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THE IMPACT OF DIGITIZATION ON THE PROFITABILITY OF SELECTED INDIAN BANKS: POOLED OLS MODEL APPROACH

Sintayehu Ermias Lolemo, Dr. Hemal B. Pandya

PH.D. Research Fellow, Gujarat University, School of Commerce, Gujarat, Ahmedabad, India
E-mail: ermiassintayehu0@gmail.com

Professor, Gujarat University, School of Commerce, Gujarat, Ahmedabad, India
E-mail: hemal1967@gmail.com

ABSTRACT

Purpose: The study assessed the relationship between digitization and bank profitability and provide insights into the banking industry.

Design/methodology/approach: A pooled OLS model was adopted, using annual reports from a sample of Indian banks over a specific period. The analysis involved assessing the correlation between digitization and bank profitability while controlling for other relevant factors.

Findings: The study found a strong and positive connection between digitization and bank profitability. The findings revealed that greater digitization efforts had a beneficial effect on the financial performance of the Indian banks examined.

Practical implications: The study highlights the importance for Indian banks to prioritize and invest in digitization initiatives to enhance their profitability. It provides valuable insights for bank managers and policymakers in formulating strategies to leverage digital technologies for financial success.

Research limitations: The study focused exclusively on Indian banks, limiting the generalizability of the findings to other banking systems and countries.

Social implication: The study underscored the significance of digitization for Indian banks, suggesting that prioritizing digital initiatives contributed to their profitability and potentially stimulated economic growth in the country.

Value: This study contributes value to the current body of literature by presenting empirical findings that shed light on the influence of digitization on Indian banks' profitability.

Keywords: Panel data, digital transformation, banking industry

1. INTRODUCTION

Digital technologies have revolutionized businesses across various sectors, including banking. In recent years, Indian banks have undergone a significant transformation as they embrace digitization. This has helped them enhance their services, improve operational efficiency, and cater to customers' evolving needs in the digital age. As a result, understanding the consequences of digitization on Indian banks' profitability has become a critical area of research.

This study investigates digitization's effects on Indian banks' profitability using panel data analysis. By using panel data that includes information on digitization measures and profitability indicators over a specific time, this research seeks to empirically analyze the correlation between digitization and profitability in the context of Indian banks.

Digitization in the banking sector encompasses a wide range of technological advancements. These advancements include online banking platforms, mobile banking apps, digital payment systems, and automated processes. Digital initiatives enable banks to streamline operations, reduce costs, expand reach, and provide enhanced services. Understanding how these digitization efforts influence banks' profitability is crucial for decision-makers within the banking industry.

Panel data analysis is a suitable methodology for this research as it enables the investigation of both cross-sectional and time-series aspects of the data. By analyzing panel data that includes multiple banks observed over a specific period, this study controlled for bank-specific factors and time-varying effects, providing a more comprehensive understanding of the relationship between digitization and profitability.

The anticipated outcomes of this study are poised to enhance the current body of literature regarding digitization's influence on banking profitability. This is especially relevant to the Indian context. The Indian banks chosen for this research encompass a diverse array of institutions, taking into account factors such as their size, market share, and digitization level. By examining the profitability implications of digitization across these banks, this study seeks to offer valuable insights into the strategic consequences of digital transformation within the Indian banking sector.

The findings of this research are expected to contribute to the existing literature on the impact of digitization on banking profitability, particularly in the Indian context. The selected Indian banks in this study represent a diverse range of institutions, considering their size, market share, and degree of digitization. By investigating the profitability implications of digitization across these banks, this research aims to provide valuable insights into the strategic implications of digital transformation within the Indian banking industry.

This study holds practical significance for Indian banks as they navigate the digital landscape. Understanding the impact of digitization on profitability can help banks formulate effective strategies to leverage digital technologies. This will optimize resource allocation, and ensure long-term profitability and sustainability. Additionally, policymakers can benefit from these insights to develop supportive policies and regulations that foster digitization growth in the banking sector.

1.1. Research questions

- What is the overall impact of digitization on the profitability of the chosen Indian banks?
- How does the adoption of online banking transactions affect the profitability of selected Indian banks?
- What is the relationship between the level of digital payment adoption and the financial performance of the chosen Indian banks in terms of profitability?
- To what degree does the implementation of mobile banking applications impact the profitability results of the chosen Indian banks?
- Are there variations in the impact of digitization on profitability among the selected Indian banks based on their market share?

1.2. Research hypothesis

From the research questions, the following hypotheses were formulated:

H1: There is a significant impact of digitization on the profitability of selected Indian banks.

H2: There is a significant relationship between the adoption of online banking transactions and the profitability of selected Indian banks.

H3: There is a significant relationship between the level of digital payment adoption and the profitability of selected Indian banks.

H4: There is a significant variation in the impact of digitization on profitability among the selected Indian banks based on their market share.

1.3. Objective of the study: -

The primary aim of this study was to investigate the impact of digitization on the profitability of selected Indian banks using a pooled OLS model approach.

- To assess the overall impact of digitization on the profitability of selected Indian banks.
- To examine the particular influence of the adoption of online banking transactions on the profitability of chosen Indian banks.
- To investigate the relationship between the level of digital payment adoption and the profitability of selected Indian banks.
- To analyze the extent to which the utilization of mobile banking applications influences the profitability of chosen Indian banks.
- To explore variations in the impact of digitization on profitability among the selected Indian banks based on their market share.

2. LITERATURE REVIEW

A 10% rise in digitalization lowers the national unemployment rate by 0.84 percentage points, having a major impact on job creation across the economy. In contrast to the predicted 18 million jobs added between 2007 and 2008, digitization is estimated to have created 19 million jobs between 2009 and 2010 (Sabbagh, 2012).

The digitization of financial services has significantly altered banking, fundamentally changing the idea of how it operates and how it interacts with customers (Romdhane, 2021). The study offers compelling evidence that institutional regulation, institutional corruption, and political unrest are impeding India's banking stability and digital growth (Syed et al., 2022).

Physical proximity and digital services must be combined by banks; digitization may be a way for them to consistently minimize risk. The ability to reinvent themselves because of this digital change can help banks defend against similar potential crises (Romdhane, 2021).

Increasing a sector's performance and growth through automation affects the economy's overall growth rate. Digitization results in lower costs, better performance, better jobs, more production, enhanced literacy, and many other benefits. Digitization helps to improve all activities in the agricultural and industrial sectors, including purchasing, sales, inventory management, trade relations, employment, product invention, and development (Sheokand & Gupta, 2017).

Pesaran et al., (2001) proposed a “bounds test” which involves comparing the results of standard t and F statistics with a set of critical values. If the statistics fall outside these boundaries, the test either rejects or accepts the null hypothesis. However, if the statistics lie within these bounds, the test does not provide a conclusive outcome.

According to Weriemmi et al. (2022), trade liberalization and digitization have a clear and positive influence economic growth. These results demonstrate that trade liberalization and digitization are crucial factors driving economic growth in the highly developed countries of Asia. Policymakers in Asian nations must comprehend how to create digital markets if they are to realize these abundant rewards. In the coming decade of digitalization, most of the world's knowledge and goods will be bought and sold online.

Sheokand and Gupta (2017) Digitization increases and reduces the time needed to complete various tasks and services. Profit margins are projected to increase because of cost reductions and expanding market spreads, highlighting the sector's earnings. Increased customer satisfaction and better service quality result from prompt and thorough service delivery.

According to Personal and Archive (2021), an improvement to a nation's digital ecosystem would simulate people sending money home, give people, businesses, and governments a convenient way to receive money digitally in the receiving nation and enhance the non-linearity of improvements to that nation's digital ecosystem.

According to Sabbagh (2012), a 10-point rise in digitization raises the human development index by around 0.17 points for developing nations, where the influence of digitization on the human development index and sub-indices is more prominent.
Ehimare and Onyenwe (2020) researched on the consequence of digitization on the profitability of a subset of Nigerian commercial banks. The overall bank profits after taxes had a considerable impact on digitization for all the banks assessed. However, digitization encourages banks to provide high availability of channels to boost revenue without having a major influence on commercial banks' return on equity.

3. THE DATA DESCRIPTION AND METHODOLOGY

This research paper covered ten years, ranging from 2013 to 2022, and used panel data as observed data. The secondary data for this study included the annual time series reports of the State Bank of India, Punjab National Bank, and Union Bank of India. These reports were obtained from the CMI Prowess IQ database.

The quantitative research design used in this study allowed for the analysis and testing of the data's pool ability using a pooled OLS model. The study aims to examine the association between variables in both the long and short run. Digitization is the independent variable and bank profitability is the dependent variable.

Table 1

Data description				
No	**Variable**	**Period**	**Type of data**	**Data sources**
1	Net profit	2013-2022	Panel data	Prowess IQ database
2	Digitalization	2013-2022	Panel data	Prowess IQ database

Normality test

In this research, the normal distribution of bank annual data was assessed using the Jarque-Bera (JB) test. The JB test is a widely used method to analyze time series data distributional properties. If the Jarque-Bera statistical value is positive and significantly deviates from zero (with a p-value less than 0.05), it indicates that the data deviates from a normal distribution.

Poolability test

Individual and time effect test

To assess the pool ability of the data, a unit root test was conducted to examine the stationary or non-stationary nature of the time series variables. The Augmented Dickey-Fuller (ADF) test was employed to investigate the existence of a unit root in the data series. To conduct meaningful analysis, time series data need to exhibit stationarity, including that the statistical characteristics remain constant.

4. DATA ANALYSIS

4.1. Descriptive statistic and Time series index

A. Descriptive statistic

Table 1

Ho: Data is normally distributed

Statistics	**Net profit**	**ATM+ADWMS**
Mean	5385.95	23310
Std. Dev.	14760.5	21886.1
Chi-square	39.892	33.716
Probability	0.00000	0.00000
Observations	10	10
Results	**Not Normal**	**Not Normal**

Source: Authors' calculations using Gretl software

In this study, 30 observations were collected from three banks over ten years. This resulted in a panel dataset with 3 banks (n = 3) and 10 years (t = 10). To assess the normality of the variables, net profit, and digitalization, normality tests were conducted.

According to the results provided in the above table, the p-values for the normality tests were determined to be below 0.05. This indicates that the null hypothesis, assuming the data adhere to a normal distribution, is rejected. In other words, net profit and digitization do not support normality assumptions.

The rejection of the normality assumption implies that the distribution of net profit and digitalization in the observed data deviates significantly from a normal distribution. This finding is relevant to consider when conducting further statistical analysis or modeling, as techniques and assumptions based on normality may not be appropriate for these variables. Alternative approaches or transformations may be necessary to account for the departure from normality and ensure subsequent analyses' validity.

B. Time series index

Figure 1

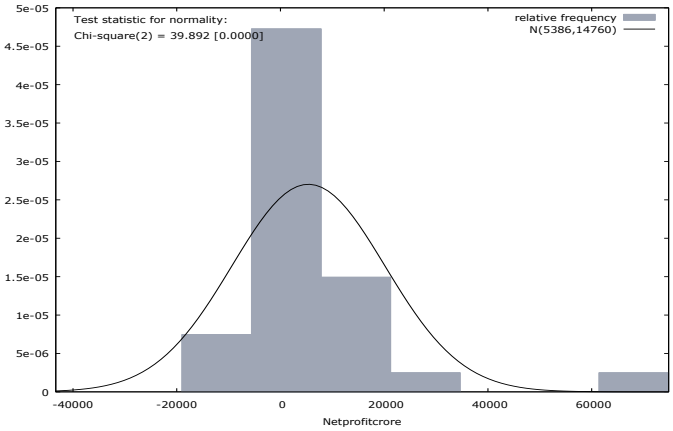

Table 2

Interval	Midpoint	Frequency	Rel. (%)	Cum (%)
<-5581.6	-12283	3	10.00	10.00
-5581.6-7821.21	11119.8	19	63.33	73.33
7821.21-21224	14523	6	20.00	93.33
21224-34627	27925	1	3.33	96.67
34627-48029	41328	0	0.00	96.67
48029.-61432	54731	0	0.00	96.67
>=61432	68134	1	3.33	100.00

Mean	Standard deviation	Ch-square value	p-value	---
5385.95	14760.5	39.892	0.00000	---

A normality test was conducted on the net profit variable, and the results indicated that its frequency distribution deviates from normality. The chi-square test produced a p-value below the predefined significance level of 0.05, leading to the rejection of the null hypothesis that assumes a normal distribution.
These findings highlight that net profit data does not conform to normal distribution. Consequently, when analyzing and interpreting the net profit variable, one must consider this departure from normality.

Figure 2

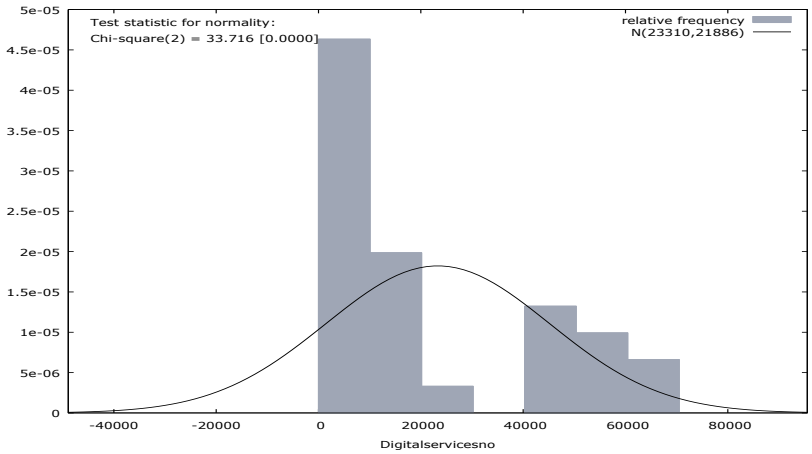

Table 3

Interval	Midpoint	Frequency	Rel. (%)	Cum (%)
<10071	5035.6	14	46.67	46.67
10071-20142	15107	6	20.00	66.67
20142-30214	25178	1	3.33	70.00
30214-40285	35249	0	0.00	70.00
40285-50356	45320	4	13.33	83.33
50356-60427	55391	3	10.00	93.33
>=60427	65563	2	6.67	100.00

Mean	Standard deviation	Ch-square value	p-value	---
23310	21886.1	33.716	0.00000	---

A normality test was performed on the digitization variable, indicating that its frequency distribution deviates from normality. The chi-square test produced a p-value lower than 0.05, resulting in the rejection of the null hypothesis that assumes a normal distribution (Mohanasundaram T. and Karthikeyan P., 2015).

These findings suggest that the digitization variable does not follow a normal distribution. It is imperative to consider this departure from normality when analyzing and interpreting digitization data.

Poolability test

Test for differing group intercepts -

Test statistic: F (2, 26) = 0.0335686

Sign. value = P (F (2, 26) > 0.0335686) = 0.96703

Ho: The groups have a common intercept

Test statistic	value
F (2,26)	0.0335686
P (F (2,26)	0.96703

After conducting a normality check, it is imperative to determine whether the data used in the study can be considered "pooled". The pooled ordinary least squares model is commonly used to assess pool ability, as it provides a quick and straightforward approach for this purpose. If the data exhibit constant values and a common intercept over time, it can be considered pooled data.

Based on the table presented above, the researcher accepted the null hypothesis as the F-test (2, 26) yielded a significant value of 0.96703. This indicates that the data can be categorized as pooled, implying that a pooled OLS model is suitable and appropriate for the study. This finding aligns with the research conducted by (Mohanasundram T. and Karthikeyan P., 2015).

Individual and time effect

Pesaran CD test for cross-sectional dependence

Ho: There is no individual effect

Test statistic	Value
z-value	2.132464
Average absolute correlation	0.437
Sign.	0.033

Wald's joint

Wald joint test on time dummies -

Ho: No time effects

Test statistic	value
The test statistic of asymptotic: chi-square (9)	13.7545
Sign.	0.13133

As a result of the conducted analysis, the three banks selected in this study exhibit a unique form of heteroscedasticity. This finding indicates that there is no significant time effect among these banks. The presence of heteroscedasticity suggests that the variability of data points differs across banks, implying that they are

influenced by several factors impacting their profitability.
The absence of a time effect suggests that common time-specific factors or trends do not influence these banks' profitability. Instead, each bank's profitability seems driven by individual characteristics or specific factors unique to that bank.

Pooled OLS model
Included 3 cross-sectional units
Time-series length = 10
Included 3 cross-sectional units
DV: Net profit and profitability

	coefficient	**St. Error**	**t-ratio**	**Sign.**
constant	-4036.61	3236.55	-1.247	.2227
Digitalization	0.404229	0.102023	3.962	.0005

	value		**value**
Mean dependent var.	5385.954	S.D. dependent var.	14760.48
Sum squared residual	4.05e+09	S.E. of regression	12024.50
R-squared	0.359244	Adjusted R-squared	.336360
F (1,28)	15.69837	P-value(F)	.000465
Log-likelihood	-323.3743	Akaike criterion	650.7486
Schwarz criterion	653.5510	Hannan-Quinn	651.6451
rho	-0.025837	Durbin-Watson	2.001670

The outcomes presented in the table above, derived from the pooled OLS model, prove a positive correlation between digitalization and bank profitability. The findings indicate that, while keeping other factors constant, a one percent increase in digitization is projected to result in a 0.404 percent enhancement in profitability.
The adequacy of the pooled ordinary least squares (OLS) model is indicated by the adjusted R2 value of 0.3592. This indicates that this model explains 35.9 percent of the overall variability in the profitability of the three chosen banks. Additionally, the fixed effect model shows an adjusted R2 of 0.360, saying that this model explains 36 percent of the total variance in the profitability of the chosen banks (referenced from the EViews 12 student version).

5. CONCLUSION

The results of this study, utilizing panel data obtained from the State Bank of India, the Punjab National Bank, and the Union Bank of India spanning from 2013 to 2022, reveal a positive correlation between digitalization and bank profitability. The results consistently demonstrate that digitalization has a significant impact on bank profitability, with a one percent increase in digitalization leading to a 0.404 percent improvement in profitability while other factors are held constant.
Moreover, the study highlights that digitalization accounts for 35.9% of the profitability variance among the selected three banks. This emphasizes the importance of digitalization strategies to enhance bank profitability and competitive advantage in the modern banking industry.
Furthermore, it is worth mentioning that the study identifies a cross-sectional impact, indicating that the digitization process influences individual banks' profitability. However, no significant time effect was observed due to heteroscedasticity. This finding emphasizes the need to consider bank-specific factors when analyzing digitalization's impact on profitability.
To further advance this area of research, future studies could explore more factors that may moderate the relationship between digitalization and profitability. They could also consider a broader range of banks, and analyze digitalization's long-term effects on bank performance.
Overall, this research contributes to our understanding of digitalization's significance in driving bank profitability. It underscores the importance of banks strategically integrating digital initiatives to enhance their financial performance and remain competitive in the evolving digital landscape.

6. RECOMMENDATION

✓ Based on the findings presented in this research paper, the following recommendations are suggested:

✓ Banks should prioritize and invest in digitalization initiatives to enhance profitability. This entails adopting digital banking platforms, offering innovative digital services, and enhancing customer experiences through online channels.

✓ It is important to understand that digitalization's impact on profitability may vary across different banks. Therefore, banks must assess their unique characteristics, customer base, and market position to develop tailored digitalization strategies that align with their specific needs and objectives.

✓ To fully leverage digitalization's benefits, banks should focus on building digital competencies within their workforce. This entails implementing training and development initiatives to empower employees with the essential skills and knowledge required to navigate the digital landscape proficiently.

✓ Digitalization is a rapidly evolving field, with innovative technologies and trends constantly emerging. Banks should stay informed about the latest developments, monitor customer preferences, and adapt their digital strategies accordingly to remain competitive and sustain profitability.

✓ Regularly assess the impact of digitalization efforts on bank profitability through comprehensive monitoring and evaluation. This includes analyzing key performance indicators, customer feedback, and financial metrics to track the effectiveness of digitalization strategies. It also includes making informed adjustments, as necessary.

7. DATA AVAILABILITY STATEMENT

Form	Year	Net profit	Digital service
1	2013	14104.98	28141
1	2014	10891.17	44867
1	2015	13101.57	46898
1	2016	9950.65	49724
1	2017	10484.1	50188
1	2018	-6547.45	59541
1	2019	862.23	58415
1	2020	68133.61	58555
1	2021	20410.47	62617
1	2022	31675.98	65030
2	2013	4748	6313
2	2014	3343	6940
2	2015	3062	8348
2	2016	-3974	9463
2	2017	1325	10681
2	2018	-12283	9668
2	2019	-9975	9255
2	2020	336	9168
2	2021	2022	13781
2	2022	3457	13219
3	2013	2158	4603
3	2014	1696	5421

3	2015	1781.6	6233
3	2016	1351.6	6883
3	2017	555.21	7518
3	2018	-5247	7642
3	2019	-2948	6650
3	2020	-2898	11158
3	2021	0.31	11179
3	2022	0.59	11200

Source: cmie prowess IQ

8. FUNDING AND CONFLICTS OF INTERESTS

This research did not receive any external funding. The authors declared that they had no conflicts of interest or competing interests that could compromise or influence the objectivity of this research.

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