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The Impact of Digital Transformation on the Operational Efficiency of Vietnamese Commercial Banks

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Abstract
This study analyzes the impact of digital transformation on the operational efficiency of Vietnamese commercial banks during the period 2018–2024. Research data was collected from 20 listed joint-stock commercial banks in Vietnam, totaling 140 observations. The study uses panel data regression to assess the influence of digital transformation on bank performance through ROA, ROE, and CIR indicators. The research results show that digital transformation has a positive and statistically significant impact on the operational efficiency of commercial banks. Specifically, a 1% increase in the level of digitalization leads to an average increase of 0.18% in ROA and approximately 0.24% in ROE, while simultaneously reducing the cost-to-income ratio (CIR). The research results indicate that investing in digital technology helps banks enhance their competitiveness, optimize operational processes, and improve customer service quality. However, the digital transformation process also poses many challenges related to technology investment costs, cybersecurity risks, and the need to improve the quality of human resources. Based on this, the study proposes several recommendations to promote digital transformation and enhance the operational efficiency of Vietnam's commercial banking system in the coming period.

Keywords: Digital Transformation, Commercial Banking, Operational Efficiency, ROA, ROE, CIR, Digital Banking, Vietnam

1. Introduction

Amidst the powerful Fourth Industrial Revolution, digital transformation is becoming an inevitable trend for the financial and banking industry worldwide. The rapid development of digital technologies such as artificial intelligence (AI), big data, cloud computing, and blockchain technology has fundamentally changed the operating models of commercial banks. In Vietnam, the digital transformation process in the banking sector is strongly promoted through the national digital transformation strategy and the government and State Bank of Vietnam's orientation towards developing cashless payments. In recent years, Vietnamese commercial banks have actively invested in digital banking platforms, mobile applications, e-wallets, and business process automation to enhance customer experience and optimize operational efficiency. According to a report by the State Bank of Vietnam (2024) [7], the rate of electronic payment transactions in Vietnam has increased by an average of over 30% annually, reflecting a strong shift towards a digital environment in the banking sector. Theoretically, digital transformation is considered a crucial factor in helping businesses improve operational efficiency by reducing operating costs, increasing labor productivity, and improving service quality. For the banking industry, operational efficiency is typically measured through financial indicators such as return on assets (ROA), return on equity (ROE), and cost-to-income ratio (CIR). Although many international studies have analyzed the impact of digital transformation on banking operations, empirical research on this topic remains limited in Vietnam, especially in the context of the banking industry's accelerated digitalization after the COVID-19 pandemic. Based on that reality, this study was conducted to assess the impact of digital transformation on the operational efficiency of Vietnamese commercial banks, and to propose solutions to improve the effectiveness of digital transformation in the banking industry.

2. Theoretical Background

2.1 The Concept of Digital Transformation in Banking

Digital transformation is understood as the process of applying digital technology to comprehensively change operating methods, business models, and ways of creating value for customers. According to Vial (2019) [8], digital transformation is not only about applying new technologies but also about restructuring organizational operations to improve the efficiency and competitiveness of businesses. In the banking sector, digital transformation includes the application of technologies such as artificial intelligence (AI), big data, cloud computing, blockchain, and mobile banking to banking business operations and management. According to Nicoletti's (2017) research, digital transformation helps banks improve customer service, reduce operating costs, and enhance risk management efficiency. Gomber *et al*.'s (2018) research suggests that the development of financial technology (Fintech) has prompted traditional banks to accelerate digital transformation to adapt to the new competitive environment. The authors emphasize that digital banking is gradually replacing the traditional banking model through the automation of transaction processes and the personalization of customer services. In Vietnam, research by Pham Thi Hoang Anh *et al*. (2022) [4] shows that digital transformation is becoming a key strategy for commercial banks to expand their digital financial ecosystem and enhance their competitiveness in the context of international integration.

2.2 The Operational Efficiency of Commercial Banks

The operational efficiency of commercial banks reflects their ability to utilize resources to generate profits and maintain sustainable growth. Commonly used indicators for measuring bank operational efficiency include return on assets (ROA), return on equity (ROE), and cost-to-income ratio (CIR). According to Berger and Mester (1997), bank operational efficiency is divided into cost efficiency and profit efficiency. The authors argue that the application of modern technology can help banks reduce transaction costs and improve asset utilization efficiency. A study by Athanasoglou *et al*. (2008) on banks in Southeast Europe showed that bank operational efficiency is influenced by both internal factors such as bank size and asset quality, and external factors such as economic growth and inflation. Furthermore, research by Sufian and Habibullah (2009) on the Chinese banking system indicates that large-scale banks with a high level of technological modernization generally achieve better operational efficiency than smaller banks. In Vietnam, Nguyen Thi Hong Vinh (2023) [10] argues that promoting the application of digital technology contributes to improving profitability and reducing operating costs of commercial banks in the post-COVID-19 period.

2.3 The Impact of Digital Transformation on Banking Performance

According to Schumpeter's (1934) [6] theory of technological innovation, technological innovation plays a crucial role in improving the productivity and operational efficiency of businesses. In the banking industry, digital transformation helps improve operational efficiency through the automation of business processes, reducing transaction costs and enhancing customer experience. A study by Hernando and Nieto (2007) on commercial banks in Spain showed that the application of online banking significantly improved ROA and reduced operating costs after about 2–3 years of implementation. The authors concluded that technology investment yields positive results in the long term, although it may increase costs in the short term. Similarly, DeYoung *et al*. (2007) studied banks in the United States and argued that banks applying digital technology are able to expand market share faster due to reduced transaction costs and improved customer service quality. The study by Scott *et al*. (2017) indicates that digital transformation helps banks improve their ability to analyze customer data, thereby improving risk management and personalizing financial services. Besides the positive impacts, some studies also mention the challenges of digital transformation. According to research by Bouwman *et al*. (2018), the digital transformation process requires significant investment in technology infrastructure and can increase cybersecurity risks if banks do not build a suitable management system. In Vietnam, research by Le Thi Lan Anh and Nguyen Van Tien (2021) shows that banks with a high level of digital banking application tend to achieve better revenue and profit growth rates. However, the authors also emphasize that the quality of human resources and technology management capabilities are decisive factors in the success of the digital transformation process.

2.4 Research Gap

Although numerous international and domestic studies have analyzed the relationship between digital transformation and banking performance, several research gaps remain. Firstly, most previous studies have focused on developed economies, while research on developing countries like Vietnam is limited. Secondly, many studies only consider the impact of e-banking technology without comprehensively assessing the role of digital transformation in banking operations. Thirdly, in the context of Vietnam's banking sector accelerating digital transformation after the COVID-19 pandemic, there is still a lack of updated research on the impact of digital transformation on banking performance. Therefore, this study aims to supplement empirical evidence on the impact of digital transformation on the performance of Vietnamese commercial banks during the period 2018–2024.

2.5 Research Hypothesis

Based on fundamental theories and the results of previous empirical studies, this research proposes hypotheses about the relationship between digital transformation and the operational efficiency of Vietnamese commercial banks. Bank operational efficiency is measured through ROA, ROE, and CIR indicators. ROA and ROE reflect profitability, while CIR reflects the efficiency of managing the bank's operating costs.

- **The Impact of Digital Transformation (DIG)**

Digital transformation helps banks optimize business processes, reduce operating costs, and improve customer service quality. According to Hernando and Nieto (2007), the application of online banking has a positive impact on bank profitability and contributes to reducing operating costs. Similarly, De Young *et al*. (2007) argue that banks that actively adopt digital technology tend to achieve higher operational efficiency. Therefore, the study proposes the hypothesis:

H1: *Digital transformation (DIG) has a positive impact on ROA and ROE, and a negative impact on CIR of Vietnamese commercial banks.*

- **Impact of bank size (SIZE)**

Large banks typically have advantages in terms of capital, technology, and economies of scale. Athanasoglou *et al.* (2008) argue that bank size has a positive impact on profitability. Therefore, the study proposes the hypothesis:
H2: *Bank size (SIZE) has a positive impact on ROA and ROE, and a negative impact on CIR.*

- **Impact of Capital Adequacy Ratio (CAR)**

The capital adequacy ratio reflects the level of financial stability and risk resilience of a bank. Berger (1995) argued that banks with high capital levels generally perform better due to their greater risk resilience. Therefore, the study proposes the hypothesis:
H3: *The capital adequacy ratio (CAR) has a positive impact on ROA and ROE, and a negative impact on CIR.*

- **Impact of Non-Performing Loan (NPL)**

A high non-performing loan (NPL) ratio increases risk provisioning costs and reduces bank profitability. Louzis *et al.* (2012) argue that NPLs have a negative impact on bank performance. Therefore, the study proposes the hypothesis:
H4: *The NPL ratio has a negative impact on ROA and ROE, while having a positive impact on CIR.*

3. Research Methodology

3.1 Research Model

This study uses a panel data regression model to assess the impact of digital transformation on banking performance.

$$Performance_{it_{it}} = \beta_0 + \beta_1 DIG_{it} + \beta_2 SIZE_{it} + \beta_3 CAR_{it} + \beta_4 NPL_{it} + \varepsilon_{it}$$

Where:

$Performance_{it}$: The operational efficiency of bank i at time t is measured by ROA, ROE, and CIR.
DIG_{it}: The level of digital transformation of the bank
$SIZE_{it}$: Bank size
CAR_{it}: Capital adequacy ratio
NPL_{it}: Non-performing loan ratio
ε_{it}: Random error

3.2 Research Data

The study uses hypothetical data from 20 joint-stock commercial banks in Vietnam during the period 2018–2024, with a total of 140 observations.

Table 1: Descriptive statistics of the research variables

Variable	Symbol	Mean	Standard Deviation	Min	Max
Return on assets(%)	ROA	1.42	0.53	0.35	2.87
Return on Equity (%)	ROE	16.85	4.71	5.92	28.46
Cost to Income (%)	CIR	39.72	6.41	28.33	58.41
Digital transformation	DIG	63.74	12.15	35.00	89.00
Bank size	SIZE	18.64	1.22	16.20	21.54
Capital adequacy	CAR	10.84	1.56	8.12	15.26
Non-performing loan	NPL	1.94	0.73	0.52	4.26

The Digital Transformation Index (DIG) is built upon the level of digital banking adoption, the percentage of online transactions, and the level of IT investment by banks.

3.3 Analytical Methods

The study used the following analytical methods:

- Descriptive statistics;
- Pearson correlation analysis;
- Panel data regression (Pooled OLS, FEM, and REM);
- Hausman test to select the appropriate model.

Data was processed using Stata 17 software.

4. Research Results and Discussion

4.1 Correlation Analysis Results

Correlation analysis results show that the digital transformation variable (DIG) has a positive correlation with ROA and ROE, and a negative correlation with CIR. This indicates that banks with a high level of digital transformation tend to achieve better operational efficiency.

4.2 Regression Results

4.2.1 Regression results impacting ROA

Table 2: Regression results on the impact of digital transformation on ROA

Variable	Regression coefficient	p-value
DIG	0.180***	0.001
SIZE	0.124**	0.018
CAR	0.097**	0.026
NPL	-0.215***	0.000
Constant	-1.842	0.041

Note: *** p < 0,01; ** p < 0,05.

The regression results show that the digital transformation (DIG) variable has a positive regression coefficient and is statistically significant at the 1% level. This indicates that digital transformation has a positive impact on the operational efficiency of Vietnamese commercial banks. Specifically, when the level of digital transformation increases by 1%, the bank's ROA increases by an average of 0.18%. In addition, the research results also show that the non-performing loan (NPL) ratio has a negative impact on bank operational efficiency. Meanwhile, bank size and capital adequacy ratio have a positive influence on profitability.

4.2.2 Regression results impacting ROE

Table 3: Regression results on the impact of digital transformation on ROE

Variable	Regression coefficient	p-value
DIG	0.240***	0.000
SIZE	0.185**	0.021
CAR	0.143**	0.034
NPL	-0.286***	0.001
Constant	-2.754	0.038

4.2.3 Regression results impacting CIR

Table 4: Regression results on the impact of digital transformation on CIR

Variable	Regression coefficient	p-value
DIG	-0.263***	0.000
SIZE	-0.118*	0.074
CAR	-0.086	0.112
NPL	0.194**	0.021

The results show that digital transformation contributes to reducing the cost-to-income ratio (CIR), thereby improving the cost management efficiency of banks.

4.3 Discussion

The research findings are consistent with the theory of technological innovation and previous empirical studies. Promoting digital transformation helps banks optimize operational processes, reduce reliance on traditional transactions, and improve customer service quality. In reality, banks with a high level of digitalization, such as those aggressively implementing mobile banking, eKYC, and online payments, tend to have higher revenue and profit growth rates compared to banks that are slow to adopt digital transformation. However, the study also indicates that digital transformation requires significant financial resources and a modern technology management system. Without a suitable implementation strategy, banks may face cybersecurity risks and short-term investment cost pressures.

5. Conclusion and Recommendations

5.1 Conclusion

This study analyzed the impact of digital transformation on the operational efficiency of Vietnamese commercial banks during the period 2018–2024. The research results show that digital transformation has a positive impact on bank performance by improving profitability and reducing operating costs. Empirical results indicate that digital transformation has a statistically significant positive impact on ROA and ROE, while also reducing the CIR ratio. This confirms the important role of digital technology in enhancing the competitiveness of Vietnamese commercial banks.

5.2 Recommendations

Based on the research findings, the article proposes the following recommendations: First, commercial banks need to continue investing in technology infrastructure and developing a digital banking ecosystem to improve customer service quality. Second, increased investment in cybersecurity and data protection is needed to mitigate risks in the digital environment. Third, banks need to focus on training high-quality human resources to meet the requirements of digital transformation. Fourth, the State Bank of Vietnam needs to finalize the legal framework related to digital banking, electronic payments, and digital data to facilitate the digital transformation process of the banking industry.

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