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The Impact of Digital Transformation on The Competitiveness of Commercial Banks in Da Nang City

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Abstract: The digital transformation of business models is no longer an option; instead, it has become an inevitable trend for banks to maintain their competitive advantage. To meet customer needs and stay caught up in the digital era, commercial banks in Da Nang City have been making efforts to digitally transform their products and services to build a system of advanced and modern digital banks, keeping pace with the general development trend of the world's banking system. The goal of the research is to examine the impact of digital transformation on the competitiveness of commercial banks in Da Nang City.

In this study, the author analyzed the digital transformation factors that affect commercial banks' competitiveness in Da Nang City, using data from 210 survey samples at commercial banks in Da Nang City in February 2024 and analyzed using SPSS 24.0 software. The proposed research model includes four factors: digital transformation, diversity of banking services, financial capacity, and risk. Through Exploratory Factor Analysis (EFA), the study has shown that digital transformation through E-banking and digital banking applications, as well as the rapid penetration of financial technology companies (Fintech), are essential factors that positively affect the competitiveness of commercial banks in Da Nang City. Research results show that in addition to digital transformation, financial capacity and diversity of banking services also positively affect banks' competitiveness, while risk is a factor that has a negative impact on it. From the results drawn, the author proposes some policy implications to improve the competitiveness of commercial banks in Da Nang city in the coming time.

Keywords: Transformational Digital transformation; Competitiveness; Finance; Technology.

I. INTRODUCTION

Vietnam, with its young population structure, rapid access and conversion of high technology, and rapid and sustainable economic growth, is poised for significant digital transformation. The Vietnamese government, recognizing the potential of the 4.0 Industrial Revolution, is particularly focused on digital transformation in the banking and finance sector. Digital banking transformation, or digital transformation, is the integration of digitalization and digital technology into all areas of banking. In essence, it represents a cultural, organizational, and operational shift in the banking sector, driven by technology.

The Financial Brand, a digital publication concentrated on strategic marketing issues in the retail banking sector, has raised crucial questions for regulatory agencies and banking executives in 2023: How have financial institutions responded as digital technology has impacted all areas of banking operations? How will digital banking transformation shape up in 2023 and beyond? What hinders the success of digital banking transformation?

 For the banking sector, although up to now, transactions carried out directly at branches and transaction offices still account for a large proportion, in fact, for nearly a decade, customers can still transact with banks through several electronic banking services such as Mobile banking, Internet banking or digital banking services, and this trend is developing over time. This evidence shows that the banking sector is also gradually transforming into digital transformation. According to Okibo and Wario (2014), digital transformation has helped commercial banks increase revenue, reduce operating costs, increase core value for customers, and, at the same time, help bank leaders make accurate and timely decisions, thereby increasing the competitiveness and operational efficiency of commercial banks.

The research content on the competitiveness of commercial banks has received contributions from many authors, such as Vo and Duong (2017), Fu et al. (2014), and Le et al. (2019), among others. However, most of these studies analyze competition in the context of different economic developments (average or recession) concerning banks' internal factors, such as diversification and credit risk, without paying attention to the digital transformation factor, which both domestic and global commercial banks are paying attention to and widely applying to optimize customer experience.

Da Nang City has strong economic growth, according to information from the Da Nang City Statistics Office (2023). Da Nang City has a reasonable growth rate, and the production situation of businesses is increasingly stable. The Gross Regional Domestic Product (GRDP) in 2023 increased by 13.2% (exceeding the resolution target), making it one of the country's localities with high growth rates. GRDP per capita in 2023 reached 107.8 million VND, up 3.4% compared to the previous year. Economic growth, in general, contributes to the growth of the banking sector. In the process of growth and development, commercial banks continuously introduce policies, products, and services to compete with each other. This has caused competition not only between commercial banks domestically but also between domestic and foreign commercial banks with strong financial capacity and superior

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technology and management levels. In addition, the increasingly strong wave of forming Financial Technology (Fintech) companies also affects the operations of commercial banks (Nguyen, 2022).

Da Nang is a key economic city in the Central region, with many commercial banks headquarters here. However, until now, there has yet to be any research on the impact factors of digital transformation on the competitiveness of commercial banks. Therefore, in this study, the author will aim to analyze the digital transformation factors that affect commercial banks' competitiveness, thereby proposing some policy implications to enhance the competitiveness of commercial banks in Da Nang City.

II. THEORETICAL BASIS AND LITERATURE REVIEW

A. Theoretical basis
1) Digitalization

Digital transformation is also understood as a process through which companies integrate various emerging technologies, enhanced with ubiquitous connectivity, to achieve superior performance and sustainable competitive advantage by transforming many aspects of business, including business models and customer experiences.

According to Martin (2008), digital transformation is the application of Information and Communications Technology and automation to develop the capacity of companies, governments, and people. Fitzgerald, Kruschwitz, Bonnet, and Welch (2014) also define digital transformation as the use of new modern technologies, such as embedded devices, social networks, and mobile devices, to enable businesses to improve central business situations as well as create new business models, streamlining production activities as well as enhancing customer experience; Similarly, according to Siebel (2019), the nature of digital transformation is defined as the convergence of the following four breakthrough technologies: Cloud Computing Technology, Big Data, and Internet of Things (IoT) and Artificial Intelligence (AI). This convergence makes the scope of activities and effects of digital transformation extremely broad, so there are many different perspectives and approaches to digital transformation. Thus, it can be understood that digital transformation is integrating digital technology into all areas of business operations to change the operating process and fundamentally provide value to customers. This requires businesses to update regularly to optimize customer experience.

2) Competitiveness

Competition, in economics, refers to the continuous struggle between economic subjects in the market to realize their economic interests and goals. The internal driving force of competition is the economic interests of the economic entity, expressed explicitly in the competition process as maintaining or expanding market possession, increasing consumption, and improving profits. The external pressure of competition is a fierce rivalry; the loser will be eliminated. According to the British Business Dictionary (published in 1992), competition is considered as rivalry between businesses in the market to compete for the same type of production resources or customers. The competitiveness of an enterprise is the strength and advantage it can mobilize to maintain and improve its position over other enterprises in the market in the long term. According to strategic manager Michael Poter, a company's competitiveness can be understood as its ability to dominate the market for products of the same type (or substitute). The ability to win and dominate the consumer market means the enterprise is highly competitive. Michael Porter is not limited to direct competitors but expands to potential competitors and substitute products. According to Domazet (2012), competitiveness is the ability of an enterprise to produce products consistently and profitably to satisfy the market's strict requirements for quality and price. Yap (2004) believes that competitiveness at the enterprise level is closely related to long-term operating efficiency and higher Return on Investment (ROI) for owners. According to Nguyen (2010), the competitiveness of commercial banks is the ability created by the bank itself based on maintaining and developing inherent advantages to consolidate and expand market share, increase profits, and withstand and overcome adverse fluctuations in the business environment.

In this study, the competitiveness of commercial banks can be understood as the ability of commercial banks to maintain, create, and develop existing advantages to increase market share and value for owners.

B. Literature review

The topic of digital transformation's impact on commercial banks' competitiveness has a number of related articles as follows. Vo and Duong (2017), when looking at factors affecting the competitiveness of Vietnamese commercial banks, pointed out that internal factors include the ratio of non-interest income, the cost ratio of allowance for credit losses, capital scale, number of banks, equity ratio, state ownership as well as macroeconomic factors, such as GDP growth rate and inflation have a significant impact on the competition of commercial banks. Using the Bayesian estimation method, Le and colleagues (2019) also pointed out factors affecting bank competition, including bank competition in the previous year, the ratio of operating costs to operating income, the ratio of equity on total assets, return on equity (ROE), loan on total assets ratio, bank size, inflation, and GDP growth.

According to Phan et al. (2020), in the Indonesian market, it has been shown that the substantial increase in Fintech companies negatively affects the business performance of commercial banks. When analyzing the relationship between financial technology innovation and the performance of commercial banks in China, Zhao et al. (2021) provided evidence that fintech innovation has a negative relationship with the profits of banks. However, for state-owned commercial banks, it improves management efficiency and capital adequacy.

In research by Nguyen (2023), the author analyzes the impact of digital transformation on the competitiveness of commercial banks in Vietnam. The article surveyed data from 150 employees of commercial banks in 2021 through the Exploratory Factor Analysis (EFA) method and showed digital transformation through E-banking and banking applications. Digital technology, as well as the rapid penetration of Fintech companies, are important factors that positively affect the competitiveness of commercial banks. In addition to digital transformation, service diversification also positively affects this factor, while risk is a factor that negatively affects competitiveness.

In a study by Xie and Wang (2023), digital transformation has become an urgent strategic task for traditional commercial banks these days. The current situation shows that there are few studies on digital transformation at commercial banks, so whether digital transformation can improve the competitiveness of banks or not is still inconclusive. This study has built an index system to measure the digital transformation process of banks in three aspects: strategic transformation, business transformation, and management transformation, using data from Chinese commercial banks. Empirical results show that digital transformation can improve banks' operational efficiency, reduce the negative impact of new technology entrants, and promote the elimination of offline channels.

Wu et al. (2023) assess the impact of digital transformation finance on the overall efficiency of commercial banks. This study argues that digital transformation is an essential challenge for commercial banks to achieve sustainable competitive advantages in the digital economy. However, traditional research should focus more on building linear models to explain non-linear relationships between factors related to digital transformation. By applying the configurational framework, this study proposes that the interaction between strategy and capabilities determines the digital transformation roadmap that can succeed or fail. Qualitative comparative analysis of digital transformation practices of Chinese commercial banks shows that: (1) the single condition of strategic orientation or capabilities does not constitute a necessary condition for high digital transformation, but the orientation of the market plays a more general role in creating shifts. (2) three configurational paths can contribute to the high digital transformation of commercial banks, such as sensing capability-based paths governed by strategic orientation, integrating capability-based paths driven by strategic orientation, and market-oriented roadmaps dominated by dynamic capabilities. (3) There are two ways leading to non-high digital transformation, verifying the existence of an asymmetric relationship compared to the configuration paths of digital transformation; (4) In paths dominated by strategic orientation, there is an alternative relationship between sensing capability and integrating capabilities. These findings contribute to the digital transformation literature and provide implications for the digital transformation of commercial banks.

After reviewing the above studies, I found quite a few studies on banking competition and digital transformation. However, research on the relationship between digital transformation and bank competitiveness in Vietnamese commercial banks in general and in Da Nang City, in particular, has not received the attention of many authors worldwide and in Vietnam. Therefore, the author's research on digital transformation's impact on commercial banks' competitiveness in Da Nang City needs to be carried out to fill the research gap and propose some recommendations on digital transformation to improve the competitiveness of commercial banks in Da Nang City.

III. RESEARCH DESIGN

A. Model and research hypotheses

Based on previous studies, the article proposes the following research hypotheses:

Hypothesis 1: Digital transformation

Digital transformation is characterized by combining advanced technologies and integrating physical systems and digital transformation, the preponderance of innovative business models and new procedures, and the creation of intelligent products and services (Verina & Titko, 2019). Martin (2008) believes that digital transformation is understood as applying information and communication technology as well as automation to develop the capacity of companies, the government, and the people. Digital transformation affects commercial banks in two main aspects. Firstly, under the influence of the 4.0 Industrial Revolution, more and more Fintech companies are being established in Vietnam. According to the ASEAN Vietnam Information Portal (2021), in 2019, investment in Fintech in Vietnam (741 million USD) surpassed investment in this field in Singapore (693 million USD) for the first time. Commercial banks must improve their competitiveness if they do not want to lose market share to Fintech companies. Second, digital transformation is not only a driving force for increasing Fintech companies but also for commercial banks to develop digital banking. By focusing on customer experience and integrating digital technologies, digital banking aims to increase the quality of mobile and online banking services (Megargel et al., 2018). Previous studies, such as Tinashe and Kelvin (2016) and Hammoud et al. (2018) have shown a positive relationship between digital banking and customer satisfaction and banking competitiveness. Therefore, hypothesis H1 is proposed as follows:

H1: Digital transformation has a positive impact on the competitiveness of commercial banks in Da Nang City

Hypothesis 2: Financial capacity

Financial capacity are the financial limits of an organization's ability to absorb losses with equity or debt without interruption (IRMI, n.d.). Financial capacity of commercial banks are understood as the ability to use finance to create profits so that the system's operation is stable and safe. Commercial banks' financial capacity include asset

scale, capital sources, and use efficiency. Rose and Hudgins (2013) state that commercial banks have many functions, but the core is still payment and credit intermediation activities between subjects with excess capital and subjects with insufficient capital, so loan quality and mobilized capital are factors that banks are always interested in to maintain operations and increase competitiveness. Research by Atoi (2018) has shown that bad debt causes increased instability in Nigerian commercial banks. In addition, commercial banks also focus on the scale of total assets when mentioning financial capacity. Most previous studies, such as Abuzayed et al. (2018), Vo and Duong (2017) have shown a positive relationship between the size and competitiveness of banks, therefore, hypothesis H2 is proposed as follows:

H2: Financial capacity have a positive impact on the competitiveness of commercial banks in Da Nang city

Hypothesis 3: Diversity in services

Research by Stiroh (2004) emphasizes that diversifying revenue sources, including transaction revenue, fee collection activities, and other non-interest income, helps US commercial banks save on operating expenses and share the cost of input factors, thereby reducing potential costs and improving profits. From there, commercial banks can increase stability and competitiveness. Similar to the above conclusion, the studies by Le et al. (2019) and Le et al. (2021) pointed out that the diversity of services is that instead of focusing on capital mobilization and loan products, banks also conduct many other operations (such as fee collection operations, commissions, sales, among others) to promote non-interest income sources. Thus, the diversity of services, including transaction revenue, fee collection activities, non-interest income, and commissions, helps commercial banks increase their competitiveness. Thus, the study proposes hypothesis H3 as follows:

H3: Service diversity has a positive impact on the competitiveness of commercial banks in Da Nang City

Hypothesis 4: Business risk

Digital risks are potential losses from digital transformation that affect achieving an organization's business goals (Kost, 2022). Digital risk is a very complex type of risk, depending on the strategy and process of deploying technology applications of the organization. Digital risks can pervade and affect every aspect of business operations, so it is necessary to apply measures to prevent and control this risk (Xie, 2020). Within the framework of banks' business activities, digital risks have the following characteristics: Digital risks are an urgent issue in business banking activities; The scope of digital risks' impact is often broad, and the rate of increase in impact is faster than that of conventional risks; In the absence of Process Automation, transactions and decisions are made manually; Process Automation requires both digital technology assets and human resources with sufficient technical understanding to deploy and operate the technology; Disruptions in banks' business operations have a more significant impact.

According to Saunders et al. (2006), banking industry operations often face many risks, such as interest rate, liquidity, and credit risks. These risks make the bank's business operations more vulnerable. Indeed, when looking at Vietnamese commercial banks, Huynh (2019) pointed out that credit risk has a negative relationship with business performance. When looking at banks in Pakistan from 2004 to 2009, Arif and Anees (2012) demonstrated that liquidity risk is negatively related to commercial banks' profits. At the same time, in the context of digital transformation, commercial banks also face risks related to security activities, network security, and issues of fraud, hackers, etc. This not only causes losses financially but also strongly affects the reputation and operations of commercial banks. Therefore, hypothesis H4 is proposed as follows:

H4: Business risk has a negative impact on the competitiveness of commercial banks in Da Nang City

Based on the hypotheses proposed by the research, it can be seen that in addition to digital transformation, other factors, such as the diversity of services, financial capacity, or risks that commercial banks in Da Nang City face, also affect banks' competitiveness. For this reason, the proposed research model is as follows:
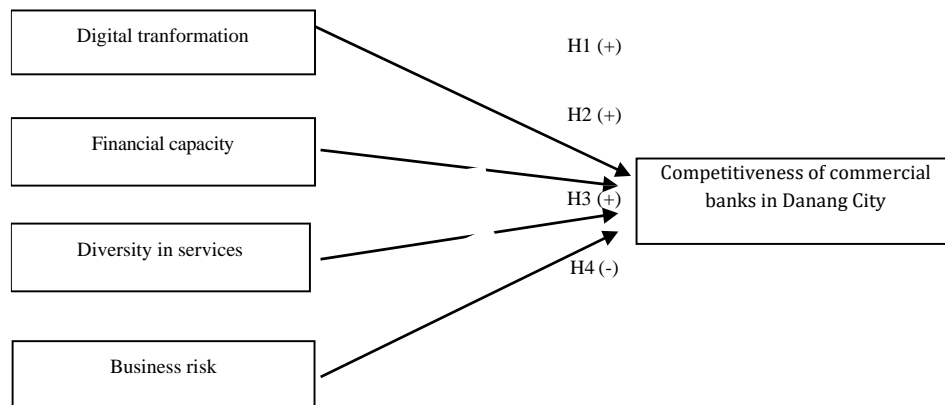

Figure 1. Proposed research model
(Source: Synthesis and recommendations of the author)

B.   Methods and research data

To ensure the reliability of the research results, the authors conducted the research through two steps: preliminary research to adjust the scale and official research. In particular, a mixed research method was used in preliminary research, with a qualitative research method conducted by interviewing experts' opinions after reviewing previous studies to adjust the scale and ask appropriate survey questions. The research experts are executives and managers at commercial banks, and several lecturers are knowledgeable in Finance, Banking, and Management at the University of Economics of Da Nang City. Quantitative research is conducted according to the following steps: Step 1: Build a questionnaire: All observed variables in the component use a 5-point Likert scale with levels (5): completely agree; (4) agree; (3) neutral; (2) disagree; (1): completely disagree. Step 2: Determine the number of samples needed for the survey: According to Hair et al. (2010), the minimum sample size to be able to analyze EFA is 50, preferably 100, the ratio between closeness on the measured variable is 5:1, better than 10:1. According to Hair (2009), in the research model, the minimum sample size in the analysis must be achieved according to the formula $n = 5 \times m$ (where n is the minimum sample size; m is the number of observed variables). The author used 19 questions in the study, so the minimum sample size is 19 x 5 = 95 samples. Besides, for Multivariate Regression Analysis, Tabachnic et al. (2007) pointed out that the number of samples must be at least $n \geq 8 \times p + 50$ (where n is the minimum number of samples and p is the number of independent variables). In this article, the model has several independent variables of 04 with 19 observed variables, so the minimum number of samples must be 82. Step 3: Send survey forms: Survey forms are collected using non-probability sampling through an online questionnaire in February 2024. The subjects surveyed were employees, specialists, managers, and executives working at commercial banks in Da Nang City. Step 4: Collect feedback: The author sent 233 questionnaires to banks in Da Nang city that needed to be surveyed. 210 answer sheets were collected. Step 5: Data processing using SPSS 24.0 analysis tool: Data was collected, synthesized, checked, and coded. The author specifically coded the questionnaire in Table 2 of this study.

The author cleaned the data and analyzed the results by examining the reliability and validity of the data and the value of Cronbach's Alpha and EFA scales. After adjusting the survey questions, the study conducted a random survey of at least 100 bank employees for preliminary analysis. Preliminary analysis results show that all coefficients reach Cronbach's Alpha greater than 0.6 and variable correlation coefficients greater than 0.3, and all factors converge and achieve loading coefficients greater than 0.5. At the same time, the research also continues to adjust the survey questions to make them easier to understand. After completing the preliminary study, the official research is conducted.

IV. RESEARCH RESULTS ANALYSIS

A.   Sample description

After conducting an online survey in February 2024, the author received 233 survey questionnaires, 23 questionnaires were eliminated because they did not meet the requirements, and finally 210 questionnaires were used for analysis. With a sample size of 210, it matches the required minimum sample size (82 observations). The primary information about the study sample is presented by the authors in Table 1 below.

Table 1. Demographic characteristics of the sample

Charateristics	Frequency	Percentage
Gender		
Male	96	45.7%
Female	114	54.3%
Total	210	100%
Age		
18-25	55	26.2%
26-30	93	44.3%
31-40	29	13.8%
>40	33	15.7%
Total	210	100%
Level of education		
High school	28	13.3%
College/university	137	65.2%
Postgraduate	37	17.6%
Others	8	3.8%
Total	210	100%
Working position		
Staff	96	45.7%

Expert	27	17.6%
Supervisor	38	13.3%
Management director	49	23.3%
Total	210	100%
Seniority		
< 5 years	125	59.5%
5– 10 years	44	21.0%
11– 15 years	19	9.0%
> 15 years	22	10.5%
Total	210	100%

(Source: Survey data of the research)

B.   Research results analysis

1)   Cronbach's Alpha reliability testing method và EFA

To consider the scale's reliability, Peterson (1994) used Cronbach's Alpha coefficient to evaluate; this coefficient must reach a value from 0.6 to 1. In particular, Cronbach's Alpha coefficient ranges from 0.6 to 0.7 and will be used if the concept is new; from 0.7 to 0.8 is acceptable, and from 0.8 to 1 is good. Besides, the total correlation coefficient of each observed variable must reach a value of 0.3 or higher. Table 2 presents a summary of the results of Cronbach's Alpha analysis. Table 2 shows that the factor loading coefficients of the observed variables are all greater than 0.7, and Cronbach's Alpha coefficient is greater than 0.8. Therefore, it can be concluded that the study's measurement scales are appropriate.

Table 2. Reliability results using Cronbach's Alpha

Code	Claims	Factor loading
CDS	**Digital transformation (Cronbach's Alpha = 0.848)**	
CDS1	Deployment of digital banking activities, promoting banks' competitiveness	**0.917**
CDS2	Digital platform applications from the wave of development of Information Technology, affecting the competitiveness of banks	**0.954**
CDS3	The development of financial technology, affecting banks' competitiveness	**0.922**
CDS4	Investment in technological innovation to increase service quality, affecting the bank's competitiveness.	**0.943**
CDS5	Investment in research and development to provide customer experience, affecting the bank's competitiveness.	**0.936**
TC	**Financial capacity (Cronbach's Alpha = 0.803)**	
TC1	Bank capital has a positive impact on banks' competitiveness	**0.820**
TC2	Bank income has a positive impact on banks' competitiveness	**0.809**
TC3	Profitability has a positive impact on banks' competitiveness	**0.818**
TC4	Asset quality of banks has a positive impact on banks' competitiveness	**0.810**
TC5	Loan quality and loan revenue has a positive impact on banks' competitiveness	**0.804**
TC6	Mobilized capital scale has a positive impact on banks' competitiveness	**0.812**
DD	**Diversity in services (Cronbach's Alpha = 0.886)**	
DD1	The number of services positively affect banks' competitiveness	**0.872**
DD2	Service quality positively affect banks' competitiveness	**0.853**
DD3	The number of non-interest services positively affect banks' competitiveness	**0.864**
DD4	Non-interest income revenue positively affects banks' competitiveness	**0.876**
RR	**Business risk (Cronbach's Alpha = 0.987)**	
RR1	Security risk negatively affect banks' competitiveness	**0.856**
RR2	Credit risk in banking operations negatively impact banks' competitiveness	**0.842**
RR3	Liquidity risk in banking operations negatively impact banks' competitiveness	**0.861**
RR4	Market risks and activities in banking operations negatively impact banks' competitiveness	**0.873**
KMO = 0.878; sig Barlett's Test = 0.000; Eigenvalues = 1.391; Total Variance Explained = 81.398%		

(Source: Data analysis results of the research)

The "Investment in research and development" scale has a Cronbach Alpha coefficient = 0.848. The Corrected Item - Total Correlation of the variable CDS5 = 0.268 (<.30) does not meet the requirements for inclusion in factor analysis. If the variable CDS5 is removed, the Cronbach Alpha coefficient will increase to 0.911. Therefore, the variable CDS5 must be eliminated to include variables in factor analysis.

The "Bank's income" scale has Cronbach Alpha coefficient = 0.803. The Corrected Item - Total Correlation of variable TC2 = 0.106 (<.30) does not meet the requirements for inclusion in factor analysis. If the variable TC2 is removed, the Cronbach Alpha coefficient will increase to 0.934. Therefore, to include variables in factor analysis, variable TC2 must be eliminated.

Table 3. Cronbach's Alpha test results after eliminating variables CDS5 and TC2

Code	Claims	Factor loading
CDS	**Digital transformation (Cronbach's Alpha = 0.911)**	
CDS1	Deployment of digital banking activities, promoting banks' competitiveness	**0.917**
CDS2	Digital platform applications from the wave of development of Information Technology, affecting the competitiveness of banks	**0.954**
CDS3	The development of financial technology, impacting banks' competitiveness	**0.922**
CDS4	Investment in technological innovation to increase service quality, affecting the bank's competitiveness.	**0.943**
TC	**Financial capacity (Cronbach's Alpha = 0.934)**	
TC1	Bank capital has a positive impact on banks' competitiveness	**0.820**
TC3	Profitability has a positive impact on banks' competitiveness	**0.818**
TC4	Asset quality of banks has a positive impact on banks' competitiveness	**0.810**
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RR2	Credit risk in business operations negatively impact banks' competitiveness	**0.842**
RR3	Liquidity risk in banking operations negatively impact banks' competitiveness	**0.861**
RR4	Market risks and activities in banking operations negatively impact banks' competitiveness	**0.873**
KMO = 0.878; sig Barlett's Test = 0.000; Eigenvalues = 1.391; Total Variance Explained= 81.398%		

(Source: Data analysis results of the research)

Besides, the model has a KMO coefficient of 0.878 (satisfying the condition that KMO has a coefficient of 0.5 or more), and the sig value of Barlett's Test is 0.000 < 0.05, meaning that the observed variables used are appropriate, and these variables are correlated with each other on the same factor. The Eigenvalues of all four factors are greater than 1.391, meaning the factors in the model are appropriate. In addition, the Total Variance Explained to the fourth factor is 81.398% (satisfying the condition greater than 50%), showing that the EFA model is appropriate (Hair, 2009).

The Rotated Component Matrix for the independent variables is presented in Table 3; the results have shown that, from the 19 initially observed variables, the model extracted 04 groups of factors, and the weights of the scale all met the requirements greater than 0.5. The smallest factor weight is the TC scale's observed variable TC1 (0.522). Thus, through EFA analysis, all scales meet the requirements.

Table 4. Rotated Component Matrix results

Factor	Observed variable	Component			
		1	2	3	4
Digital transformation	CDS1			.724	
	CDS2			.934	
	CDS3			.822	
	CDS4			.925	

Financial capacity	TC1	.522		
	TC3	.905		
	TC4	.859		
	TC5	.835		
	TC6	.899		
Diversity in services	DD1			.724
	DD2			.805
	DD3			.837
	DD4			.838
Business risk	RR1	.934		
	RR2	.940		
	RR3	.916		
	RR4	.934		

(Source: Data analysis results of the research)

2)   Correlation level analysis

The correlation results between variables in the model are presented in Table 4. In particular, the correlation coefficient between the dependent variable CT (Competition) and CDS TC, DD, and RR variables are 0.308; 0.589; 1; 0.453, respectively, between 0 and 1. All variables have sig values 0.000 < 0.05, showing that the independent variables have a linear relationship with the dependent variable and are suitable for multiple regression analysis.

Table 5. Correlation results between independent variables and dependent variables

		CDS	TC	DD	RR
CT	**Pearson Correlation**	0.308 **	0.589**	1**	0.453**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000
	N	210	210	210	210

(**) Correlation at 0.01

(Source: Data analysis results of the research)

3)   Multiple regression analysis

The next part of the study conducted multiple regression analysis after testing the scale using Cronbach's Alpha, EFA, and correlation analysis. Table 5 presents the multiple regression results.

Table 6. Regression results

Variable	Unstandardized		Standardized	Sig.	VIF
	B	**Standard deviation**	**Beta**		
Constant	.084	.233		.720	1.630
CDS	.169	.046	.202	.000	1.630
TC	.149	.068	.143	.030	1.287
DD	.350	.063	.344	.000	1.405
RR	.224	.052	.250	.000	1.821
R^2 = 0.507; Adjusted R Square = 0.507; Durbin-Watson = 1.539; ANOVA sig. = 0.000					

(Source: Data analysis results of the research)

The regression results show that the R-square value is 0.507, meaning 50.7% of the change in the dependent variable is explained by the independent variables in the model. The Durbin-Watson value is 1.539 (approximately 2), showing that the research model does not have first-order serial autocorrelation. ANOVA Test has a value sig. of 0.000 (less than 0.05), so it can be concluded that the current regression model is suitable for the data set. In addition, the results of testing the multicollinearity phenomenon show that the VIF coefficients of the independent variables are all less than 10, proving that the model does not have a serious multicollinearity phenomenon.

Research is done through a Scatterplot to test the linear relationship (Figure 2). The standardized residual value is presented on the vertical axis of the plot, and the standardized predicted value is presented on the horizontal axis. Figure 2 shows that the standardized residuals are concentrated around the 0 coordinate of the vertical axis, so the data do not violate the linear relationship assumption.
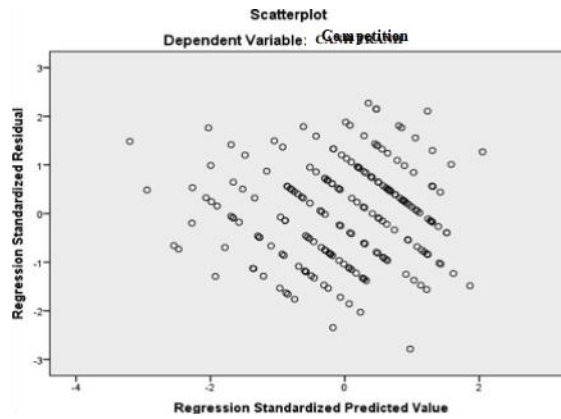
Figure 2. Scatterplot
(Source: Data analysis results of the research)

In addition to the linearity test, the study also tested the assumption that the residuals have a normal distribution through the P-P Plot frequency diagram or the Histogram frequency graph. Results from Figure 3 from the Histogram chart shows the graph has a bell shape, satisfying the standard normal distribution form. At the same time, the mean value is approximately equal to 0, standard deviation is approximately equal to 1. This implies that the data do not violate the residual normal distribution.
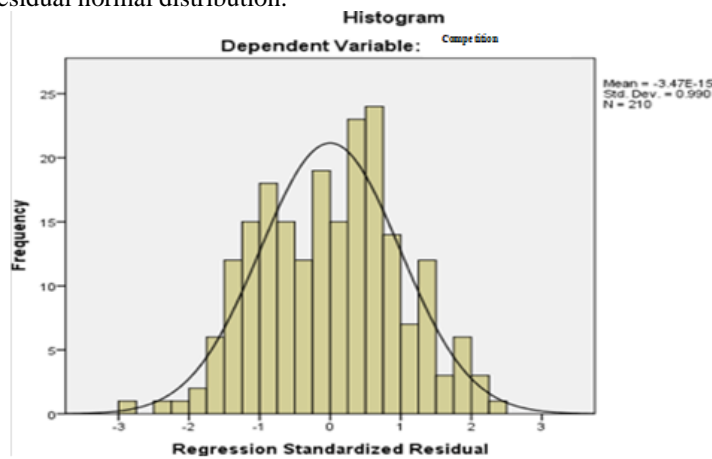
Figure 3. Histogram diagram
(Source: Data analysis results of the research)

C. Conclusions

From the research results presented in section 3.2.3, the author has some discussions as follows.

Firstly, the research results in Table 5 show that digital transformation positively impacts commercial banks' competitiveness with a beta coefficient of 0.169, with a value sig. of $0.00 < 0.05$. This result is similar to some previous studies, such as Megargel et al. (2018), Tinashe and Kelvin (2016), and Hammoud et al. (2018). This is also consistent with the opinions of most experts when they believe that the global economic downturn has negatively impacted the entire economy and the system of commercial banks. Digitalization has created conditions for customers to have more channels for payment and consumption; on the other hand, it also helps commercial banks increase fees collected. In addition, under the influence of Fintech companies with technological advantages, commercial banks have been forced to implement digital banking to maintain the market and ensure competitiveness. For these reasons, the article accepts hypothesis H1: Digital transformation positively impacts commercial banks' competitiveness in Da Nang City.

Second, the positive regression coefficient between financial capacity and competitive capacity of commercial banks, with the value sig. is $0.030 < 0.05$, meaning that financial capacity impacts commercial banks' competitiveness. This result is consistent with the practical situation; in recent years, the State Bank of Vietnam (SBV) has required commercial banks to have a capital increase roadmap to meet the minimum capital adequacy ratio (CAR) according to Circular No. 41/2016/TT-NHNN from January 1, 2020 (State Bank of Vietnam, 2016). Up to now, quite a few commercial banks have not met this standard. The majority of survey subjects in the sample were banks that did not meet this standard, meaning that commercial banks in Da Nang City in the sample were mostly banks with weak financial capacity. Therefore, there is a relationship between the two variables, financial capacity and competitiveness of commercial banks. Therefore, the study accepts hypothesis H2: Financial capacity is positively related to the competitiveness of commercial banks in Da Nang City.

Third, service diversity positively impacts commercial banks' competitiveness with a regression coefficient of 0.196 and a sig value of 0.000 < 0.05. This result is consistent with the original hypothesis and previous studies, such as Abuzayed et al. (2018) and Stiroh (2004). In fact, service diversity is a trend for most banks as the market share of traditional activities, such as lending is saturated. In addition, the diversity of services also helps commercial banks share operational risks and take advantage of existing customer advantages and operational networks to cross-sell products and services, thereby increasing operational efficiency and enhancing the competitiveness of commercial banks. Therefore, the article accepts hypothesis H3: Service diversity positively affects the competitiveness of commercial banks in Da Nang City.

Fourth, although the positive regression coefficient is 0.224 and the sig value of 0.00 > 0.05 between the business risk variable and competitiveness, but based on the content of the survey questions, the study shows an inverse (or unfavorable) relationship between business risk that commercial banks face and competitiveness. This result is consistent with most previous studies. Indeed, besides liquidity risk, credit risk will cause commercial banks to reduce their capital adequacy ratio as well as the profitability of capital and assets, thereby reducing the competitiveness of commercial banks. Besides, in the context of the 4.0 Industrial Revolution, commercial banks face security risks related to customer information leaks or illegal bank account intrusions. This affects the reputation and trust of customers in commercial banks, causing the bank's competitiveness to decline. Therefore, the study accepts hypothesis H4: Business risk negatively impacts commercial banks' competitiveness in Da Nang City.

In summary, from the research findings, it is evident that digital transformation, financial capacity, service diversity, and business risk all play a significant role in shaping the competitiveness of commercial banks in Da Nang City. Most of the research's hypotheses were validated.

V. CONCLUSIONS AND POLICY IMPLICATIONS

The article aims to analyze the impact of digital transformation on the competitiveness of commercial banks in Da Nang City. Research results show that digital transformation is a critical factor that positively impacts the competitiveness of commercial banks in Da Nang City. Besides digital transformation, financial capacity and service diversity are factors that positively affect banking competition, while risks negatively affect competitiveness. These results are consistent with previous studies as well as the proposed research hypothesis. Thus, the goal that the research set out has been completed, especially the survey subjects of the project, which mainly concentrated on commercial banks in Da Nang that do not have good financial capacity and have not met the standards for capital adequacy ratio according to Circular No. 41/2016/TT-NHNN (State Bank of Vietnam, 2016); this means that, in the future research direction, the study will expand the sample size and research subjects for all commercial banks as well as banks with 100% foreign capital to have a more comprehensive view of competitiveness. In addition, the research has yet to consider the impact of other factors on digital transformation concerning banks' competitiveness. Therefore, the study needs to analyze the relationship between other factors and digital transformation and competitiveness in the following research direction.

From these research results, the author proposes the following policy implications:

First, commercial banks in Da Nang City must build a comprehensive digital transformation strategy with specific goals, plans, and implementation roadmaps for developing "digital banking with increased convenience and customer experience", thereby increasing the competitiveness of banks. It is necessary to identify digital transformation as an essential factor that positively affects the competitiveness of commercial banks. Therefore, commercial banks in Da Nang City should continue to promote investment in information technology applications in E-banking products (Mobile banking, Internet banking) to enhance customer convenience. Thus, customers can perform all financial transactions at home or work without going directly to the bank's branch/transaction office. In addition, commercial banks in Da Nang City should also consider gradually converting current operating methods to livebank and digital banking to satisfy customers' needs for transactions at anytime and anywhere.

Second, financial capacity are also an issue that commercial banks in Da Nang City must be mindful of in order to contribute to implementing a successful digital transformation strategy and increasing competitiveness. Digital transformation can require heavy financial investment and long-term support. Banking institutions must spend money developing and implementing new systems, technology, and infrastructure. At the same time, they must also consider the maintenance and upgrade costs associated with digital transformation. Therefore, budgeting is also a big challenge in the transformation of digital banking. Depending on the scale, financial capacity, and resources, each bank has different levels of digital transformation with the awareness of the significance of abundant budget and long-term support. Due to the ability to apply many new technologies, the life cycle of banking hardware and software investments is often shorter than in other industries. Hence, banking digital transformation requires continuous upgrading and updating, leading to colossal technology investment and operating costs on technology infrastructure. Abundant financial capacity will help commercial banks have enough conditions to invest in designing banking technology infrastructure to develop a technology platform ecosystem for banking to provide customers with experiences at the right time and exact locations.

Third, the diversity in services positively affects the competitiveness of commercial banks. Digital transformation requires change from customers. Some customers may have difficulty adapting to new technologies or have concerns about security and privacy. Therefore, the bank is always a pioneer in developing and diversifying products and services, always ready to provide full support, training, and information to help customers during the transformation process. Moreover, commercial banks in Da Nang City must prioritize investment in product diversification. To maximize the effectiveness of these diversification efforts, it is recommended that commercial banks establish a specialised product research and development department (R&D). This department should focus on high-technology products and services, reduce reliance on cash payments, and emphasize unique features to create a competitive edge. Furthermore, to increase competitiveness, commercial banks in Da Nang City should also consider assortment depth as a diversification strategy. This will allow them to fully exploit existing customer resources and increase cross-selling, thereby creating a unique competitive position.

Fourth, to successfully transform digitally and increase competitiveness, commercial banks in Da Nang City must pay attention to risks, especially risks to security activities. Security and risk can be benefits of digital transformation, but simultaneously, it poses new challenges in information security and risk management. Banking organizations must ensure their systems are secure and confidential when customer information and transactions are transferred electronically. At the same time, new risks, such as cyber-attacks, online fraud, and privacy violations must be quickly responded to. Therefore, commercial banks in Da Nang City need to look for excellent personnel in the field of Information Technology to ensure both the security of customer information and convenience during use. In addition, with technological advantages, commercial banks in Da Nang City can also link with fintechs to boost customer satisfaction.

VI. Special thanks to

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