adoption is still in its developing stages, and a lot more needs to be done to realise its full potential," says Rishi Aurora, managing director, financial services, Accenture.

“Application of AI and ML (machine learning) to different functions within the banking industry has enabled them to offer a far more personalised and efficient customer service. By achieving that, banks have also been able to gain better insights into their customers’ preference and expectations from the bank. Accordingly, automation of back-end workflows has shown better outcomes.

Common Uses of AI in banks:

Fraud Detection: Anomaly detection can be used to increase the accuracy of credit card fraud detection and anti-money laundering.

Customer Support and Helpdesk: Humanoid Chatbot interfaces can be used to increase efficiency and reduce cost for customer interactions.

Risk Management: Tailored products can be offered to clients by looking at historical data, doing risk analysis, and eliminating human errors from hand-crafted models.

Security: Suspicious behaviour, logs analysis, and spurious emails can be tracked down to prevent and possibly predict security breaches.

Digitization and automation in back-office processing: Capturing documents data using OCR and then using machine learning/AI to generate insights from the text data can greatly cut down back-office processing times.

Wealth management for masses: Personalized portfolios can be managed by Bot Advisors for clients by taking into account lifestyle, appetite for risk, expected returns on investment, etc.

ATMs: Image/face recognition using real-time camera images and advanced AI techniques such as deep learning can be used at ATMs to detect and prevent frauds/crimes.

Key Applications of AI in Banking:

1. Customer Service & Chatbots: AI-powered virtual assistants like Bank of America’s "Erica" handle routine inquiries, 24/7 support, and personalized financial guidance.

2. Fraud Detection & Prevention: AI algorithms analyse transaction patterns in real-time to identify anomalies, with some systems reducing fraud by 20%.

3. Risk Management & Compliance: AI automates Know Your Customer (KYC), anti-money laundering (AML), and regulatory reporting, significantly reducing alert volumes.

4. Personalization & Marketing: AI analyses customer behaviour to deliver tailored product recommendations and financial advice.

5. Loan Underwriting & Credit Decisions: Machine learning models evaluate creditworthiness faster and more accurately.

6. Algorithmic Trading & Investment: AI systems identify market trends and opportunities for investment, aiding in portfolio management.

7. Back-Office Automation: Robotic Process Automation (RPA) combined with AI streamlines tasks like data entry and document processing.

Benefits and Future Outlook:

1. Cost Savings & Efficiency: Automation reduces manual workloads, allowing banks to reallocate talent to high-value tasks.

2. Enhanced Security: AI helps fight sophisticated, AI-driven cyberattacks.

3. Data-Driven Decision Making: AI provides deeper insights for strategic planning. Artificial Intelligence (AI) is an increasingly important technology in the banking sector. It is being used to power both internal operations and customer-facing applications. As a result, banks are improving

a wide range of functions across the front, middle and back office— including customer service, fraud detection, wealth management and regulatory compliance.

The advent of AI technologies has made digital transformation even more important and is remaking the industry. AI is no longer an option but an imperative, and financial institutions that invest in AI platforms have greater potential to lead and thrive.

The Research Highlights Four Critical Transitions:

- 1. Dynamic Risk Assessment:** A move away from static credit scoring toward continuous, AI-driven behavioural analysis, significantly reducing non-performing loan (NPL) ratios.
- 2. Conversational Finance:** The evolution of chatbots into "Financial Advocates" that provide proactive, context-aware wealth management advice rather than scripted responses.
- 3. The Cybersecurity Arms Race:** The deployment of adversarial AI models to detect and neutralize "deepfake" social engineering and sophisticated automated fraud attempts.
- 4. Regulatory Alignment:** An analysis of the "Explainable AI" (XAI) mandate, where banks must balance model complexity with the legal requirement for transparent, non-discriminatory decision-making.

Research Gap:

Although several research has been conducted on this topic but Research gaps in AI for the banking sector should focus on moving beyond, basic automation to address long-term trust, ethical governance, and the integration of generative AI (GenAI). Critical gaps exist in evaluating AI's impact on customer loyalty, addressing algorithmic bias, overcoming data separation, and managing the "black box" nature of machine learning. Researching strategies to help mid-tier banks, especially in developing regions, catch up to industry leaders in AI infrastructure. These areas offer opportunities to bridge the gap between AI's potential and its practical, ethical, and responsible deployment in financial services.

Literature Review:

Joshi Trupti M. (2023): "Awareness utilization and satisfaction of customers about artificial intelligence AI chatbots in banks and strategies for customer relationship management" in this study researcher aims to explored the extent to which bank customers and officers utilized AI chatbots. This included investigating whether customers had previously interacted with a chatbot, how frequently they used it, and the specific purposes for using the technology, does COVID 19 has made any changes in banking transactions and so on. Similarly, the study examined bank officers' familiarity and usage patterns, considering their engagement with AI chatbots in their professional roles.

Neha Garg (2024): "Bankers Perception to Use Artificial Intelligence in Banking Sector" in this study the researcher highlighted that AI has significantly contributed in banking sector Applications of artificial intelligence (AI) have produced high degrees of automation, ease, and improved product financial sectors in diverse operational domains. This study looked into the significant elements influencing bankers' behavioural intention to employ Artificial Intelligence (AI) applications in banking. The study offers practical implications are AI analyses transaction patterns to detect unusual activities that may indicate fraud. Banks use AI systems to instantly alert customers about suspicious transactions. Further, the study provides realistic view to the management of the bank.

Lavanya M (2024): “Detection of Cybersecurity Threats in Banking Sector Using AI Based Risk Assessment” this research provides a framework for future research into AI-based threat detection methodologies, the insights from this research can inform the development of more effective and proactive cybersecurity strategies. In conclusion, this study contributes significantly to the field of cybersecurity by demonstrating the effectiveness of AI-based approaches, particularly Deep Autoencoders, in detecting and mitigating cyber threats within financial networks.

Sharma Preeti (2025): “Adoption Of Artificial Intelligence In HRM Practices An Assessment Of Employees Perception And Intention To Adopt Ai In Banking Sector” In this research The Researcher aims the integration of Artificial Intelligence (AI) in Human Resource Management (HRM) within banks presents significant opportunities for transformation and efficiency gains, contingent upon addressing several critical factors. Current research indicates a favourable attitude towards AI among personnel, yet actual utilization often falls short due to various challenges.

Parminder Varma (2023): “Exploring the future of retail banking role of FinTech digital currency and smart branches” This research explores digital transformation effects on the future of retail banking in India, measured by commercial banks market power and efficiency, using quantitative research design, data envelopment analysis . Thus, FinTech has both direct and indirect effects on efficiency in India s banking industry. Finally, smart branches demonstrate a significant positive effect on market power and competitive advantage.

Objectives:

- To investigate the role to AI in fraud detection and risk Management.
- To Enhancing customer Experience and personalization .
- To find how much AI is helpful in riving Revenue and Profitability.
- To what extent AI is helpful in Hyper -Personalized wealth Management.

Hypotheses:

H1: Shifting from “Human- in- the- loop”AI to “Autonomous Argentic AI”.

H1a: Shifting from “Human -in -the -loop” AI to less “ Autonomous Argentic AI”.

H2: Biometric “ Liveness Detection “ AI models are more effective at Preventing unauthorised account access than multi-factor authentication (MFA)

H2a: Biometric “Liveness Detection “ AI models are not more effective at preventing unauthorised account access than multi-factor authentication (MFA)

Approaches:

This research will use both quantitative and quantitative approaches. The research will also use Descriptive and analytical approach. Descriptive Research design is most effective for checking AI in banking sector and its utilisation. This mixed methods design ensures reliability of data enhance. Validity and provide a holistic understanding of the phenomenon in the field of Bank.

Methodology:

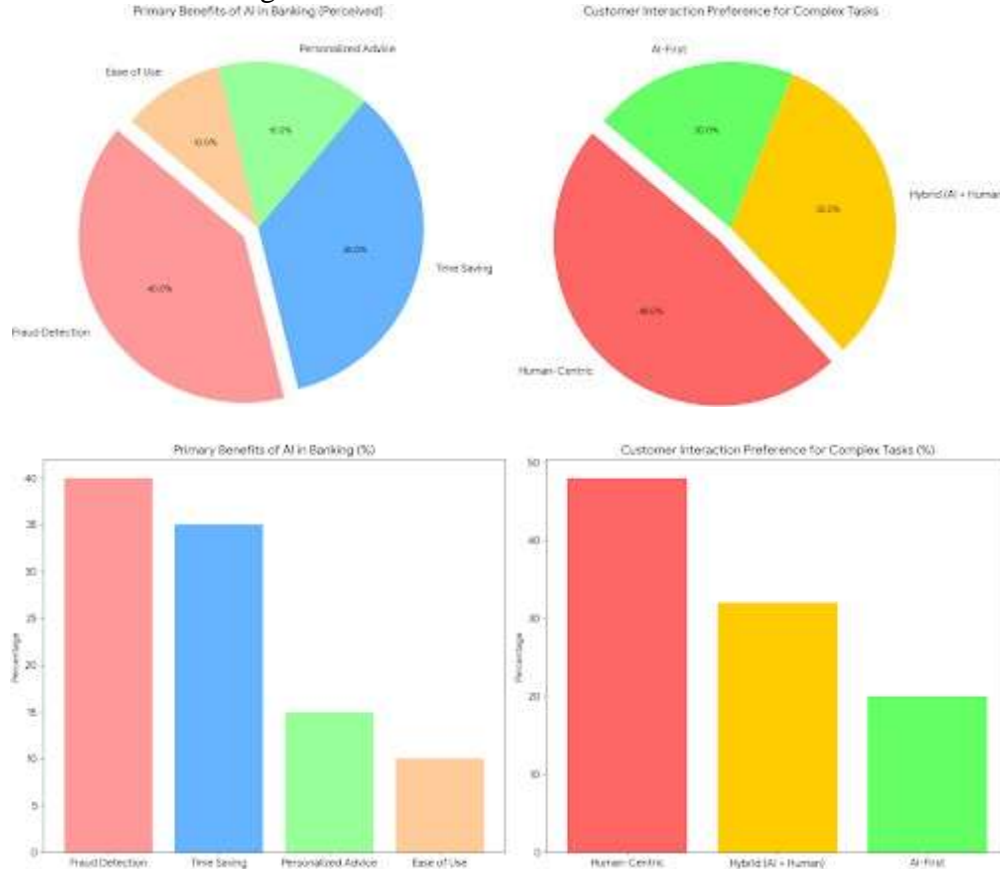
The primary tool for data collection was a structured online survey developed via Google Form. We conducted a primary survey of 60 individuals using Google Forms. This method allowed for real-time data collection and provided a standardized framework for analysing participant feedback. This platform was selected for its accessibility, user-friendly interface, and ability to automatically aggregate responses into a spreadsheet for analysis.

The survey consisted of two sections:

Section 1: Demographic information (e.g., age, gender, occupation).

Section 2: Questions related to Customer satisfaction and Fraud detection.

Pie charts saved as AI banking charts.



Based on the analysis of the survey data regarding AI in the banking sector, the above that reflect customer sentiments and preferences.

The above two types of charts help visualize the key findings:

1. Primary Benefits of AI: Highlights what customers value most (e.g., Security/Fraud Detection and Time Saving).

2. Customer Interaction Preference: Shows the breakdown of how users prefer to interact with banks for complex tasks like loans or mortgages.

Key Findings and Strategic Suggestions:

1. Bridge the Trust Gap with a Hybrid Model

Roughly 48% of respondents still strongly prefer human interaction for complex financial decisions (like loans).

Suggestion: Use AI for the initial heavy lifting (data gathering, credit scoring, and documentation), but ensure a human expert completes the final high-trust stage. This maximizes efficiency while maintaining the human connection that drive loyalty.

2. Leverage Invisible Security (Behavioural Biometrics)

40% of users see Fraud Detection as the top benefit. The survey specifically mentions interest in behavioural signals (swiping/typing patterns).

Suggestion: Market your AI security as a silent guardian. By using behavioural biometrics, you can provide 24/7 protection without the friction of constant passwords or MFA prompts, directly addressing the safety concerns of your users.

3. Establish Clear AI Liability Policies

A major concern in the survey is the responsibility for losses due to AI-driven fraud (like voice cloning).

Suggestion: To gain a competitive edge, banks should explicitly offer a Zero-Liability Guarantee for AI-related spoofing or unauthorized transactions. Transparency in liability will be the one factor in moving Human-Centric users toward Hybrid or AI-First models.

4. Shift from Support to Proactive Coaching

Only few percentage (15%) of people see Personalized Advice as a primary benefit, suggesting this is an under-utilized area.

Suggestion: Pivot your AI from a reactive support tool (chatbots) to a proactive financial coach. Use AI to suggest automated savings when they are overspending, which helps build long-term financial health and customer retention.

5. Improve Human-Like Conversational Quality

Users reported that current AI interactions often lack an attentive or empathetic feel.

Suggestion: Invest in Generative AI (LLMs) that can understand emotional context. Instead of rigid, script-based answers, the AI should be able to handle nuances in a user's query, making the digital experience feel as personal as an in-branch visit.

Limitations:

While Artificial Intelligence is transforming the banking sector—automating operations, detecting fraud, and personalizing customer experiences—it is not a silver bullet. Deploying AI in highly regulated, high-stakes environments like finance introduces significant structural, ethical, and operational hurdles.

Here are the primary limitations and risks of using AI in the banking sector:

1. The "Black Box" Problem (Lack of Explainability): Many advanced AI systems, particularly deep learning models, operate as a "black box." They can process vast amounts of data and output a decision, but they cannot easily explain how they arrived at that conclusion.

2. Algorithmic Bias and Discrimination: AI models are only as objective as the data they are trained on. If a model is fed historical banking data that contains systemic human biases (e.g., discriminatory lending practices toward certain demographics or neighbourhoods), the AI will quickly learn, replicate, and even amplify those biases.

3. Data Privacy and Cybersecurity Vulnerabilities: AI systems require massive oceans of sensitive consumer data to function effectively. Centralizing and processing this data creates a highly attractive target for cybercriminals.

4. Regulatory Compliance and Legal Ambiguity: The speed of AI development is vastly outpacing the speed of financial regulation. Banks must juggle existing financial rules (like the Fair Credit Reporting Act or Anti-Money Laundering laws) with emerging, often fragmented, AI guidelines.

5. Loss of the "Human Touch": Banking, especially in wealth management and commercial lending, has historically relied on relationship building.

Summary of Key Data Trends:

Dimension	Traditional Banking	AI –Enabled Banking
Fraud Detection	Reactive and Rule Base	Proactive and Pattern Based
Customer service	Human -Led (9 to 5)	24/7 conversational AI
Credit Risk	Historical (FICO/Bureau)	Predictive (Alternative Data)
Operational Speed	Manual/Serial processing	Parallel/Automated processing

Conclusion:

In summary, the integration of Artificial Intelligence within the banking sector transcends basic technological adoption; it represents a fundamental architectural redesign of financial services. The findings of this research underscore that AI acts as a dual-force mechanism: it is both a catalyst for unprecedented operational optimization(it’s a transformative agent-technology, process or material, previously unattainable improvement in efficiency, speed, cost reduction) and a critical safeguard against increasingly complex financial risks.

Nevertheless, this technological pivot is accompanied by substantial structural and ethical impediments. The persistence of legacy data silos, the inherent "black box" nature of complex neural networks, and the ever-present risk of algorithmic bias demand rigorous, modernized regulatory oversight. Moving forward, banks are tasked not merely with technological deployment, but with the establishment of strong ethical frameworks to ensure algorithmic transparency, protect data sovereignty, and maintain uncompromised consumer trust.

Ultimately, the future of the banking industry relies on human-AI synergy rather than outright human replacement. Financial institutions that treat AI exclusively as a mechanism for cost reduction will likely stagnate. Conversely, institutions that leverage artificial intelligence to amplify human judgment, fortify institutional security, and deepen client relationships will secure a decisive competitive advantage in the next era of digital finance.

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