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Article

How does digital transformation impact bank performance?

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FINANCIAL ECONOMICS | RESEARCH ARTICLE

How does digital transformation impact bank performance?

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Abstract: Digital transformation is a keyword that has not only been mentioned in recent years but is also strongly applied by companies. However, the benefits of digital transformation for companies are still an issue that needs to be researched. Therefore, this study is conducted to determine the dynamics of digital transformation on banking business results. The research was conducted with joint stock commercial banks in Vietnam listed on the stock exchange. Based on text analysis on annual reports to measure banks' digital transformation level from 2015 to 2021. Research results have shown that digital transformation has a negative impact on bank's performance (through the return on assets and return on equity). Furthermore, the study also found that there was a paradoxical situation where COVID-19 increased the profits of banks. This result provides exciting discussions related to digital transformation and bank performance.

Subjects: Corporate Finance; Banking; Strategic Management

Keywords: Digital transformation; bank performance; text analysis; performance

1. Introduction

Companies and countries worldwide are in the era of technology development, and the digitalization trend is being applied in all industries (Zhai et al., 2022). Accordingly, digital transformation has been considered the leading trend in recent years. Regarding the speed of digital transformation of the economy, countries such as the US, China, and Singapore are considered to be leading the digital transformation trend. Therefore, implementing digital transformation becomes an inevitable trend not only for countries but also for companies. However, whether the implementation of digital transformation succeeds or fails is a matter of consideration. Will digital

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transformation bring economic development benefits to companies or only create pressure to reduce the firm performance? Fitzgerald et al. (2014) report a digital technology dichotomy. That is, directors think about the advantages of adopting digital transformation but are disappointed with the progress of digital transformation and getting performance from it in their company.

In Vietnamese enterprises, banking is considered one of the fastest-growing digital transformation industries. Digital transformation in banking will enable many banking transactions that are now done on computers or mobile phones (Kitsios & Kamariotou, 2021; Kitsios et al., 2021). The variety of possibilities, the time and cost savings, and the ease of use of these applications consistently give them a share of the usual banking channels (bank branches). In addition, through these applications, owner-customers can have real-time information on the valuation of their investment products, bank promotions, and expenses they incurred through digital means to receive more good offers (Kitsios et al., 2021). The benefits above make digital banking more attractive for young people and smartphone owners (Ananda et al., 2020a, 2020b; Panda, 2020; Talbot & Ordonez-Ponce, 2020).

There have been several studies on digital transformation in companies and banks. Several studies show a positive impact of digital transformation on performance (Zhai et al., 2022). However, some studies show a relatively slow impact of digital transformation on firm performance. After digital transformation, it takes about five years to make any sense of firm performance (Beccalli, 2007; Kriebel & Debener, 2019). Most studies imply a linear relationship between digital transformation and business results. However, some studies show a U-shaped relationship between digital transformation and business results (Guo & Xu, 2021). There is still much debate about evaluating the impact of digital transformation on the business results of enterprises. It can be seen that there are many different research results in specific contexts. Therefore, specific research is needed in banking development in Vietnam.

Digital development has been changing economies around the globe at a rapid pace, and the COVID-19 pandemic has contributed to accelerating this process. In that strong digitization trend, developing digital banking is the inevitable path for Vietnamese banks. Because of such importance, we conduct research to determine the impact of digital transformation on the business results of Vietnam Joint Stock Commercial Banks. This study will make the following contributions: (1) It will help supplement the theory of innovation and the business results of enterprises. Digital transformation will change how banks operate amidst increasing competition in the industry. (2) The extent of digital transformation and whether it increases the business results of banks when resources (people, finance, time) are focused on this activity will be explored. The study will investigate whether the trade-off of resources is sustainable development or creates difficulties for banks. (3) From the results of this study, some policy implications will be proposed to help banks operate more efficiently when deciding to carry out digital transformation activities. These policy implications will assist banks in making effective decisions regarding digital transformation.

2. Literature review

2.1. Digital transformation

There are many definitions of digital transformation (DT). For example, some researchers think that DT uses new technologies, such as mobile devices, digital communication, etc., to improve business operations Fitzgerald et al. (2014), which business activities can include improving operational processes, improving the customer experience of services, or digitizing all jobs based on machine resources Fitzgerald et al. (2014). At the same time, studies show that DT applies information technology to production and business activities (Agarwal et al., 2010). In addition, some authors believe that DT is applying digital technology to innovate business models to create more value for businesses (Kane et al., 2015; Schallmo et al., 2017). In this study, the authors use the concept/perspective of Fitzgerald et al. (2014) to define DT as using new digital technology to improve the business operations of enterprises.

Regarding objectives and concepts, DT uses digital technology to innovate business models and add value to the company. However, not all businesses implementing DT also bring about the desired effect (Zhai et al., 2022). In the United States, as of 2017, up to 50% of business owners disclose their failure to DT (according to a survey by Wipro Digital in 2017). Although businesses are very interested in sales activities, the successful implementation of sales is a big issue that needs to be considered to have accurate results (Kane et al., 2015; Schallmo et al., 2017). Because there are issues related to switching costs, workforce, and time, conversely, many businesses will also have better results when they reduce operating costs (Zhai et al., 2022) and significantly add value to the company (Kane et al., 2015; Schallmo et al., 2017). Regarding the characteristics of DT, according to Bharadwaj (2013); and Nambisan et al. (2019), DT has the outstanding feature of applying technological techniques to enterprises' business and production activities. Besides, Nambisan et al. (2019) also show that DT brings higher efficiency to the company when reducing costs and increasing profit when the process is improved. At the same time, Verhoef et al. (2021) show that DT helps develop business models and create more value for companies.

Measuring digital transformation: There are many approaches to measuring and assessing digital transformation (DT). Firstly, DT can be measured through a questionnaire about digital transformation in a business, such as the length of time digital banking has been used on the system (Kitsios & Kamariotou, 2021; Verhoef et al., 2021). Additionally, a common method for measuring DT involves a solution based on textual analysis (Kriebel & Debener, 2019). Specifically, researchers use the frequency of appearance of terms related to digital transformation (Verhoef et al., 2021). Some of the terms related to digital transformation that researchers commonly use include digital transformation, digitalization, internet, website, ATM, web, computer, online, information system, IT, information technology, bankcard, virus, digital, e-banking, payment service, hardware, cloud, email, mobile device, server, tablet, password, encryption, smartphone, LAN, wireless ... (Kitsios et al., 2021). This study will use the second measurement approach through text analysis of keywords related to digital transformation on annual reports.

2.2. Digital transformation for the economy as well as for companies

Information technology or digital transformation has a positive relationship with economic growth (Hajli et al., 2017). However, according to Hajli et al. (2017), although DT plays a role in the economy, it does not positively affect labor productivity. On the other hand, in terms of microeconomics, DT helps businesses improve their business activities (Kaur & Sood, 2017), thereby increasing the GDP contribution of enterprises to the economy in general (Galindo-Martín et al., 2019).

Similarly, the study by Ardito et al. (2021) looked at a sample of US small businesses. The findings suggest that DT adoption can enhance innovation. Additionally, Ribeiro-Navarrete et al. (2021) investigated the effect of revenue on the financial performance of the service industry. The authors use social media and instruction in digital tools to capture DT and discover that these elements improve business success. Similar research was conducted by Llopis-Albert et al. (2021) on the impact of DT strategy on stakeholder satisfaction and company operating models in the automotive industry.

2.3. Digital transformation and bank performance

The stronger the bank's digital transformation implementation, the stronger the business strategy. The bank wants to enhance corporate value by integrating digital technology into its operations and processes (Saebi et al., 2017; Zhai et al., 2022). Applying digital transformation will help improve the bank's reputation and attract more customers. This will help the bank compete and strengthen (Ardito et al., 2021; Lin & Kunnathur, 2019). At the same time, applying argument-passing will help enhance communication between leaders, employees, and customers.

Moreover, this will help improve operating costs (Ardito et al., 2021; Lin & Kunnathur, 2019; Zhai et al., 2022). The application of digital transformation will help save time, optimize operational processes as well as better manage risks. As a result, banks will improve service quality for

customers (Boufounou et al., 2022). Reducing operating costs and increasing work efficiency also increase the bank's performance. Therefore, the research hypothesis is put forward as follows:

Hypothesis: Digital transformation has a positive impact on bank performance

3. Method

3.1. Research model

Based on research objectives and referring to previous research by Zhai et al. (2022), Guo and Xu (2021) research model is described as follows:

$$\text{Bank performance}_{it} = \alpha_i + \beta_1 \text{Digital_Transformation}_{it} + \beta_1 \text{Controlvariables}_{it} + \varepsilon_{it}$$

In which the research variables in the model are described in detail as follows:

Bank performance: The performance of banks is described through two representative indexes, ROE (return on equity) and ROA (return on assets). These are two common indicators chosen by many researchers as a proxy for performance.

Digital transformation: Based on text analysis, the study scans the annual reports of each bank. Words related to digital transformation in banking, such as Technology, Internet, digitization, Fintech, ATM, etc., are considered keywords related to digital transformation. Therefore, the number of words related to digital transformation will represent the level of digital transformation in Vietnamese joint stock commercial banks.

Control variables: In this study, the research team uses control variables in the model, including Bank size based on total assets (SIZE), loan growth rate (LOAN_ GROWTH); COVID-19 pandemic (COVID); non-performance loan ratio (NPL), and annual growth economic (GGDP). These are some indicators that are considered to represent a bank's performance.

Details of the measurement of variables in the research model are described in Table 1.

Table 1. The variables defined

Variable name	Code	Measurement	Expected
Dependent variable			
Bank performance	ROE	=return on equity	
	ROA	=return on assets	
Independent variables			
Digital transformation	DT	Digital transformation level. It is measured through keywords related to digital transformation in the annual report.	+
Control variables			
Bank size	SIZE	=ln(total assets)	+
COVID-19 pandemic	COVID	=0 if year<2020 and =1 if year≥2020	+
Loan growth	LOAN_ GROWTH	=(loan _t -loan _{t-1})/loan _{t-1}	+
Non- performance loan	NPL	= Non- performance loan on total assets	+
GDP growth	GGDP	GDP growth (annual %)	+

3.2. Data

With the objective and description of the variables in the model, the data will be collected on the financial statements and annual reports of the joint-stock commercial banks listed on the Vietnam Stock Exchange from 2015 to 2021. Data on digital transformation is collected by analyzing text (Analysis text) bank's annual reports. Words and phrases related to digital transformation will be counted and collected when appearing on the report. All other variables are collected based on financial statements from platforms such as Stoxplus (belonging to FiinPro, a reputable financial unit in Vietnam). Collected data will be encrypted and put into STATA software version 15 for calculation and analysis.

3.3. Data analysis

Panel data will be used for comparison with the examination of listed banks in 2015–2021. Depending on the characteristics of the fields of research, one of three models can be used for panel data: (1) The Pooled OLS model is the simplest model when not accounting for differences between banks; however, this model is rarely used; (2) The Fixed effect model (FEM) is a further development of Pooled when accounting for other differences between banks, and there is a correlation between the residuals of the model and the independent (variables or unique characteristics of each bank related to the independent variables); There is no relationship between the residuals and the model's independent variables in the Random effect model (REM), which is comparable to the Fixed model in terms of how banks differ from one another. The Hausman test will choose the research model between the Fixed and Random effect models.

Suppose the model is satisfied and does not suffer from one of the above three defects. In that case, it can be concluded that the research model is reliable in estimating the impact of digital transformation on bank performance. In contrast, it is necessary to overcome the model defects when the model encounters one of two defects, autocorrelation, and heteroskedasticity. With the endogeneity, the author conducts the Generalized Method of Moments (GMM) correction to control endogeneity.

4. Result

4.1. Descriptive

Collected data will be encrypted and put into STATA 15 software for analysis. Initially, to get preliminary information about variables. Then, descriptive statistics techniques will be used. The results of the descriptive analysis show that the mean ROA achieved by banks is 0.09, of which the maximum is 0.36 and the minimum is −0.004. The average ROE is 0.115, the maximum is 0.303, and the minimum is −0.046. The mean digital conversion of banks is 46.2 (46 words related to digital transformation in each annual report), the maximum is 219 words, and the minimum is one word. Because keywords related to DT have been collected since 2015. Therefore, in the early stages, some banks rarely mentioned keywords related to digital transformation, so there was

Table 2. Descriptive

Variables	Mean	Sd	Min	Max
ROA	.009	.007	−.004	.036
ROE	.115	.079	−.046	.303
DT	46.201	35.952	1	219
SIZE	32.718	1.08	30.51	35.11
GGDP	4.84	1.9	1.69	6.47
LOAN_ GROWTH	.193	.111	−.11	.652
Observation=182				

a case where DT received the value 1. (At one year in a bank, there is little interest or mention of digitalisation). Descriptive statistics of other variables are described in Table 2.

4.2. Regression

The regression analysis results were performed for the dependent variables: ROA and ROE. The Hausman test results show that the FEM model is more suitable than the REM model in both models with the dependent variables ROA and ROE. However, tests for autocorrelation and heteroskedasticity both occur in these two models. Therefore, the study makes corrections through the GMM model. The GMM method will help to address endogeneity issues. The AR(1) indicators meet the requirement when their p-values are all less than 0.05; the AR(2) indicators are all greater than 0.05, and the p-value of the Hansen test is also greater than 0.05. Therefore, the GMM models used are reliable. The regression results are described in detail in Tables 3 and 4.

The regression analysis with GMM shows that digital transformation has a negative impact on firm performance (ROA and ROE). This indicates that digital transformation activities are reducing bank performance. In addition, COVID-19 has a positive impact on bank performance. It can be seen that the banking sector has no negative impact on bank performance and brings in more profits for the banks. NPL ratio has a negative effect on ROE (beta is negative and statistically

Table 3. Regression results with ROA

	(1)	(2)	(3)	(4)
ROA	POOLED OLS	FEM	REM	GMM
ROA _{t-1}				0.765*** (0.0926)
LnDT	-0.000165 (0.000675)	0.000150 (0.000493)	9.57e-05 (0.000495)	-0.000652*** (0.000193)
COVID	0.0297*** (0.00795)	0.00738 (0.00517)	0.0169*** (0.00459)	0.0119** (0.00540)
SIZE	0.00233*** (0.000546)	0.00849*** (0.00145)	0.00456*** (0.000922)	0.000895 (0.000594)
NPL	-0.0120 (0.0525)	-0.0274 (0.0391)	-0.0173 (0.0394)	-0.0311 (0.0717)
GROWTH_LOAN	0.0145*** (0.00485)	-0.000111 (0.00302)	4.91e-05 (0.00308)	0.0116** (0.00472)
GGDP	0.00624*** (0.00182)	0.00183* (0.00110)	0.00365*** (0.00101)	0.00251** (0.00112)
Constant	-0.108*** (0.0200)	-0.281*** (0.0441)	-0.163*** (0.0282)	-0.0412* (0.0235)
Observations	168	168	168	168
R ²	0.683	0.689		
Number of banks		26	26	26
Hausman test		0.000		
Autocorrelation test		0.000		
Heteroskedasticity test		0.000		
AR(1)				0.001
AR(2)				0.299
Hansen test				0.587

Standard errors in parentheses

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

Table 4. Regression results with ROE

	(1)	(2)	(3)	(4)
ROE	POOLED OLS	FEM	REM	GMM
ROE _{t-1}				0.682*** (0.0649)
LnDT	-0.00301 (0.00640)	-0.00548 (0.00586)	-0.00469 (0.00581)	-0.00863*** (0.00227)
COVID	0.312*** (0.0754)	0.0664 (0.0614)	0.203*** (0.0531)	0.0866* (0.0517)
SIZE	0.0368*** (0.00518)	0.109*** (0.0173)	0.0537*** (0.00872)	0.00889 (0.0146)
NPL	-0.974* (0.498)	-0.879* (0.464)	-0.778* (0.463)	-1.330** (0.628)
GROWTH_LOAN	0.174*** (0.0460)	0.000983 (0.0359)	0.0158 (0.0366)	0.158*** (0.0516)
GGDP	0.0676*** (0.0172)	0.0191 (0.0131)	0.0454*** (0.0118)	0.0194* (0.0111)
Constant	-1.516*** (0.189)	-3.537*** (0.524)	-1.900*** (0.270)	-0.338 (0.476)
Observations	168	168	168	168
R ²	0.624	0.571		
Number of banks		26	26	26
Hausman test		0.000		
Autocorrelation test		0.000		
Heteroskedasticity test		0.000		
AR(1)				0.005
AR(2)				0.215
Hansen test				0.436

Standard errors in parentheses

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

significant at 5%). In addition, the results show that the higher the NPL ratio, the lower the ROE. LOAN GROWTH positively impacts ROA and ROE (significant at 5%). Finally, GGDP positively impacts ROA and ROE (significant at 5% and 10%).

The analysis results of the impact of digital transformation on bank performance through the two indicators of ROA and ROE show similar results. From this, it can be seen that the promotion of digital transformation during the research period has reduced bank performance.

5. Discussion

Research results show a negative impact of digital transformation on ROA and ROE. The results of this study are also similar to the previous study by Beccalli (2007) and Kriebel and Debener (2019). This study and the study of Kriebel and Debener (2019) have similarities both in terms of measuring DT (through the frequency of related keywords in the annual report) and also in terms of results (negative impact) of DT on business performance). Kriebel and Debener (2019) conducted their research in the German market. Kriebel and Debener (2019) suggested that digital transformation activities require up to 5 years to be effective. The difficulties in the digital transformation process are related to IT infrastructure issues. The issue of resources and technological infrastructure is a significant investment, but the business results from investing in digital transformation

(DT) may not be immediately apparent (Kriebel & Debener, 2019). The authors also return to the annual reports, the keywords about digital transformation are mentioned a lot with accompanying adjectives such as: missing, limited, error... This can see limited problems. In deploying as well as fixing the DT system. For a developing country like Vietnam, implementing digital transformation involves a trade-off between initial investment and the resulting outcomes. It can be argued that Vietnamese banks are experiencing the “profitability paradox.” This phenomenon suggests that, under competitive pressure, using available technologies for all market participants can increase efficiency but not affect profits (Beccalli, 2007; Kriebel & Debener, 2019). In Vietnam, for successful digital transformation, it is necessary to invest in more technological equipment, innovate transaction protocols and encounter many errors in the implementation process. Although digital transformation is considered a success, banks have had to trade off a lot of financial, human and time costs to build and handle errors that occur during the digital transformation implementation. Therefore, in the stage of partial digital transformation, the business results can be seen better, but due to the large trade-off costs, the issue of profit from digital transformation is not clear in this period.

COVID-19 has positively impacted the ROA and ROE, indicating that banks have generated higher profits during the COVID-19 period. The work-from-home model has significantly reduced costs in bank operations. However, there have been no disruptions in business operations (credit and non-credit activities), as Kitsios et al. (2021) reported. Conversely, the Vietnamese government’s support of post-COVID-19 loans has increased bank profits.

NPL ratio negatively impacts banking results (both ROA and ROE). It can be seen that credit risk control and management activities are of great significance to banks. The increase in the non-performance loan ratio reduces the profitability of banks. This research result is consistent with previous studies by Ekşi and Doğan (2022) when the results show the negative impact of non-performance loans bank’s performance.

According to Nguyen et al. (2021), Growth Loans positively impact ROA and ROE, demonstrating that lending remains a primary source of income for banks. The interest rate differential between deposits and loans and other lending activities makes lending a crucial activity for banks. Additionally, economic growth positively impacts ROA and ROE, indicating that banks benefit from general economic development. The country’s economic growth brings benefits to both individuals and businesses. Increased trade and better investment opportunities increase demand for loans and deposits. Notably, the real estate market’s upward trend in Vietnam is closely related to borrowing from banks, resulting in a significant increase in bank profits when the market booms.

6. Conclusion and implications

The study presented the content of digital transformation in banks in Vietnam. Digital transformation is using new digital technologies to enable business innovations in banking. At the same time, through data analysis to assess the impact of digital transformation on bank performance, the study shows the extent to which digital transformation negatively impacts bank performance (ROA, ROE). This result would indicate that digital transformation decreases profit. From the results of this study, any implications are given as follows:

6.1. Theoretical implications

Research has shown a significant relationship between digital transformation and bank performance and that the level of digital transformation implemented by a bank can negatively impact its performance. This finding supports the resource-based theory and the profitability paradox in the banking industry, as banks face competition from the market and pressure to adopt digital transformation. However, limited infrastructure resources have hindered the development of digital transformation, which has resulted in more efficient banking operations but reduced profits due to the profitability paradox.

6.2. Practical implications

This research result also helps banks to have investment policies for digital transformation to get performance. The experimental results show that difficulties with IT infrastructure are the main obstacles to banking operations. Therefore, banks need to consider IT systems as an important factor that needs to be upgraded to serve better digital transformation activities (which are mandatory in the face of increasingly fierce competition from rivals). Digital transformation needs a specific roadmap to ensure stable and sustainable development. In addition, for investors, information about digital transformation can be a signal for their investment decisions. When information about IT systems is good, digital transformation items are stable and increasingly developing, and these are signs of increased profitability for the bank. When information about increasing digital transformation does not mention technology infrastructure upgrades, this is still considered a negative signal for profitability growth.

7. Limitation and future research

The study systematized the theory related to digital transformation and found the impact of digital transformation on business results of Vietnamese joint stock commercial banks through quantitative data analysis. However, the study still has certain limitations. The study only performed a digital conversion assessment based on text analysis on the frequency and frequency of mentioning technology-related words. Not to mention how to measure based on application development digital transformation process. From the above limitation, the study proposes orientations for further studies. The following studies use newer and richer metrics to provide more detailed assessments of digital transformation.

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