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Research on the Impact of Digital Transformation on the Performance of Commercial Banks from the Perspective of Management Innovation: Empirical Analysis based on the Shanghai and Shenzhen A-Share Listed Banks

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ABSTRACT

Taking the 2011-2021 A-share listed banks in Shanghai and Shenzhen as the research sample, the impact of digital transformation on the financial performance of commercial banks is explored from the micro level. The study has found that the digital transformation has significantly improved the financial performance of commercial banks, and this conclusion is still valid after the robustness test. Mechanism analysis found that digital transformation can improve the management innovation of commercial banks, and then improve the financial performance of commercial banks. The heterogeneity analysis shows that digital transformation improves financial performance better than in non-state banks, but not significant, and improves financial performance better in small banks and significantly than in large banks.

KEYWORDS

Commercial Banks; Digital Transformation; Financial Performance and Management Innovation.

1. INTRODUCTION

As an economic subject, commercial banks can create more profits for shareholders, solve a lot of employment and achieve more tax revenue. Commercial banks have financial functions, which can provide financial support for other economic subjects and promote other economic subjects' better development.

With the rapid development of digital economy, more and more Chinese enterprises regard digital transformation as the focus of their development strategy, in order to adapt to the new round of development competition under the background of digital economy. Relying on big data formation and utilization in recent years, financial steady progress in the field of science and technology, commercial Banks also improved, part of commercial Banks to speed up the digital transformation, the digital development strategy as one of the important strategy of overall development strategy, within the bank actively practice the concept of digital transformation, cultivation and the introduction of digital transformation talents, the construction of digital transformation system. However, there are also some small and medium-sized banks with insufficient understanding, insufficient support and insufficient strength in the digital transformation.

Based on the historical background of the digital economy and the current situation of the digital transformation of banks, this paper conducts theoretical and empirical research on whether the digital transformation improves the financial performance of commercial banks, and explores the role mechanism of the digital transformation affecting the financial performance of commercial banks from the perspective of management innovation.

2. LITERATURE REVIEW AND RESEARCH HYPOTHESES

2.1. Literature Review

The enabling effect of digital transformation has become the focus of scholars. In terms of financing and investment, scholars have found through research that digital transformation can promote enterprises to obtain commercial credit financing, reduce excessive investment and underinvestment by alleviating information asymmetry. Based on the perspective of value creation, Chen Xu et al. (2023) studied the role of digital transformation on enterprise performance by optimizing enterprise cost and enhancing operational efficiency; it has a significant impact on improving enterprise performance. Lai Hongbo, Le Yang (2023) Based on the intermediary role of organizational learning, the research found that the digital transformation of enterprises promotes organizational learning, and has a significant positive impact on enterprise performance through organizational change and technological innovation. Chen Yinfei, Mary Yang (2022) found that digital transformation has a promoting effect on business model innovation, and digital transformation can improve the operating efficiency of enterprises by promoting business model innovation. Li Jinglin, Yang Hongjie (2023) found that enterprise digitalization promotes the sustainable development of enterprises by enhancing the quality of internal control, improving the social responsibility performance, alleviating the degree of financing constraints and strengthening green technology innovation.

In terms of the impact of digital transformation on commercial banks, Xing Tong and Su Yuhai (2024) discussed the differences and dynamic evolution of digital transformation development of China's four major types of commercial banks. Zhang Wei (2024) studied the pain points and solutions of banking digital transformation. Jia Yalu et al. (2024) found that digital transformation can significantly improve the operation stability of commercial banks; the adjustment and change of business structure is an important path to affect the stability of bank operation through digital transformation, and digital transformation can have a positive impact on the operation stability by increasing the proportion of bank retail loans, time deposits and business diversification. Further analysis showed that for scale

With large banks, poor social credit environment and high level of external fintech development, digital transformation can more significantly improve their operational stability.

Most scholars have empirically studied the impact of digital transformation on the performance of listed companies, while there is little research on the impact of digital transformation on an industry or commercial banks, most of the existing studies of commercial banks are explained from the theoretical perspective of analysis. Thus, the mechanism of the impact of digital transformation on the performance of commercial banks. The study in this paper may add a little more empirical evidence to the digital transformation affecting the performance of commercial banks.

2.2. Research Hypotheses

"Management innovation refers to the introduction of a more effective new management method or method that has not been adopted by enterprises. It is the radiation of organizational innovation at the level of enterprise management" (Chang Zexiu, 1994). Organization life cycle theory also expounds the organization needs to change, because of various organizations in different stages of development of the internal environment and external environment, in order to better adapt to the environment, better use of resources, to achieve the new development goals, organization must be various continuous improvement and optimization, to get organization adjustment and innovation. Digital transformation promotes the transparency and symmetry of information based on data, and analyzes and arranges the available information of data, which enhances the level of organizational integration and improves the comprehensive competitiveness of the organization, thus promoting management innovation.

At present, many enterprises manage low data processing efficiency, the response speed of research and processing of enterprise information is slow, unable to submit more accurate information materials on time, which leads to the scientific, real-time and accuracy of information in enterprise management. Under the background of digital, enterprises use advanced information technology and data processing technology, fully reduce the error rate, the enterprise can quickly and efficient collection, integrated analysis and processing information, thus greatly enhance the reliability of enterprise decision-making, improve the estimation analysis and prediction management ability, so as to improve the management level of enterprise, "data, power, algorithm" accelerate the decision-making process, make more rapid response possible (Newell S, Marabelli M, 2015).

Commercial bank management includes customer resource management, business process and approval management, customer risk management, provision management, capital management, asset and liability management, etc.

Commercial Banks to implement digital transformation, can improve the level of customer management level, through the front desk to accept the customer trading accounting system to customer deposits, finance and other assets and transaction records to the background customer management system, customer management system through data analysis function, the customer asset classification, reasonable forecast of customer demand, to transfer information to the hall customer identification system and customer manager to expand customer marketing system. In terms of loan customers, asset mortgage or guarantee guarantee has been Banks as an effective second source of repayment guarantee, with the first and second repayment source of customers can be the bank priority, with the big data information accumulation, the bank constantly aware of some special industry customers or specific stage of development, the lack of mortgage assets is the development of normal characteristics, these customers operating good credit benefits for the object, using big data and system for this kind of customers, can expand bank credit object, further optimize the allocation of credit resources. With the digital transformation, the approval data of banks has been timely transmitted in different departments, different positions and levels, accelerating the approval process. The application of mobile office system guarantees the business acceptance, approval and daily business handling anytime and anywhere, and further improves the development efficiency. Through the collection of external market environment data, customer group data and historical data, and the optimization of the risk management system model, the bank further strengthens the customer risk control and early warning, and reduces the loss of benefits. Through the management innovation brought about by the digital transformation, banks can more accurately classify the five levels of loans (normal, concerned, secondary, suspicious, loss), and draw reasonable provisions accordingly. Capital adequacy ratio management is an important requirement in the development of commercial banks. The application of big data and technology can optimize various risk ratings and measurement, improve the level of capital management, and better deal with various risks. Appropriate asset and liability management methods supported by digital support can promote commercial banks to achieve better profits on the premise of safety and liquidity.

From the above analysis, it can be seen that digital transformation in general enterprises can promote management innovation by promoting organizational optimization, and can also promote enterprise management innovation by optimizing management data. In commercial banks, digital transformation promotes the performance of banks by promoting the management innovation of credit resource allocation, business process, examination and approval. Based on the above theoretical analysis, the following hypotheses are put forward: H1: Digital transformation promotes the financial performance improvement of commercial banks; H2: Digital transformation promotes management innovation, and management innovation further promotes the financial performance improvement of commercial banks.

3. STUDY DESIGN

3.1. Sample Selection and Data Source

In 2011-2021 a-share listed Banks for the research samples, the digital transformation data from digital financial research center of Beijing university team, bank management data from the annual report and financial information, the banking boom source survey statistics of the People's Bank, the deposit reserve ratio from the People's Bank of China.

3.2. Model Building and Variable Definition

The explained variable-return on assets. Referring to relevant studies, this paper chooses the rate of return on assets of banks as the measure of financial performance. The index formula is: return on assets = net profit / average asset balance.

The explanatory variable-the degree of digital transformation. Using the data released by the research group of the Digital Finance Research Center of Peking University, the higher the value, the higher the degree of digital transformation of banks.

Model building

ROA i t = $\alpha 0$ +$\alpha 1$ Digital i , t +Controls i , t +εi t

In this paper, the capital adequacy ratio (Car), net profit margin (Nis), loan-to-loan ratio (Dpr), the ratio of the equity (Ear) and the characteristics of the bank are selected as the control variables (see Table 1 for the definitions of specific variables).

Table 1. Variable definition table

type of variable	Variable name	variable symbol	variable-definition
explained variable	ROE	Roa	Net income / average assets
explanatory variable	Degree of digital transformation	Digital	The Research group of the Digital Finance Research Center of Peking University announced it
controlled variable	capital adequacy ratio	Car	Total capital / total risk-weighted assets
	net interest margin	Nis	It is the bank's net interest income (interest income minus interest expense) divided by the bank's total assets or interest assets
	Equity asset ratio	Ear	Owners' equity / total assets
	Deposit and loan ratio	Dpr	Total loans / total deposits
	Banking industry sentiment index	Bici	Results of the national banker questionnaire survey conducted by the People's Bank of China
	The RMB deposit reserve requirement ratio	Rrr	The central bank requires the reserve requirement as a percentage of its total deposits

4. THE EMPIRICAL RESULTS AND THE ANALYSIS

4.1. Descriptive Statistics

Table 2 shows the descriptive statistics for the main variables: the mean return on assets (Roa) is 0.0102, a minimum value 0.00528 and a maximum value 0.0166; this indicates a significant gap in interbank return on assets. The average degree of digital transformation is 4.144, the minimum value is 0.978, the maximum value is 5.217, and the standard deviation is 0.752. There are some differences in the digital transformation between sample banks. No other variables have abnormal extreme values, indicating that the selection of variables is generally reasonable.

Table 2. Descriptive statistics for the main variables

variable	sample capacity	mean	standard error	least value	crest value
ROE	216	0.0102	0.0022	0.00528	0.0166
Degree of digital transformation	216	4.144	0.752	0.978	5.217
capital adequacy ratio	216	0.131	0.0169	0.0988	0.184
net interest margin	216	0.0234	0.00497	0.0132	0.0448
Equity asset ratio	216	0.0668	0.0121	0.0434	0.116
Deposit and loan ratio	216	0.68	0.124	0.295	1.034
Banking industry sentiment index	216	0.716	0.0744	0.605	0.854
The RMB deposit reserve requirement ratio	216	0.177	0.0279	0.115	0.21

4.2. And the Benchmark Regression

Table 3. Regression results

VARIABLES	(1)	(2)	(3)
	Roa	Roattm	Roa
Degree of digital transformation	0.001**	0.001***	
	(0.000)	(0.000)	
L. Degree of digital transformation			0.001*
			(0.000)
capital adequacy ratio	0.040***	0.039***	0.045***
	(0.010)	(0.009)	(0.011)
net interest margin	0.153***	0.124***	0.152***
	(0.044)	(0.038)	(0.048)
Equity asset ratio	0.015	0.018	0.013
	(0.016)	(0.017)	(0.020)
Deposit and loan ratio	0.003**	0.003**	0.002
	(0.001)	(0.001)	(0.001)
Banking industry sentiment index	0.002	0.003	0.004
	(0.002)	(0.002)	(0.003)
The RMB deposit reserve requirement ratio	0.059***	0.054***	0.061***
	(0.007)	(0.007)	(0.007)
Constant	-0.016***	-0.016***	-0.017***
	(0.003)	(0.003)	(0.003)
Observations	216	216	185
R-squared	0.531	0.504	0.540

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 3 (1) shows the regression results. The estimated coefficient of the degree of digital transformation and the return on assets (Roa) is significantly positive, indicating that the high degree of digital transformation of banks at this stage can significantly promote the improvement of return on assets. Suppose H1 has been well verified.

4.3. Robustness Test

Replacement by the explanatory variable. Roattm The calculation formula is the net profit divided by the ending asset balance of the current period. This paper analyzes significantly positive improvement of bank financial performance. This paper selects Roattm as the alternative explained variable to further analyze the improvement of bank financial performance. After changing the explained variables, Table 3 column (2) shows the regression results, indicating that the high degree of digital transformation of banks at this stage can significantly promote the Roattm improvement, It further shows that the digital transformation of banks has a significant positive effect on the improvement of both bank Roa and Roattm.

The digital transformation indicators are delayed in one phase. The digital transformation of banks is a strategic decision made to promote the future development of banks, and there may be a time lag effect. In order to eliminate this influence, the digital transformation indicators will be delayed to return again. The regression results in Table 3 (3) show that the regression coefficient of the bank is significantly positive at the level of 1%, assuming that H1 is still true.

4.4. Further Analysis

4.4.1. Mechanism Analysis

The above theory analysis shows that the digital transformation can promote commercial bank management innovation, so as to improve the financial performance of commercial Banks, to verify this mechanism, this paper adopts the intermediary effect, the introduction of management innovation intermediary variables, reference existing research, select the main business income / management expenses, main business income / assets average balance two index entropy value for its measure. The regression shows that the degree of digital transformation significantly promotes the management at the 5% level, the management innovation significantly promotes the rate of return on assets at the 1% level, and the regression coefficient of the digital transformation degree on the return on assets is reduced from 0.001 to 0.0003, indicating the existence of the intermediary role of management innovation. The Sobel test, with a Z-value of 1.698, was significant at the 10% level, verifying that the mediation effect existed. As can be seen above, the assumption H2 holds.

4.4.2. Heterogeneity Analysis

(1) The heterogeneity of property rights

Among banks with different property rights, is there a big difference between the strategic integration and implementation of digital transformation to improve performance? To analyze this problem, the samples were divided into two groups: state banks and non-state banks, and the regression results are shown in Table 5. For the significance of coefficient difference between groups, we were sampled 500 times, and the empirical p-value size of 0.13 was not significant.

(2) Scale heterogeneity

Is there a big difference in the difficulty of implementing digital transformation and the performance of banks of different sizes? In order to answer this question, this paper regressed the samples according to the asset size of the bank. The samples were divided into large bank groups and small and medium-sized bank groups according to the median of the logarithm of the total assets. The regression results are shown in Table 5. To test the significance of the difference between coefficients between groups, we sampled 500 times, and the empirical p-value size was 0 significant.

5. CONCLUSION AND RECOMMENDATIONS

Based on the data of China's A-share listed banks from 2011 to 20221, this paper empirically analyzes the impact of banks' digital transformation performance on banks' performance. The results show that digital transformation promotes management innovation, and then promotes the improvement of bank performance. Based on the above conclusions, this paper proposes the following countermeasures and suggestions:

Strengthen the understanding of the digital transformation. The characteristics of the digital era are becoming more and more obvious. The CPC Central Committee and the country have made it clear to accelerate the development of the digital economy, and banks must constantly accelerate the digital transformation from the perspective of their own development and serving the real economy.

Supporting the digital transformation of hardware and software facilities. Some systems in the bank may be established very early, and how the connection between the system and the system is also limited. In the process of digitization, it is necessary to replace the hardware of the system, develop the system software, build new models, connect new connections, and give full play to the value of the system and big data.

Third, make use of digital transformation to better promote management innovation and performance improvement. The effect of digital transformation in different banks is different, and its role is affected by many factors. Banks must continue to summarize, reasonable adjustment, rely on digital transformation to better focus on management innovation, so as to promote performance improvement.

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REFERENCES

[1] Chen Xu, Jiang Yao, Xiong Yan. Research on the influence mechanism and path of digital transformation on enterprise performance [J]. Economic system reform, 2023, (02): 112-120.

[2] Lai Hongbo, Le Yang. Research on the impact of digital transformation on enterprise performance -- The intermediary role of organizational learning based on it [J]. Prices in China, 2023, (04): 121-124.

[3] Chen Yinfei, Mary Yang. Research on the relationship between digital transformation, business model innovation and business operation efficiency [J]. Economic Forum, 2022, (01): 135-146.

[4] Li Jinglin, Yang Hongjie. Research on the mechanism of enterprise digitalization to promote the sustainable development of enterprises -- empirical evidence from listed companies in China [J]. Journal of Hubei University of Economics, 2023,21 (04): 56-69 + 127-128.

[5] Xing Tong, Su Yuhai. Differences and distribution dynamics of the digital transformation and development of the four major types of commercial banks in China [J]. Economic issues, 2024, (05):43-51. DOI:10.16011/j. cnki. jjwt. 2024.05.009.

[6] Wei Zhang. Pain points and cracking of the digital transformation of the banking industry [J]. China Finance, 2024, (01): 78-79.

[7] Jia Yaru, Lu Jing, Guo Pei. Digital transformation, business structure and business stability of banks [J]. Financial Theory and Practice, 2024, (03): 51-62.

[8] Newell S, Marabelli M. Strategic opportunities (and challenges) of algorithmic decision-making: A call for action on the long-term societal effects of ‘datification’[J]. Journal of Strategic Information Systems,2015,24(1):3-14.