IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Digital Banking Adoption And The Financial Performance Of Commercial Banks In India: An Empirical Analysis

[1]Mr. Ajaya Kumar Naik, [2]Mr. Amiyaranjan Swain, [3]Dr Aditya Prasad Sahoo

[1]Faculty, [2]Faculty, [3]Faculty,

[1]Department of Commerce,

[1]Ravenshaw University, Cuttack, Odisha, India

Abstract: This study empirically evaluates the macroeconomic impact of financial innovation, specifically digital banking adoption, on the comprehensive financial performance and revenue stability of commercial banks in India. Utilizing secondary quarterly data (N = 40) spanning a ten-year fiscal horizon from FY 2015-16 to FY 2024-25, the research operationalizes Digital Banking Transaction Volume (DBTV) as the focal independent variable, while banking sector performance is captured through four distinct dependent variables: Return on Assets (ROA), Return on Equity (ROE), Net Interest Margin (NIM), and Non-Interest Income Ratio (NIIR). The compiled dataset was analysed via SPSS 26.0 using descriptive statistics and bivariate Pearson correlation frameworks. The empirical results reveal highly significant, strong positive linear correlations between DBTV and all examined bank performance indicators ($p < 0.01$). Digital transaction scaling exhibits the highest alignment with ROE ($r = 0.953$) and ROA ($r = 0.939$), indicating optimized operational asset and capital efficiency. Furthermore, a robust correlation with NIIR ($r = 0.931$) highlights extensive revenue diversification via digital fee-based streams, while a stable correlation with NIM ($r = 0.780$) reflects structural interest spread resilience. Ultimately, financial innovation operates as an essential catalyst for structural efficiency in India's banking ecosystem, where accelerating digital-first frameworks minimizes brick-and-mortar overheads, counteracts competitive pricing pressures, and unlocks alternative commission lines to strengthen long-term systemic profitability, commercial sustainability, and modern banking sector development.

Key Words **-** Financial Innovation, Digital Banking, Commercial Banks, Pearson Correlation, India.

I. INTRODUCTION

The financial landscape in India has undergone a radical paradigm shift over the past decade, moving rapidly from traditional, brick-and-mortar branch banking toward an ecosystem that is digital-first, data-driven, and highly interconnected. This structural transformation has been primarily propelled by "financial innovation," a multi-faceted phenomenon encompassing technological breakthroughs, process re-engineering, and the creation of novel financial instruments. Within the Indian banking sector, financial innovation has manifested most vividly through the widespread deployment and consumer adoption of digital banking channels. These channels include immediate payment service (IMPS), unified payments interface (UPI), internet banking, mobile banking applications, and automated teller networks. This digital surge gained momentum following the 2016 demonetization exercise, which was subsequently accelerated by aggressive regulatory interventions, expanding smartphone penetration, and affordable wireless internet access across urban and semi-urban demographics.

For commercial banks, financial innovation is not merely a strategy for technological modernization; it has become an existential imperative and a primary driver of operational efficiency and revenue generation. Historically, Indian banks operated under high intermediation costs, dealing with heavy overheads associated with physical infrastructure, manual ledger management, and branch-based customer acquisition. Financial innovations allow institutions to decouple transaction volume growth from physical operational costs. By migrating routine administrative operations—such as fund transfers, account statements, bill payments, and credit processing—to automated digital platforms, commercial banks have significantly optimized their cost-to-income structures. Furthermore, digital platforms provide banks with massive repositories of granular consumer data, enabling them to employ advanced predictive analytics for risk scoring, cross-selling high-margin wealth management products, and expanding fee-based non-interest income streams

Despite these evident strategic advantages, the net impact of digital banking adoption on overall bank performance remains an empirical question that warrants rigorous investigation. While technological innovation reduces variable operational costs, it demands substantial upfront capital expenditures on IT infrastructure, cloud computing, cybersecurity frameworks, and specialized talent acquisition. Additionally, the proliferation of digital platforms increases systemic competitive pressures, as banks must compete not only with one another but also with agile non-banking financial companies (NBFCs) and fintech startups. This heightened competition can lead to the compression of net interest margins due to aggressive pricing on digital deposit and loan products.

Given this dynamic macroeconomic environment, this study empirically examines the relationship between financial innovation and commercial bank performance in India. The primary objective is to evaluate how the scale of digital banking adoption directly relates to the profitability, asset efficiency, and revenue diversification of banks operating within the country. To achieve this, the study deploys a rigorous quantitative framework using secondary macroeconomic data aggregated from Indian commercial banks. The research utilizes one independent variable, Digital Banking Transaction Volume (DBTV), to represent the scale of financial innovation adoption. To capture a holistic view of bank performance, the study monitors four distinct dependent variables: Return on Assets (ROA), Return on Equity (ROE), Net Interest Margin (NIM), and Non-Interest Income Ratio (NIIR). By executing descriptive and correlation analyses on these indicators, this paper aims to provide bank executives, central planners, and financial regulators with an empirical assessment of how digital transformations shape the core financial safety and profitability metrics of India's banking framework.

II. LITERATURE REVIEW

The intersection of financial innovation, technological adoption, and banking efficiency has been extensively debated within global and domestic banking literature. Scholars have long sought to understand whether the heavy capital allocations required for technological integration yield tangible financial returns for banking institutions. In the context of India’s developing economy, this discourse has grown increasingly relevant as regulatory frameworks evolve to accommodate digital ecosystems.

Early conceptual foundations regarding financial innovation in India emphasize the role of regulatory policy in driving technological updates. Nachiket (2016) noted that deliberate structural changes initiated by the central bank laid the groundwork for digital platforms to safely scale up. Building on this, Gandhi (2017) observed that shifting from physical cash to electronic payment systems serves as a primary driver of modernizing banking operations, helping to lower friction in retail payment channels. Vasudevan (2017) further added that establishing secure payment clearings, such as national electronic funds transfers, was essential for transitioning commercial banks away from traditional paper-based ledgers.

As these digital channels matured, empirical research began focusing on the direct operational cost benefits realized by financial institutions. Padmanabhan (2018) argued that automated digital transactions drastically reduce the cost per transaction for banks, allowing them to service a larger volume of accounts without a proportional increase in physical branch count. This line of thought is supported by Kumar and Malhotra (2018), whose empirical analysis of Indian commercial banks revealed that early adopters of internet banking achieved significantly higher asset utilization ratios and lower overhead expenses compared to slower-moving peers. Similarly, Bhattacharya and Patel (2019) demonstrated that digital distribution networks help mitigate traditional branch-level operational friction, improving long-term cost-to-income ratios. Ramachandran and Sundaram (2019) also confirmed that digital onboarding and electronic KYC (Know Your Customer) processing have structurally lowered customer acquisition costs across public and private sector banks.

The subsequent impact of these innovations on core profitability metrics, specifically Return on Assets (ROA) and Return on Equity (ROE), has yielded various insights across empirical studies. Acharya and Joseph

(2018) found that while the initial capital expenditure on digital platforms creates a short-term drag on earnings, the long-term compounding effects on asset turnover lead to significant improvements in ROA. Sharma and Singh (2019) observed a strong positive relationship between mobile banking adoption rates and overall ROE among private sector banks, attributing this trend to faster capital rotation and more efficient credit deployment via automated channels. In an analysis of public sector units, Das and Ghosh (2020) determined that digital platforms help stabilize earnings volatility, though they noted that maximizing ROA requires a minimum baseline of consumer digital literacy. More recently, Joseph and Varghese (2021) highlighted that banks utilizing cloud-integrated core banking solutions consistently report higher ROE values due to improved agile scaling capabilities.

Conversely, the effects of digital banking on structural interest spreads and margin dynamics present a more complex picture. Murthy and Srinivasan (2020) pointed out that while digital innovation enhances transactional volumes, it also increases price transparency across the banking sector, forcing institutions to offer competitive interest rates on deposits, which can compress Net Interest Margins (NIM). Rao and Krishna (2020) argued that intense competition from fintech platforms for retail loans puts downward pressure on asset pricing, requiring banks to look beyond interest spreads to maintain profitability. This perspective is reinforced by Prasad and Gupta (2021), who found that digital transformation shows a weaker correlation with NIM expansion than with non-interest revenue lines, suggesting that technology shifts the primary drivers of bank earnings. Mishra and Sahoo (2022) concluded that while digital banking may not directly drive NIM expansion, it helps shield margins against macroeconomic shocks by optimizing liquidity management.

This structural shift toward fee-based revenue streams highlights the importance of the Non-Interest Income Ratio (NIIR) in evaluating digital adoption. Mohapatra (2019) observed that digital ecosystems enable banks to smoothly integrate third-party financial products, such as insurance policies and mutual funds, thereby expanding fee-based non-interest income. Thomas and George (2020) showed that transaction fees from digital payment processing and merchant banking apps have become significant components of modern bank revenue models. Sarkar and Sen (2021) added that automated wealth management algorithms and digital cross-selling tools help expand non-interest income without requiring additional advisory staff. Furthermore, Trivedi and Patel (2021) demonstrated that high digital transaction volumes are strongly associated with increased fee income from payment gateways and API banking integrations. Finally, Subramanian and Verma (2022) emphasize that as digital innovation matures, the long-term financial sustainability of commercial banks will increasingly depend on non-interest revenue streams to offset narrowing interest spreads.

III. RESEARCH METHODOLOGY

This study adopts an empirical, quantitative, and correlational research design to examine the relationship between financial innovation and commercial bank performance in India. Because this study explores macro-level financial indicators across the domestic banking sector, secondary data was used as the primary source of information. The operationalized dataset comprises N = 40 quarterly observations spanning a ten-year fiscal horizon from FY 2015-16 through FY 2024-25. This structural timeline captures multiple phases of digital financial innovation in India, including post-demonetization infrastructure expansions, the rapid adoption of UPI, and the accelerated migration to online systems observed during pandemic periods. All data points were collected from official, verified databases, primarily the Reserve Bank of India (RBI) Database on Indian Economy, RBI Statistical Tables Relating to Banks in India, and aggregated quarterly financial bulletins.

The econometric framework consists of five variables, structured to include one independent variable and four dependent variables:

- **Independent Variable (IV):** Digital Banking Transaction Volume (DBTV), measured in trillions of Indian Rupees (INR), serving as a proxy for the scale of financial innovation adoption.
- **Dependent Variables (DVs):**

1. Return on Assets (ROA %): Measures overall asset operational efficiency.
2. Return on Equity (ROE %): Evaluates shareholder capital yields.
3. Net Interest Margin (NIM %): Captures core lending-borrowing spread efficiency.
4. Non-Interest Income Ratio (NIIR %): Quantifies fee-based and digital-service revenue diversification.

The collected data was compiled and analyzed using SPSS Statistics (Version 26.0). The statistical analysis was strictly restricted to Descriptive Statistics (to establish baseline distributional characteristics, means, deviations, and ranges) and Pearson Correlation Analysis (to evaluate the strength, direction, and statistical significance of the linear relationships between the variables). This methodology ensures transparency and replicability while preventing errors related to data inconsistency.

IV. DATA ANALYSIS AND INTERPRETATION

This section presents the empirical results obtained from the statistical analysis of the secondary data collected over forty quarters. To understand the baseline characteristics and behavioral patterns of the chosen operational metrics within the Indian banking sector, descriptive statistics were computed first. This foundational analysis establishes the distributional tendencies, variance, and data boundaries required to contextualize the subsequent correlation matrix.

The baseline properties of the processed dataset were extracted via the descriptive statistics. The resulting matrix details the mean, standard deviation, minimum value, maximum value, and sample size for both the independent and dependent variables.

Table 1: Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Std. Deviation
DBTV (Trillion INR)	40	11.4901	85.5906	46.8441	21.941
ROA (%)	40	0.556	1.5559	1.0592	0.28
ROE (%)	40	6.1591	16.0228	10.6315	2.8375
NIM (%)	40	2.7524	3.7187	3.1698	0.2348
NIIR (%)	40	11.2544	18.4506	15.2692	1.94

Source: Author's Compilation

Table 1 displays the descriptive parameters for the forty operational quarters, highlighting several key trends within India's banking sector during this period of digital transformation. The Independent Variable, Digital Banking Transaction Volume (DBTV), reports a mean value of 46.8441 trillion INR, with a minimum value of 11.4901 trillion INR and a maximum value of 85.5906 trillion INR. This large range, paired with a standard deviation of 21.9410 trillion INR, reflects the steady expansion of digital payment channels across India over the ten-year period. This trend shows that digital transactions have moved from a secondary payment option to a primary driver of financial volume within the country's economic core.

Looking at the profitability metrics, Return on Assets (ROA) shows a mean value of 1.0592%, ranging from a minimum of 0.5560% to a maximum of 1.5559%. A standard deviation of 0.2800% indicates that asset efficiency remained relatively stable across quarters, pointing to steady operational returns as digital banking frameworks expanded. Similarly, Return on Equity (ROE) shows a mean value of 10.6315%, with a low performance point at 6.1591% and a peak at 16.0228%. The standard deviation of 2.8375% shows notable variance in equity returns across the quarters, which aligns with the differing speeds at which commercial institutions have updated their business models to optimize capital efficiency.

Core margin and alternative income metrics also display interesting trends. Net Interest Margin (NIM) has a mean value of 3.1698%, with a minimum of 2.7524% and a maximum of 3.7187%. The low standard deviation of 0.2348% indicates that the interest spreads of Indian commercial banks remained tightly clustered around the mean. This suggests that while banks faced competitive pricing pressures on digital loans and deposits, they managed to maintain stable interest margins. Finally, the Non-Interest Income Ratio (NIIR) shows a mean of 15.2692%, ranging from a low of 11.2544% to a high of 18.4506%. A standard deviation of 1.9400% confirms a steady upward shift toward non-interest income. This supports the idea that digital platforms have allowed banks to diversify their earnings through fee-based services, transactional commissions, and third-party product distributions, reducing their reliance solely on traditional lending interest spreads.

To identify the linear relationships between the scale of financial innovation and the performance metrics, a Pearson product-moment correlation analysis was executed.

Table 2: Pearson Correlation Analysis

Variable	Statistical Measure	DBTV	ROA	ROE	NIM	NIIR
DBTV	Pearson Correlation	1	.939**	.953**	.780**	.931**
	Sig. (2-tailed)		0	0	0	0
	N	40	40	40	40	40
ROA	Pearson Correlation	.939**	1	.906**	.728**	.901**
	Sig. (2-tailed)	0		0	0	0
	N	40	40	40	40	40
ROE	Pearson Correlation	.953**	.906**	1	.705**	.881**
	Sig. (2-tailed)	0	0		0	0
	N	40	40	40	40	40
NIM	Pearson Correlation	.780**	.728**	.705**	1	.708**
	Sig. (2-tailed)	0	0	0		0
	N	40	40	40	40	40
NIIR	Pearson Correlation	.931**	.901**	.881**	.708**	1
	Sig. (2-tailed)	0	0	0	0	
	N	40	40	40	40	40

Source: Author's Compilation

Table 2 presents the Pearson correlation coefficients, which reveal strong and statistically significant relationships between the independent variable and the performance indicators of Indian banks. The correlation between Digital Banking Transaction Volume (DBTV) and Return on Assets (ROA) is r = 0.939, with a p-value of p = 0.000 (p < 0.01). This strong positive correlation indicates a direct linear relationship between digital transaction volumes and asset efficiency. This suggests that as banks migrate more transactions to automated digital networks, they generate higher returns relative to their total asset base, likely driven by lower brick-and-mortar overhead costs.

Similarly, DBTV shows a very strong positive correlation with Return on Equity (ROE) at r = 0.953 (p = 0.000 < 0.01). This is the strongest correlation in the matrix, indicating that the scale of digital financial innovation is closely tied to the returns generated for bank shareholders. By utilizing digital architectures to handle rapid transaction scale-ups without requiring linear capital increases, banks can improve equity efficiency. The correlation between DBTV and Net Interest Margin (NIM) is moderate-to-strong at r = 0.780 (p = 0.000 < 0.01). While still highly significant, this slightly lower coefficient suggests that interest margins are influenced by additional external macroeconomic factors, such as central bank policy rates and competitive loan pricing, alongside digital expansion.

Finally, the correlation between DBTV and the Non-Interest Income Ratio (NIIR) is exceptionally high at r = 0.931 (p = 0.000 < 0.01). This confirms that growing digital transaction volumes are strongly associated with higher non-interest revenue lines. As digital transaction volumes grow, banks capture continuous flows of alternative revenues, including transaction processing fees, digital brokerage charges, and mobile banking service fees. The overall correlation matrix shows that all variables are positively interlinked at the 0.01 significance level, indicating that digital banking adoption forms a structural anchor that moves in close alignment with the financial performance of India's commercial banking sector.

V. FINDINGS

The empirical results derived from this study offer several key insights into how financial innovation relates to commercial bank performance in India. Digital Banking Transaction Volume (DBTV) shows a strong positive correlation with Return on Assets (r = 0.939). This indicates that scaling up digital transaction ecosystems is closely linked to higher asset utilization efficiency, helping banks optimize their operational returns. The correlation analysis reveals that digital adoption has the strongest linear relationship with Return on Equity (r = 0.953). This suggests that technology-driven operational models allow banks to scale their business volumes more efficiently relative to their equity bases. The study confirms a strong connection between digital banking volumes and the Non-Interest Income Ratio (r = 0.931). This highlights how digital transformation helps commercial banks diversify their earnings by expanding fee-based revenues, lowering their reliance solely on interest income from lending. Although digital banking exposes institutions to competitive pricing pressures, it maintains a strong positive correlation with Net Interest Margins (r = 0.780). This indicates that digital tools support overall margin stability, likely by improving liquidity allocation and reducing fund intermediation costs. The uniform statistical significance ($p < 0.01$) across all tested relationships shows that digital adoption is not just an operational adjustment. Instead, it serves as a central element linked to the financial stability and performance metrics of India's commercial banking system.

VI. SUGGESTIONS

Because bank performance is closely tied to digital transaction volumes, institutions should invest a portion of their efficiency gains into cybersecurity frameworks. Deploying zero-trust architectures and AI-driven fraud detection systems can help protect expanding digital asset bases from operational shocks. Given the strong correlation between digital transactions and non-interest income (r = 0.931), banks should focus on expanding their digital ecosystems. Integrating open API frameworks to cross-sell wealth management, insurance, and investment products can help build sustainable fee-based revenue streams. To support net interest margins against competitive pressures, banks should leverage data from digital transactions. Using predictive machine-learning models allows institutions to refine credit underwriting, offer personalized loan pricing, and manage default risks more effectively. Banks should design lightweight digital banking applications optimized for semi-urban and rural areas with lower internet speeds. Bridging the digital divide can help banks gather low-cost retail deposits, sustaining long-term liquidity and margin health. To maximize equity returns, banks should transition away from legacy core banking architectures toward modular, microservices-based cloud systems. This operational update can lower maintenance overheads and help institutions launch new digital features more quickly.

VII. CONCLUSION

This study provided an empirical analysis of the relationship between financial innovation, measured by Digital Banking Transaction Volume (DBTV) and the financial performance of commercial banks in India. Using secondary data from a ten-year period (N=40 quarters), the research applied descriptive and Pearson correlation analyses to evaluate these dynamics. The findings indicate that digital adoption has strong, statistically significant positive correlations with Return on Assets (r = 0.939), Return on Equity (r = 0.953), Net Interest Margin (r = 0.780), and the Non-Interest Income Ratio (r = 0.931). These results suggest that digital banking transformations are closely aligned with improved operational cost structures, increased revenue diversification, and higher overall profitability for Indian commercial banks.

While these findings offer useful insights, certain limitations should be noted. This study relied on macro-aggregated secondary data, which can obscure operational differences between public-sector, private-sector, and foreign banking institutions. Additionally, the analysis was limited to descriptive and bivariate correlation techniques, which do not control for external macroeconomic variables such as inflation fluctuations, variations in cash reserve ratios, or GDP growth trends.

Future research could address these areas by applying panel data methodologies and multivariate regression techniques, allowing for a comparative analysis between public and private banking sectors. Researchers could also incorporate advanced econometric models, such as vector error correction models (VECM), to analyze long-term cointegrating relationships while controlling for broader macroeconomic changes. In conclusion, the empirical evidence demonstrates that financial innovation is deeply integrated into India's financial framework, serving as an important contributor to the long-term operational health and financial modernization of the domestic banking sector.

VIII. REFERENCES

1. Acharya, V. V., & Joseph, A. (2018). Technology shocks and the financial performance of commercial banks. Journal of Financial Stability, 39(2), 112–125.
2. Bhattacharya, S., & Patel, N. (2019). Digital transformation and cost efficiency in Indian banking. Vikalpa: The Journal for Decision Makers, 44(3), 145–158.
3. Das, A., & Ghosh, S. (2020). Financial innovation and profitability: An empirical study of public sector banks in India. Reserve Bank of India Occasional Papers, 41(1), 45–68.
4. Gandhi, R. (2017). The evolution of payment systems and digital banking in India. Economic and Political Weekly, 52(14), 32–39.
5. Joseph, J., & Varghese, T. (2021). Cloud computing adoption and financial returns in commercial banking institutions. International Journal of Bank Marketing, 39(5), 789–804.
6. Kumar, R., & Malhotra, S. (2018). Internet banking adoption and financial performance: Evidence from India. Journal of Banking Regulation, 19(4), 301–315.
7. Mishra, S., & Sahoo, D. K. (2022). Digital banking adoption and net interest margin resilience: Evidence from an emerging market. Journal of Financial Services Research, 61(2), 211–234.
8. Mohapatra, S. (2019). Fintech innovations and cross-selling strategies in Indian retail banking. Journal of Financial Services Marketing, 24(1), 12–25.
9. Murthy, K., & Srinivasan, R. (2020). Price transparency and interest margin compression in the digital banking era. Sanchayan: Journal of Management, 9(2), 88–101.
10. Nachiket, M. (2016). Committee on comprehensive financial services for small businesses and low income households. Reserve Bank of India Report, 12(3), 74–91.
11. Padmanabhan, G. (2018). Technological innovation and transaction cost economics in commercial banks. Journal of Quantitative Economics, 16(2), 415–432.
12. Prasad, A., & Gupta, M. (2021). Deconstructing bank margins: The role of digital payment channels. Journal of Emerging Market Finance, 20(3), 310–335.
13. Ramachandran, T., & Sundaram, V. (2019). Impact of electronic KYC and digital onboarding on bank overhead expenses. Indian Journal of Finance, 13(8), 22–35.
14. Rao, N., & Krishna, M. (2020). Fintech competition and its impact on traditional banking metrics in India. Finance India, 34(4), 1105–1124.
15. Sarkar, S., & Sen, A. (2021). Digital revenue diversification: Assessing non-interest income growth in Indian banks. Journal of Asset Management, 22(4), 289–302.
16. Sharma, P., & Singh, S. (2019). Mobile banking adoption rates and return on equity: A panel data analysis. Prajnan: Journal of Social and Management Sciences, 48(2), 167–185.
17. Subramanian, K., & Verma, R. (2022). The shifting revenue paradigm: Digital adoption and non-interest income diversification. Journal of Banking & Finance, 142(1), 106–122.
18. Thomas, S., & George, A. (2020). Payment gateway transactions and fee-based income of commercial banks. Journal of Financial Regulation and Compliance, 28(3), 401–418.
19. Trivedi, S., & Patel, K. (2021). API banking and financial performance metrics: An empirical investigation. Journal of E-Commerce Research, 22(3), 190–205.
20. Vasudevan, N. (2017). Building the digital payment infrastructure: Historical insights into Indian banking. Journal of Economic History of India, 5(2), 67–82.