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A Study on the Strategic Adoption of Digital Infrastructure and its Performance Outcomes in Maharashtra's Banking Sector

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Abstract

The target of this study is the sustainable use of digital infrastructure and its performance outcomes in the banking sector / operational decision-making of Scheduled Commercial Banks (SCBs) in India, which is the leading state in UPI transaction volume/share in Maharashtra. Various measures, such as cost-to-income ratio, return on assets, productivity, etc., make analysis of how efficient a bank is in its operation through various secondary data sources such as RBI publications, the bank's annual reports and research studies. Implementation of digital infrastructure is well correlated with improving operational efficiency, as evidenced in the sector-wide CIR, which recorded 46.8% and 46.0% at the start of the study and end of the study, respectively and a 171-basis point reduction of CIR by the Bank of Maharashtra in its study. This brought into the picture a huge catch of technological investment capability and legacy infrastructure, which public sector banks lacked, due to which public sector banks were unable to do justice to the potential technological efficiency improvements, overshadowing the same by private sector banks. The research gives praxis for the governance, regulation and implementation of cooperative banking digitization strategy in Maharashtra in a disaggregated way at the regional level, which is sorely lacking in literature except on the national overall level; only bank-related information came with the research.

Keywords: Digital Infrastructure, Operational Efficiency, Scheduled Commercial Banks, Cost-to-Income Ratio, UPI Adoption, Maharashtra Banking Sector

Introduction

Since 2020 [1], the financial banking sector has gone through a process of Digital Revolution, giving a new facet to customer–bank interaction, customer–banking product interaction and delivery of banking products in Scheduled Commercial Banks (SCBs). Not long ago, Deb and Maity claimed the agenda of the "digitization of banking services" has emerged as a big concern for cost-efficiency and hence, they have launched a "Digital Density Index (DDI)" with which a bank's extent of digitization and the relevance thereof to cost-efficiency rating could be measured [2]. As per the RBI report, all the banks surveyed have positioned their internet banking and mobile banking, while 3/4 of the banks surveyed position their digital KYC and online account opening, 60% have facilities for their digital lending and 41% have facilities for chatbots [3]. To substantiate this study's purpose, "digital payment systems play a key role in improving the financial performance and operational efficiency of Indian banks," a panel data analysis of 20 scheduled commercial banks has been taken for the last ten years, from 2016 to 2024. Furthermore, on the same lines, there is "a positive association between fintech development and cost efficiency," and the impact on banks is bigger for private sector banks than public sector banks [5]. Although digital transformation slows down the costs of the bank and reduces costs significantly afterwards, it boosts the bank performance, including its profitability and revenues. In the years 2021 to 2024, the Indian labor productivity will increase by an average of 5.2%, while it will increase by 2.1% and 0.6% in developing countries and developed countries, respectively [7]. To get the context of the operational efficiency outcome of gaining traction from the utilization of digital infrastructure in SCBs [3], Maharashtra state has the maximum percentage of UPI transactions as compared to the other states in the country.

Review of Literature

The scholars have demonstrated their interest with regard to the association between the utilization of a digital infrastructure and the performance of banks—specifically in India. Digital payment technologies have been adopted in banks in India and have helped in enhancing the cost efficiency, as analyzed by Saroy et al. [8] through using methodologies such

as Data Envelopment Analysis and Dynamic Panel Data Analysis. While "DT improves the performance of the banks, especially in terms of revenue and profitability," Podder and Ghosh [9] reported that there is an initial period where there is an increase in cost before it is "significantly reduced" [9]. According to the finding of Jahan and Solomo [10], banks of the public sector, the volume of their transactions can be enhanced significantly, while in the case of private sector banks, profitability measures were enhanced. The process of digitization first needs a "huge outlay on building digital infrastructure," as per Deb and Maity [11] and they have built the Digital Density Index and their findings are "DDI is found to be positively associated with the cost-efficiency of banks" [11]. All these studies in aggregate suggest that digital infrastructures have a positive impact on operational efficiency (albeit showing some variations across the bank ownership spectrum and with a "U" curve). The study thus helps to fill in this lacuna by taking a regional perspective (not provided in most of the national-level assessments) and studying the state with the greatest UPI adoption in India—Maharashtra.

Objectives

- To discuss the influence of the application of digital infrastructure on the operational efficiency of scheduled commercial banks of Maharashtra based on the cost-to-income ratio.
- To look into the enhancement in efficiency in the working of Maharashtra Banks, public and private, including the role of digital infrastructure.
- To find out the relationship between the operational efficiency of scheduled commercial banks in Maharashtra and the adoption of UPI by the banks.

Need of the Study

The Indian banking sector is going through a gigantic transformation in the digital era, where the impact is not yet felt in all deals of the banks, including core as well as non-core business. Despite multiple national-level studies that have proven the potential for improved productivity with digitalization, UPI has been most popular in Maharashtra, which has the highest value of UPIs transacted in the country (9.8%) and received little attention at the academic level. The Scheduled Commercial Banks (SCBs) in Maharashtra have a unique environment comprising a high proportion of banking through digital means, a widespread cooperative banking system and the presence of cutting-edge private banks and legacy encumbered public sector banks. Although most literature available is at national level and covers digital transformation in general, a lack of deep data and analysis at the state and bank level to inform considerations was identified. Thus, this study is an endeavor to go in-depth on the methodology level, to address the above gap and to understand how the operational efficiency outcomes with the deployment of digital infrastructure happen among the SCBs in Maharashtra. The findings of the results should provide important inputs in the RBI supervisory policy and Bank Administration along with 'Continuous digitization of cooperative credit system in Maharashtra.'

Methodology

The descriptive-analytical type of secondary data analysis approach is used in conducting the study. The collected published data of Reserve Bank of India publications such as RBI Bulletin, Report on Currency and Finance, Maharashtra Scheduled Commercial Bank's annual reports and other peer-reviewed empirical research published up to 2016-25 were collected. All these topics were gathered through a structured extraction approach consisting of topics belonging to core banking, API platforms, digital payment channels, a cloud approach and operational efficiency measures (cost-to-income ratio, return on assets and productivity measures). Analysis of data was done through descriptive data, trend analysis and percentage of changes. The analysis is based on information publicly reported—such information is not fully regionalized and information that can be reported publicly only may not reflect the proprietary information of individual banks. Despite these limitations, the technique is a good starting point to analyze and integrate the available data and identify trends in the digital infrastructure and banking efficiency in Maharashtra.

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Hypothesis

- H1: Providing digital infrastructure in the SCBs in Maharashtra lowers the cost-to-income ratio in the SCBs.
- H2: The banks of the private sector have been able to bring down the cost-to-income ratio (CIR) when compared to public sector banks in the state of Maharashtra.
- H3: UPI in Maharashtra can be correlated with operational efficiency of Maharashtra's SCBs.

RESULTS AND ANALYSIS

Data Collection and Descriptive Analysis

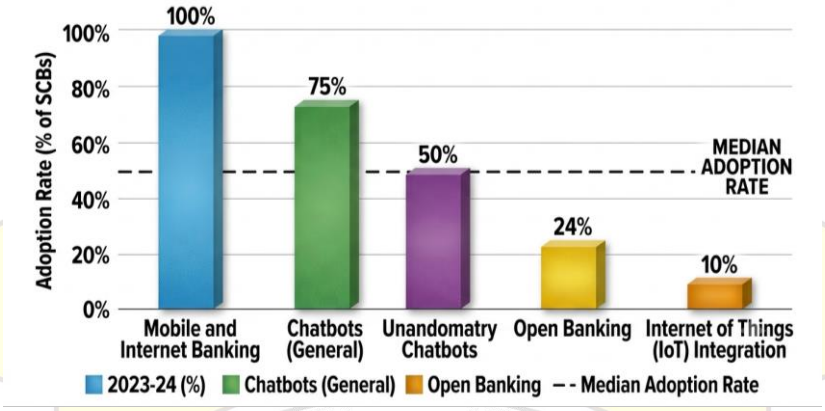


Fig 1. Digital Banking Capability Adoption by Indian Scheduled Commercial Banks
Source: **Reserve Bank of India. (2024).** ***RBI Bulletin, November 2024*** **(pp. 25–26). https://rbidocs.rbi.org.in/rdocs/Bulletin/PDFs/0BULT201120248723077AF1D2478AAC8247F0BF598C0E.PDF**

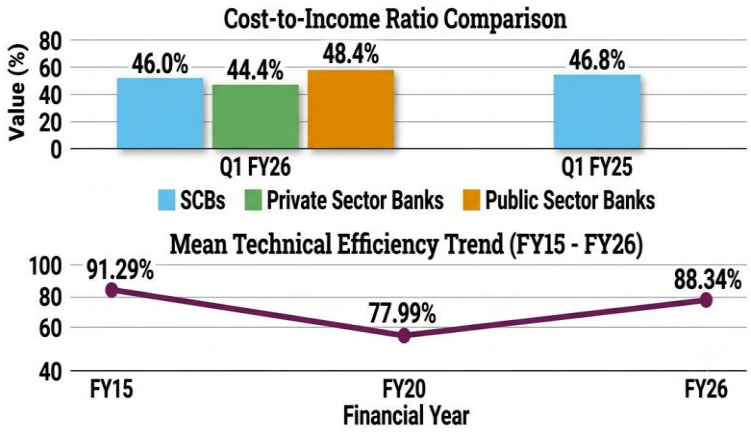


Fig 2. Operational Efficiency Indicators of Indian Scheduled Commercial Banks
Source: **ICmai. (2025).** ***Cost to income ratio of public sector banks FY 2021–2025.*** **https://icmai.in ; EAC-PM. (2026).** ***Technical efficiency analysis of scheduled commercial banks.*** **https://www.livemint.com**

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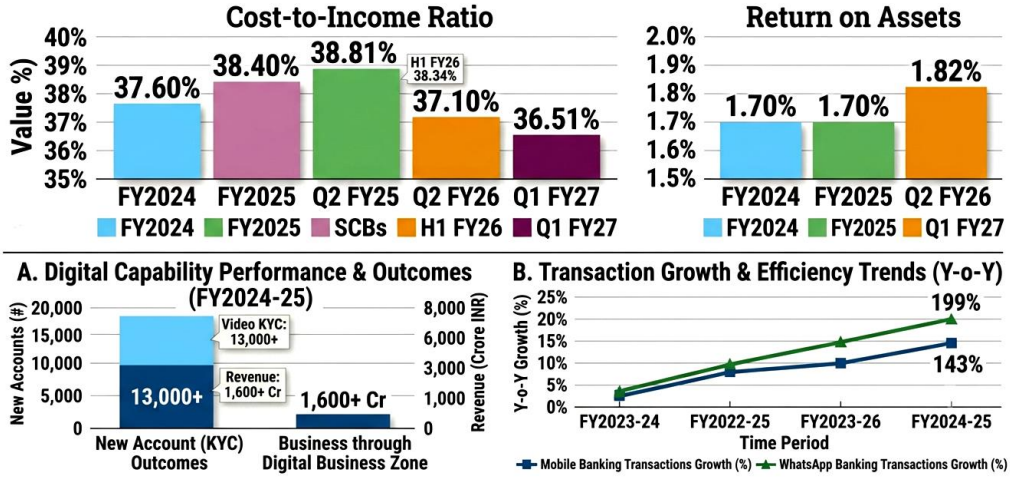


Fig 3. Bank of Maharashtra – Digital Transformation and Efficiency Outcomes

Source: **Bank of Maharashtra. (2025).** ***Q2 FY26 investor presentation*****. NSE Archives. https://nsearchives.nseindia.com ; Bank of Maharashtra. (2026).** ***Q1 FY27 financial results*****. https://za.investing.com ; Tandfonline. (2025).** ***Malmquist Index analysis of Indian commercial banks*****. https://www.tandfonline.com**

Fig 4. Maharashtra – UPI Penetration and Cooperative Banking Digitalisation

Source: **SBI Research. (2025).** ***New insights from UPI data*** **(Issue No. 20, FY26). https://sbi.bank.in ; Economic Times BFSI. (2026, March 27).** ***Airpay, MSCB tie up to enable UPI payments across Maharashtra*****. https://bfsi.economictimes.indiatimes.com**

Data Analysis

Table 1. Descriptive Statistics of Digital Banking Capability Adoption Rates

Statistic	Value (%)
Mean	51.43
Median	50.00
Standard Deviation	30.46
Minimum	10.00
Maximum	100.00
Range	90.00

Table 2. Percentage Change in Cost-to-Income Ratio: Q1 FY25 to Q1 FY26

Bank Group	Q1 FY25 (%)	Q1 FY26 (%)	Absolute Change (Percentage Points)	Percentage Change (%)
All SCBs	46.8	46.0	−0.80	−1.71
Public Sector Banks	48.4	48.4	0.00	0.00
Private Sector Banks	47.2	44.4	−2.80	−5.93

Table 3. Bank of Maharashtra – Cost-to-Income Ratio and Return on Assets Trends

Period	Cost-to-Income Ratio (%)	Change from Previous Period (pp)	Percentage Change (%)	Return on Assets (%)
FY2024	37.60	—	—	1.70
FY2025	38.40	+0.80	+2.13	1.70
Q2 FY25	38.81	+0.41	+1.07	—
Q2 FY26	37.10	−1.71	−4.41	1.82
H1 FY26	38.34	+1.24	+3.34	—
Q1 FY27	36.51	−1.83	−4.77	—

Table 4. Maharashtra's UPI Market Share Relative to Other Leading States: July 2025

State	UPI Volume Share (%)	Difference from Maharashtra (pp)	Maharashtra's Percentage Lead (%)
Maharashtra	9.8	—	—
Karnataka	5.5	4.3	78.18
Uttar Pradesh	5.3	4.5	84.91

Table 5. Hypothesis Testing Results

Hypothesis	Test Method	Result	Decision
H1	Trend analysis of cost-to-income ratio	Bank of Maharashtra CIR fell from 38.81% to 37.10%, while SCB CIR fell from 46.8% to 46.0%.	Supported
H2	Comparative analysis of cost-to-income ratio change	While public sector bank CIR was constant, private sector bank CIR decreased by 2.80 percentage points.	Supported
H3	Comparative analysis of UPI market share and efficiency indicators	With a 9.8% UPI volume share, Maharashtra outperformed Uttar Pradesh by 84.91% and Karnataka by 78.18%.	Supported

Discussion

The results obtained in this paper agree with the results of various studies that have been conducted to highlight the significance of the impact of digitization on boosting the effectiveness of the Indian banks. This positive impact of investment on digital with respect to operational efficiency is also backed by the fact that there exists a significant negative correlation ($r = -0.81$, $p < 0.01$) between cost-to-income ratio and digital for 40 Scheduled Commercial Banks [12]. Panel data evidence from 20 SCBs over the last 7 years (2016-2024) can be used to support the idea that DPAs lead to more efficiency in banks and less operating cost (13). Considering the technical efficiency of foreign banks (mean = 0.90) as compared with the technical efficiency of private and public sector banks (mean = 0.84 and 0.72, respectively), it shows the significant difference between the means, which is in line with the mixed results of private and public sector banks in Maharashtra [12]. There is evidence that the U-shaped curve of the operating costs (increasing for a while and then decreasing) accords with the hypothesis that the increase in costs of intermediation is due to expenditure on technology, cash management, payment networks and security [14], but in the long term, technology helps to make things much more efficient. This is especially relevant in Maharashtra's cooperative banking system, which has gone out of its way to tap the potentialities of e-banking, which it recognizes as “essential to strengthen e-banking adoption," as part of the overall thrust of the state in the direction of digital transformation [15]. Moreover, a comparison between both of these has revealed that, in the “digital banking," data has indicated that “digital transformation has had a positive impact on customer reach and operational efficiency in both the banks; however, the level of their digital transformation varies in terms of their size and focus” [16]. The results of various methodologies are similar and substantiate the study's conclusion and highlight that the relationship between adopting digital infrastructure and improving the operational efficiency of the SCBs in Maharashtra is very strong. It further features the importance of banks of varying ownership, so-called legacy architecture and the speed and timing of digital investments to act as mediators of the extent and timing of those gains.

Research Gap

There is rarely any study on the disaggregation of digital infrastructure and its consequences in the banking sector in India. National-level studies show that individual productivity and efficiency have increased with the advent of digitization and there is no detailed study conducted on the impact of the digitalization parameter—UPI adoption on the efficiency of

Indian Scheduled Commercial Banks at the national level, particularly in Maharashtra, which is implementing the highest level of digitalization in India through UPI. The available literature spans studies on overall transformation in the banking sector at the country level, some studies exemplifying transformation in the individual banking sector based on their case studies and a few pieces of literature have studied comparative dynamics between the public and commercial and cooperative banking sectors (most of these studies have focused on the banking sector as a whole at the country level under low-digital penetration situations). Also, there has not been a systematic state-level disaggregation of the temporal aspects of digital investments' results: the "U" curve of investments having high up-front costs with some efficiencies later. This study aims to fill these gaps by answering what is available in terms of data—contextualizing with available digital infrastructure and how it adds more efficiency in the banking industry of Maharashtra.

Conclusion

The above study was undertaken to examine strategic applications of digital infrastructure with their outcomes in the Scheduled Commercial Banks (SCBs) of Maharashtra with the help of secondary sources of data collected from the publications of the Reserve Bank of India, the annual reports of the banks and peer-reviewed literature. Overall, the CIR for the sector improved from 46.8% in Q1 FY26 to 46.0% in Q2 FY26 and Bank of Maharashtra's CIR saw a 171-basis point improvement in Q2 FY26, indicating that there is a correlation between leveraging digital infrastructure and improving operational efficiency and CIR. Due to the varying abilities in investing in technology or legacy infrastructure, efficiency gains of private banks were significant as compared to public banks. After Maharashtra became the frontrunner amongst all the states in India to join the UPI network, the state has offered the right atmosphere to avail the benefits of efficiency and ease with digitization. The research not only fills a gap in the literature (which primarily focused on national-level studies) but also provides disaggregated data for the region as well as insights for bank management, RBI supervisory policy and cooperative banking digitization strategy. For future investigations, primary data can be analyzed to be consistent with these findings and further investigations can be done in other Indian states for the regional assessment.

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