Library Progress International
Vol.44 No. 3, Jul-Dec 2024: P. 18729-18738

Print version ISSN 0970 1052
Online version ISSN 2320 317X

Original Article

Available online at www.bpasjournals.com

AI Powered Risk Management: Addressing Cybersecurity Threats in Financial Systems

Mrs. Sonali Soundenkar [a], Dr. Karuna Bhosale [b], Dr. Mayur Dilip Jakhete [c], Prof. Kalyani Kadam [d], Dr. Venu Gopala Rao Chowdary [e], Dr. H. Kanaka Durga [f]

[a] Assistant Professor, Computer Science and Engg., Pimpri Chinchwad University Pune, Maharashtra, India , sonalik15@gmail.com

[b] Assistant Professor, Computer Science and Engg., Pimpri Chinchwad University Pune, Maharashtra, India, karuna.bhosale@pcu.edu.in

[c] Assistant Professor, Computer Science and Engg., Pimpri Chinchwad University Pune, Maharashtra, India, jakhete.mayur@gmail.com

[d] Assistant Professor, Computer Science and Engg., Pimpri Chinchwad University Pune, Maharashtra, India, kalyanikadam9032@gmail.com

[e] Associate Professor, K L Business School, K L Deemed to be University, Andhra Pradesh, India, Email:- drchowdary959@gmail.com

[f] Associate Professor, KL Business School, KLEF Vaddeswaram, Andhra Pradesh, India, Email:- dhy1679@gmail.com

How to cite this article: Sonali Soundenkar, Karuna Bhosale, Mayur Dilip Jakhete, Kalyani Kadam, Venu Gopala Rao Chowdary, H. Kanaka Durga (2024) AI Powered Risk Management: Addressing Cybersecurity Threats in Financial Systems. *Library Progress International,* 44(3), 18729-18738.

ABSTRACT

The increasing sophistication of cybersecurity threats poses substantial risks to financial systems worldwide, making effective risk management essential. This study explores the integration of Artificial Intelligence (AI) in enhancing cybersecurity risk management within financial institutions. AI-driven tools offer advanced capabilities for identifying, predicting, and mitigating cyber threats, leveraging machine learning algorithms, neural networks, and predictive analytics to detect anomalies and potential breaches in real-time. By automating risk assessment processes, AI systems enhance accuracy in threat detection, reduce response times, and minimize human error, thus strengthening overall cybersecurity resilience. This research highlights key AI-powered techniques such as anomaly detection, behavioral analysis, and predictive threat modeling, which collectively offer financial systems a proactive defense mechanism against cyber-attacks. Furthermore, challenges surrounding AI implementation, including data privacy concerns, regulatory compliance, and ethical considerations, are examined. Through a comprehensive analysis of AI applications in risk management, this paper underscores the transformative role of AI in creating secure, resilient financial ecosystems and presents a framework for financial institutions to adopt AI-driven cybersecurity strategies effectively. Digital innovations hold vast potential to expand financial inclusion, improve efficiency, mitigate risks, and meet customer demands in a dynamic digital economy. However, concerted efforts are needed to address cyber security vulnerabilities, build robust digital infrastructure, up skill workforce capabilities, and design ethical frameworks governing data use. India's digital finance transformation will have far-reaching implications for competitiveness, profitability, and stability of the banking sector.

Keywords: *digital banking; mobile banking; artificial intelligence; Threat intelligence; open banking*

1.1 **1. Introduction**

The rapid digitization of the financial sector has led to a surge in sophisticated cyber threats, posing significant risks to the integrity, confidentiality, and availability of financial systems. Financial institutions, being custodians of sensitive information and assets, are frequent targets of cyber-attacks ranging from phishing and ransomware to data breaches and advanced persistent threats. Traditional methods of risk management and cybersecurity, although effective to an extent, are increasingly challenged by the evolving and unpredictable nature of cyber threats.

Artificial Intelligence (AI) has emerged as a powerful tool in enhancing risk management frameworks, particularly in the area of cybersecurity. By leveraging machine learning algorithms, natural language processing, and predictive analytics, AI can help institutions detect, prevent, and respond to cyber threats more efficiently. Unlike conventional systems, AI-powered models are capable of processing vast amounts of real-time data, learning from patterns, and adapting to novel threats, thereby enabling a more dynamic approach to cybersecurity.

AI-driven risk management offers several advantages: it improves threat detection accuracy, reduces false positives, enhances response times, and helps in anticipating potential vulnerabilities before they are exploited. Furthermore, AI systems can assess risks by analyzing behavioral patterns, enabling institutions to take proactive steps to mitigate fraud, phishing, and other cyber-attacks. As financial systems continue to integrate digital solutions, AI-powered risk management is becoming essential for maintaining trust, security, and compliance in the financial industry.

The Indian banking industry is undergoing unprecedented technological disruption, driven by the country's booming digital economy, financial inclusion initiatives, and burgeoning start-up ecosystem. India has the world's second largest internet user base at over 500 million, growing smart phone penetration, and one of the largest and most sophisticated fintech markets globally [1]. Propelled by these trends, the traditionally conservative banking sector is embracing digital transformation.

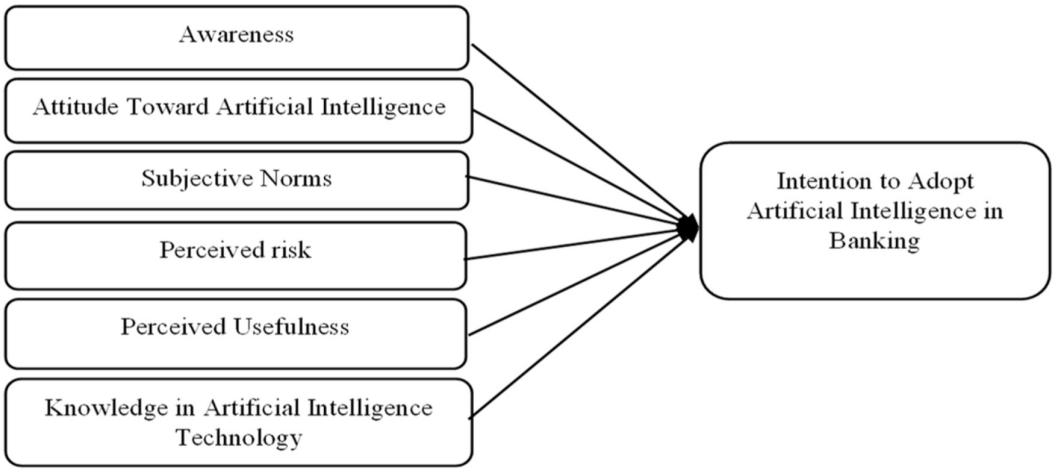

Fig 1 AI in Banking

Digital technologies are fundamentally altering conventional banking business models centered around physical branch networks by enabling digital distribution channels and data-driven, hyper-personalized services. This transition brings immense opportunities as well as risks for incumbent banks and new entrants. Financial institutions are adopting emerging technologies such as artificial intelligence (AI), application programming interfaces (APIs), blockchain, augmented reality and focusing on cyber security. This digital revolution could deepen financial access, efficiency, and resilience, helping India become a digitally empowered economy.

This paper analyses key technologies revolutionizing Indian banking and their multifaceted impact on operations, services, competitiveness and risks. Current regulatory approaches governing digital finance evolution are evaluated along with imperatives for banks undertaking digital transformation.

1.2 **2. Proliferation of Mobile Banking**

Mobile phones are emerging as the preferred digital channel for delivering financial services in India. Growing smart phone penetration, declining data costs following the 2016 entry of Reliance Jio, and government efforts to expand digital payments have fueled surging mobile banking adoption [2].

India's mobile banking transactions ballooned from INR 35 billion in 2015-16 to INR 7.7 trillion in 2019-20 [3]. Leading banks offer feature-rich mobile apps providing conveniences like instant account opening, shopping, utility bill payments, cheque deposit, and lending wealth management services. Table 1 summarizes key offerings of major Indian banks' mobile apps.

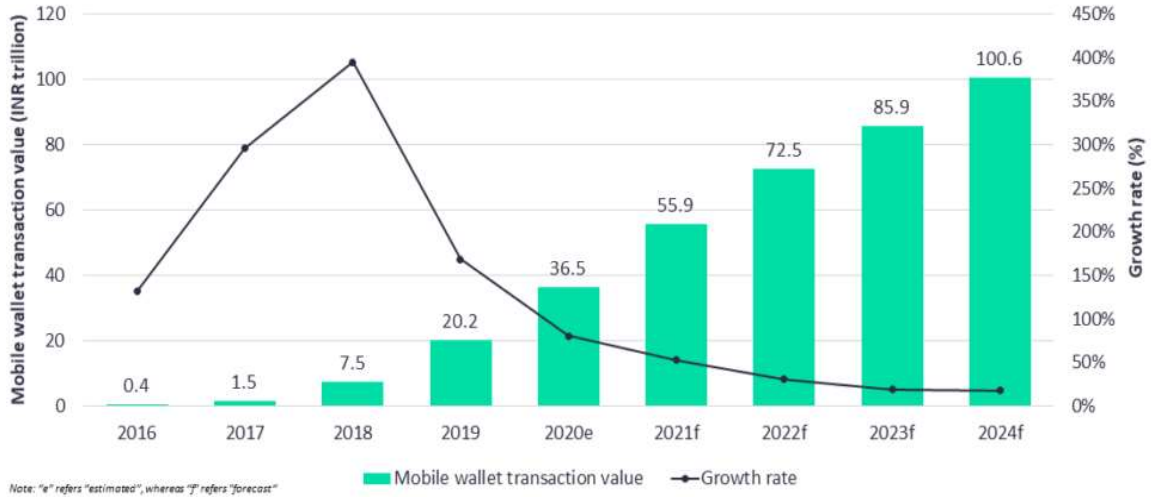

Fig 2 Financial Inclusion Through ICT and Mobile Banking

Table 1. Features of leading Indian banks' mobile banking apps.

Bank	**Mobile App**	**Key Features**
State Bank of India	YONO SBI	Integrated marketplace, spending analysis, financial services marketplace
HDFC Bank	PayZapp	Smartbuy payments, loyalty programs, bill pay
ICICI Bank	iMobile	Voice assistance, instant savings account, education loan services
Axis Bank	Axis Mobile	Biometric login, apply gold loan, virtual debit card

The Unified Payments Interface (UPI), a real-time interbank system developed by the National Payments Corporation of India, has been a game changer. UPI powers user-friendly peer-to-peer and merchant payments through simple ID/QR code scanning. UPI recorded over 4.6 billion transactions worth INR 8.3 trillion in December 2021 [4]. Leading private banks have integrated UPI into their mobile apps, while the government's BHIM app makes UPI accessible to wider demographics.

But how exactly is the mobile revolution impacting Indian banking?

1.2. 2.1 Operational Impact

Transitioning to mobile shifts banks' focus from costly branch expansion to efficient digital distribution [5]. Mobile lowers customer on boarding/servicing costs by automating processes and enabling self-service options. Banks leverage mobile analytics for customer insights to cross-sell products and drive personalized engagement.

Mobile data helps banks overcome information asymmetries and physical access barriers to serve remote unbanked segments, expanding market reach.

1.2. 2.2 Service Innovation

Mobile acts as a platform for banks to embed value-added services and augment customer experience. For instance, HDFC Bank's artificial intelligence-powered IRA chatbot provides contextual assistance to customers within its mobile app [6]. Location-based offers, spend analysis, financial advice apps, and biometric e-signatures further enrich mobile banking services. Many banks integrate their apps with online marketplaces for hotel/travel bookings, online shopping and food delivery. Mobile thus enables banks to evolve into digital lifestyle platforms.

1.2. 2.3 Security Challenges

Mobile banking significantly expands attack surfaces for cyber threats. App vulnerabilities, malware attacks, and phishing to steal login credentials are key concerns [7]. Security experts have demonstrated techniques to hack mobile apps and bypass multi-factor authentication through spoofing [8]. India has seen rising instances of cyber criminals gaining unauthorized access to bank accounts by compromising mobile devices. Banks are responding by deploying AI-powered cyber security tools, biometrics for user verification, secure APIs and robust encryption. However balancing security with convenience remains an ongoing challenge.

1.2.

1.2. 2.4 Financial Inclusion

Mobile overcomes last-mile barriers in reaching remote villages where setting up branches is unviable. Rural penetration of affordable smart phones and mobile internet is bridging this gap. The government's Jan Dhan Aadhaar Mobile (JAM) trinity leverages mobile to expand access to financial services [9]. During COVID-19 lockdowns, mobile enabled prompt disbursal of direct benefit transfers to India's huge unbanked population. Agent banking models utilizing local neighborhood retailers as cash points provide assisted mobile banking for tech-illiterate sections. Such initiatives are vital for advancing financial inclusion.

In summary, mobile is not just a channel for banks but a transformative technology redefining operations, services, competitiveness, and social impact. However, India's socioeconomic diversity necessitates balancing high-tech capabilities with on-ground support to avoid digital divides. Hybrid models blending digital tools with human intermediation will continue playing an important role in financial inclusion.

1.3 **3. Opportunities and Challenges with Adoption of Artificial Intelligence**

As data volumes explode in banking, AI-based technologies are garnering significant interest to harness data for insights, automation and predictive capabilities. India's banking sector is recognizing AI's potential to reform processes, decision-making and customer experience. Markets and Markets forecasts the Indian AI in banking space will grow from $980 million in 2019 to over $3 billion by 2024 [10].

Major Indian banks are piloting AI applications across functions including credit underwriting, personalization, process automation, compliance and security. Private sector banks at the forefront of AI adoption include ICICI Bank, HDFC Bank and Axis Bank [11]. Table 2 summarizes key AI applications by leading Indian banks.

Table 2. Adoption of artificial intelligence by major Indian banks.

Bank	AI Applications
HDFC Bank	IRA virtual assistant chatbot, Cash forecasting using ML, Fraud detection, Natural language processing for complaints
ICICI Bank	Software robots for 200 business processes, AI for credit card spending analysis
SBI	Anthropic virtual assistant, Predictive analytics for next best offers, Intelligent loan processing, AI for HR analytics

But what promises and risks does increasing AI usage bring for banking in India?

1.3.

1.3. 3.1 Enhancing Customer Experience

Banks are deploying conversational AI chatbots and virtual assistants to deliver personalized services 24x7 across channels. State Bank of India's AI-based virtual assistant can converse in English, Hindi and Hinglish, providing 85 percent of banking services [12]. Its humanlike interactions and contextual knowledge aid customer engagement. AI is also leveraged for sentiment analysis of social media chatter to gauge brand perception and tailor marketing.

1.3.

1.3. 3.2 Improving Credit Risk Decisions

AI algorithms help banks analyze alternative datasets from payments firms, e-commerce activity, and social media to evaluate creditworthiness of thin file customers lacking credit history. This expands lending to underserved segments. HDFC Bank employs AI for contextual lending assessments using behavioral data like online shopping habits [13].

1.3.

1.3. 3.3 Detecting Anomalies and Fraud

Banks lose billions annually to fraud and cybercrime in India [14]. Deploying machine learning techniques for transaction monitoring, network security, identity verification and scraping online data can mitigate risks. Axis Bank utilizes AI to screen employee computers and network endpoints for cyber threats and data exhilaration [15].

1.3.

1.3. 3.4 Automating Processes

Adoption of robotic process automation using software bots is transforming banks' back-end processes. Software bots can work 24/7, faster and more accurately than humans for repetitive, rules-based tasks. ICICI Bank's software robotics execute 1 million banking transactions daily, saving ICICI Bank's software robotics execute 1 million banking transactions daily, saving over 60,000 hours [16]. This improves productivity, accuracy and compliance. Table 3 outlines major back-office functions being automated using AI at Indian banks.

Table 3. Back-office automation use cases for AI in Indian banks.

Process	Description
Loan processing	Extracting information from documents, credit history analysis, risk scoring
KYC verification	Automating identification checks and paperwork for customer onboarding
Compliance reporting	Generating regulatory reports for submission to RBI and other bodies
Data extraction	Classifying and extracting insights from textual and image data
Reconciliation	Matching transactions, ledger entries, foreign exchange settlements
Customer service	Answering queries, complaint classification and routing

1.3.

1.3. 3.5 Challenges in AI Adoption

However, Indian banks face obstacles in scaling up AI usage [17]:

- Outdated legacy IT systems constrain data aggregation required for AI model training. Core banking overhauls are needed.
- Talent shortage of quality data scientists and AI experts persists despite banks' growing hiring.

1.4 **4. Blockchain Applications in Banking**

Blockchain technology is garnering significant interest within India's banking industry for its potential to transform payments processing, trade finance, KYC, and cyber security [18]. Block chain’s distributed ledger architecture could enhance transparency, security, immutability and operational efficiency for multiple banking functions.

India ranks among top five countries globally for blockchain-related patent filings, reflecting growing innovation [19]. Leading Indian banks, financial institutions and technology firms are actively exploring blockchain use cases through proofs of concept, consortiums and regulatory sandbox testing.
Table 4 summarizes key blockchain initiatives by major Indian banks.

Table 4. Blockchain initiatives by Indian banks.

Bank	Blockchain Initiatives
ICICI Bank	Blockchain platform for overseas trade transactions with Emirates NBD
Axis Bank	Blockchain-based authenticated collections platform with Standard Chartered
Yes Bank	Multi-bank blockchain trade finance network with OPIC, US EXIM Bank
SBI	Bank chain consortium for KYC database with UAE Exchange, ICICI, DCB, Kotak Mahindra

1.4.

1.4. 4.1 Payments Processing

Blockchain is being evaluated for domestic and cross-border payments to enable real-time settlement, cost reduction, transparency and regulatory compliance [20]. ICICI bank has piloted international remittances to Singapore using blockchain that lowered costs and provided hassle-free tracking [21].
For domestic payments, NPCI is building a blockchain platform to complement UPI and facilitate auto-reconciliation between banks, merchants and customers [22]. Blockchain infrastructure could strengthen integrity and traceability across complex payments ecosystems.

1.4. 4.2 Trade Finance

Paper-heavy processes make trade finance costly and vulnerable to errors. Blockchain trials aim to digitize trade documents like purchase orders and invoices, automate procedures using smart contracts and integrate flows between exporters, importers, regulators and banks [23]. In 2018, ICICI Bank executed India's first blockchain-enabled trade finance deal with Emirates NBD [24].
Digitization provides real-time visibility into trade asset status. Smart contracts enable automated releases of payment upon meeting predefined conditions, reducing settlement times.

1.4. 4.3 KYC Processes

Multiple banks having to independently verify customers' identities make KYC cumbersome and duplicative. Block chain's distributed ledger offers a channel to create tamper-proof, shared KYC records of validated identities that can be securely accessed by approved institutions [25].
In 2016, ICICI bank spearheaded Bank chain, a consortium for exploring blockchain-based KYC data sharing with other leading banks [26]. However, data privacy concerns need addressing before scaling such systems.

1.4. 4.4 Challenges for Adoption

Despite promising proofs of concept, blockchain faces hurdles to large-scale deployment in Indian banking [27]:

- Immature regulations around blockchain need evolving to boost adoption. Approval timeframes for trials must be streamlined.
- Limited interconnectivity with legacy core banking systems constrains integration. Banks hesitate replacing functional legacy systems.
- Lack of common standards impedes interoperability between bank blockchain. A collaborative approach is needed.
- Security vulnerabilities like 51% attacks need mitigation as blockchain transitions from controlled test environments to real-world deployment.
- Shortage of blockchain talent and developers affects productive utilization. Building expertise is critical.

Nevertheless, block chain's transformation potential for banking is tremendous. Targeted regulatory frameworks, scalable architectures, and consortiums to pilot end-to-end solutions will be critical to unlocking its benefits.

1.5 **5. Transitioning to Open Banking**

Globally, open banking approaches are disrupting traditional financial services value chains by promoting greater consumer data sharing and ecosystem collaboration [28]. India is gradually embracing open banking principles to stimulate innovation and expand financial access.

Open banking entails leveraging APIs and new-age technologies to securely provide third parties access to consumer data and bank systems. This drives development of value-added services and revenue models. India's 2015 Aadhaar e-KYC framework and 2016 UPI launch laid groundwork for an open banking system.

Recent policies mandating banks to adopt open APIs, establish regulatory sandboxes and data empowerment frameworks signal accelerating moves towards open banking. India's 2020 account aggregator framework enables real-time, consent-based financial data sharing. Such infrastructure aims to catalyze an ecosystem of consumer-centric financial applications.

Table 5 outlines key policies and initiatives shaping India's open banking evolution.

Table 5. Regulatory policies and initiatives driving open banking in India.

Initiative	**Description**
RBI bank account number portability	Allow customers to switch banks without changing account number
NAV approach to digital payments	Network access providers to use APIs to access bank customer digital transactions
India open data policy	Government data sharing mandate to spur innovation
RBI account aggregator framework	Consent-based financial data sharing system
BBPS interoperable bill payments	Unified payment interface for utility bill payments via banks, fintechs

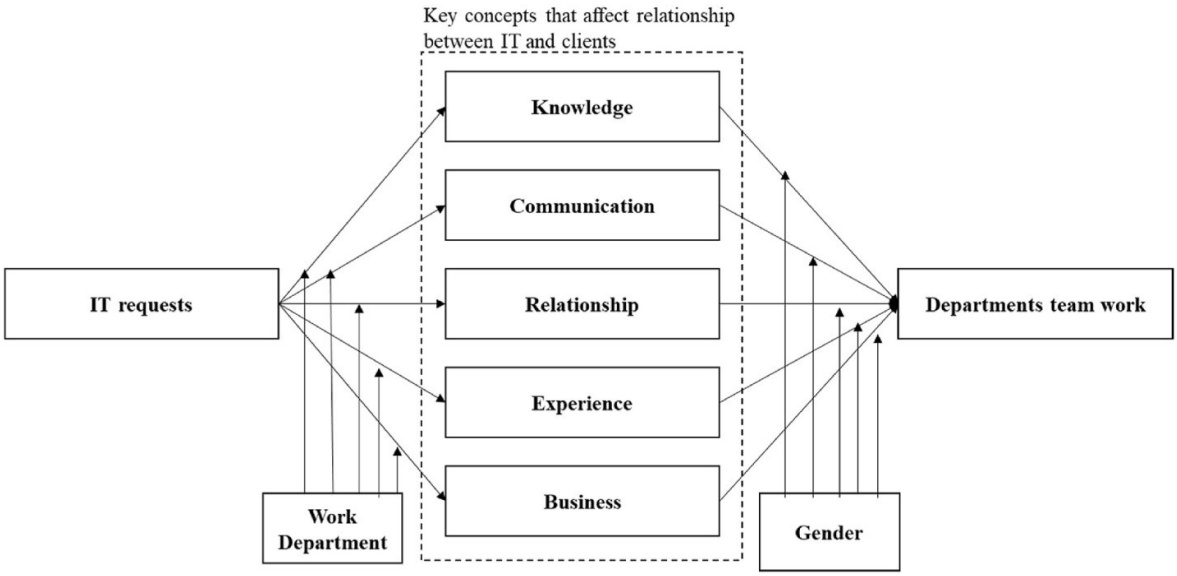

Fig 3 Conceptual explanatory model

Table 6. Ownership wise statistics of mean of TE and CE scores in impact of digital payment adoption on Indian banking sector efficiency

	TE				**CE**			
	Foreign	**Private**	**Public**	**All Banks**	**Foreign**	**Private**	**Public**	**All Banks**

Average	0.9	0.15	1.5	4.7	0.52	0.15	1.0	3.7
S.D	0.1	0.79	0.2	3.5	0.24	0.42	1.6	4.1
Min	0.2	0.8	0.1	3.7	0.61	0.24	1.4	3.4
Max	0.4	1.5	1.5	4.2	0.14	0.26	1.9	2.3

This transition brings both opportunities and challenges for Indian banking:

1.5. 5.1 Opportunities

- Deeper customer insights from data sharing help banks cross-sell products and provide personalized pricing.
- Open APIs enable innovative payment services and better integrate banking into digital ecosystems.
- New revenue streams by monetizing APIs and forging partnerships with fintech startups.
- Regulatory compliance and risk management improves as processes get automated and digitized.

1.5. 5.2 Risks and Challenges

- Cyber security threats increase as more external parties connect to bank systems via APIs [21].
- New competitors emerge such as fin techs utilizing bank APIs/data to offer services to bank customers.
- Ensuring sufficient consent, transparency and control mechanisms for customer data sharing is vital.
- Relinquishing tightly controlled vertical silos to participate in interconnected ecosystems poses cultural challenges for banks.

With thoughtful execution, open banking can catalyze innovation across India's digital finance ecosystem. But it requires balancing collaboration with competition to ensure healthy market dynamics. Regulatory oversight safeguarding consumer interests is critical as open banking gains momentum.

Table 7. Summary Statistics for all sector wise of digital payment adoption on Indian banking sector efficiency

Year	**OBS**	**TE**				**CE**			
		Mean	**Std. Dev**	**Min**	**Max**	**Mean**	**Std. Dev**	**Min**	**Max**
2019	15	0.7	0.2	0.75	1	0.52	0.13	0.75	1
2020	15	0.75	0.13	0.9	1	0.54	0.42	1.2	1
2021	15	0.9	0.4	0.94	1	0.61	0.54	1.9	1
2022	15	1.0	0.34	1.5	1	0.74	0.46	1.47	1
2023	15	1.2	0.41	1.7	1	0.87	0.65	2.3	1

1.6 **6. Conclusion**

India's banking sector is experiencing unprecedented digital disruption driven by innovative technologies, evolving consumer behaviors and progressive regulations. Mobile has emerged as the dominant digital interface revolutionizing banking engagement models and bridging inclusion gaps. Transition to intelligent banking leveraging AI/ML is underway to transform decision-making and enhance experience. Blockchain pilots have successfully demonstrated efficiency improvements for processes like payments, trade finance and KYC. Policies are progressively enabling open banking capabilities to spur collaboration and innovation ecosystems.

These digital trends presage a future of banking that transcends physical channels to seamlessly embed finance into customers' lifestyles. Incumbents and agile startups are forging new competitive dynamics and collaborative

synergies. However, this data-driven, technology-intensive transition poses risks around security, ethics and digital divides that necessitate precautions. Concerted efforts to foster talent, research, governance and cooperative frameworks will be vital to maximizing digital banking's far-reaching potential while minimizing downsides. Instead of a threat to be resisted, India's banking leaders must embrace digital transformation as a pathway to long-term resilience, inclusion and competitiveness in the 21st century digital economy.

Data Availability

Banks' balance sheet data were accessed from the Reserve Bank of India's (RBI) 'Statistical Tables Relating to Banks in India'. Data on number of bank branches were from the RBI's Branch Banking Statistics'. Both are annual publications available on the RBI website (https://rbi.org.in/Scripts/publications.aspx). Data on payment systems (NEFT, ATM, PoS and Cards) are from the monthly Data Releases titled 'Bankwise Volumes in NEFT/RTGS/Mobile Transactions/Internet Banking Transactions' (https://rbi.org.in/scripts/NEFTView.aspx) and Bankwise ATM/PoS/Card Statistics (https://rbi.org.in/scripts/ATMView.aspx) available on the RBI website.

Ethics Declarations

The authors declare no conflict of interest.

References

1. Anagnostopoulos, Ioannis. 2018. Fintech and Regtech: Impact on Regulators and Banks. Journal of Economics and Business 100: 7–25. [Google Scholar] [CrossRef]
2. Aron, Janine. 2018. Mobile Money and the Economy: A Review of the Evidence. The World Bank Research Observer 33: 135–88. [Google Scholar] [CrossRef] [Green Version]
3. Ameme B, Wireko J (2016) Impact of technological innovations on customers in the banking industry in developing countries. Bus Manag Rev 7(3):388–397. [Google Scholar] [CrossRef]
4. Banna, Hasanul, M. Kabir Hassan, and Mamunur Rashid. 2021. Fintech-Based Financial Inclusion and Bank Risk-Taking: Evidence from OIC Countries. Journal of International Financial Markets, Institutions and Money 75: 101447. [Google Scholar] [CrossRef]
5. Black, William, and Barry. J. Babin. 2019. Multivariate Data Analysis: Its Approach, Evolution, and Impact. In The Great Facilitator. Berlin/Heidelberg: Springer, pp. 121–30. [Google Scholar] [CrossRef]
6. Burns, Scott. 2018. M-Pesa and the 'Market-Led' Approach to Financial Inclusion. Economic Affairs 38: 406–21. [Google Scholar] [CrossRef]
7. Cecchetti, Stephen G., and Kermit Schoenholtz. 2020. Finance and Technology: What Is Changing and What Is Not. CEPR Discussion Papers 15352: 1–40. [Google Scholar]
8. Chang, Victor, Partricia Baudier, Hui Zhang, Qianwen Xu, Jingqi Zhang, and Mitra Arami. 2020. How Blockchain can Impact Financial Services–the Overview, Challenges and Recommendations from Expert Interviewees. Technological Forecasting and Social Change 158: 120–66. [Google Scholar] [CrossRef]
9. Chavan, Palavi, and Bhaskar Birajdar. 2009. Micro Finance and Financial Inclusion of Women: An Evaluation. Reserve Bank of India Occasional Papers 30: 109–29. [Google Scholar]
10. Dao BTT, Nguyen KA (2020) Bank capital adequacy ratio and bank performance in Vietnam: a simultaneous equations framework. J Asian Finance Econ Bus 7(6):39–46. [Google Scholar] [CrossRef]
11. Dang, Van Cuong, and Quang Khai Nguyen. 2021. Internal Corporate Governance and Stock Price Crash Risk: Evidence from Vietnam. Journal of Sustainable Finance & Investment. [Google Scholar] [CrossRef]
12. Demir, Ayse, Vanesa Pesqué-Cela, Yener Altunbas, and Victor Murinde. 2022. Fintech, Financial Inclusion and Income Inequality: A Quantile Regression Approach. The European Journal of Finance 28: 86–107. [Google Scholar] [CrossRef]

13. Duncombe, Richard, and Richard Boateng. 2009. Mobile Phones and Financial Services in Developing Countries: A Review of Concepts, Methods, Issues, Evidence and Future Research Directions. Third World Quarterly 30: 1237–58. [Google Scholar] [CrossRef]
14. Ekinci R (2021) The impact on digitalization on financial sector performance. In: Kahyaoğlu SB (ed) The impact of artificial intelligence on governance, economics and finance, I. Springer, Singapore, pp 99–119. [Google Scholar] [CrossRef]
15. Frost, Jon, Leonardo Gambacorta, Yi Huang, Hyun Song Shin, and Pablo Zbinden. 2019. BigTech and the Changing Structure of Financial Intermediation. Economic Policy 34: 761–99. [Google Scholar] [CrossRef] [Green Version]
16. Gautam, Amit, and Siddhartha Rawat. 2017. Cashless and Digital Economy and its Effect on Financial Inclusion in India. Financial Sector in India 20: 77–85. [Google Scholar]
17. Ghosh, Saibal. 2020. Financial Inclusion in India: Does Distance Matter? South Asia Economic Journal 21: 216–38. [Google Scholar] [CrossRef]
18. Haque, Sabrina Sharmin, Monica Yanez-Pagans, Yurani Arias-Granada, and George Joseph. 2020. Water and Sanitation in Dhaka Slums: Access, Quality, and Informality in Service Provision. Water International 45: 791–811. [Google Scholar] [CrossRef]
19. Hersugondo H, Anjani N, Pamungkas ID (2021) the role of non-performing asset, capital, adequacy and insolvency risk on bank performance: a case study in Indonesia. J Asian Finance Econ Bus 8(3):319–329. [Google Scholar] [CrossRef]
20. Iqbal, Sana, Ahmad Nawaz, and Sadaf Ehsan. 2019. Financial Performance and Corporate Governance in Microfinance: Evidence from Asia. Journal of Asian Economics 60: 1–13. [Google Scholar] [CrossRef]
21. Jack, William, and Tavneet Suri. 2014. Risk Sharing and Transactions Costs: Evidence from Kenya's Mobile Money Revolution. American Economic Review 104: 183–223. [Google Scholar] [CrossRef]
22. Khan, Harun R. 2012. Issues and Challenges in Financial Inclusion: Policies, Partnerships, Processes and Products. Korea 18: 84–17. [Google Scholar]
23. Khan, Shagufta, Vineet Chouhan, Bibhas Chandra, and Shubham Goswami. 2014. Sustainable Accounting Reporting Practices of Indian Cement Industry: An Exploratory Study. Uncertain Supply Chain Management 2: 61–72. [Google Scholar] [CrossRef]
24. Kim, Minjin, Hanah Zoo, Heejin Lee, and Juhee Kang. 2018. Mobile Financial Services, Financial Inclusion, and Development: A Systematic Review of Academic Literature. The Electronic Journal of Information Systems in Developing Countries 84: e12044. [Google Scholar] [CrossRef] [Green Version]
25. Li, Feng, Hui Lu, Meiqian Hou, Kangle Cui, and Mehdi Darbandi. 2021. Customer Satisfaction with Bank Services: The Role of Cloud Services, Security, E-Learning and Service Quality. Technology in Society 64: 101487. [Google Scholar] [CrossRef]
26. Mader, Philip. 2018. Contesting Financial Inclusion. Development and Change 49: 461–83. [Google Scholar] [CrossRef] [Green Version]
27. Mor S, Gupta G (2021) Artificial intelligence and technical efficiency: the case of Indian commercial banks. Strateg Chang 30(3):235–245. [Google Scholar] [CrossRef]
28. Nazaritehrani A, Mashali B (2020) Development of E-banking channels and market share in developing countries. Financ Innov. https://doi.org/10.1186/s40854-020-0171-z. [Google Scholar] [CrossRef]