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Determinants of Digital Transformation in the Organization: Empirical Evidence from the Vietnam Banking Sector

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ABSTRACT

This study examines the key factors influencing digital transformation within Vietnam's banking sector. To achieve this objective, the authors employ a quantitative approach that integrates Structural Equation Modeling (SEM) and fuzzy-set Qualitative Comparative Analysis (fsQCA) to analyze data collected from 450 banking employees across Vietnam. The findings reveal that factors such as technological infrastructure, leadership capability, employee competency, digital transformation strategy, and digital pressure significantly enhance a bank's digital transformation capability (DTC), which in turn strongly predicts the overall level of digital transformation (LDT). However, factors such as risk management, financial capacity, organizational culture, and government support showed limited or negative influence. Furthermore, the study extends the linear findings by identifying multiple causal configurations that lead to a high level of digital transformation capability (DTC), highlighting the critical roles of strategic flexibility and internal readiness. The findings offer practical implications for banking executives and policymakers while advancing theoretical development of digital transformation through an integrated, context-specific model tailored to emerging markets.

Keywords: Digital transformation capability, Technology–Organization–Environment framework, Dynamic capabilities, PLS-SEM–fsQCA, Vietnamese banking sector

INTRODUCTION

Digital transformation (DT) is becoming a prevalent topic in current academic and professional discussions. DT is defined as "a key term to express organizational changes influenced by digital technologies" (Dethine et al., 2020, p. 20). Correani et al. (2020) indicated that digital transformation has become a pivotal force across sectors, altering conventional business models, operational structures, and competitive landscapes. Carbó-Valverde et al. (2024) revealed that digital transformation is not merely a technological transition; it requires a fundamental reconfiguration of corporate strategies and operational frameworks, prompting companies to adapt to an increasingly digitalized market environment.

In the banking sector, digital transformation is no longer optional for banks. It is a strategic imperative driven by evolving customer expectations, regulatory change, competition from fintechs/neobanks, and technology advances. However, the current state of digital transformation in banks has remained average. For instance, BCG (2025) shows that more than 60% of bank technology spending still goes to "run-the-bank" activities (maintenance, legacy systems) rather than innovation, which limits capacity for transformation. Another report notes that only 51% of institutions are actively implementing digital transformation initiatives. Therefore, investigating the factors influencing digital transformation has attracted significant attention from current scholars.

We conducted a recent literature review to assess the current state of research on digital transformation in the banking sector (see Table 1). The review reveals that, although research on digital transformation in the banking sector has grown significantly, most studies have concentrated on its outcomes—such as profitability, operational efficiency, and risk mitigation—rather than its underlying determinants. For example, Citterio et al. (2024), Podder and Ghosh (2025), and Yang and Chen (2025) examined the impact of digital transformation (DT) on profitability, operational costs, and efficiency. Similarly, Jia and Liu (2024) and Xu et al. (2025) examined the role of DT in mitigating credit and systemic risks, while Huynh (2025) focused on its relationship with liquidity creation. These studies consistently demonstrate the positive effects of DT adoption but do not examine the organizational, technological, or environmental factors that drive its successful implementation.

Only a limited number of studies have shifted attention toward the antecedents of DT. Papathomas and Konteos (2024) examined leadership and strategic alignment as key

enablers of transformation maturity, while Porfírio et al. (2024) analyzed both people-related and external factors influencing digitalization within firms. The systematic review by Feliciano-Cestero et al. (2023) revealed the influence of human (soft) and non-human elements (such as knowledge, leadership, digital servitization, and technology) on digital transformation, which may either facilitate or hinder the firm's digital transformation. Mo Bin et al. (2021) categorized determinants of DT into internal and external factors. Accordingly, internal factors comprise leadership and management support, organizational culture, employee competency, and financial resources. External factors encompass technological infrastructure, market dynamics, and the regulatory environment. These researchers also noted that SMEs differ significantly from large enterprises in their digital transformation journeys due to resource constraints, organizational structures, and varying levels of technological readiness. Werth et al. (2020) conducted a qualitative analysis of the determinants affecting digital transformation (DT) in the financial services sector, with a particular emphasis on banking and insurance industries. Consequently, these scholars showed that although the digital transformation of banking and insurance industries has been influenced by factors (such as political, economic, social, technological, bargaining power of suppliers, and bargaining power of buyers), the impact of social factors and the bargaining power of buyers is perceived to be higher in the banking sector compared to insurance. However, these works primarily focus on conceptual issues and provide limited empirical validation. Moreover, the majority of existing research has been conducted in developed economies (e.g., Europe, China, and India), with limited attention to Southeast Asian or Vietnamese contexts, where institutional structures, resource limitations, and regulatory dynamics differ markedly.

From a contextual standpoint, the Vietnamese banking sector provides a compelling but under-researched environment for digital transformation studies. Despite strong national initiatives for digitalization—such as the National Digital Transformation Program to 2030 and the State Bank of Vietnam’s Strategy for Digital Banking Development—academic research on the determinants of digital transformation in Vietnamese financial institutions remains scarce. Existing studies (e.g., Linh et al., 2025) have primarily focused on how digital transformation influences bank performance, with limited attention to the conditions that foster or hinder this process.

From a theoretical standpoint, the existing literature lacks an integrated framework that synthesizes multiple perspectives to explain the determinants of digital transformation. Werth et al. (2020) revealed that a significant shortcoming is the lack of a comprehensive theoretical model that fully encompasses the intricate interactions among these components. Current frameworks are generally disjointed, frequently

separating organizational, strategic, or technology elements without adequately considering their interactions across various industrial settings. Accordingly, developing differentiated models for specific industries, such as banks, insurers, SMEs, and marketing departments that account for unique structural and regulatory environments, is necessary.

Methodologically, most prior studies have relied on secondary data and econometric techniques such as GMM or panel regression (e.g., Citterio et al., 2024; Xu et al., 2025), focusing on cross-country or macro-level financial indicators. Few studies employ primary data at the organizational level to capture the perceptions, capabilities, and strategic orientations that shape DT decisions within firms. Consequently, there is limited empirical evidence regarding how leadership commitment, human resource readiness, technological infrastructure, and regulatory pressure jointly influence digital transformation in banks. According to Al-Faihani and Al-Alawi (2020), most current studies have concentrated on organizational or strategic factors. Consequently, the human side of transformation (such as employee adoption and customer trust) needs deeper exploration.

In response to these research gaps, this study provides novel empirical evidence on the determinants of digital transformation in Vietnam's banking sector—an underexplored yet strategically significant context within emerging economies. The study aims to address two research questions:

RQ1. What are the determinants regarding technological, organizational, and environmental factors for a bank's digital transformation capability?

RQ2. Which combinations of factors are most effective in enhancing banks' digital transformation capability?

To address this question, the study integrates fuzzy-set Qualitative Comparative Analysis (fsQCA) with Structural Equation Modeling (SEM) to empirically examine how various determinants influence both digital transformation capability and the overall level of digital transformation within Vietnam's banking sector. The study makes a significant contribution to the current literature in several ways.

First, the paper provides new empirical findings from Vietnam's banking industry, a crucial yet underexplored environment in digital transformation research. Most previous research has concentrated on developed economies or general industrial settings. However, this study targets a specific developing nation and sector. Second, this study develops a comprehensive, sector-specific model that integrates multiple theoretical frameworks, including the Technology–Organization–Environment (TOE) framework,

Diffusion of Innovation (DOI) theory, Resource-based View (RBV), and Dynamic Capabilities (DC) perspective. This holistic approach facilitates a multifaceted understanding of the drivers of DT, capturing both internal capabilities and external pressures that influence digital transformation. The study reframes the digital transformation discourse by positioning DT as a dependent variable—an outcome of various organizational, technological, and environmental determinants—thereby providing a more complete understanding of how and why DT occurs. The study utilizes both SEM and fsQCA models to address the research questions. The study employs PLS-SEM to test the structural model and hypotheses. On the other hand, fuzzy-set Qualitative Comparative Analysis (fsQCA) reveals various configurations or causal paths that contribute to a high level of digital transformation capability. This dual-method approach adds methodological rigor and helps capture causal complexity and equifinality, addressing the call for more nuanced, multi-path analysis in digital transformation research.

The overall structure of the research framework is outlined as follows. We present the theoretical framework, research model, and research evidence for the relationships in Section 2. Section 3 presents the research methodology. Sections 4 and 5 present the research findings, discussion, and implications.

Table 1 *Studies about Digital Transformation in the Banking Sector.*

Study	Dependent Variable(s)	Independent Variable(s)
Yang and Chen (2025)	Operational cost, credit risk, and flexibility	AI, blockchain, automation
Podder and Ghosh (2025)	Profitability, efficiency	IT investment, online services, automation
W. Wang et al. (2025)	Bank regulatory violations	DT level (digital processes, monitoring)
Felipe et al. (2025)	Operational efficiency, service innovation	Adoption of Industry 4.0 tech (AI, IoT, automation)
Linh et al. (2025)	Bank performance, stability	DT level, big-data mining indicators
Hoque et al. (2024)	Bank risk	Digital transformation factors
Xu et al. (2025)	Bank credit risk	Degree of digital transformation
Huynh (2025)	liquidity creation	Bank digitalization
Papathomas and Konteos (2024)	Transformation maturity stage	Strategy, leadership, infrastructure
Citterio et al. (2024)	Profitability (ROA, ROE)	DT adoption index, IT efficiency, network efficiency
X. Wang et al. (2024)	enterprise violation risk	level of digital transformation
Porfírio et al. (2024)	perceived impact on digital transformation in organizational performance and in business volume	People, Internal factors, external factors
Jia and Liu (2024)	Systemic risk, market share volatility	DT intensity (AI, cloud)
Cao et al. (2022)	Non-performing loan ratio	DT index (digital investment, analytics)

Source. Authors' collection

THEORETICAL BACKGROUND

This study integrates the TOE, DOI, RBV, and DC frameworks to analyze the determinants of digital transformation (DT) in Vietnam's banking sector.

Technology – Organization – Environment (TOE) model and Diffusion of Innovation (DOI)

The Technology–Organization–Environment (TOE) framework, originally proposed by DePietro et al. (1990), serves as a foundational model for examining the adoption of technological innovation within firms. Accordingly, the framework identifies three primary settings that affect the adoption and implementation of technical innovations inside a firm: (i) the technological context; (ii) the organizational context; and (iii) the environmental context. According to T.H. Nguyen et al. (2022), the technical background illustrates the current technologies employed and the emerging technologies pertinent to each company. Within the TOE framework, the organizational context captures firm-specific characteristics, including size, scope, and resource availability. In

contrast, the environmental context represents the broader business landscape, including industry competition, regulatory conditions, and governmental influence. The technology-organization-environment model has been frequently applied in the literature on technological adoption. For instance, Hashimy et al. (2023) clarified the blockchain adoption process by examining it from several technological, organizational, and environmental perspectives. Similarly, Khan et al. (2021) extended the technology-organization-environment framework to shed light on how companies behave when they adopt and use mobile payment systems. Tajudeen et al. (2018), employing the technology-organization-environment framework in their research, identified that factors related to technology, organization, and environment significantly influence the utilization of social media for comprehending customer needs and enhancing organizational communication and public relations.

The diffusion of innovation (DOI) was introduced by Rogers (1995). Accordingly, the adoption of digital innovations is influenced by five key factors: relative advantage, compatibility, complexity, trialability, and observability. Schmitt et al. (2019) showed that the technology-organization-environment framework aligns with the diffusion of innovation theory and has received substantial empirical validation since its inception, as both models address technology adoption at the firm level. In the realm of digital transformation, these characteristics can shape banking institutions' attitudes and actions toward adopting emerging technologies. Innovations that enhance operational efficiency and align well with existing systems have a higher likelihood of adoption (Fairooz & Wickramasinghe, 2019). In the context of Vietnam’s banking sector, the diffusion of innovation theory elucidates variations in adoption rates, particularly in relation to differing levels of technological readiness, organizational culture, and market pressure among organizations.

Resource-based view (RBV) and Dynamic Capability Theory (DC)

According to Barney et al. (2001), the Resource-Based View (RBV) explains how firms achieve and sustain competitive advantage by leveraging distinctive internal resources and capabilities. On the other hand, the Dynamic Capabilities (DC) theory expands this viewpoint by highlighting the necessity for firms to consistently adapt, reconfigure, and integrate resources in response to rapid technological change (Teece, 2018). The RBV is widely recognized as a foundational theory for understanding how firms build and maintain competitive advantage through the effective deployment of valuable, rare, and inimitable resources. Teece (2018) further emphasized that the Dynamic Capabilities (DC) framework provides the foundation for firms to integrate, reconfigure, and renew their resources in response to technological and market changes.

Dynamic capability refers to a firm's ability to identify, seize, and transform opportunities, making it a critical mechanism for managing digital transformation.

The application of the Resource-Based View (RBV) and Dynamic Capabilities (DC) in the banking sector is evident in multiple instances. Vafaei-Zadeh et al. (2024) showed that previous studies in the context of DT have identified several key constructs that influence the utilization of the Resource-Based View, including IT and digital capabilities, complementary resources, strategic orientation, and collaboration and relational resources. Accordingly, a firm's unique resources and capabilities, including Big Data analytics, the Internet of Things (IoT), and innovation capabilities, are essential enablers of digital transformation. Meanwhile, Nwankpa and Roumani (2016) argued that investments in information technology do not directly enhance performance; instead, an effectively structured digital transformation strategy mediates their influence.

Technological Factors

MacLean and Titah (2023) indicated that technological competency refers to a company's ability to efficiently utilize, manage, and integrate technology into its operations and processes, as well as to deliver IT service management that fulfills the needs of all departments. Therefore, utilizing digital technology to enhance operations, create new products and services, and foster creativity is essential in digital transformation (Jayawardena et al., 2023). The technical components encompass the integration of innovative solutions, autonomous products, technological developments, collaborative advancements, and value generation (Feliciano-Cestero et al., 2023). Bagheri et al. (2019) revealed that by investigating novel technology, companies may seek opportunities in overseas markets. Consequently, technological expertise and competencies were essential for entering new markets. Scholars found that technologies are advancing at a rapid rate, beyond the capacity of businesses to assimilate them. As a result, several advantages and disadvantages are associated with digital transformation. For instance, digitized and automated companies may be controlled remotely without completely halting production during a market disruption. This advantage enhances productivity (Chen & Kamal, 2016), facilitates a firm's development, and enables it to achieve internationalization with few or no physical or geographic restrictions due to the IoT (Hassouneh & Brengman, 2011). According to Alcácer and Cruz-Machado (2019), the deficiency of technical resources and inadequate infrastructure represent disadvantages associated with this gap, linked to the four primary factors that facilitate or impede digital transformation and internationalization in enterprises.

In this study, technological factors of the bank include its technology platform and digital transformation progress. According to Saarikko et al. (2020), IT and digital

competencies are essential facilitators of digital transformation, supplying the requisite technological framework and digital proficiency to propel transformation initiatives. An adequate IT infrastructure facilitates system integration, cloud computing, and data security, guaranteeing smooth operations and digital advancement. Abdurrahman et al. (2024) found that technological capabilities—particularly robust technology platforms—significantly and positively affect both digital transformation and innovation within the banking sector. In other words, these scholars highlighted the role of the technological platform in promoting the digital transformation of the bank. In other aspects, Trang et al. (2024), in an investigation of the impact of information technology applications, such as core banking systems, on the risk profiles of Vietnamese commercial banks, indicated that the implementation of internal IT systems can reduce risks, highlighting the significance of technology platforms in bolstering banking stability. According to Ha and Nguyen (2022), establishing digital-native banks with integrated digital user interfaces and back-end systems facilitates substantial cost reductions and operational agility, emphasizing the critical role of modern technology platforms in digital transformation. Similarly, Verhoef et al. (2021) showed that digital technology development is considered an external factor that contributes to the digital transformation of MSMEs. Therefore, the authors propose that:

H_1. The technology platform has a positive influence on the bank's digital transformation capability.

H_2. The Digital transformation development has a positive influence on the bank's digital transformation capability.

Organizational Factors.

Eggers and Park (2018) emphasized that, beyond digital resources, organizational adaptation plays a critical role in facilitating digital transformation, particularly through flexible structures that respond effectively to change. These adaptations encompass factors such as leadership, strategy, organizational culture, and employee engagement. Previous studies contend that digital transformation affects organizational structure, promoting a flexible framework consisting of distinct business units, agile organizational forms, and digital functional domains.

According to Zhang and Wang (2024), the structure and strategic direction of a company may either promote or obstruct digital change. Studies in the manufacturing sector further suggest that refining organizational structures and re-engineering business models are essential for enhancing digital transformation capabilities. AlBar and Hoque (2019) classified organizational factors into two main categories – top management

support and organizational culture – and found both to be key antecedents of information and communication technology (ICT) adoption. Similarly, Yigitbasioglu (2015) found that institutional pressure and top management support are positively associated with the adoption of cloud computing solutions. Mazzei and Noble (2017) highlighted that improvements in leadership ideologies and behaviors significantly influence the digital transformation competencies of enterprises. Accordingly, these organizational modifications facilitate more agile and informed leadership decision-making by enabling immediate access to open information and data. In other aspects, Kindermann et al. (2021) indicated that organizational factors include a strategic orientation, which is essential in guiding a firm's digital transformation path by aligning digital initiatives with long-term business objectives. Organizations with a strong digital orientation are more likely to invest in continuous digital transformation initiatives, thereby facilitating the effective integration of emerging technologies. A study by Blanka et al. (2022) established a human-centered paradigm highlighting the significance of staff competencies – specifically intrapreneurial and digital skills – in facilitating digital transformation. The findings indicated that personnel with stronger capabilities are more likely to engage actively in digital transformation initiatives, thereby facilitating organizational change and innovation. Lai et al. (2021) supported this view, concluding that enhanced IT proficiency increases employee autonomy and collaboration, thereby improving organizational agility – a critical factor for responding to rapid changes associated with digital transformation. Factors such as risk management and financial capability are also associated with the digital transformation of the organization. For example, a McKinsey report highlighted that banks integrating risk management into their digital initiatives can accelerate the pace of transformation. By automating procedures and engaging risk teams early, banks mitigate delays and improve regulatory compliance. Similarly, Boehm et al. (2021) reported that a financial institution reduced operational expenses by 85% and accelerated code deployment by 90% by integrating risk assessments into agile development methodologies. Therefore, the authors propose that:

H_3. Leadership capability positively influences the bank's Digital transformation capability.

H_4. A digital transformation strategy positively influences the bank's digital transformation capability.

H_5. Employee competency and comprehension positively influence the Digital transformation capability of the bank.

H_6. Bank risk management positively influences the Digital transformation capability of the bank.

H_7. Bank corporate culture positively influences the Digital transformation capability of the bank.

H_8. Digital transformation pressure positively influences the Digital transformation capability of the bank.

H_9. Bank financial capability positively influences the Digital transformation capability of the bank.

Environmental Factors

The environmental setting has a significant influence on the adoption of digital transformation by SMEs. According to AlBar and Hoque (2019), the environmental context encompasses the regulatory environment, government support, competitive pressures, supplier influence, and customer expectations. Literature indicates that SMEs functioning within a framework constrained by government laws and regulations have a low rate of ICT adoption. Thus, government rules and regulations, intellectual property rights, consumer protection legislation, and compliance can either promote or hinder the use of ICT by SMEs (Al-Somali et al., 2011). Ifinedo (2012) defined government support as the authoritative support and dedication to motivate and inspire organizations to adopt and disseminate IT/IS within their environment. Accordingly, government support plays a crucial role in advancing digital transformation by facilitating adoption and addressing various barriers that hinder its adoption among organizations. The critical role of government support in promoting digital transformation has been empirically demonstrated in several studies by Lutfi et al. (2016) and Pathan et al. (2017). Therefore, the authors suggest that:

H_{10}. Government support for digital transformation positively influences the digital transformation capability of the bank.

Digital Transformation Capability and the Level of Digital Transformation

Sousa-Zomer et al. (2020) found that an organization's digital transformation capability significantly influences both firm performance and the level of digital transformation achieved. In other words, organizations with robust digital transformation capabilities provide ongoing strategy renewal to maintain responsiveness and competitiveness in a rapidly evolving environment. Similarly, the research by Abdurrahman et al. (2024) also revealed that technology and ecosystem capabilities significantly and positively influence digital transformation and innovation, suggesting that improving DTC is essential for progressing digital transformation levels. This view is further supported by several studies (Alsufyani & Gill, 2022; Li et al., 2020), which

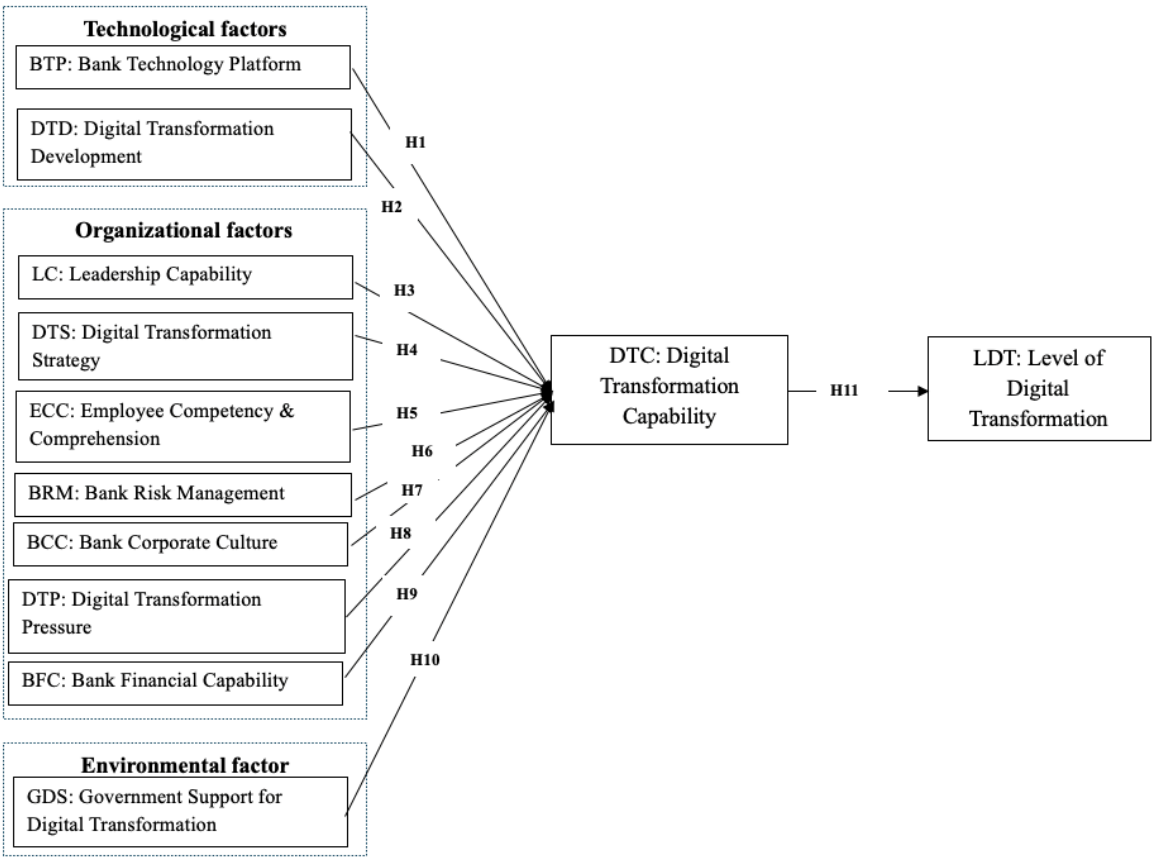
confirm that government and regulatory support are vital in accelerating firms' digital transformation initiatives. Therefore, the authors suggest that:

H_{11}. Digital transformation capability positively influences the level of digital transformation of the bank.

Building on the preceding discussion, this study integrates the TOE, DOI, RBV, and DC frameworks into a cohesive analytical model that explains both the determinants and mechanisms of digital transformation in the banking sector. Accordingly, the integration of these theories and models forms a hierarchical and interactive theoretical model. In detail, the technology-organization-environment model provides the structural foundation by categorizing determinants into technological, organizational, and environmental domains. Diffusion of Innovation theory is enriched by specifying the innovation attributes that shape banks' digital transformation capability, such as the digital platform and digital development. Additionally, the Resource-Based View (RBV) strengthens the model by identifying internal strategic and human resources as sources of transformation capability.

Furthermore, Dynamic Capabilities (DC) explains the dynamic processes that enable organizations to continuously adapt and transform these resources in response to technological and environmental pressures. In other words, these frameworks converge in the concept of Digital Transformation Capability (DTC), which mediates the relationship between the identified determinants and the Level of Digital Transformation (LDT). This integrated framework advances beyond traditional adoption studies by linking contextual enablers with strategic and adaptive mechanisms. It thereby offers a comprehensive explanation of how and why banks in emerging economies achieve successful digital transformation. The conceptual model is presented in Figure 1.

Figure 1 *The Conceptual Model*



Source: Authors' Construction

RESEARCH METHODOLOGY

Sampling and Data Collection

Building on this framework, the present study examines the current state of digital transformation among organizations in Vietnam's banking sector. Accordingly, the target population consisted of Vietnamese employees who possess knowledge or direct experience related to digital transformation activities within their banks. To ensure relevance, two criteria guided respondent selection: (i) participants must be Vietnamese citizens, and (ii) participants must be currently employed in the banking sector. To recruit participants, the research team initially contacted 34 commercial banks across Vietnam between September and November 2024 to request assistance in distributing the survey. Due to data security regulations, access to employees' official emails was restricted. However, six leading commercial banks—Vietcombank, BIDV, VietinBank, Agribank, MB Bank, and Techcombank—agreed to support the research by distributing the survey through their internal professional networks and LinkedIn groups. Although only 6 out of 34 commercial banks participated in the survey, these banks represented both state-owned and joint-stock institutions, which together account for a substantial portion of the

national banking workforce. This mix enhances the representativeness of the sample with respect to the Vietnamese banking sector. Participation was voluntary and anonymous.

The survey was developed using Google Forms. After pilot testing with 10 respondents to ensure clarity and comprehension, the final version was activated online and distributed with the assistance of bank managers and industry contacts. The questionnaire consisted of two main sections: Section 1 gathered demographic information. Section 2 measured the study constructs using established multi-item scales on a five-point Likert scale (1 = "strongly disagree" to 5 = "strongly agree"). Each respondent was allowed a single submission, and the survey link remained open from December 2024 to February 2025.

A non-probability sampling method, combining convenience and purposive techniques, was employed. This approach was deemed appropriate because (i) the study focuses specifically on employees with an understanding of digital transformation processes, and (ii) probability sampling was not feasible given the confidentiality and restricted access typical of the banking industry. This method also optimized time, financial, and human resources.

The formula for calculating sample size is presented in Equation 1:

Equation 1*: Sample size calculation*

$$n = \frac{N * X}{X + N - 1}$$

Where:

$X = (\frac{Z_\alpha}{2^2} * P(1 - P))/MOE^2$

n = Sample size,

P = Proportion of the sample

MOE = Margin of error; a 5% margin of error is usually selected

N = Population size

Z-($\alpha/2$) = The critical value of the normal distribution at a $\alpha/2$ (for a confidence interval level of 95%, α is 0.05 and the critical value is 1.96)

For a 95% confidence level (Z = 1.96) and a 5% margin of error, the minimum required sample size was 385 (Etikan & Babatope, 2019). Additionally, an a priori power analysis using Soper's (2023) online PLS-SEM calculator indicated a minimum of 200 cases to detect a medium effect size, given the study's model complexity. A total of 500 responses were collected, of which 50 were incomplete, resulting in a final sample of 450 valid responses (a 90% usable rate).

Ethical considerations were strictly observed. The survey did not collect any personally identifiable information, such as names, addresses, or phone numbers. Respondents were informed about the study's objectives, assured of confidentiality, and provided informed consent before participation. A drop-off option was also available, allowing participants to complete the questionnaire at their convenience.

Measurement Scales

The variables utilized in the research model are presented in Table 2. Accordingly, the authors adapted validated scales developed by previous scholars (as shown in Table 2).

Table 2. *Variables and Items*

Variable	Items	Instrumentation
Bank technology platform – BTP	● The bank employs digital technologies that are aligned with the needs of both customers and employees. ● The bank has developed technological infrastructure across its departments and divisions. ● The bank maintains a modern website and offers advanced internet and mobile banking applications. ● The bank utilizes an internal interaction system to minimize direct task delegation. ● The bank adopts cloud computing technology for internal management purposes.	(Ánh & Nương, 2022; Tungpantong et al., 2022)
Digital transformation development - DTD	● The bank provides training programs for employees on digital transformation and digital applications. ● The bank empowers employees to engage in self-directed learning related to digital transformation. ● The bank has an information technology department that supports other departments in implementing digital transformation. ● The bank places strong emphasis on developing employees' skills in using digital applications.	(T. M. H. Nguyen & Bui, 2021)
Leadership capability – LC	● The bank's leadership demonstrates a strong interest in digital transformation. ● The leadership maintains a positive attitude toward the bank's digital transformation efforts. ● The leadership uses new technological applications in their interactions. ● The leadership actively supports proposals to apply technology in digitizing operational and managerial processes within the bank. ● The leadership continuously engages in learning to enhance their capabilities in response to the demands of digital transformation. ● The leadership is willing to address concerns arising from the potential downsides of digital transformation.	(Ánh & Nương, 2022)

Variable	Items	Instrumentation
Digital transformation strategy – DTS	● Digital transformation objectives are incorporated into the bank's business strategy. ● The bank has established a dedicated unit to oversee the digital transformation process. ● The bank engages specialized firms or organizations to provide consulting and implementation support for digital transformation initiatives. ● The bank aims to deliver an optimal customer experience through digital platforms.	(Ánh & Nương, 2022)
Employee competency & comprehension – ECC	● Employees are proficient in using information technology applications. ● Employees are capable of resolving technical issues related to technology. ● Employees can easily learn new digital technologies. ● Employees can update their knowledge of emerging technologies with ease. ● Employees are willing to collaborate and contribute to the development of new digital technologies.	(Ánh & Nương, 2022)
Bank risk management – BRM	● The bank consistently prioritizes risk management activities to ensure stable business operations. ● The bank is capable of effectively handling risk incidents during business processes through the application of digital technologies. ● The bank has implemented a risk control system based on technological platforms.	(Hassan Al-Tamimi & Mohammed Al-Mazrooei, 2007)
Bank corporate culture – BCC	● Bank employees are actively involved in processes, decision-making, and the execution of tasks related to digital transformation. ● Employees demonstrate a strong sense of responsibility. ● The bank's data is always verified before being stored or shared. ● There is a high level of coordination and consensus among employees within the bank. ● The bank exercises control, conducts testing, and facilitates discussions before implementing digital transformation initiatives. ● The bank is prepared to respond to changes brought about by the adoption of digital technologies. ● The bank is willing to take risks and accept potential failures in the process of digital transformation. ● The bank makes dedicated efforts to achieve its digital transformation goals.	(Ánh & Nương, 2022)
Digital transformation pressure – DTP	● The bank needs to leverage digital technology applications to enhance customer interactions. ● The bank needs to optimize its operational and management processes. ● The bank requires stronger integration and coordination among departments. ● The bank needs to utilize its resources more efficiently to remain competitive with other banks. ● The bank needs to improve transparency and effectiveness in its governance.	(Ánh & Nương, 2022)

Variable	Items	Instrumentation
	● The bank needs to innovate in developing products for its customers.	
Bank financial capability – BFC	● The bank ensures funding for the infrastructure costs associated with digital transformation. ● The bank is financially capable of compensating high-quality personnel to meet the demands of digital transformation. ● The bank guarantees payment for digital transformation service providers.	(T. M. H. Nguyen & Bui, 2021)
Government support for digital transformation - GDS	● The government has introduced incentive policies to promote the adoption of digital transformation in the banking sector. ● The government has reformed institutional frameworks, improved the business environment, and promoted the development of open data. ● The government has implemented national digital transformation programs to support the digitalization of financial and credit institutions. ● The State Bank organizes the annual "Banking Digital Transformation Day" and hosts various conferences to foster collaboration between businesses and banks in digital transformation.	(Krüger & Teuteberg, 2016; Zhu et al., 2006)
Digital transformation capability – DTC	● The bank is fully capable of digitizing all operational and management processes. ● The bank can deliver new value and customer experiences through digital technology platforms. ● The bank can optimize resource allocation and utilization using digital technology platforms. ● The bank is fully capable of achieving successful digital transformation. ● The bank can attain higher business performance following digital transformation.	(Ánh & Nương, 2022)
Level of digital transformation – LDT	● Digital customer experience (innovation and transformation of services) ● Digital business strategy (marketing, portfolio management, ecosystem development) ● Information management system, security, and data protection ● Operations ● Data (customer information and internal bank data) ● Corporate culture	(Huong & Hoa, 2024)

Data Analysis Methods

The data analysis was conducted using partial least squares structural equation modeling (PLS-SEM). The author employs Partial Least Squares (PLS) for model estimation due to (i) its predictive focus, which aligns with the model's objectives; (ii) the absence of standard distribution requirements for the items; and (iii) the complexity of the research model (Henseler et al., 2009). "Advanced Analysis of Composites" (ADANCO) software was used to examine the hypothesized model (Henseler et al., 2015).

The assessment of the hypotheses established in SEM follows a twofold pre-analysis phase for both the measurement models and, thereafter, the structural model.

Additionally, the authors also conducted a fuzzy set qualitative comparative analysis (fsQCA) to determine the configurations that result in a high degree of digital transformation capability (DTC) in the banking sector, and the role of factors, whether core or supporting, within three categories: technological factors, organizational factors, and environmental factors. While PLS-SEM identifies the net and linear effects of technological, organizational, and environmental factors, fsQCA complements these results by revealing how different configurations of these factors jointly produce the outcome. This dual-method approach is conceptually justified because SEM assumes symmetric and additive relationships among variables. In contrast, fsQCA captures causal asymmetry and equifinality—showing that multiple, distinct pathways can lead to the same level of DTC (Fainshmidt et al., 2020). Therefore, the combination of PLS-SEM and fsQCA provides a more comprehensive understanding of the phenomenon by integrating the strengths of variance-based (SEM) and set-theoretic (fsQCA) perspectives. Accordingly, the authors posit that digital transformation capability (DTC) in the banking sector is a function of 10 factors (Equation 2).

Equation 2**:** *Fuzzy-set model*

$$DTC = \int (BTP, DTD, LC, DTS, ECC, BRM, BCC, DPT, BFC, GDS)$$

Where DTC – Digital transformation capability, BTP – Bank technology platform, DTD – Digital transformation development, LC – leadership capability, DTS – Digital transformation strategy, ECC – Employee competency & comprehension, BRM – Bank risk management, BCC – Bank corporate culture, DTP – Digital transformation pressure, BFC – Bank financial capability, GDS – Government support for digital transformation.

Because the survey used 5-point Likert scales to measure the constructs, thresholds of 4, 3, and 2 were adopted to represent full membership, crossover, and full non-membership, respectively, when converting the data for fsQCA. This calibration ensured that all values ranged from 0 to 1 (Pappas & Woodside, 2021). Next, truth tables were constructed to identify all possible causal configurations leading to high levels of digital transformation capability (DTC). Each condition was calibrated with binary values, where one indicates the presence of a high DTC, and 0 denotes a low DTC. Accordingly, the authors also sorted the truth table by frequency threshold at 1 and raw consistency threshold at 0.8 to remove the configurations with low frequency and consistency (Pappas & Woodside, 2021).

RESULTS AND ANALYSIS

Descriptive Analysis

The demographic profile of respondents in this study indicates a workforce that is both youthful and comparatively experienced, with a robust educational background (Table 3). Of the 450 participants, 54% are female, and 46% are male, indicating a somewhat even gender distribution. The majority of respondents (64.89%) were between 20 and 39 years old, representing the most dynamic and adaptable segment of the workforce, typically more engaged with and influenced by technological advancements. Educational attainment among participants was relatively high: 58.44% held a bachelor's degree, 8.89% possessed postgraduate qualifications, and fewer than 15% had only a high school education. Income distribution indicates that 68% of respondents earn less than 20 million VND per month, suggesting a predominance of personnel in junior- to mid-level roles. Work experience was evenly distributed, with 32.67% of respondents having more than five years of experience in the banking industry and 51.9% having between one and five years, indicating a workforce that blends fresh perspectives with institutional expertise. Respondents hold various positions: 35.56% of total respondents are bank tellers, while significant percentages also include functional officers (40.00%), middle managers (15.56%), and senior managers (8.89%), indicating a multi-tiered comprehension of digital transformation across hierarchical levels.

The execution of digital transformation within these organizations appears to focus primarily on strategic initiatives and customer-oriented improvements. A significant majority (81.11%) report that their banks have implemented digital business strategies encompassing marketing, investment portfolios, and ecosystem growth. Approximately 49.33% indicate initiatives aimed at enhancing the digital consumer experience, implying a focus on outward-facing enhancements. Nonetheless, profound internal transformation appears to be infrequent: just 30% reported progress in information management systems and cybersecurity, with even fewer recognizing alterations in operations (1.11%), internal data use (4.00%), or company culture (3.11%). The data underscores a trend in which banks emphasize apparent, customer-focused modifications rather than fundamental, infrastructure alterations. When asked about the objectives of digital transformation, only 16.67% of participants cited improved operational or commercial efficiency as the primary goal.

In comparison, even smaller proportions mentioned enhancing customer connections (0.44%) or increasing competitiveness (0.22%). The data suggests either employees' unawareness of overarching strategic objectives or a disconnect in communication and alignment between leadership and personnel. In the assessment of their bank's total digital transformation on a scale of 1 to 10, the majority (59.11%) ranked

it within the intermediate range (4–6), while just 23.56% classified it as advanced (7–10), and 17.33% assigned a poor grade (1–3). These findings suggest that although banks have begun implementing digital transformation initiatives, most employees perceive the progress as partial or superficial. This highlights the need for more comprehensive, integrated, and organization-wide strategies to ensure meaningful transformation in the future.

Table 3 *Demographic Profile of the Respondents*

	Criteria	Number (N=450)	Percentage (%)
Gender	Male	207	46.00
	Female	243	54.00
Age	Below 20 years old	34	7.56
	[20-30] years old	135	30.00
	[31-40] years old	157	34.89
	[41-50] years old	76	16.89
	[51-60] years old	34	7.56
	from 60 years old	16	3.56
Educational qualification	High school	63	14.00
	Vocational/College diploma	84	18.67
	Bachelor's degree	263	58.44
	Postgraduate degree (Master's/PhD)	40	8.89
Income level	Below 10 Million VND	136	30.22
	[10-20] Million VND	170	37.78
	[21-30] Million VND	78	17.33
	[31-40] Million VND	37	8.22
	Above 40 Million VND	29	6.44
Working experience	Below 1 year	69	15.33
	[1-3] years	115	25.56
	[4-5] years	119	26.44
	Above 5 years	147	32.67
Job Position	Bank Teller	160	35.56
	Functional Officer	180	40.00
	Middle manager	70	15.56
	Senior manager	40	8.89

	Criteria	Number (N=450)	Percentage (%)
Aspects of Digital Transformation Implemented by the Bank	Digital customer experience (innovation/transformation of services)	222	49.33
	Digital business strategy (marketing, investment portfolio, ecosystem, etc.)	365	81.11
	Information management system, safety, and cybersecurity	135	30.00
	Operations	5	1.11
	Data (customer and internal bank information)	18	4.00
	Corporate culture	14	3.11
	Others	8	1.78
Objectives of the Bank's Digital Transformation	Increase operational/business efficiency	75	16.67
	Strengthen customer relationships	2	0.44
	Enhance the bank's competitiveness in the market	1	0.22
Overall Evaluation of the Bank's Digital Transformation Level	Level 1-3	78	17.33
	Level 4-6	266	59.11
	Level 7-10	106	23.56

The Goodness of the Model Fit

The authors evaluate the model's Goodness of Fit (GoF) using the standardized root mean squared residual (SRMR), the unweighted least squares discrepancy (dULS), and the geodesic discrepancy (dG), as detailed in Table 4. A lower SRMR indicates a superior fit of the theoretical model (Henseler et al., 2015). Byrne (1998) indicates that an SRMR value below 0.05 denotes an adequate fit. Therefore, the results demonstrate a strong model fit, with an SRMR value of 0.0424—well below the recommended threshold of 0.05. The dULS value and the dG value must not surpass the 99th percentile ("HI99") thresholds to maintain model fit (dULS=1.546, $p>0.01$ and dG=0.9618, $p>0.01$) (Henseler et al., 2015). Accordingly, the results indicate that our model demonstrates a satisfactory goodness of fit.

Table 4 *Goodness of Model Fit.*

	Value	HI99
SRMR	0.0424	0.0425
dULS	1.5467	1.5521
dG	0.9618	1.1462

Source. Author's contribution

Measurement Model Analysis

The measurement model was analyzed using CFA, in which the authors estimated a saturated structural model with all constructs freely correlated. All constructs in this study were modeled as reflective, as the indicators are considered manifestations of their underlying latent constructs and are expected to covary with them. The results for the measurement model are presented in Table 5. Accordingly, to achieve indicator reliability, the loading of each item on its associated construct should be greater than 0.7 (Henseler, 2021). To establish construct reliability, Dijkstra-Henseler's rho (ρA) and Cronbach's alpha(α) should be greater than 0.7 (Hair et al., 2017; Henseler, 2021). To establish convergent validity, the Average variance extracted (AVE) for each construct should be larger than 0.5 (Fornell & Larcker, 1981; Hair et al., 2017). Furthermore, the author also assesses the indicator multicollinearity via Variance Inflation Factors (VIF).

According to Hair et al. (2019), reliability values should range from 0.6 to 0.9, indicating satisfactory to good reliability. However, values of 0.95 and higher are problematic as they indicate redundancy, reduce construct validity, and increase undesirable response patterns. Accordingly, indicators with excessively high or low loading values were removed to enhance the model's reliability. The analysis revealed that all indicator loadings for the reflective constructs exceeded 0.70, indicating satisfactory construct reliability. Despite specific loading values of the indicators being suboptimal (e.g., ECC_5 = 0.9006, BCC_3 = 0.6633, DTP_2 = 0.6913, DPT_4 = 0.6291, LDT_1 = 0.9249), removing these indicators results in a decrease in the goodness of fit (GoF). Hair et al. (2019) show that indicators with loadings below the recommended threshold of 0.7 were retained when their theoretical importance was deemed significant and when the construct's composite reliability (CR) and average variance extracted (AVE) values remained within acceptable limits. Retaining such indicators ensured the content validity of the constructs while maintaining adequate measurement quality. As a result, the authors maintained these indicators.

The reliability of construct scores was assessed drawing upon Dijkstra-Henseler's rho (ρA) (Dijkstra & Henseler, 2015); Composite reliability (ρc) (Werts et al., 1978); and Cronbach's alpha (α) (Cronbach, 1951). Accordingly, all values of latent constructs

should be higher than 0.7. Dijkstra and Henseler (2015) argued that Cronbach's alpha may be too conservative, while the composite reliability may be too liberal. These scholars suggested Dijkstra-Henseler's rho (ρA) as an approximately exact measure of construct reliability, which usually lies between Cronbach's alpha and composite reliability. The results show that Dijkstra-Henseler's rho (ρA), Composite reliability (ρc), and Cronbach's alpha(α) exceed 0.7. Therefore, the study concludes that all reflective constructs achieved indicator and construct reliability.

To establish convergent validity, the average variance extracted (AVE) for each construct should be larger than 0.5 (Hair et al., 2017). Furthermore, the variance inflation factors (VIF) are also below the threshold of 5. The results show that the model achieves convergent validity.

Table 5 *Results for the Assessment of Reflective Measurement Models.*

Construct	Model	Items	Loadings	Dijkstra-Henseler's rho (ρA)	Jöreskog's rho (ρc)	Cronbach's alpha(α)	AVE	VIF
BTP	**Reflective**			0.8478	0.8476	0.8482	0.6496	
		BTP_1	0.7892					1.4805
		BTP_2	0.7250					2.0578
		BTP_3	0.7400					1.8870
DTD	**Reflective**			0.8673	0.8653	0.8654	0.6168	
		DTD_1	0.7923					2.7192
		DTD_2	0.8047					3.0665
		DTD_4	0.8206					1.6314
LC	**Reflective**			0.8618	0.8596	0.8597	0.6715	
		LC_3	0.8217					1.9522
		LC_4	0.8204					2.2280
		LC_5	0.7604					2.2664
		LC_6	0.7354					1.9261
DTS	**Reflective**			0.9163	0.9103	0.9052	0.7188	
		DTS_2	0.8512					2.0674
		DTS_3	0.7666					2.2395
		DTS_4	0.8381					2.2312
ECC	**Reflective**			0.8480	0.8377	0.8394	0.5662	
		ECC_1	0.7212					1.5714
		ECC_2	0.8767					2.9777
		ECC_4	0.8804					3.9692
		ECC_5	0.9006					3.1107
BRM	**Reflective**			0.8275	0.8199	0.8229	0.5347	
		BRM_1	0.7846					1.5000

Construct	Model	Items	Loadings	Dijkstra-Henseler's rho (ρA)	Jöreskog's rho (ρc)	Cronbach's alpha(α)	AVE	VIF
		BRM_2	0.7358					1.5000
BCC	**Reflective**			0.8605	0.8588	0.8600	0.6701	
		BCC_1	0.7445					1.9315
		BCC_3	0.6633					1.9327
		BCC_4	0.7060					1.7604
		BCC_8	0.8787					1.7787
DTP	**Reflective**			0.8777	0.8767	0.8768	0.6403	
		DTP_1	0.7946					1.8731
		DTP_2	0.6913					2.0173
		DTP_4	0.6291					1.7498
		DTP_5	0.7963					1.5316
BFC	**Reflective**			0.8795	0.8792	0.8790	0.6454	
		BFC_1	0.8180					2.4458
		BFC_2	0.7783					2.7000
		BFC_3	0.8576					1.8461
GDS	**Reflective**			0.7341	0.7328	0.7320	0.5785	
		GDS_1	0.8363					2.2792
		GDS_2	0.7964					2.5981
		GDS_3	0.7623					2.1014
		GDS_4	0.8040					2.0650
DTC	**Reflective**			0.7971	0.7958	0.7975	0.5653	
		DTC_2	0.7957					2.1686
		DTC_3	0.7866					2.0985
		DTC_4	0.8001					2.9557
		DTC_5	0.8304					2.8501
LDT	**Reflective**			0.8943	0.8899	0.8887	0.7299	
		LDT_1	0.9249					2.9830
		LDT_2	0.8302					3.2369
		LDT_3	0.8033					2.1333

Note: BTP – Bank technology platform, DTD – Digital transformation development, LC – leadership capability, DTS – Digital transformation strategy, ECC – Employee competency and comprehension, BRM – Bank risk management, BCC – Bank corporate culture, DTP – Digital transformation pressure, BFC – Bank financial capability, GDS – Government support for digital transformation, DTC – Digital transformation capability, LDT – Level of digital transformation

Source. Author's contribution

Discriminant validity was assessed using the Fornell–Larcker criterion and the Heterotrait–Monotrait ratio of correlation (HTMT) (Fornell & Larcker, 1981; Henseler et al., 2015). According to the Fornell-Larcker criterion, the AVE for a construct should

be greater than its squared correlation with all other constructs to achieve discriminant validity.

Table 6 *Discriminant Validity: Fornell-Larcker Criterion*

Construct	DTD	LC	DTS	ECC	BCC	DTP	BFC	GDS	DTC	BRM	BTP	LDT
DTD	0.650											
LC	0.484	0.617										
DTS	0.056	0.096	0.672									
ECC	0.500	0.489	0.103	0.719								
BCC	0.583	0.603	0.100	0.509	0.566							
DTP	0.167	0.273	0.078	0.254	0.236	0.535						
BFC	0.394	0.720	0.065	0.372	0.597	0.189	0.670					
GDS	0.458	0.336	0.050	0.235	0.374	0.059	0.280	0.640				
DTC	0.574	0.717	0.193	0.617	0.627	0.390	0.565	0.298	0.645			
BRM	0.064	0.009	0.001	0.014	0.047	0.000	0.015	0.066	0.002	0.579		
BTP	0.381	0.511	0.072	0.467	0.540	0.272	0.373	0.241	0.655	0.010	0.565	
LDT	0.185	0.242	0.070	0.190	0.206	0.147	0.204	0.105	0.305	0.023	0.202	0.730

Table 6 presents the results of the Fornell-Larcker criterion for the study. The squared inter-construct correlations of DTD and BTC, LC and BCC, LC and DTC, BCC and BFC, BCC and DTC, and DTC and BTP were larger than their AVEs. However, recent studies have suggested that the Fornell–Larcker criterion alone may be insufficient for establishing discriminant validity. The Fornell-Larcker criteria exhibit unsatisfactory performance, especially in cases when the indicator loadings on a construct exhibit slight variation (e.g., all indicator loadings fall within the range of 0.65 to 0.85) (Henseler *et al.*, 2015; Voorhees *et al.*, 2016). Therefore, the study additionally evaluated discriminant validity using the HTMT ratio, as recommended by Henseler *et al.* (2015).

Table 7 *Discriminant Validity: Heterotrait-Monotrait Ratio of Correlations (HTMT)*

Construct	DTD	LC	DTS	ECC	BCC	DTP	BFC	GDS	DTC	BRM	BTP	LDT
DTD												
LC	0.692											
DTS	0.238	0.309										
ECC	0.717	0.708	0.320									
BCC	0.761	0.772	0.313	0.723								
DTP	0.406	0.520	0.273	0.505	0.483							
BFC	0.625	0.845	0.255	0.619	0.772	0.433						
GDS	0.677	0.577	0.221	0.495	0.613	0.242	0.529					
DTC	0.758	0.846	0.439	0.790	0.787	0.619	0.750	0.546				
BRM	0.253	0.091	0.033	0.123	0.223	0.009	0.121	0.256	0.049			
BTP	0.617	0.714	0.267	0.685	0.736	0.516	0.611	0.492	0.808	0.102		
LDT	0.430	0.493	0.263	0.441	0.458	0.381	0.452	0.324	0.552	0.150	0.450	

Table 7 presents the HTMT results. Accordingly, all values were below the 0.85 threshold and statistically less than 1, based on 95th-percentile bootstrap confidence intervals, confirming the absence of multicollinearity. Therefore, the results conclude that discriminant validity is ensured.

Structural Model Analysis

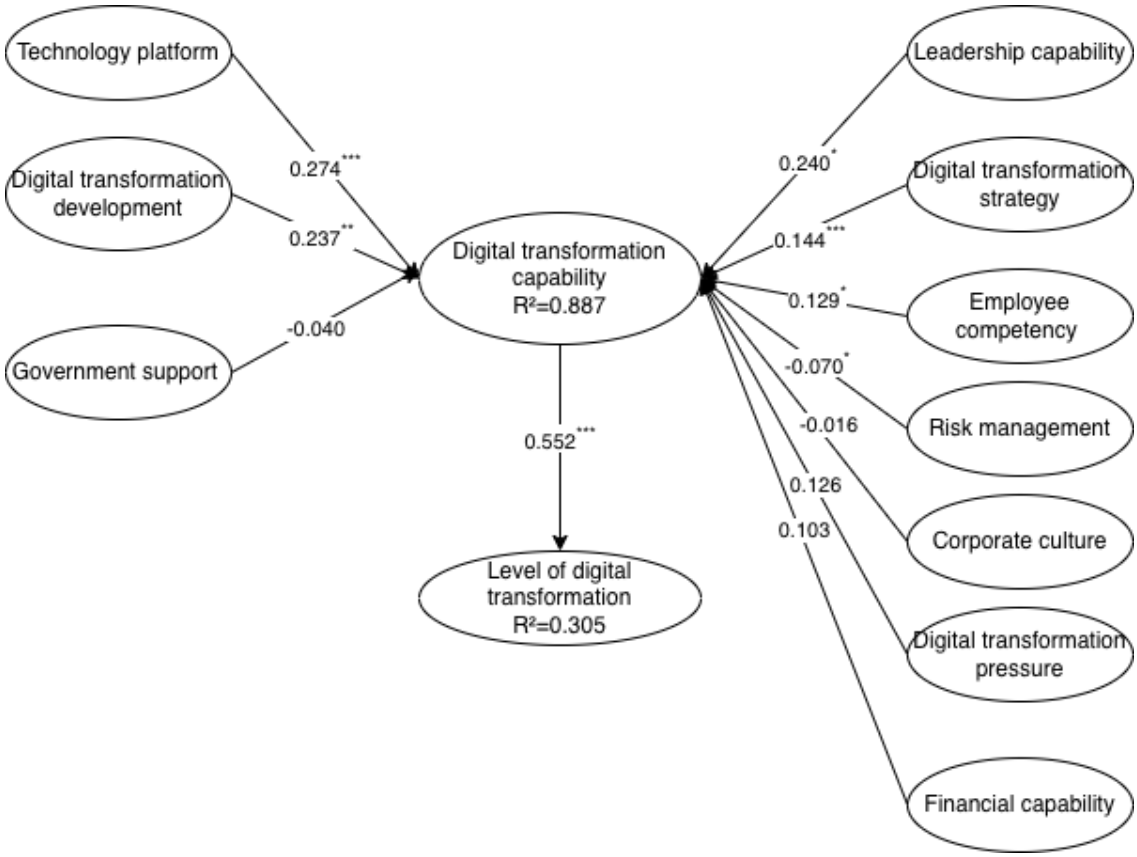
The structural model assesses the relationships between different constructs. In doing so, the study applies the bootstrap resampling method of Cotterman and Senn (1992) to test the significance of the paths.

Table 8 presents the R-squared of the study. R^2 refers to in-sample explanatory power. Accordingly, R^2 ranges from 0 to 1, with higher values indicating a greater explanatory power (Hair et al., 2019). The R^2 values of 0.8874 and 0.3046 are regarded as high within behavioral science, indicating a strong explanatory capacity of the model. Additionally, the study evaluates the explanatory power of endogenous variables using the Adjusted R^2, which offers a more accurate estimate of the relationship between dependent and independent variables (Long & Freese, 2001). The Adjusted R^2 values for the two endogenous constructs, digital transformation capability (DTC) and level of digital transformation (LDT), are 0.8848 and 0.303, respectively, indicating explanatory powers of 88.48% and 30.3%. Figure 2 presents the research model.

Table 8 *R-Squared*

Construct	Coefficient of determination (R^2)	Adjusted R^2
DTC	0.8874	0.8848
LDT	0.3046	0.303

Figure 2 *Graphical Representation of the Research Model.*



Source. Author's contribution

Additionally, the path coefficient estimates should be significant based on the percentile bootstrap confidence interval, and their sign should be consistent with the associated hypotheses. Regarding significant path coefficients, an effect size (f^2) above 0.02, 0.15, and 0.35 indicates a small, medium, and large effect size, respectively (Cohen, 1988).

The results presented in Table 9 indicate that both internal and external factors exert significant influences on banks' digital transformation capability and their overall level of digital transformation. The model supports hypotheses H1, H2, H3, H4, H5, H8, and H11. Among these, the bank technology platform has the strongest impact on digital transformation capability ($\beta = 0.274$, $p < 0.01$), emphasizing the importance of a strong and adaptable technological infrastructure. Leadership capability ($\beta = 0.240$, $p < 0.05$)

and digital transformation development ($\beta = 0.237$, $p < 0.05$) also make significant contributions, while a clear digital transformation strategy ($\beta = 0.144$, $p < 0.01$) provides moderate influence. Employee competency and comprehension ($\beta = 0.129$, $p < 0.05$) and digital transformation pressure ($\beta = 0.126$, $p < 0.05$) show smaller but meaningful effects.

The most influential relationship is between digital transformation capability and the overall level of digital transformation ($\beta = 0.552$, $p < 0.01$), highlighting that the ability to manage and apply digital technologies is the primary driver of transformation success.

Further analysis indicates that digital transformation capability acts as a partial mediator in the relationships between key factors, such as technology platform, transformation development, leadership, strategy, employee competency, and transformation pressure, and the overall level of digital transformation. This finding confirms that these factors enhance transformation outcomes mainly by strengthening internal capabilities.

In contrast, bank risk management shows a negative relationship with digital transformation capability ($\beta = -0.070$, $p < 0.05$), suggesting that overly rigid risk control practices may hinder innovation. Additionally, bank corporate culture, financial capability, and government support do not show significant effects, implying that cultural, financial, and policy factors currently play limited roles in driving digital transformation in Vietnamese banks.

Overall, the findings emphasize that digital transformation success depends mainly on internal readiness—particularly technology infrastructure, leadership, strategy, and workforce capability—rather than external conditions or resources.

Table 9 *Results of the Structural Model*

	Hypothesis	Direct/Indirect Effect	T-value	P-value	95% Confidence Interval (Percentile Bootstrap)	Effect size (f^2)	Support
H1	**BTP -> DTC**	0.274	3.937	0.000	[0.0742; 0.467]	0.242	Yes
H2	**DTD -> DTC**	0.237	3.284	0.001	[0.0718; 0.449]	0.146	Yes
H3	**LC -> DTC**	0.240	1.675	0.047	[-0.0859; 0.995]	0.096	Yes
H4	**DTS -> DTC**	0.144	4.428	0.000	[0.0609; 0.231]	0.157	Yes
H5	**ECC -> DTC**	0.129	2.161	0.016	[-0.0481; 0.294]	0.053	Yes
H6	**BRM -> DTC**	-0.070	-1.936	0.027	[-0.1526; 0.048]	0.038	Yes
H7	**BCC -> DTC**	-0.016	-0.141	0.444	[-0.3653; 0.337]	0.001	No
H8	**DTP-> DTC**	0.126	3.142	0.001	[0.0225; 0.231]	0.090	Yes
H9	**BFC -> DTC**	0.103	0.699	0.243	[-0.6903; 0.373]	0.023	No
H10	**GDS -> DTC**	-0.040	-0.826	0.205	[-0.1758; 0.085]	0.007	No
H11	**DTC -> LDT**	0.552	9.919	0.000	[0.4015; 0.692]	0.438	Yes
Med	**BTP -> DTC -> LTD**	0.151	3.671	0.000	[0.0449; 0.281]	NA	Yes
Med	**DTD -> DTC -> LDT**	0.131	3.143	0.001	[0.0352; 0.259]	NA	Yes
Med	**LC -> DTC -> LDT**	0.133	1.740	0.041	[-0.0453; 0.459]	NA	Yes
Med	**DTS -> DTC -> LDT**	0.080	4.014	0.000	[0.0359; 0.132]	NA	Yes
Med	**ECC -> DTC -> LDT**	0.071	2.052	0.020	[-0.0258; 0.175]	NA	Yes
Med	**BRM -> DTC -> LDT**	-0.039	-1.904	0.029	[-0.0838; 0.025]	NA	Yes
Med	**BCC -> DTC -> LDT**	-0.009	-0.140	0.445	[-0.2179; 0.181]	NA	No
Med	**DTP-> DTC -> LDT**	0.070	2.978	0.002	[0.0117; 0.132]	NA	Yes
Med	**BFC -> DTC -> LDT**	0.057	0.707	0.240	[-0.3473; 0.211]	NA	No
Med	**GDS -> DTC -> LDT**	-0.022	-0.813	0.208	[-0.0982; 0.055]	NA	No

Note: BTP – Bank technology platform, DTD – Digital transformation development, LC – leadership capability, DTS – Digital transformation strategy, ECC – Employee competency and comprehension, BRM – Bank risk management, BCC – Bank corporate culture, DTP – Digital transformation pressure, BFC – Bank financial capability, GDS – Government support for digital transformation, DTC – Digital transformation capability, LDT – Level of digital transformation

Configuration Analysis

The configuration analysis identifies three distinct combinations of conditions leading to a high level of digital transformation capability among Vietnamese banks (Table 10). The findings highlight the concept of causal complexity, demonstrating that

there is no single path to transformation success. Instead, banks can achieve similar outcomes through multiple, equally effective configurations—a principle known as equifinality (Fiss, 2011). The overall solution shows strong reliability, with a consistency of 0.973 and coverage of 0.831, indicating that the identified configurations explain a substantial portion of the successful cases.

Among the three configurations, Configuration 2 emerges as the most dominant and consistent (coverage = 0.743, consistency = 0.996). It combines a robust technology platform, continuous digital transformation initiatives, effective leadership, and high employee competency, suggesting that technological readiness supported by leadership and human capital is the most reliable path to digital success. Configuration 1 similarly emphasizes technology, leadership, and strategy execution, reaffirming the central role of these elements. Configuration 3, though less frequent, demonstrates that banks can achieve high transformation capability through targeted investments in digital development and employee skill enhancement, even in the absence of substantial risk management support.

Across all configurations, the core conditions that consistently appear are the bank technology platform, digital transformation development, leadership capability, digital transformation strategy, and employee competency, which together form the foundation for transformation success. In contrast, factors such as risk management, corporate culture, and government support serve as peripheral conditions—enhancing but not driving transformation outcomes. Overall, these findings emphasize that while strategic flexibility exists, successful digital transformation in Vietnamese banks consistently depends on strong technological infrastructure, visionary leadership, coherent strategy, and a digitally skilled workforce.

Table 10 *Configuration analysis for high digital transformation capability (DTC)*

	Config 1	Config 2	Config 3
BTP		l	l
DTD	l	l	l
LC	l	l	l
DTS	l		l
ECC		l	l
BRM	l		Ä
BCC	l	l	
DTP		l	l
BFC	l	l	l
GDS	l	l	l
Raw coverage	0.695	0.743	0.279
Unique coverage	0.080	0.085	0.002
Consistency	0.984	0.996	0.999
Solution coverage		0.831	
Solution consistency		0.973	

Note: ● = presence of a condition, ○ = absence of a condition, l = presence of a core condition, and "blank space" = "don't care"

DISCUSSION

The purpose of this study was to examine how technological, organizational, and environmental factors influence digital transformation in Vietnam's banking sector and to identify the configurations that lead to high transformation capability.

Drivers of Digital Transformation

Overall, the findings indicate that both technological and organizational factors exert significant and direct influences on the digital transformation capabilities of Vietnamese banks. A robust and scalable technological infrastructure, ongoing transformation development, and adaptable systems provide the foundation for integrating and leveraging digital innovations. These findings are consistent with previous research by Ha and Nguyen (2022), Saarikko et al. (2020), and Trang et al. (2024), which underscores that robust technological infrastructures, such as digital platforms and continuous transformation development, are foundational enablers of digital transformation in the banking sector.

Meanwhile, organizational factors, including leadership capability, a clearly articulated transformation strategy, employee competency and comprehension, and responsiveness to digital pressures, emerge as critical internal enablers that convert technological potential into real transformation outcomes. These results are consistent with prior studies by AlBar and Hoque (2019); Kindermann et al. (2021); Lai et al. (2021); Yigitbasioglu (2015), which emphasize that internal organizational readiness and the ability to respond effectively to digital demands are vital to transformation success. From a theoretical standpoint, these findings confirm that digital transformation is not purely a technology-driven initiative but a socio-technical process that depends equally on strategic alignment, strong leadership, human capability, and adaptability to external influences.

The significance of these relationships indicates that digital transformation in Vietnam's banking sector is not solely driven by technology, but rather by the effective alignment between technological and organizational dimensions. First, technological readiness, represented by the bank's technology platform and ongoing transformation development, emerges as fundamental because it provides the infrastructure for digital integration, data analytics, and customer interaction. In Vietnam, where many banks are upgrading from legacy systems, advanced and interoperable technologies are prerequisites for introducing digital banking services and competing with agile fintech firms. Moreover, leadership capability and digital transformation strategy exert significant influence on transformation outcomes by shaping vision, allocating resources, and coordinating organizational change. In hierarchical institutions like Vietnamese banks, leadership commitment is often the decisive factor in overcoming resistance and driving innovation. A clear strategy ensures that digital initiatives are integrated into long-term objectives rather than treated as isolated IT upgrades. Third, employee competency and comprehension are critical because transformation success depends on the workforce's ability to operate and adapt to new technologies. In the Vietnamese context, where digital competencies are still emerging, this relationship illustrates the need for continuous training and knowledge sharing to strengthen internal capabilities. Finally, digital transformation pressure acts as a catalyst that accelerates adoption. However, its significance depends on the bank's internal capacity to respond effectively.

By contrast, hypotheses H7, H9, and H10 were not supported, indicating that bank corporate culture, financial capability, and government support have insignificant effects on banks' digital transformation capability. Regarding H7, we found that corporate culture does not have a direct measurable influence on digital transformation capability. This finding can be explained by the fact that cultural shifts are profound and slow-moving and therefore take years to internalize. Additionally, banks in developing or

transitional economies, such as Vietnam, tend to adopt a top-down transformation approach in which managerial decisions drive change, often limiting employee empowerment and bottom-up innovation. As a result, organizational culture (values, collaboration, openness) may not align with digital transformation goals, weakening its direct impact. The results did not align with those of Wintarto et al. (2024), who found a significant impact of culture on digital transformation. Similarly, the findings suggest that financial strength alone does not necessarily enhance digital transformation capability (H9). This finding is also in contrast to the study by Du and Wang (2024), who demonstrated that financial support (from banks and capital markets) strengthens the effect of digital transformation on innovation and organizational outcomes. A possible explanation is that employees in Vietnamese banks perceive financial resources as an enabler rather than a driver of transformation; they believe that true digital progress depends on leadership vision, technological skills, and effective execution. Many banks may have resources but lack digital leadership, talent, or strategy alignment, so funds are not efficiently channeled toward capability building.

Regarding H10, the results differ from the findings of Lutfi et al. (2016) and Pathan et al. (2017), who emphasized the positive role of government support in facilitating digital transformation. This discrepancy can be explained by the indirect nature of government support in Vietnam's digital ecosystem. Government initiatives—such as investments in digital infrastructure, fintech regulations, and training programs—primarily target the broader ecosystem rather than individual bank capabilities. As a result, their effects may be indirect, enhancing environmental readiness instead of directly improving banks' internal transformation capabilities. Policies may be generic and not tailored to banking institutions. Consequently, banks perceive government programs as bureaucratic, slow, or misaligned with their digital needs.

From Digital Transformation Capability to the Level of Digital Transformation

The results demonstrate a strong and direct relationship between digital transformation capability and the overall level of digital transformation in Vietnamese banks. This indicates that banks possessing higher levels of digital capability, reflected in their technological expertise, organizational agility, and capacity for continuous learning, are better positioned to implement advanced digital initiatives and achieve tangible transformation outcomes. This interpretation aligns with prior studies, such as those by Abdurrahman et al. (2024), Li et al. (2020), and Sousa-Zomer et al. (2020), which emphasize that strong digital capabilities enable organizations to continuously refine their strategies and remain responsive in volatile environments.

From a theoretical perspective, this finding reinforces the Resource-Based View (RBV) and dynamic capability theory, which propose that sustainable transformation depends on an organization's ability to integrate, build, and reconfigure resources in response to environmental change (Teece et al., 1997). Digital transformation capability thus represents a strategic resource that enables banks to convert technological potential into operational and strategic outcomes. In the context of Vietnam's banking sector, this relationship underscores that transformation success relies not merely on technology adoption but on the bank's internal ability to manage and leverage digital assets effectively. Banks with stronger transformation capabilities can adapt more rapidly to regulatory changes, enhance customer experience, and innovate in service delivery, thereby achieving higher levels of digital maturity.

The Mediating Role of Digital Transformation Capability

The findings demonstrate that digital transformation capability plays a pivotal mediating role in linking technological, organizational, and environmental factors to the overall level of digital transformation in Vietnamese banks. This finding suggests that digital transformation capability acts as the mechanism that translates readiness and intent into actual transformation outcomes. The results are consistent with the findings of Abdurrahman et al. (2024), who demonstrated that technological capabilities have a significant positive impact on both digital transformation and innovation. This finding suggests that robust technological infrastructure, such as a bank technological platform, enhances digital transformation capability, which in turn drives levels of digital transformation. The findings also align with the explorations of Al-Moaid and Almarhdi (2024); Blanka et al. (2022); Rubio-Andrés et al. (2024), who indicate that dynamic capabilities, including digital transformation capability, are crucial for successful digital transformation initiatives.

From a theoretical standpoint, this mediating effect substantiates the Resource-Based View (RBV) and dynamic capability theory, both of which emphasize that competitive advantage arises not from possessing resources per se, but from the organization's ability to reconfigure and apply them dynamically in response to change (Teece et al., 1997). In this study, the bank's technology platform or leadership commitment alone does not guarantee transformation success; rather, their influence depends on whether the institution can develop the agility, learning orientation, and absorptive capacity necessary to operationalize these resources. This finding, therefore, extends existing TOE-based digital transformation models by revealing how external and organizational factors are internalized into outcomes—through the mediating mechanism of transformation capability.

In the Vietnamese banking context, this mediation effect is particularly significant. Although many banks have invested substantially in digital infrastructure and formal transformation strategies, they continue to face challenges in realizing full transformation benefits due to fragmented processes, capability gaps, and rigid organizational structures. The results imply that only banks capable of translating technological and strategic inputs into adaptive routines and innovation practices can achieve higher digital maturity. Thus, digital transformation capability serves as the strategic conduit connecting technology, leadership, strategy, and human capital, transforming them from static assets into dynamic performance outcomes.

The Negative Risk Management Path

Contrary to expectations, the study reveals a negative relationship between bank risk management and digital transformation capability, as well as an adverse sequential effect on the overall level of digital transformation. These findings suggest that excessively conservative or compliance-oriented risk management practices may hinder a bank's ability to develop the internal competencies necessary for effective digital transformation. In such settings, strict control mechanisms can discourage experimentation, slow the adoption of emerging technologies, and reinforce a culture of risk aversion that conflicts with the dynamic and adaptive nature of digital transformation.

From a theoretical perspective, this finding can be explained through organizational inertia theory (Hannan & Freeman, 1984) and dynamic capability theory (Teece et al., 1997), which argue that overly rigid routines and regulatory compliance can constrain an organization's ability to sense and seize new opportunities. In the Vietnamese context, where banks operate under stringent regulatory oversight and have historically prioritized stability over innovation, risk management systems are often designed to prevent failure rather than to enable controlled experimentation. This structural rigidity limits organizational agility and inhibits the reconfiguration of resources necessary for digital innovation. These findings contrast with previous studies by Boehm et al. (2021) and T. M. H. Nguyen and Bui (2021), who viewed effective risk management as a facilitator of transformation by mitigating digital risks and ensuring safe innovation. The divergence likely stems from contextual factors, particularly the dominance of state ownership and regulatory conservatism in Vietnam's banking sector, which constrain strategic flexibility. Accordingly, the results highlight the need for banks to adopt balanced and adaptive risk management frameworks that support innovation while maintaining institutional stability. This context-specific insight contributes new theoretical understanding by challenging the prevailing assumption that stronger risk control universally promotes digital

transformation and by demonstrating that, in emerging markets, overly cautious governance can act as a barrier to technological and organizational change.

Configurational Insights from fsQCA

The fsQCA results complement the SEM analysis by uncovering multiple, equally effective pathways that lead to high digital transformation capability in Vietnamese banks. While the SEM results established that factors such as technological infrastructure, leadership capability, strategy, and employee competence have significant linear effects, the fsQCA findings reveal how these conditions interact synergistically. The result reinforces the principle of causal complexity, demonstrating that transformation success can emerge from different configurations of conditions rather than a single dominant path.

In comparison with Porfírio et al. (2024), who identified diverse configurations leading to digital transformation performance across organizations, this study reaches a similar conclusion—that digital transformation is multi-dimensional and context-dependent. Both studies affirm that combinations of internal and external factors (e.g., technological readiness, leadership, and environmental pressures) jointly shape digital outcomes. However, this study advances the discussion by offering a distinct classification of antecedents grounded in the Technology–Organization–Environment (TOE) model and by integrating insights from the Resource-Based View (RBV). Unlike Porfírio et al.'s broader focus on general organizational performance, this research explains specifically how technological and organizational capabilities interact to form digital transformation capability, which in turn drives transformation outcomes in the banking sector. Furthermore, the fsQCA configurations offer contextual insights that complement and extend the SEM results, revealing how multiple conditions interact to produce high digital transformation capability. For instance, Configuration 2 demonstrates that strong technological platforms, effective leadership, and high employee competence jointly underpin successful digital transformation. This result is consistent with previous studies emphasizing the importance of leadership-driven digital adoption (Kindermann et al., 2021; Li et al., 2020). In contrast, Configuration 3 shows that even in contexts with weaker risk management, banks can achieve high transformation capability through strong leadership and human capital investment, a nuance rarely captured in previous linear models.

IMPLICATIONS AND FUTURE STUDY

Theoretical Implications

This study makes significant contributions to the digital transformation literature in several important ways. First, it integrates multiple theoretical frameworks—including

the Technology–Organization–Environment (TOE) framework, Diffusion of Innovation (DOI) theory, Resource-Based View (RBV), and Dynamic Capabilities (DC)—to examine the combined effects of technological, organizational, and environmental factors on digital transformation. This multi-theoretical approach offers a more comprehensive understanding of how these factors interact to shape digital transformation outcomes. Previous studies mainly relied on TOE and DOI models. Consequently, this fragmented approach limits our understanding of how technological, organizational, and environmental forces interact. Previous studies have often integrated the Technology–Organization–Environment (TOE) and Technology Acceptance Model (TAM) frameworks to investigate technological, organizational, and environmental factors influencing technology adoption or initial usage (e.g., Khan et al., 2021; Tajudeen et al., 2018). While valuable, this integration remains limited to behavioral explanations and does not capture the capability-building and strategic transformation aspects that follow adoption.

This current study integrates behavioral intention models (TOE, DOI) with strategic resource theories (RBV, DC), addressing a major critique in existing digital transformation (DT) literature. The TOE framework, a widely applied theoretical model, conceptualizes technological innovation as a function of interrelated technological, organizational, and environmental factors that influence both adoption and implementation. However, TOE fails to analyze internal organizational structures, driving factors, and dynamics. Meanwhile, RBV adds an inside viewpoint on competitive advantage. According to RBV, an organization's internal resources drive sustained competitive advantage. Digital transformation in banking requires a combination of technology, leadership, and personnel competencies.

In contrast, dynamic capabilities theory emphasizes an organization's ability to integrate, reconfigure, and adapt its resources to evolving technological and market conditions. In the context of digital transformation, banks must respond rapidly to technological advancements, market shifts, and evolving customer behaviors to remain competitive. The diffusion of innovation (DOI) hypothesis explains how bank staff absorb and diffuses technologies. This combination also provides a multi-dimensional perspective on digital transformation, recognizing that adoption and success depend not only on resources and technologies but also on institutional context and organizational dynamics.

Second, this study advances existing research by providing a multi-level theoretical explanation of digital transformation that moves beyond simple technology adoption to encompass strategic, organizational, and capability-driven dimensions. Specifically, the integration reveals a new context-capability-outcome mechanism, where contextual

enablers drive the development of overall digital transformation capabilities, which in turn determine the level of digital transformation achieved. In other words, we reveal a sequential mechanism linking contextual determinants, digital transformation capability, and the level of digital transformation. The model shows that technological, organizational, and environmental enablers influence transformation outcomes not directly, but through the development of internal digital transformation capability. This capability acts as a conversion mechanism, transforming external pressures and resources into organizational adaptability and innovation. The sequence from determinants → capability → level explains both potential (capability building) and realized (transformation level) aspects of digital transformation. This perspective introduces a novel capability-based pathway that explains how and why contextual factors are converted into sustainable digital transformation outcomes.

Third, this study examines the Vietnamese banking sector, which has been underrepresented in the literature. Previous studies have predominantly focused on digital transformation in developed economies or general industrial contexts, potentially overlooking the distinct institutional, cultural, and infrastructural challenges faced by developing nations. Therefore, this study may expand the geographical and sectoral scope of the digital transformation field. The study provides empirical validation of the theoretical model in the emerging market context, such as Vietnam, where digital transformation challenges differ from those in developed economies. Additionally, it also reinforces the need for contextualized theorization in the literature.

One of the significant contributions of the study is the identification and prioritization of key determinants via a dual analysis between SEM and fsQCA. Accordingly, the findings underscore the critical role of factors such as technological infrastructure, leadership capability, digital transformation strategy, employee competency, and environmental pressure in enhancing banks' digital transformation capabilities. Previous models frequently consider these variables as equally weighted or treat them in isolation; however, this study, utilizing fsQCA, elucidates the core and peripheral factors that contribute to high digital transformation capability. The results highlight that internal capabilities (organizational readiness) matter more than external enablers (e.g., government policy), challenging some assumptions in TOE and DOI frameworks. Notably, the fsQCA findings deepen the understanding of how digital transformation impacts organizational structures and processes by highlighting the interplay of multiple enabling factors rather than single causal relationships. Previous studies have often relied on linear, single-path causal models that oversimplify the complexity of real-world transformation processes. However, the fsQCA in this study reveals multiple configurations (causal pathways) that lead to high digital transformation

capability. This finding validates the concept of equifinality, which supports that multiple combinations of conditions (configurations 1, 2, 3) can lead to the same successful outcome. Meanwhile, the findings also emphasize a causal asymmetry: the presence of a factor (e.g., leadership) may enable digital transformation in one configuration but be irrelevant in another. In other words, the present investigation is one of the few studies enriching theoretical modeling by aligning with complex systems theory and configuration theory.

Notably, our study reveals the negative association between risk management and digital transformation capability in banks. The result illustrates the phenomenon of the risk-innovation paradox. Prior literature has typically framed risk management as a governance mechanism that mitigates uncertainty and facilitates digital initiatives (e.g., Boehm et al., 2021; T. M. H. Nguyen & Bui, 2021). However, the present findings reveal that in the banking sector, overly conservative or rigid risk management frameworks can inadvertently hinder the development of digital transformation capabilities by constraining flexibility and responsiveness. From a dynamic capabilities perspective, this paradox underscores the dual function of risk management. Accordingly, it protects organizations against technology and market uncertainty while potentially inducing organizational inertia that hinders innovation. In the banking sector, this paradox is especially pronounced, as banks operate under stringent regulatory and compliance frameworks. By contrast, digital initiatives often introduce data, cybersecurity, and operational risks, which trigger additional controls and oversight. Therefore, risk management in banking tends to be rule-bound and hierarchical, creating organizational inertia that slows or constrains capability-building. In other words, although risk management enhances stability and reputation assurance, it may simultaneously limit the agility and adaptability required for rapid and continuous digital transformation. This finding enriches the digital transformation and risk management literature by revealing that the effectiveness of risk governance is contingent on striking a balance between control and flexibility, extending the risk–innovation paradox into the capability-building domain of digital transformation.

Practical Implications

Practically, our study also presents significance for banking managers and decision-makers aiming to successfully implement digital transformation initiatives, particularly in developing country contexts such as Vietnam. First, the findings highlight the essential need for a strong technological infrastructure. The bank’s technological platform proved to be the most significant determinant in influencing digital transformation capability (DTC). These results indicate that banks should prioritize the development of scalable,

secure, and integrated IT infrastructures—encompassing mobile and internet banking platforms, cloud-based systems, and advanced internal data-sharing architectures—to support sustainable digital transformation. In the absence of a robust technology base, other transformation initiatives may be ineffectual or unsustainable.

Second, leadership skills and digital transformation strategy demonstrated a substantial beneficial impact on DTC. This finding emphasizes the vital function of top management, which must go beyond mere endorsement to lead actively, support, and resource digital transformation initiatives across the organization. Leaders should articulate a coherent digital vision, foster an adaptive and innovation-oriented organizational culture, and embed transformation goals within the firm's overall strategic agenda. Creating a specialized digital transformation unit or task force supports enhancing coordinated and targeted implementation. Additionally, the study highlighted the significance of staff proficiency and understanding. Employees' preparedness for digital competencies and receptiveness to technological change are crucial to improving transformation capabilities. Banks should invest in ongoing training, upskilling initiatives, and change management techniques to guarantee their personnel can proficiently utilize and adapt to new digital tools. Furthermore, the study finds that pressure for digital transformation – stemming from both internal competitiveness and external environmental demands – acts as a catalyst for change, exerting a positive influence on digital transformation capability. Banks should proactively monitor market dynamics and leverage competitive pressures to drive continuous innovation, rather than waiting to respond reactively to crises.

In contrast, the study revealed that conventional risk management techniques had an adverse impact on digital transformation capabilities. These findings indicate that overly conservative risk control mechanisms may inadvertently hinder innovation by creating rigid frameworks that resist organizational change. Financial institutions must enhance their risk management frameworks to be more adaptable and conducive to agile digital activities. To mitigate this effect, organizations should engage risk management teams early in the digital transformation process to align innovation efforts with regulatory and operational standards, thereby balancing compliance with agility. Notably, financial competence and government support did not have a substantial impact on DTC in this scenario. This finding suggests that mere access to cash or supporting legislation is inadequate; rather, strategic resource allocation and organizational preparedness are the determinants of success. Organizational culture was not identified as a key facilitator unless accompanied by tangible leadership and technical investments, indicating that abstract cultural ideals must be converted into practical behaviors and processes.

Interestingly, the application of fsQCA shows that several effective configurations or pathways exist for attaining high digital transformation capabilities. This result underscores the notion that banks are not required to adhere to a uniform model. They should evaluate their own strengths, whether in leadership, technology, or human resources, and pursue a tailored transformation approach that best fits their context. Overall, this study underscores that successful digital transformation in the banking sector depends on the strategic alignment of technological infrastructure, visionary leadership, employee competencies, and adaptive risk management. At the same time, it acknowledges that the optimal transformation strategy may differ across institutions, depending on their organizational culture, resource endowments, and regulatory contexts.

Limitations and Future Research

The paper acknowledges several limitations that can guide future research. First, this study focuses exclusively on the banking sector in Vietnam. As a result, it limits the generalizability of the findings to other sectors. Future research could extend this framework to other sectors such as fintech, manufacturing, and healthcare to develop a more comprehensive understanding of digital transformation across diverse organizational and industrial settings. Second, the study is conducted in Vietnam, a developing country with unique economic, technological, and cultural conditions. While this fills a gap in underrepresented contexts, the results may not fully apply to developed markets. Therefore, a comparative analysis across markets may be useful for reflecting differences in the digital transformation process. Finally, the authors also designed a cross-sectional research study that collected and assessed data at a single point in time. Therefore, future longitudinal studies could provide valuable insights into the dynamic and iterative nature of digital transformation processes, particularly given the rapid evolution of technological advancements and the organizational adaptation over time.

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