

## Assessing the Impact of Digital Transformation on Risk Management in Vietnam's Joint-Stock Commercial Banks

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### Abstract

*The phenomenon of digital transformation is an increasingly significant global trend, particularly evident in contemporary society. The banking sector is at the forefront of this transformation, driven by advancements in science and digital technology. This shift offers a blend of both opportunities and challenges, especially for joint-stock commercial banks. While these institutions are benefiting from the adoption of digital technologies, they are also facing a range of risks. These include credit, liquidity, and information risks, as well as security concerns like unauthorized access to sensitive data for card or electronic bank account usage and challenges in detecting fraudulent transactions. Given this backdrop, assessing the impact of digital transformation on risk management within joint-stock commercial banks is vital. Our study involved a thorough investigation at 18 joint-stock commercial banks, including interviews with 192 participants.*

**Keywords:** Risk management, banking sector, digital transformation, EFA, multiple regression.

### 1. Introduction

The development of enterprises is regarded as a pivotal undertaking in Vietnam's strategy for socio-economic advancement. The promotion of enterprise development is expected to facilitate economic growth and significantly contribute to the expansion of the gross national product. Since the onset of the COVID-19 pandemic in 2020, businesses have encountered numerous challenges in their production, commercial, and export endeavors. The phenomenon of business recovery is of significant magnitude. Presently, business operations exhibit a significant dependence on loans, primarily procured from credit institutions. According to Mr. Dang Duc Thanh, Chairman of the Vietnamese Economists Club (VEC), the proportion of equity capital in the business amounts to only 20-30%, with the remaining being credit loans obtained from commercial banks. The current scenario has resulted in an overwhelming strain on the credit market. It is now compelled to meet the needs for both immediate and extended-term capital sources for the economy and businesses. This study demonstrates that the expansion of lending to businesses presents a favorable prospect for commercial banks to enhance their credit portfolio. However, it also entails numerous risks for banks, particularly when faced with challenges in accurately assessing the financial standing of these businesses. The level of control exerted over corporate customers is not stringent. Indeed, risk management in banking activities assumes an exceedingly crucial role in the new era. As the financial landscape evolves with the advent of technological advancements and shifts in global dynamics, effective risk management becomes indispensable for ensuring the stability,

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sustainability, and resilience of banking institutions. Addressing the intricate array of risks, which encompasses credit risk, market risk, operational risk, liquidity risk, compliance risk, and emerging digital risks, requires a thorough and forward-thinking strategy.

In this new era, characterized by rapid technological changes and interconnected financial systems, banks must continuously refine their risk management strategies. The integration of digital technologies introduces both opportunities and challenges, demanding a nuanced understanding of risks associated with cybersecurity, data privacy, and the evolving regulatory landscape. Successfully navigating these complexities requires robust risk assessment methodologies, sophisticated analytical tools, and a vigilant leadership that is attuned to the intricacies of the modern banking environment. In the trend of concerning the integration of international economies, accompanied by the robust development of the Fourth Industrial Revolution, digital transformation emerges as a pivotal goal and an inevitable developmental strategy for the global banking system, with specific emphasis on Vietnam's joint-stock commercial banks. Effectively managing risks in the context of digital transformation requires these banks to identify and measure risks adeptly, with a strong focus on technological innovation for the development and implementation of risk management tools. However, traditional risk management systems often concentrate on constructing response measures post-risk occurrence, rendering them inadequate in addressing sudden risks promptly. Moreover, various barriers hinder the timely sharing and processing of data. The advent of big data technology is poised to revolutionize the channels and mechanisms for collecting, analyzing, and applying information, creating technical conditions conducive to effective risk management. Utilizing data mining techniques through customer transactions provides banks with crucial information sources for credit risk management. The big data utilization technology is expected to enhance the automation of liquidity risk management in banks and bolster decision support for liquidity risk analysis and measurement. Additionally, Blockchain technology finds utility in controlling banking risks. Assessing the factors influencing risk management in banks is a crucial and necessary undertaking. This evaluation plays a pivotal role in assisting banks in improving the efficiency of their risk management practices within the context of digital.

This study was undertaken with the primary objective of assessing the effecting of digital transformation elements on risk management activities within the banking sector. The intention behind this research is to establish a foundational understanding that can guide the comprehensive implementation of digitalization initiatives across the entire banking industry. In the current landscape, where digital transformation is increasingly becoming a defining feature of the banking sector, it is imperative to scrutinize how these technological changes intersect with and affect risk management practices. The research endeavor seeks to deliver insights into the intricate relationship between digitalization factors and the efficacy of risk management in banks. By doing so, it seeks to lay the groundwork for a cohesive and synchronized adoption of digital strategies that can enhance risk management capabilities across the broader banking landscape. Through a systematic analysis of various digital transformation components and their impact on risk management, this research endeavors to contribute valuable insights to the banking industry. The findings are anticipated to serve as a valuable resource for banking professionals, policymakers, and other stakeholders, fostering informed decision-making and strategic planning in the realm of digital transformation and risk management.

## **2. Literature review**

As Matt et al, (2015) posit, digital transformation serves as a driving force, offering solutions to the challenges that banks encounter in the digital era. It involves a cultural shift, organizational restructuring, and changes in business operations through

technology. The comprehensive provision of digital services to customers, minimizing direct interactions, and introducing information technology products are key facets of this transformation. Effective collaboration between the marketing and IT departments within banks is essential for successful digital product offerings (Lugovsky - 2021).

Le Thi Thuy Van (2021) expands the definition of digital transformation as the transition from a conventional business model to a digital one, facilitated by the adoption of technologies such as big data, Internet of Things (IoT), and cloud computing. This shift entails modifications in operational approaches, leadership styles, work processes, and corporate culture. Le Cam Tu (2021) emphasizes the comprehensive process of reshaping a bank's business model, strategy, and culture through the integration of digital technology platforms, including Artificial Intelligence (AI) and Blockchain.

Essentially, the digital revolution in the banking sector represents a complete embrace of digital technology, encompassing the digitization of all aspects and operations in banking. This transformation is instrumental in keeping pace with trends and better meeting customer needs. The evolution of digital transformation in businesses, especially in the banking sector, generally progresses through three stages: Digitalization of information, process digitization, and comprehensive digitization.

Khuc et al. (2021) investigated the factors that affect the quality of digital transformation processes within Vietnamese commercial banks. They identified five critical factors: Digital transformation environment, Digital transformation capacity, senior leaders, facilities, and employees demonstrating positive correlations. Notably, the digital transformation environment and senior leadership were deemed to exert the greatest influence on the process's quality. Building on this, Dr. Nguyen Tu Anh (2022) highlighted the inevitability of digital transformation across economic sectors, particularly in banking. Recognizing this trend, he emphasized the necessity for rigorous control and management of potential risks associated with digital transformation. According to his research, key risks for the banking industry in the next five years include climate change, economic recovery levels, the speed and scope of digitalization, disruption from new technologies, outdated IT systems, data integrity, use of ML/AI, competition from new entrants, data privacy, and model risks related to ML/WHO. Notably, climate change emerged as the most critical factor, with 91% of respondents expressing concerns about its impact on asset loss, factory damage, and reduced borrowing capacity. Le Hai Trung and colleagues (Banking Academy, 2021) delved into operational risks at Vietnamese commercial banks, exploring factors including metrics like the outstanding loans to total assets ratio and non-interest income to total income ratio, profit to total assets, and the number of branches. Using the Pooled OLS method, fixed effects, and uncertain effects, their results revealed that the GDPG variable had a negative impact, aligning with expectations, while the impact of Return on Assets (ROA) differed from predictions, indicating the complexity of operational risk dynamics in commercial banking.

The research titled "IOT Impacts and Digital Transformation at Listed Vietnam Banks" conducted by Nguyen et al. (2021), addresses the imperative for Vietnamese banks to undergo a transformative shift in Adapting to the vigorous growth of the digital economy in Vietnam. With the digital transformation wave sweeping across various industries, the study underscores the necessity for banks to embrace a new business model. This model advocates for the integration of technology into operations and the digitization of business processes, emphasizing automation and intelligence. The overarching goal is to enable banks to deliver products and services on digital platforms while effectively leveraging data to enhance business resolution and customer engagement. The research adopts a comprehensive approach, employing a combination of quantitative and qualitative analytical methods. Notably, the study utilizes OLS regression supported by Eviews for quantitative analysis. The data collection process involves sourcing information from reliable internet platforms and websites, encompassing stock prices

from HOSE or HNX stock exchanges, rates from the bank system, and economic indicators such as GDP and CPI from authoritative sources such as the Bureau of Statistics and the Ministry of Finance. This combined-method research offers valuable insights into the influence of IoT and digital transformation on listed banks in Vietnam, providing a nuanced understanding of the changing landscape within the context of the growing digital economy.

Pham Ngoc Diep, in a 2022 study at Military Bank, emphasized the factors crucial for the success of a bank's digital transformation. According to Diep, customer considerations, followed by innovation and the ongoing modernization of infrastructure, operating models, solution definition, data, and human resources, precede the imperative to grasp and master technology. However, it's noteworthy that Diep's research was qualitative in nature, lacking quantitative analysis.

Fortis et al. (2021) conducted an article titled "Digital transformation and strategy in the banking sector: Evaluating the acceptance rate of E-services." This study examined the ongoing digital transformation in the Greek banking sector, focusing on factors such as serving remote areas, differentiation from competitors, and cost reduction. Utilizing a Multivariate Regression Analysis based on the Technology Acceptance Model, the study involved 161 employees from Greek banks. The findings highlighted the perceptions of bank employees regarding new technologies and offered practical insights for Greek banking executives to ease the shift into the digital age through targeted educational programs.

Research by Indra Saputra, Etty Murwaningsari, and Yvonne Augustine in 2023 conducted at Trisakti University, Indonesia, and explored the function of Enterprise Risk Management and Digital Transformation in maintaining the stability of the banking sector in Indonesia. Utilizing questionnaires administered to directors, managers, division heads, and branch heads in the Indonesian banking sector, the research employed descriptive and verification analyses. The findings demonstrated that both Enterprise Risk Management and Digital Transformation exert a substantial and positive influence on the sustainability of the banking sector, underscoring the profound impact of technological advancements on the industry's resilience.

Hussain (2022) investigated the relationship between employee skills, task quality, and technical accuracy within the banking sector of England. Employing a quantitative research approach through a questionnaire survey, the study revealed that task quality acts as a mediator in the association between employee skills and technical accuracy. This suggests that improved employee skills lead to enhanced task quality, ultimately resulting in increased technical accuracy.

In conclusion, a review of domestic and foreign research related to influencing factors on risk management in banks indicates varying perspectives and a lack of consensus on the number of influencing factors. The author proposes a further exploration of these factors and their impact through an integration of both qualitative and quantitative research approaches, specifically focusing on joint-stock commercial banks in Vietnam.

### **3. Methodology**

This research employs a quantitative approach with the objective of developing theoretical models and hypotheses to establish a robust relationship between empirical observations and mathematical expressions. The research population includes all executive officers, encompassing directors, division heads, department heads, branch heads, and managers. Questionnaires were distributed to this population through various channels such as phone calls, Zalo, Google Forms, and direct visits to respondents facilitated by official contact persons. The author conducted a comprehensive review and analysis of prior studies on factors influencing risk management at joint-stock

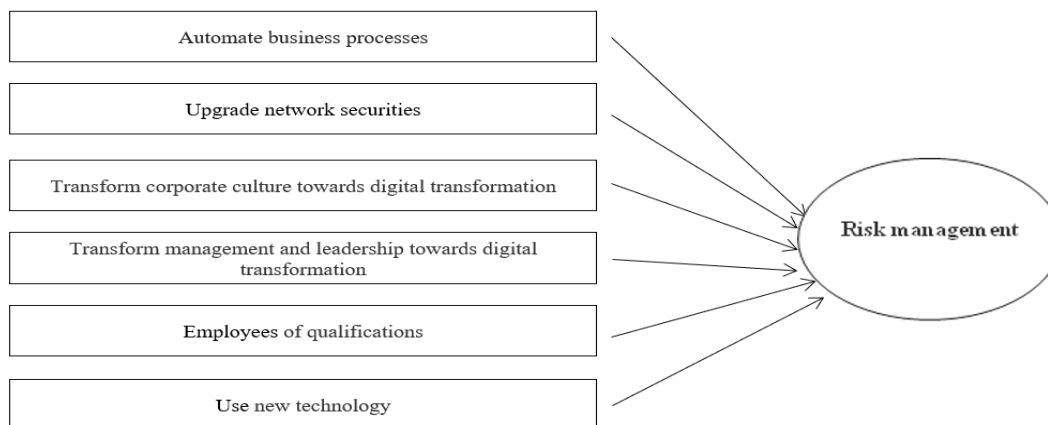
commercial banks in Vietnam in the context of digital transformation. Following this, the author conducted interviews with experts to design a research model, formulate research hypotheses, and construct a scale of factors affecting risk management at joint-stock commercial banks in Vietnam concerning digital transformation.

The quantitative research method builds upon the research model established during the qualitative research phase to test hypotheses and assess the impact levels of identified factors. Interviews conducted in a semi-structured format to test and screen the variables of the model, refining scales and completing the survey instrument for the research variables. Through open-ended questions, experts' opinions on factors impact on risk management at joint-stock commercial banks in Vietnam in the current digital transformation context were collected. The author utilized the interview content, either audio-recorded or transcribed with permission, to evaluate established scales and identify scales for quantitative research. The preliminary scale, which synthesized research results by domestic and foreign scientists, was presented to experts for feedback.

The research model, after discussions and consultations with experts, encompasses six factors influencing the effectiveness of risk management at joint-stock commercial banks in Vietnam within the context of digital transformation. These factors include the automation of business processes, upgrading network security, transformation of corporate culture towards digital transformation, transformation of management and leadership towards digital transformation, qualifications of employees, and the utilization of new technology. The interview process concluded after experts provided their comments, evaluations, and potential additions to the model, ensuring a comprehensive and well-informed approach to studying risk management in the digital transformation landscape of joint-stock commercial banks in Vietnam.

The proposed research model entails six hypotheses to be tested, with the dependent variable being "Risk Management" (RM) and the following independent variables:

Model 1. Research model Factors affecting risk management



The hypotheses are as follows:

(ABP) Automate business processes

(UNS) Upgrade network securities

(TCC) Transform corporate culture towards digital transformation

(TML) Transform management and leadership towards digital transformation

(EOQ) Employees of qualifications

(UNT) Use new technology

H1: Automate business processes has a positive impact on risk management in terms of digital transformation. This hypothesis posits that automating business processes

enhances risk management by improving productivity, compliance, and overall customer experience. Examples include using automation to improve office administration, increase processing speed, and identify customers with RPA-enabled tools.

H2: Upgrade network security is positively related to risk management in the context of digital transformation. This hypothesis asserts that enhancing network security is crucial in mitigating cybersecurity risks associated with online banking transactions. As hackers exploit vulnerabilities, robust security measures are essential to prevent system collapse and financial losses.

H3: Transform corporate culture towards digital transformation is positively related to risk management in the context of digital transformation. This hypothesis suggests that cultivating a culture aligned with digital transformation goals fosters a learning organization, customer-centric thinking, and creativity. This involves changing perceptions, evaluating values, and communicating new cultural values during digital transformation.

H4: Transform management and leadership towards digital transformation is positively related to risk management in the context of digital transformation. This hypothesis emphasizes the importance of leadership adapting to digital transformation, possessing technological awareness, systems thinking, long-term strategic vision, and supporting employees to navigate the transformation effectively.

H5: Employees of qualification have a positive relationship with risk management in the context of digital transformation. This hypothesis highlights the significance of skilled and professional staff in minimizing errors during operations and addressing management and resource development for effective risk management.

H6: Using new technology has a positive relationship with risk management in terms of argument transfer. This hypothesis suggests that the utilization of new technologies, such as Artificial Intelligence, contributes to increased efficiency, improved operational processes, enhanced customer experience, and ultimately aids in managing future risk.

The study centers on risk management within joint-stock commercial banks in Vietnam during the era of digital transformation, encompassing diverse dimensions of risk, including credit risk, market risk, liquidity risk, operational risk, legal and compliance risk, reputation risk, and strategic risk. The scales for these variables have been crafted by drawing on existing studies and adjusted to align with the specific characteristics of coal mining enterprises through expert discussions.

The quantitative data collection involved distributing 270 survey questionnaires to 18 joint stock commercial banks in Vietnam, yielding 215 responses with a response rate of 79.63%. After removing invalid votes, 192 responses were qualified for data entry. The survey instrument included Likert scales for factors affecting risk management, and the data analysis utilized SPSS software to assess scale quality, evaluate variable correlations, and conduct linear regression analysis. The expert interview instrument utilized a Likert scale, with responses ranging from Strongly Disagree (1) to Strongly Agree (5).

## **4. Results discussion**

### **4.1. Data analysis**

#### **Quality of scale**

Once the survey data were entered into SPSS 22 software, the author employed the tool to compute two reliability standards for the scale, namely Cronbach's Alpha and Total Correlation coefficient (Corrected Item - Total Correlation), to assess the scale's quality for each factor. The examination of the scale's quality yielded the following results:

Table 1. Summary of scale reliability assessment

Scale	Cronbach's Alpha coefficient	Observed variables	Corrected Item-Total Correlation	Conclusion
ABP	0.804	ABP1	0.517	Qualified
		ABP2	0.592	Qualified
		ABP3	0.623	Qualified
		ABP4	0.606	Qualified
		ABP5	0.623	Qualified
UNS	0.746	UNS1	0.373	Qualified
		UNS2	0.601	Qualified
		UNS3	0.496	Qualified
		UNS4	0.726	Qualified
TCC	0.417	TCC1	0.318	Not
		TCC2	0.133	Not
		TCC3	0.315	Not
TML	0.739	TML1	0.511	Qualified
		TML2	0.504	Qualified
		TML3	0.539	Qualified
		TML4	0.575	Qualified
EOQ	0.739	EOQ1	0.540	Qualified
		EOQ2	0.544	Qualified
		EOQ3	0.609	Qualified
UNT	0.722	UNT1	0.413	Qualified
		UNT2	0.685	Qualified
		UNT3	0.518	Qualified
		UNT4	0.449	Qualified
RM	0.772	RM1	0.615	Qualified
		RM2	0.186	Not
		RM3	0.565	Qualified
		RM4	0.566	Qualified
		RM5	0.621	Qualified
		RM6	0.621	Qualified

Source: own calculation

Based on the above table, it is evident that the Cronbach's Alpha coefficient for 5 factors is  $> 0.6$ , and 1 factor has a Cronbach's Alpha coefficient  $< 0.6$ ; we eliminate this factor. Among the 5 factors with Cronbach's Alpha coefficient  $> 0.6$ , the observed variable RM2 has a correlation coefficient  $< 0.3$ ; therefore, we eliminate this variable. The correlation coefficient of the remaining scales is greater than 0.3. The remaining scales in the research model are reliable and satisfactory for further in-depth analysis. We proceed to run Cronbach's Alpha coefficient again and have the following Table 2:

All remaining scales in the research model are reliable and satisfactory for further in-depth analysis

#### Exploratory factor analysis

Following the assessment of the scale's quality, the author determined that all observed variables ensure reliability in measuring the factors they observe. To evaluate the degree of correlation between variables in explaining the concept of the factor, the author conducted the KMO test (Kaiser-Meyer-Olkin) and Bartlett's Test of Sphericity. The results are presented in Table 3.

The KMO (Kaiser-Meyer-Olkin Measure of Sampling Adequacy) coefficient, registering a value of 0.740, fulfills the criterion of  $0.5 \leq \text{KMO} \leq 1$ . This suggests the suitability of

exploratory factor analysis. The significance coefficient of Bartlett's Test of Sphericity is 0.000, meeting the condition of being less than or equal to 0.05. This robustly supports the conclusion that the results of exploratory factor analysis (EFA) are highly significant, confirming that the observed variables are correlated and converge to account for the factors.

Table 2. Summary of scale reliability assessment

Scale	Cronbach's Alpha	Observed variables	Corrected Item-Total Correlation	Conclusion
ABP	0.804	ABP1	0.517	Qualified
		ABP2	0.592	Qualified
		ABP3	0.623	Qualified
		ABP4	0.606	Qualified
		ABP5	0.623	Qualified
UNS	0.746	UNS1	0.373	Qualified
		UNS2	0.601	Qualified
		UNS3	0.496	Qualified
		UNS4	0.726	Qualified
TML	0.739	TML1	0.511	Qualified
		TML2	0.504	Qualified
		TML3	0.539	Qualified
		TML4	0.575	Qualified
EOQ	0.739	EOQ1	0.540	Qualified
		EOQ2	0.544	Qualified
		EOQ3	0.609	Qualified
UNT	0.722	UNT1	0.413	Qualified
		UNT2	0.685	Qualified
		UNT3	0.518	Qualified
		UNT4	0.449	Qualified
RM	0.824	RM1	0.633	Qualified
		RM3	0.617	Qualified
		RM4	0.603	Qualified
		RM5	0.608	Qualified
		RM6	0.634	Qualified

Source: own calculation

Multiple linear regression analysis

The findings presented in Table 4 indicate that all Sig values, representing the Pearson correlation between independent variables and dependent variables, are <0.05. Furthermore, a Pearson Correlation coefficient <0.5 suggests the absence of multicollinearity.

Table 3. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.740
Bartlett's Test of Approx. Chi-Square	1321.150
Sphericity Df	190
Sig.	.000



Table 4. Pearson's Linear Correlation Analysis

## Correlations

		RM	ABP	UNS	TML	EQQ	UNT
RM	Pearson Correlation	1	.554*	.535**	.513**	.450**	.480**
	Sig. (2-tailed)		.000	.000	.000	.000	.000
	N	192	192	192	192	192	192
ABP	Pearson Correlation	.554**	1	.143*	.341**	.184*	.178*
	Sig. (2-tailed)	.000		.048	.000	.011	.014
	N	192	192	192	192	192	192
UNS	Pearson Correlation	.535**	.143*	1	.233**	.223**	.414**
	Sig. (2-tailed)	.000	.048		.001	.002	.000
	N	192	192	192	192	192	192
TML	Pearson Correlation	.513**	.341**	.233**	1	.240**	.284**
	Sig. (2-tailed)	.000	.000	.001		.001	.000
	N	192	192	192	192	192	192
EQQ	Pearson Correlation	.450**	.184*	.223**	.240**	1	.315**
	Sig. (2-tailed)	.000	.011	.002	.001		.000
	N	192	192	192	192	192	192
UNT	Pearson Correlation	.480**	.178*	.414**	.284**	.315**	1
	Sig. (2-tailed)	.000	.014	.000	.000	.000	
	N	192	192	192	192	192	192

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

Source: own calculation

Table 5: Table of results of regression coefficient test

Coefficients<sup>a</sup>

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	-.164	.169		-.969	.334		
ABP	.294	.037	.367	7.962	.000	.868	1.152
UNS	.281	.042	.321	6.715	.000	.807	1.239
TML	.158	.034	.219	4.571	.000	.810	1.235
EQQ	.158	.035	.210	4.536	.000	.863	1.159
UNT	.139	.045	.154	3.100	.002	.752	1.330

a. Dependent Variable: RM

Source: own calculation

The author tests the linear relationship between the dependent variable RM and the independent variables (ABP, UNS, TML, EQQ, UNT) to determine whether the

regression model is suitable for the study or not. The results in Table 5 show that there are 5 factors that are statistically significant: ABP, UNS, TML, EOQ, UNT is statistically significant in the analytical model with sig. < 0.05, and these 5 factors have an impact on the effectiveness of risk management at joint stock commercial banks in the context of digital transformation. In addition, the VIF coefficients are all less than 2, so it can be concluded that there is no multicollinearity between these factors. The regression model to evaluate the impact of factors on the effectiveness of risk management at joint stock commercial banks in Vietnam in the context of digital transformation is written as follows:

$$RM = -0,164 + 0,294*ABP + 0.281*UNS + 0.158*TML + 0.158*EOQ + 0,139*UNT$$

The analysis results of the multiple linear regression models show that all 5 factors have a positive and significant impact on the effectiveness of risk management at joint stock commercial banks in the context of digital transformation (the regression coefficient is not standardized with a positive sign).

According to the summary table of the model, the coefficients R<sup>2</sup> and adjusted R<sup>2</sup> are reported as 0.656 and 0.647, respectively. This indicates that the independent variables in the research model collectively account for 65.6% of the variation in the dependent variable. The remaining 34.4% is attributed to the influence of variables outside the model and random error.

Table 6: Evaluation of the fit of the regression model

Model Summary<sup>b</sup>

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.810 <sup>a</sup>	.656	.647	.23715	1.769

a. Predictors: (Constant), UDT, ABP, EOQ, TML, UNS

b. Dependent Variable: RM

Source: own calculation

#### 4.2. Findings

Research has demonstrated that factors such as “automating business processes”, “upgrading network securities”, “transforming management and leadership towards digital transformation” and “utilizing new technology” have substantial impacts on risk management within the banking sector. This empirical evidence serves as a valuable resource for managers, enhancing their understanding of the crucial role that digital technology plays in effective risk management within the banking industry.

Moreover, the term "employee quality" in this study is contextualized within the application of digital technology, extending beyond conventional employee attributes. Consequently, this emphasizes the imperative need for promptly elevating staff quality to align with the ongoing development of digital transformation within the banking sector.

In addition, the study reveals that transforming corporate culture towards digital transformation does not exhibit a significant relationship with risk management at banks. In essence, this implies that the corporate culture within banks concerning digital transformation has yet to be clearly defined.

### 5. Conclusion

During the Fourth Industrial Revolution era, digital transformation within the banking industry has become an inevitable trend for those seeking to enhance competitive

advantage and fortify risk management. Swift adaptation to this trend positions banks to be more proactive within the process of digital transformation, fostering sustainable development in the future.

The scope of risk management in joint-stock commercial banks involves addressing risks related to credit, market, operations, liquidity, and compliance.

To effectively manage these risks, banks must construct a risk management process tailored to the developmental needs and regulatory requirements of each business activity. Technical support capabilities and data management frameworks should be enhanced to ensure efficient risk and capital management. Emphasis on collateral management, risk identification and measurement, internal assessment, and risk warning is crucial, involving a thorough review of the enterprise's financial situation and credit information to assess debt payment capability and timing.

IFRS standards emerge as pivotal tools in bank risk management, particularly in addressing accounting functions for financial instruments. These standards encompass decision rules for classification, impairment instruments, valuation, and accounting instruments, with a focus on proper risk accounting to assess and mitigate risks throughout the financial system.

While many joint stock commercial banks in Vietnam have embraced new technologies such as AI, online automatic answering robots, and IoT, the country faces a shortage of qualified human resources proficient in information technology, particularly in digital transformation. Some banks resort to outsourcing or partnering with Fintech companies, potentially compromising the quality of their IT staff and impeding the speed and quality of digital transformation. Future efforts should concentrate on training IT personnel, offering additional benefits, and creating attractive working conditions to attract talents in the field.

Artificial intelligence (AI) plays a pivotal role in identifying unusual activities in transactions and minimizing fraud risks. Leveraging historical data, AI aids banks in making flexible and intelligent decisions, contributing to improved customer experiences through psychographic analysis, behavior understanding, and personalization. Furthermore, big data proves instrumental in customer understanding, trend prediction, process optimization, and risk management. Its applications in the banking industry enhance customer experiences, provide personalized services, detect fraud, manage investment portfolios, and improve internal processes.

Leadership awareness is deemed an urgent requirement for the digital transformation process. Leaders in banking must possess knowledge not only of finance and banking but also of the latest technology in Industry 4.0. Planning resource requirements, setting clear goals, providing strategic vision, restructuring the bank's organization, and creating products suitable for the digital transformation process are crucial leadership roles. Leaders can draw lessons from the achievements of foreign banks in digital transformation and leverage global competition as motivation for successful digital transformation within their own institutions.

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#### CONFLICT OF INTEREST

We would like to assure you that our research is conducted independently and in full compliance with legal regulations, solely for scientific purposes. We prioritize safeguarding information security for corporates and banks that engage in interviews. We kindly assure you that this product is solely the result of our research team's efforts and has not yet been published in any magazine. We assure you that we will fully accept responsibility in the event of any conflicts of interest that may arise regarding the utilization of the findings from this research.

Author 1 – Pham Thi Thu Hoai: Conceptualization; Methodology; Formal Analysis; Investigation; Writing – Original Draft; Project Administration; Software; Supervision; Funding Acquisition

Author 2 – Nguyen Thanh Vu: Conceptualization; Methodology, Validation; Data Curation, Writing – Review & Editing.

We affirm that the data utilized in the research has been thoroughly examined in accordance with appropriate protocols, thereby ensuring scientific rigor. We are prepared to furnish the raw data from the study and address any inquiries pertaining to the data.

The findings presented in the article are derived from the research methodologies employed by the author. The recommendations outlined in the study are intended solely as a point of reference for individuals with comparable conditions residing in Northern Vietnam. The utilization of these research findings by individuals and organizations necessitates careful evaluation of the current conditions and circumstances.

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