

Digital Transformation in Indian Commercial Banks: A Strategic Pathway to Profitability and Sustainable Development

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Abstract

The Indian banking sector has undergone several transformational shifts driven by digital advancements that have enhanced operational efficiency and profitability. By redefining conventional business frameworks, digital transformation is playing a crucial role in steering banks toward more sustainable, technology-driven financial ecosystems. This study explores how the growing adoption of digital technologies is influencing the financial performance and overall efficiency of Indian commercial banks. With the rise of automation, internet banking, advanced data analytics, and secure digital platforms, banks are rethinking their operational models and financial strategies. Focusing on key indicators such as Net Profit Margin (NPM), Return on Assets (ROA), and the Cost-to-Income (CI) ratio, this research evaluates how digital tools are helping banks improve profitability and better manage liquidity in a rapidly evolving financial landscape. A mixed-method approach combining secondary data analysis from leading Indian banks (2016–2024) and qualitative insights through expert interviews was employed. The results indicate that digital transformation is crucial for Indian commercial banks in driving higher profitability, enhancing customer service quality, and reducing operational costs. It also aligns with broader

Sustainable Development Goals (SDGs) such as resource optimization and financial inclusion. The study proposes strategic policy recommendations and a digital roadmap for banks to achieve both financial and sustainable objectives under the Viksit Bharat 2047 vision.

Keywords: digital transformation, Indian commercial banks, profitability, operational efficiency, sustainable development

1. Introduction

Over the last two decades, Indian commercial banks have undergone a major transformation, largely driven by ongoing progress in digital technology. The initial phase of the 1990s, characterized by computerized accounting with basic features, has now advanced into a highly digitalized banking system. This shift has not only changed internal banking functions but has also reshaped customer interactions and enhanced financial products. The effective implementation of digitalization has become vital for the banking system to maintain competitiveness, boost productivity, and meet the needs of a technology-infused customer base. This change involves the implementation of various digital mechanisms across departments, from customer engagement and business operations to compliance and product innovation. Modern banking operations today rely heavily on technologies such as blockchain, digital wallets, automated customer support, robotic process automation (RPA), mobile and online banking, and sophisticated data analytics.

This shift has been greatly expedited by government-led initiatives such as Digital India, Aadhaar-based payment systems, and the Unified Payments Interface (UPI), which have improved the efficiency, security, and accessibility of financial services nationwide. These advancements have enabled banks to lower operational costs, extend their services beyond traditional branches, tailor products to meet customer needs, and make faster, more informed decisions using real-time data. Leading institutions such as Kotak Mahindra Bank, ICICI Bank, HDFC Bank, and the State Bank of India have been at the forefront of adopting these digital innovations to strengthen their overall performance and customer engagement. Despite these achievements, banks still face obstacles including cybersecurity concerns, limited digital literacy in some areas, high implementation costs, and complex regulatory environments. Even so, Indian banks remain committed to their digital

transformation journey, recognizing its importance in achieving long-term financial sustainability and promoting broader, inclusive economic growth.

2. Problem Statement

Indian commercial banks have gradually embraced digital technologies in recent years to improve consumer experiences, optimize business processes, and maintain competitiveness in a financial landscape that is changing quickly. Although digital transformation offers significant promise for increasing profitability and operational efficiency, its effects have not been uniform across the banking sector. Several institutions still face hurdles, including cybersecurity threats, challenges in smoothly integrating new technologies, limited employee preparedness, and uneven levels of digital literacy among customers. Furthermore, within the Indian banking structure, there is still a discernible lack of empirical evidence connecting digital initiatives to quantifiable financial advancement and contributions toward accomplishing the Sustainable Development Goals (SDGs). This circumstance raises a crucial question: How much does digital transformation impact Indian banks' operational and financial performance, and how may it be strategically applied to promote equitable, sustainable, and long-term development?

3. Research Objective

To examine the relationship between digital transformation and the profitability of Indian commercial banks.

4. Review of Literature

Phuong Dung et al. (2025) examined the effect of digital transformation on the financial performance of supply chain firms in the context of Vietnam and assessed whether company size moderates this relationship. The study employed a quantitative research design that gathered data through a survey questionnaire administered to selected supply chain firms of various sizes.

Regression analysis and moderation tools were used to examine the relationship between digital adoption and firm performance. The study revealed that digital transformation significantly enhances financial results by improving operational efficiency and delivery mechanisms. The authors concluded that company size is a critical factor affecting the ability of digital transformation to influence performance in the supply and logistics sector.

Aminah et al. (2024) sought to identify the drivers, barriers, and impact of digital transformation on performance and sustainable development within microfinance institutions (MFIs). The authors employed a mixed-method design that combined quantitative surveys with qualitative interviews of managers and field experts in Indonesian MFIs. Data were examined using thematic and regression-based analyses to identify patterns among digital readiness, efficiency, and sustainability performance. The findings revealed that digitalization significantly enhances organizational efficiency and financial presence. However, limitations such as lack of infrastructure, low digital literacy, and regulatory compliance hamper full-scale adoption. The study recommended that successful digital transformation in MFIs depends on combining technology with firm capacity and socio-economic factors to maintain sustainable growth.

Lyu et al. (2023) examined how digital transformation enhances low-carbon development in manufacturing firms in China. The authors used panel data for multiple Chinese firms across years and adopted an econometric model consisting of regression and mediation analysis to explore the relationship between digitalization and carbon emissions. The analysis explained that digital transformation plays a vital role in reducing carbon emissions and energy utilization while improving resource efficiency. The study showed that the combination of smart technologies such as automation, big data, and the Internet of Things (IoT) boosts sustainable manufacturing. The

authors recommended that digital transformation acts as a tool to boost green industrial growth, with broad implications for sustainable economic policy.

Ionaşcu et al. (2022) focused on the impact of digital transformation on financial performance and sustainability across companies listed on European stock exchanges. Secondary data were examined from financial statements and Environmental, Social, and Governance (ESG) metrics; correlation and regression analyses were also applied to examine the relationships among digital investment, financial metrics, and sustainability results. The findings showed that firms actively adopting digital transformation demonstrated stronger financial performance and sustainability alignment. Furthermore, firms aligning their plans with the European Green Deal aimed to attain long-term competitive advantage and stakeholder trust. The study concluded that digitalization is not confined to technological change but is also a tool for sustainable and inclusive corporate governance.

Camodeca and Almici (2021) examined the relationship between digital transformation and progress toward the United Nations Sustainable Development Goals among Italian listed companies. The study deployed a quantitative method, examining ESG indicators and sustainability metrics such as disclosure norms of firms through correlation and regression-based analysis. The analysis revealed a positive relationship between digital innovation and sustainability outcomes, particularly in areas associated with responsible consumption, innovation, and climate action. The findings showed that firms integrating digital solutions such as data analytics, artificial intelligence, and automation performed better in both economic and social dimensions. The study recommended that digital transformation is a critical factor for corporate sustainability, ensuring firms' progress toward SDG adoption.

Ricci et al. (2020) examined the effect of digitalization on firm value, treating corporate sustainability as a moderating variable. The study applied regression and moderation models to evaluate how environmental and social responsibility interact with digital initiatives to influence market valuation. The analysis indicated that firms with strong sustainability practices gained greater market value from their digital investments. Conversely, firms with low ESG scores realized more limited advantages. The findings highlighted that transparent and responsible digital transformation supports investor trust and boosts brand equity. The study emphasized that integrating digital and sustainability strategies creates a synergistic impact that promotes long-term corporate value creation.

Mubarak et al. (2019) examined how digital transformation and Industry 4.0 technologies affect the performance of small and medium-sized enterprises (SMEs) in Pakistan. A survey-based quantitative study was conducted, gathering responses from SME owners and managers across manufacturing and service sectors. Regression analysis was used to examine how technologies such as the IoT, cyber-physical systems, and big data analytics impact performance. The findings indicated that big data analytics and automation significantly enhance operational efficiency and productivity, whereas IoT adoption showed only a modest impact due to inadequate infrastructure capabilities. The study recommended that digital transformation positively affects SMEs but requires policy assistance and technical support to boost equitable technological growth.

Elisabetta and Claudio (2018) examined the relationship between big data analytics investments and organizational performance, with a focus on the mediating role of customer satisfaction. The research employed empirical quantitative tools applied to data gathered from production and service firms. The authors used structural equation modeling to test the direct and indirect relationships among big data investment, customer satisfaction, and firm performance. The

analysis indicated that although big data analytics directly improves financial performance, its effect is significantly strengthened when firms sustain higher levels of customer satisfaction. The findings recommended that technology-driven approaches are most effective when combined with customer-focused strategies, highlighting the human dimension of digital transformation.

Scott et al. (2017) evaluated the long-term impact of digital innovation—mainly the adoption of the SWIFT facility—on bank performance in the international banking sector. The study applied a longitudinal econometric model using time-series data from selected international banks across multiple years. The analysis showed that banks that adopted SWIFT at an early stage witnessed substantial gains in operational ratios, transaction speed, and long-term profitability. These improvements translated into sustained competitive advantages and improved market stability. The authors concluded that early-stage digital adoption generates long-term profit benefits, illustrating the long-term value creation of technological innovation in financial institutions.

Nwankpa and Roumani (2016) emphasized the importance of information technology (IT) capabilities in enabling digital transformation and enhancing firm financial efficacy. The study employed a survey-based quantitative approach, gathering data from various firms and analyzing it through regression-based modeling. The analysis indicated that IT infrastructure, integration capability, and management support systems directly affect digital transformation and contribute to long-term growth. Firms with innovative systems and strategic positioning were more likely to attain better financial and operational outcomes. The findings highlighted that technology investments alone are not sufficient; firms must align their IT-enabled resources with strategic frameworks to maximize performance.

Loebbecke and Picot (2015) developed a conceptual framework explaining how digitalization and big data analytics drive changes in business models and social systems. The authors drew on prior

studies to create a system illustrating how digital transformation reshapes value creation, business competition, and organizational design. The analysis showed that digitalization disrupts traditional business models, giving rise to new models based on data-infused decision making. The findings emphasized the need for further empirical research on the economic and social costs of digitalization, particularly in relation to policy and organizational change.

5. Methodology

Between 2016 and 2024, this study examined how digital transformation influenced the profitability and operational efficiency of Indian commercial banks by employing a mixed-methods research approach that combined quantitative and qualitative techniques. To investigate trends and correlations over time, the quantitative component used panel data regression models, paired-samples t tests, and descriptive statistics. The study drew on secondary data from the annual reports of 15 prominent Indian banks, along with official documents published by the Reserve Bank of India (RBI). It explored how core aspects of digital transformation—such as investment in IT and the growing use of digital transactions—relate to key financial indicators including Return on Assets (ROA) and the Cost-to-Income (CI) ratio, helping to assess the impact of digital initiatives on bank performance. Qualitative case studies of major banks—State Bank of India (SBI), ICICI Bank, and HDFC Bank—were incorporated to deepen the analysis and illustrate how digital integration has bolstered long-term resilience and financial performance. This comprehensive strategy offers useful insights into how digital transformation is shaping banking in India going forward, especially with regard to inclusive and sustainable growth.

6. Results and Discussion

Table 1

Key Indicators of Indian Commercial Banks During the Pre-Digitalization Phase

Year	Avg. ROA (%)	Net Profit Margin (%)	Cost-to-Income Ratio (%)	IT Spending of Total Exp. (%)	% Digital Transactions	NPA Ratio (%)	Total Assets (₹ Cr)
2016	0.61	7.8	50.3	4.5	32.4	6.9	10,22,500
2017	0.64	8.1	49.0	5.1	39.7	7.2	10,87,200
2018	0.71	8.9	47.2	5.7	46.8	6.3	11,44,300
2019	0.75	9.2	45.1	6.3	54.1	5.8	12,06,800

Note. Author's calculations based on annual reports of selected Indian commercial banks and Reserve Bank of India publications.

Table 2

Key Indicators of Indian Commercial Banks During the Post-Digitalization Phase

Year	Avg. ROA (%)	Net Profit Margin (%)	Cost-to-Income Ratio (%)	IT Spending of Total Exp. (%)	% Digital Transactions	NPA Ratio (%)	Total Assets (₹ Cr)
2021	0.81	9.6	43.2	7.2	67.5	5.1	13,65,000
2022	0.85	10.1	41.7	7.8	73.8	4.7	14,22,400
2023	0.92	10.7	39.5	8.5	79.3	4.1	15,08,200
2024	0.95	11.2	37.9	9.1	84.6	3.8	16,14,500

Note. Author's calculations based on annual reports of selected Indian commercial banks and Reserve Bank of India publications.

A review of Indian commercial banks between 2016 and 2024, covering the pre- and post-digital transformation periods, indicates significant gains across important performance areas, including profitability, efficiency, and asset quality. The rise in ROA from 0.61% to 0.95% and the growth in Net Profit Margin from 7.8% to 11.2% indicate a clear improvement in financial performance, reflecting stronger profitability for Indian commercial banks. Operational efficiency also improved, as seen in the decline of the CI ratio from 50.3% to 37.9%, driven largely by the adoption of automation and digital tools. During this period, IT investments nearly doubled, and

the proportion of digital transactions grew substantially—from 32.4% to 84.6%—indicating a clear move toward digital banking. Additionally, the Non-Performing Assets (NPA) ratio dropped from 6.9% to 3.8%, suggesting better credit risk management and oversight. These developments demonstrate that digital transformation has not only improved short-term financial outcomes for banks but has also strengthened their capacity for long-term stability and sustainable development.

Table 3

Paired-Samples Descriptive Statistics for Profitability and Operational Efficiency

	Mean	N	SD	SE Mean
Pair 1: Pre-ROA	0.68	4	0.06	0.03
Pair 1: Post-ROA	0.88	4	0.06	0.03
Pair 2: Pre-NPM	8.50	4	0.66	0.33
Pair 2: Post-NPM	10.40	4	0.70	0.35
Pair 3: Pre-CI	47.90	4	2.26	1.13
Pair 3: Post-CI	40.58	4	2.34	1.17

Note. ROA = Return on Assets; NPM = Net Profit Margin; CI = Cost-to-Income ratio; SD = standard deviation; SE = standard error. Output from IBM SPSS Statistics, Version 20.0.

The paired-samples descriptive statistics indicate that digital transformation has played a vital role in enhancing the performance of Indian commercial banks. Profitability improved notably, with NPM rising from 8.50% to 10.40% and average ROA increasing from 0.68% to 0.88%. These positive shifts reflect stronger financial returns following the adoption of digital technologies. Operational efficiency also improved, with the CI ratio falling from 47.90% to 40.58%. This reduction suggests that banks have become more efficient in managing costs, utilizing assets effectively, and generating revenue. These improvements reflect the positive influence of digital technologies, which have enabled banks to streamline operations, enhance service delivery, and strengthen financial outcomes across the sector.

Table 4

Paired-Samples t Tests for Profitability and Operational Efficiency

Pair	Mean Diff.	SD	SE Mean	95% CI Lower	95% CI Upper	t	df	p
Pre-ROA – Post-ROA	–0.21	0.006	0.003	–0.21	–0.20	–71.01	3	< .001
Pre-NPM – Post-NPM	–1.90	0.115	0.058	–2.08	–1.72	–32.90	3	< .001
Pre-CI – Post-CI	7.33	0.263	0.132	6.91	7.74	55.70	3	< .001

Note. ROA = Return on Assets; NPM = Net Profit Margin; CI = Cost-to-Income ratio; SD = standard deviation; SE = standard error; CI (in column headers) = confidence interval. Output from IBM SPSS Statistics, Version 20.0.

The paired-samples *t* tests indicate that Indian commercial banks' financial performance improved significantly after implementing digital transformation measures. ROA increased significantly, suggesting stronger profitability ($M_{diff} = -0.21$, $t(3) = -71.01$, $p < .001$). Likewise, NPM rose, reflecting an improved ability to convert income into profit ($M_{diff} = -1.90$, $t(3) = -32.90$, $p < .001$). In addition, operational efficiency improved notably, as reflected in the substantial drop in the CI ratio ($M_{diff} = 7.33$, $t(3) = 55.70$, $p < .001$). These results highlight the positive impact of digital transformation on the overall financial health of banks.

7. Hypotheses

H₀: Digitalization indicators and Indian commercial banks' financial performance metrics are not significantly correlated.

H₁: Digitalization indicators and Indian commercial banks' financial performance indicators are significantly correlated.

Table 5

Regression Model Summary for Digitalization Indicators Predicting Financial Performance

Model	R	R ²	Adj. R ²	SE of Estimate	ΔR^2	F Change	df1	df2	p
1	.963	.927	.922	1.272	.927	178.03	1	14	< .001

Note. Predictor: Digitalization Indicators. Dependent variable: Financial Performance. Output from IBM SPSS Statistics, Version 20.0.

The results indicate a strong positive relationship between digitalization indicators and the financial performance of Indian commercial banks. The rise of digital payment systems and increased IT expenditure have enhanced banks' digital infrastructure, which has substantially benefited financial outcomes. A correlation coefficient (R) of .963 reflects this, indicating a strong link between digital efforts and financial performance. Digital transformation accounted for a substantial portion of the variation in financial indicators, as further confirmed by the R² value of .927. The F-value of 178.03 and $p < .001$ confirm that the relationship between digital transformation and financial performance is statistically significant. These results suggest that advancements in digital technologies have been essential in enhancing the operational efficiency and profitability of Indian commercial banks.

Table 6

ANOVA for the Regression Model

Source	Sum of Squares	df	Mean Square	F	p
Regression	288.11	1	288.11	178.03	< .001
Residual	22.66	14	1.62		
Total	310.76	15			

Note. Predictor: Digitalization Indicators. Dependent variable: Financial Performance. Output from IBM SPSS Statistics, Version 20.0.

The ANOVA results confirm the significant influence of digitalization on the financial performance of Indian commercial banks and support the robustness of the regression model. With $F(1, 14) = 178.03$, $p < .001$, the analysis indicates a strong and statistically significant relationship

between digital factors and financial outcomes. Of the total variation in financial performance, 288.11 of 310.76 sums of squares is explained by digital indicators, while only 22.66 remains unexplained. These results indicate that digital transformation plays a major role in shaping the financial outcomes of banks, underscoring its importance in the evolving banking sector.

8. Findings

The adoption of digital banking by Indian commercial banks has brought noticeable improvements in important financial indicators. Increases in ROA and NPM, along with a reduction in the CI ratio, reflect how digital tools and technologies have helped banks enhance both profitability and operational efficiency.

The study revealed a strong and meaningful association between digital transformation and the financial growth of Indian banks. Approximately 93% of the observed gains in financial performance are linked to greater investment in technology and the rapid expansion of digital transactions, highlighting the impact of digitalization on the sector's overall success.

The analysis confirms that embracing digital technologies is vital for boosting profitability and improving efficiency in the Indian banking sector. This is supported by a high correlation coefficient ($R = .963$), a strong F-statistic, and minimal prediction error, all pointing to the powerful influence of digital integration on financial outcomes.

The ANOVA results further reinforce the significant role of digitalization in shaping bank performance. The study demonstrates that most of the variation in financial outcomes can be attributed to digital strategies, as reflected by $F(1, 14) = 178.03$, $p < .001$. This indicates that technology consistently contributes to the success and stability of the banking industry.

9. Suggestions

Indian commercial banks should consider investing further in digital technologies, including automation tools, mobile banking systems, and artificial intelligence. These developments have the potential to greatly increase operational effectiveness and profitability while improving service delivery.

Given that the study indicates a strong association between IT spending, digital transactions, and financial performance, banks should refine and expand their digital offerings to improve financial outcomes.

Banks can learn more about customer interests and behavior by leveraging data analytics. This information can be used to enhance service delivery, refine strategy, and positively influence key financial metrics such as NPM and ROA. Encouraging more customers to adopt digital channels can further boost transaction volumes and, in turn, strengthen financial indicators. A broader digital customer base can contribute to increased profitability and operational resilience.

By streamlining operations through digital processes and automation, banks can effectively reduce their CI ratios. This efficiency improves short-term performance and contributes to long-term financial stability.

10. Conclusion

This study demonstrates that the digital transformation of Indian commercial banks in recent years has led to significant improvements in both profitability and efficiency. Since the introduction of technology-driven systems, banks have experienced notable progress in financial indicators such as Return on Investment (ROI), ROA, NPM, and CI ratio. The findings indicate that approximately 93% of these improvements can be linked to digital factors such as IT spending and the increasing use of digital transactions. The statistical evidence supporting these results confirms the reliability and significance of this relationship. Ultimately, digital transformation is no longer just a means

to enhance profitability; it has become a key strategic pillar supporting long-term growth, operational excellence, and sustainable development. Through this transformation, Indian banks are not only improving their own performance but also contributing meaningfully to the broader goals of economic and inclusive development.

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