DIGITAL TRANSFORMATION STRATEGY AND BUSINESS MODELS: EXPLORING THE RELATIONSHIPS IN EMERGING ECONOMIES

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Abstract

Digital transformation (DT) fundamentally reshapes business models (BMs) across emerging economies, yet limited empirical evidence exists regarding the underlying mechanisms driving this transformation (Rane et al., 2024; Li et al., 2024). This study investigates the impact of technological, organizational, and environmental factors on DT levels and subsequent BM innovation. By integrating the technology-organization-environment (TOE) framework with BM innovation theory, we developed a conceptual model that was tested through structural equation modeling (SEM). Data were collected from 319 firms across multiple industries in Vietnam using validated scales. Bootstrap analysis confirmed the model's reliability and the validity of hypothesis testing. The results reveal that technological readiness, organizational capabilities, and environmental pressures significantly predict DT levels, which in turn influence BM innovation. Technology infrastructure investment emerges as the strongest predictor of transformation success. These findings extend the application of the TOE framework to emerging market contexts and provide actionable insights for firms pursuing digital BM innovation. The research limitations include a single-country focus and a cross-sectional design. Future research should examine longitudinal transformation patterns across diverse emerging economies to validate these relationships.

Keywords: Business, Digital Transformation, Environment, Organization, Technology

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1. INTRODUCTION

Digital transformation (DT) has emerged as an inevitable phenomenon in the contemporary economic landscape, compelling enterprises to restructure their business models (BMs) to sustain a competitive advantage and adapt to continuously evolving market dynamics (Agustian et al., 2023; Liu et al., 2024; Shostak et al., 2024). DT encompasses the strategic integration of advanced technologies such as artificial intelligence, internet of things, big data analytics, cloud computing, and mobile technologies into business operations to enhance performance, optimize customer experiences, and create novel value propositions for firms (Cennamo et al., 2020; Li et al., 2024).

Within the increasingly complex and competitive global economic environment, DT has been shown to have a profound impact on BMs through the integration of digital technologies across all facets of firm operations (Kovtunenko & Lozan, 2024). Recent research suggested that firms can utilize digital platforms to expand their operational scope, access new revenue streams, deliver personalized customer experiences, and enhance decision-making processes through real-time data analytics (Li et al., 2024; Rane et al., 2024). Furthermore, DT has facilitated the emergence of innovative BMs, including the sharing economy, on-demand services, and online platforms, thereby transforming entire industry value chains (Bouncken et al., 2021).

Although numerous studies have explored the impact of DT on BMs, the majority of these investigations have concentrated on organizational determinants within large-scale firms (Li et al., 2024; Zhang, Xu, et al., 2023). Current research predominantly focuses on large-scale firms with substantial resources, those pioneering in specific domains, or industries with high levels of digitization, such as education, healthcare, finance, and banking (Bouncken et al., 2021; Li et al., 2024). Notably, these studies typically examine DT from perspectives of technology, performance, or customer experience without comprehensive approaches that integrate technological, organizational, and environmental factors into BM frameworks. Moreover, current studies frequently overlook cultural and organizational changes necessary to support DT processes (Rane et al., 2024).

Specifically, in emerging markets such as Vietnam, studies addressing DT and its implications on BMs remain sparse (Li et al., 2024; Shostak et al., 2024). The economic and institutional contexts in emerging markets differ significantly from those in developed economies, necessitating tailored research to understand the unique impacts of DT in these environments. Vietnam, with its rapidly growing economy and active government support for digital initiatives, provides an exemplary context for investigating the intersection of technological readiness, organizational capacity, and environmental pressures influencing DT.

This research is conducted to analyze how DT influences BMs by exploring the relationship between the level of DT and BM innovation within the Vietnamese context. Specifically, this study employs the technology-organization-environment (TOE) framework combined with BM innovation theory to systematically assess how technological, organizational, and environmental dimensions shape DT processes and outcomes. The quantitative approach employs a survey methodology, gathering data from enterprises across multiple industries to validate the proposed theoretical framework empirically.

This study's rationale lies in addressing the existing research gap related to the nuanced conditions of emerging economies, particularly Vietnam, where DT strategies are rapidly evolving. Understanding these dynamics contributes valuable insights for local enterprises aiming to leverage digital tools for BM enhancement effectively. By integrating theoretical perspectives with empirical data from an emerging market, this research enriches existing DT literature, offering actionable guidance for practitioners and policymakers.

The research is structured into the following sections. Section 2 presents the theoretical framework and formulates research hypotheses. Section 3 details the research methodology adopted for the empirical investigation. Section 4 discusses key research findings derived from data analysis. Section 5 evaluates the implications of DT on BMs in light of the results obtained. Finally, Section 6 concludes the paper by summarizing the contributions, identifying limitations, and suggesting directions for future research.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1. Impact of digital transformation on business models

Digital transformation has been defined as the integration of digital technologies into all areas of a business, fundamentally altering how organizations operate and deliver value to customers (Beulen & Bode, 2021; Li et al., 2024). This process extended beyond mere digitization or informatization, requiring a shift in organizational culture, leadership mindset, and business processes. Li et al. (2024) emphasized that DT involved the convergence of information technology (IT), computing, communication, and connectivity to drive organizational change and restructure operational systems. DT unfolded across several distinct levels, reflecting the degree of digital integration and strategic alignment within firms.

The literature has identified five levels of DT maturity. At the initial level, firms had not established clear DT goals and typically implemented only basic digital solutions (Li et al., 2024). The developing level marked the stage where organizations began to formulate digitalization objectives, with some leaders recognizing the potential of DT to improve efficiency (Tonder et al., 2023; Xu et al., 2024). At the developed level, digital initiatives became integrated into business strategy, although challenges in implementation and performance measurement persisted (Cennamo et al., 2020). The advanced level was characterized by the broad integration of DT into operations; yet, scaling these efforts across all departments remained difficult (Bouncken et al., 2021). At the leading level, firms continuously innovated and pursued DT as an ongoing process, striving to become digital enterprises.

DT initiatives have typically focused on one of three strategic orientations: 1) optimizing operations, 2) enhancing customer experience, and 3) creating new BMs (Tonder et al., 2023). Rane et al. (2024) and Shostak et al. (2024) observed that organizations often prioritized one orientation based on their competitive context and digital capabilities.

The first orientation, operational optimization, involved leveraging digital technologies to streamline processes, reduce costs, and improve productivity (Rane et al., 2024). Firms pursuing this path adopted tools such as automation, data analytics, and integrated information systems to enhance efficiency and support decision-making (Tonder et al., 2023). The second orientation, customer experience enhancement, focused on utilizing digital platforms and data-driven insights to understand customer needs better, personalize interactions, and foster engagement (Shostak et al., 2024). DT in this context enabled firms to deliver more responsive and tailored services, strengthening customer relationships. The third orientation, the creation of new BMs, entailed reimagining value creation and delivery mechanisms in response to digital opportunities (Tonder et al., 2023). Firms adopting this approach developed innovative products, services, or platforms that disrupted traditional industry structures and unlocked new revenue streams (Rane et al., 2024).

The literature has demonstrated that DT significantly influenced the configuration and dynamics of BMs (Al-Hmesat et al., 2025; Bouncken et al., 2021). Liu et al. (2024) found that DT prompted firms to reconsider their value propositions, customer segments, channels, and revenue mechanisms. Digital technologies enabled new forms of value co-creation, facilitated the development of platform-based BMs, and allowed for greater agility in responding to market changes (Bouncken et al., 2021).

Bouncken et al. (2021) argued that DT drove the evolution of BMs by enabling new ways of organizing resources, interacting with stakeholders, and creating competitive advantages. For example, the adoption of e-commerce, cloud computing, and big data analytics allowed firms to expand their reach, personalize offerings, and optimize resource allocation (Liu et al., 2024). Shostak et al. (2024) further noted that DT fostered the emergence of hybrid and networked BMs, which leveraged digital platforms to connect multiple actors and create new value networks.

Despite these advances, earlier studies often focused on developed economies, leaving the mechanisms through which DT reshaped BMs in emerging contexts less explored (Kraiwanit & Terdpaopong, 2024; Liu et al., 2024).

Although the transformative potential of digital technologies has been widely acknowledged, research on DT in emerging economies has remained limited (Tonder et al., 2023; Xu et al., 2024). Tonder et al. (2023) and Xu et al. (2024) highlighted several unique challenges faced by firms in these contexts, including constraints related to digital capabilities, institutional environments, and technological infrastructure. Xu et al. (2024) observed that the lack of skilled human resources, inadequate regulatory frameworks, and uneven digital infrastructure often hindered the effective adoption and scaling of DT initiatives.

In addition, Tonder et al. (2023) suggested that the interplay between organizational readiness, institutional support, and market dynamics in emerging economies shaped the outcomes of DT and its impact on BMs. The literature also indicated that there was a need for more empirical research examining how firms in emerging economies navigated these challenges and leveraged DT to innovate their BMs (Xu et al., 2024).

Future research could address these gaps by investigating the contextual factors that moderate the relationship between DT strategies and BM innovation in emerging markets. Such studies would contribute to a more nuanced understanding of DT in diverse economic environments and inform the development of context-sensitive strategies for digital innovation (Tonder et al., 2023; Xu et al., 2024).

2.2. Models for assessing the impact of digital transformation on business models

Assessing the impact of DT on a firm's BM is a rapidly evolving field of research, with numerous models and theoretical frameworks proposed. Some literature focuses on measuring the effectiveness of DT through financial indicators such as revenue, profit, and productivity. Others stress assessing the impact of DT on non-financial aspects, such as customer satisfaction, innovation, and organizational adaptability (Shostak et al., 2024). The capability maturity model (CMM) assesses an enterprise's readiness and ability to implement DT. This model helps identify areas for improvement and development, thereby creating a suitable transformation roadmap. These DT assessment models are valuable tools for businesses to determine their current position and guide their development path. These models are developed based on various methodologies and techniques, including case studies, surveys, data analysis, and the construction of conceptual frameworks and models. The manufacturing sector applies the Awareness, Readiness, Technology, and Operation (ARTO) development model to support successful DT based on critical determinants (Rane et al., 2024).

Some common models employed to assess the impact of DT include the Nine Elements of Digital Transformation, the MIT Sloan digital transformation framework, and Gartner's digital maturity model. These models provide a comprehensive view of DT, encompassing technological, human, process, and BM aspects. However, the TOE model is most commonly used in research. The TOE model has demonstrated that technological, organizational, and environmental factors, including new technologies, people, corporate culture, competitive pressures, legal regulations, and government support, can significantly impact a company's readiness and adaptability to DT. The TOE model is applied in research across various application domains, including manufacturing, logistics, supply chains, and services (Nguyen et al., 2022).

Despite the diversity of approaches and application scopes, all DT models share a common goal: to provide businesses with a tool to assess, guide, and improve their DT processes. Each country or region will utilize different DT maturity

assessment models, depending on its specific DT strategies. In this study, the authors combine the TOE model with the BM innovation theory of enterprises undergoing DT under Vietnam's national DT strategy from 2020 to 2030 to investigate the relationship between the level of DT and the BM of firms (Decision No. 749/QD-TTg, 2020).

2.3. Hypotheses design

2.3.1. Technological determinant

Technological determinants, as discussed in this study, refer to the application of advanced technologies in production and business processes, encompassing levels of automation, innovative features, user experience, and digital services (Tonder et al., 2023). To assess the impact of technological factors, this study focuses on the following key aspects: the level of investment in DT, the ability to apply technology in business operations, the effectiveness of data management and exploitation, the level of IT system integration, and cybersecurity risk management. Technology investment costs, including hardware, software, training, and maintenance, should be proportionate to the enterprise's financial conditions to ensure the sustainability of the transformation process (Nguyen et al., 2022).

The compatibility of new technologies with existing systems is also crucial, particularly for firms with complex IT infrastructures (Xu et al., 2024). Simultaneously, cybersecurity risk management, including information security policies and system integration, may be emphasized to ensure the safety of data collection, processing, analysis, and security processes (Rane et al., 2024). Therefore, the following hypothesis is proposed:

H1: Technological factors have a positive impact on the level of digital transformation.

2.3.2. Organizational determinants

Organizational factors focus on the internal characteristics of the enterprise, measured by variables such as leadership's commitment and awareness of DT, the degree of alignment of corporate culture with DT, the DT capacity of employees, the flexibility of the organizational structure, and the level of digitization of business processes. Specifically, leadership's role is reflected in building a vision, setting strategic directions, and inspiring employees to achieve their goals. Leaders with commitment and proper awareness will mobilize the necessary resources, creating motivation for the DT process (Alasiri & AlKubaisy, 2022; Zhang, Xu, et al., 2023).

The capacity of the staff is a key factor, including the ability to adapt to digital technology, the skills to use software, and a positive attitude towards technology and new work processes. Employees might be equipped with digital knowledge skills, and conditions must be created to successfully apply new technologies (Teng et al., 2022; Zhang, Wang, et al., 2023).

The level of digitization of business processes is closely tied to the digitization of activities, automation of processes, and effective data management, including supply chain optimization and order control (Alasiri & AlKubaisy, 2022; Tonder et al., 2023). In addition, a flexible organizational structure will quickly adapt to each stage of the DT. Corporate culture, encompassing values, norms, beliefs, and attitudes, significantly impacts the ability to adopt and adapt to new technologies. An open, flexible, creative, and willing-to-learn culture will promote successful DT (Tonder et al., 2023; Zhang, Wang, et al., 2023). Therefore, the second hypothesis is designed:

H2: Organizational factors have a positive impact on the level of digital transformation.

2.3.3. Environmental determinants

Environmental factors are external elements that can influence the DT process, creating both business opportunities and challenges. The variables used to measure these determinants include market competitiveness, government policies and support, the level of information and communication technology infrastructure development, customer readiness for DT, and the influence of economic factors. Specifically, market competitiveness within the industry encourages businesses to quickly adopt digital innovations in order to maintain their position and avoid falling behind their competitors. A fiercely competitive environment requires firms to undergo DT to support and enhance their competitiveness (Tonder et al., 2023).

Government policies and regulations, including DT regulations and strategies, also significantly impact. Firms might proactively adapt to the constantly changing legal environment to ensure compliance with new rules on data security and e-commerce. In addition, the role of regulatory agencies, standards, and financial support policies from the government should also be considered (Nguyen et al., 2022; Zhang, Wang, et al., 2023).

The level of interconnectedness within the digital ecosystem, reflected in the relationships between technology partners, service providers, and support organizations, enables firms to access the resources and knowledge necessary for DT. External IT consultants' support and relationships with suppliers and customers are environmental factors affecting the DT process (Nguyen et al., 2022). Therefore, the third hypothesis is proposed:

H3: Environmental factors have a positive impact on the level of digital transformation.

2.3.4. Level of digital transformation

Digital transformation has a profound impact on BMs, altering how firms operate, deliver value, create value, and generate new revenue streams (Shostak et al., 2024). DT can lead to the formation of entirely new BMs, such as platform models, subscription models, and freemium models (Chen et al., 2023; Zhang, Xu, et al., 2023). DT enables businesses to create new BMs and disrupt established ones (Teng et al., 2022). DT facilitates communication and collaboration, transforming organizational activities to support innovation in BMs and subsequently shape performance (Li et al., 2024; Liu et al., 2024).

In the context of Vietnam, the Ministry of Information and Communication has issued a Decision No. 1970/QD-BTTTT approving the project to identify indicators for assessing the level of DT in

enterprises and supporting the promotion of DT in enterprises (Ministry of Information and Communication, 2021). Accordingly, the set of indicators for assessing the level of DT in enterprises is organized into six pillars: 1) digital experience for customers, including online presence and online activities on the Internet; 2) DT strategy, including plans and processes for applying digital means to achieve the overall goals and development of the business; 3) infrastructure and DT to serve the transmission, collection, processing, storage, and exchange of digital information, including telecommunications networks, the Internet, computer networks, and databases; 4) operational efficiency through specific guidelines, methods, rules, procedures, regulations, forms, and established tasks to support and promote the achievement of goals; 5) DT of corporate culture to create an environment using technology to control and manage employee working time; and 6) data and information assets of the firm.

DT allows firms to create and capture value by integrating new technological environments into their firm strategies. The application of DT helps optimize processes and opens up new opportunities for developing sustainable BMs (Teng et al., 2022). Therefore, the fourth hypothesis is designed as:

H4: The level of digital transformation positively impacts the business model in firms.

3. RESEARCH METHODOLOGY

3.1. Research design

This study employs a quantitative research method to investigate the factors that influence DT in BMs. Initially, to identify relevant determinants and refine measurement items to fit the Vietnamese context, in-depth interviews and focus group discussions were conducted with experienced DT experts (Hair et al., 2019). Subsequently, follow-up interviews were held with a small group randomly selected from the main sample to clarify specific aspects of how DT affects BMs. This helped revise and finalize the official questionnaire.

Following the qualitative phase, primary data were collected using a structured questionnaire distributed directly or via email to enterprises, aimed at validating the proposed model and hypotheses. The dataset was cleaned to remove incomplete, inaccurate, or duplicate responses, as suggested by Hair et al. (2019). The study employed partial least squares structural equation modeling (PLS-SEM) to assess reliability, convergent validity, and discriminant validity of the measurement scales, as well as to evaluate model fit and test hypotheses. The measurement model was examined for indicator reliability, composite reliability (CR), average variance extracted (AVE), and discriminant validity. Subsequently, the structural model was evaluated using the bootstrap method (2,000 resamples) to test the statistical significance of the path coefficients and overall model fit.

3.2. Survey questionnaire

The initial measurement model was developed based on a comprehensive literature review. The questionnaire was then reviewed and adjusted by 10 DT consultants and 12 senior business executives to ensure contextual relevance to Vietnamese firms. A pilot test was conducted with 22 respondents to verify the clarity, relevance, and reliability (as measured by Cronbach's alpha) of the scales prior to their formal deployment.

The final questionnaire, written in Vietnamese, consisted of two parts. Part 1 collected demographic information, including gender, job position, firm size, industry, and years of experience with DT. Part 2 included 27 items that measured variables affecting the impact of DT on BMs. Specifically, the technology factor (5 items), organizational factor (5 items), and environmental factor (5 items) were adapted from Tonder et al. (2023) and Zhang, Wang, et al. (2023); the DT (7 items) was based on the readiness assessment framework by the Ministry of Information and Communication (2021); and the BM factor (5 items) was informed by studies of Liu et al. (2024) and Tonder et al. (2023).

3.3. Research sample

The formal study was carried out using a survey questionnaire targeting enterprises undergoing DT. The sample was selected based on a list provided by the DT portal of the Ministry of Planning and Investment. A combination of direct contact and email distribution was used to reach firms across various sectors and scales. The questionnaire was delivered with clear information about the study's purpose, voluntary participation, and data confidentiality. A total of 319 valid responses were collected for analysis.

The descriptive statistics of the sample are as follows: male participants accounted for 57.68% and females for 42.32%, which may reflect the gender distribution in the surveyed sectors. Respondents held diverse managerial positions, including senior executives (9.40%), directors (39.50%), deputy directors (26.96%), and department heads (24.14%), providing a multidimensional view of DT from various levels of management.

Most of the firms surveyed were small and medium-sized enterprises (SMEs) (74.29%, 237 firms), followed by large firms (20.38%, 65 firms), and micro or informal firms (5.33%, 17 firms). This structure aligns with the enterprise distribution in Vietnam. Participating firms came from a wide range of industries, including wholesale and retail (19.75%), accommodation and food services (16.93%), and education and training (12.54%). Other sectors such as agriculture, construction, transportation, real estate, and administrative services were also represented, demonstrating the diversity of the sample. The firms varied in their DT experience, with 17.55% having less than one year, 42.95% between one and five years, and 39.50% having more than five years, enabling comparative analysis across transformation stages.

3.4. Data collection and analysis

Data collection occurred from October 2024 to June 2025. Initial responses were screened based on three validation questions at the start of the questionnaire. Responses were discarded if firms did not confirm the use of digital technologies in transformation or if answers showed suspicious

patterns (e.g., selecting only one option or providing inconsistent demographic data). To address potential common method bias resulting from single-source data, a comprehensive collinearity assessment was conducted. All variance inflation factor (VIF) values were below the threshold (< 3), indicating the absence of common method bias. The questionnaire results are summarized in Table 1, showing that all measurement items satisfied the requirements for model validation (Hair et al., 2019).

Table 1. Statistical results of some variable indicators

Codes	*Variables*	*Mean*	*Std. dev.*	*Outer loading*	*Outer VIF*
BM1	Create new BMs	4.075	1.002	0.822	2.098
BM2	Create new business value	4.279	0.934	0.847	2.380
BM3	Create new distribution channels	4.072	0.956	0.861	2.471
BM4	Provide new customer service support	4.003	0.925	0.800	1.955
BM5	Personalize customer care	4.141	0.843	0.882	2.921
DT1	Strategic orientation	4.257	0.965	0.703	1.702
DT2	Multi-channel customer experience and sales	4.154	0.956	0.810	2.229
DT3	Supply chain automation	4.050	1.003	0.779	1.964
DT4	Deploy information systems and data management	3.574	0.967	0.707	1.810
DT5	Risk and cybersecurity management	3.991	0.829	0.820	2.313
DT6	Informatization of financial, accounting, and human resource management activities	3.978	0.813	0.863	2.765
DT7	Capacity of human resources in the enterprise	3.925	0.792	0.829	2.441
Envi1	Level of market competition	3.749	1.074	0.751	1.666
Envi2	Government policies and support	3.755	1.049	0.716	1.545
Envi3	Level of digital ecosystem connectivity, technology partners, service providers	4.025	0.943	0.837	2.082
Envi4	Level of customer readiness for DT	3.969	1.010	0.837	2.419
Envi5	Impact of economic factors	4.022	0.990	0.856	2.652
Orga1	Appropriateness of corporate culture with DT	3.674	1.068	0.808	1.944
Orga2	Flexibility of organizational structure	3.915	0.984	0.836	2.145
Orga3	Digitization of business processes	3.442	1.075	0.820	2.069
Orga4	DT capacity of employees	3.332	1.009	0.780	1.835
Orga5	DT's commitment to leadership	3.931	0.914	0.787	1.733
Tech1	Level of IT infrastructure investment in digital technology	4.473	0.895	0.803	1.963
Tech2	Level of application of new technologies in business activities	4.310	0.941	0.793	1.889
Tech3	Level of software and information system integration	3.978	0.836	0.795	1.946
Tech4	Level of data management and exploitation	4.141	0.945	0.813	2.039
Tech5	Level of cybersecurity risk management	3.893	0.889	0.864	2.394

Source: Authors' elaboration.

4. RESULTS AND FINDINGS

4.1. Measurement model evaluation

The study evaluated the measurement model by assessing internal reliability (achieving reliability in the indicators within the scale and internal consistency reliability).

Scale reliability assessment was evaluated using Cronbach's alpha and CR. The research findings in Table 2 indicate that these indices for the component scales all exceed 0.7 and fall within the range of 0.859 to 0.898. The CR coefficients also meet the required threshold, ranging from 0.899 to 0.925. Consequently, the measurement model demonstrates strong internal consistency and reliability. These results confirm the strong internal consistency and reliability of the measurement model.

Table 2. Estimation results of some indicators of the measurement model

Factors	*Cronbach's alpha*	*CR*	*AVE*	*BM*	*DT*	*Envi*	*Orga*	*Tech*
BM	0.898	0.925	0.711	**0.843**				
DT	0.898	0.920	0.623	0.767	**0.789**			
Envi	0.859	0.899	0.642	0.721	0.702	**0.801**		
Orga	0.866	0.903	0.650	0.729	0.689	0.684	**0.807**	
Tech	0.873	0.908	0.663	0.704	0.752	0.638	0.645	**0.814**

Source: Authors' elaboration.

Evaluation of observed variable quality. The quality of observed variables was evaluated using outer loading coefficients. All observed variables demonstrated outer loadings greater than 0.70, with values ranging from 0.73 to 0.882. According to Hair et al. (2019), outer loadings above 0.70 indicate that the indicators are reliable and contribute substantially to their respective constructs. This threshold is widely accepted in the literature, as loadings above 0.70 suggest that the latent construct explains more than 50% of the variance in the observed variable.

Convergent validity assessment. The AVE index was employed to assess the convergent validity of the scales. According to Hair et al. (2019), a scale achieves convergent validity if the AVE value is 0.5 or higher (meaning the independent factor explains at least 50% of the variance in each constituent observed variable). Table 2 presents the AVE values, which range from 0.623 to 0.711, exceeding the 0.5 threshold. This confirms that the scales used in this study meet the requirements for convergent validity (Henseler et al., 2015).

Discriminant validity assessment. Discriminant validity was evaluated using both the Fornell-Larcker

criterion and the heterotrait-monotrait (HTMT) ratio. The Fornell-Larcker criterion requires that the square root of the AVE for each construct be greater than its correlations with other constructs, ensuring that each construct is empirically distinct (Fornell & Larcker, 1981). The results confirmed that all constructs met this criterion. Recent literature has highlighted the limitations of the Fornell-Larcker approach and recommends the use of the HTMT ratio as a more robust assessment of discriminant validity (Henseler et al., 2015). In this study, all HTMT values were below the conservative threshold of 0.85, with the highest value being 0.844, thus supporting discriminant validity. This threshold is widely cited in the literature as an appropriate cut-off for establishing discriminant validity in variance-based structural equation modeling (SEM) models (Henseler et al., 2015).

Table 3. Assessment of discriminant validity via the HTMT criterion

Factor	*BM*	*DT*	*Envi*	*Orga*	*Tech*
BM					
DT	0.844				
Envi	0.818	0.790			
Orga	0.825	0.777	0.793		
Tech	0.793	0.844	0.731	0.740	

Source: Authors' elaboration.

4.2. Evaluation of the SEM model

Statistical hypothesis testing was conducted using bootstrapping (Hair et al., 2019). The structural model estimation results presented in Table 4 demonstrate that the direct effects of technology, organization, and environment factors have a positive and statistically significant influence on the level of *DT*, with all p-values less than 0.05. The level of *DT*, in turn, has a statistically significant and positive impact on the *BM*. Furthermore, the positive path coefficients (sample mean column) indicate that all relationships within the model have a positive influence on both the level of *DT* and the enterprise's *BM*. These findings are consistent with previous studies that have identified the significant influence of TOE factors on *DT* and *BM* innovation (Nguyen et al., 2022; Liu et al., 2024). Consequently, all research hypotheses, from *H1* to *H4*, are supported.

In addition, the inner VIF values for all latent constructs fall within the range of 1 to 2.182, all below the threshold of 3. The highest outer VIF value is also only 2.394, which is less than 3. Therefore, it can be concluded that there is no multicollinearity present in this structural model (Hair et al., 2019).

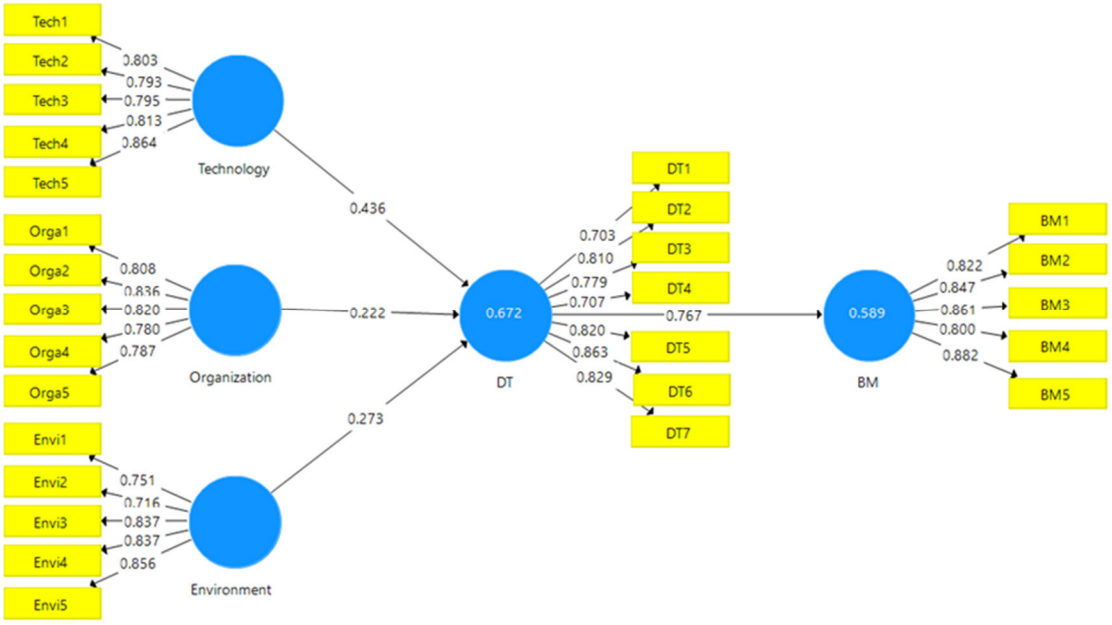
Table 4. Results of direct effect estimation in the SEM model

Direct impact	*Original sample*	*Sample mean*	*Std. dev.*	*T-statistics*	*P-values*	*Inner VIF values*	*Hypothesis conclusion*
DT → BM	0.767	0.768	0.033	23.004	0.000	1.000	Supported
Envi → DT	0.273	0.274	0.049	5.604	0.000	2.146	Supported
Orga → DT	0.222	0.220	0.053	4.209	0.000	2.182	Supported
Tech → DT	0.436	0.436	0.048	9.070	0.000	1.956	Supported

Source: Authors' elaboration.

The R^2 value of 0.672 for *DT*, as shown in Figure 1, indicates that 67.2% of the variance in *DT* is explained by the three factors: 1) technology (*Tech*), 2) organizational (*Orga*), and environmental (*Envi*). Meanwhile, 58.9% of the variance in the *BM* is attributed to the impact of *DT*.

Figure 1. Results of the SEM model testing



The estimation results in Table 5 confirm that all indirect effects of the structural model are statistically significant (p-value < 0.05). When combined with the statistically significant direct relationship estimations, this result demonstrates a partial mediating effect. Furthermore, both the direct and indirect effects have the same direction (as shown by the positive path coefficients in Tables 4 and 5). Therefore, it can be concluded that the mediating effect of the degree of *DT* in this study is a complementary partial mediating effect.

Table 5. Results of mediation effect estimation in the structural model

Indirect impact	*Original sample*	*Sample mean*	*Std. dev.*	*T-statistics*	*P-values*	*Mediating effect*
Envi → DT → BM	0.209	0.210	0.038	5.541	0.000	Additional intermediary
Orga → DT → BM	0.170	0.169	0.041	4.105	0.000	Additional intermediary
Tech → DT → BM	0.334	0.335	0.043	7.765	0.000	Additional intermediary

Source: Authors' elaboration.

Evaluating the quality and fit of the research model. The standardized root mean square residual (SRMR) index is used to assess the model's fit. Typically, a well-fitting model will have an SRMR value lower than 0.08. The results from Table 6 show that the indices for the Saturated model and Estimated model are 0.056 and 0.076, respectively, both less than 0.08, indicating that the model satisfies the overall goodness-of-fit criteria. The Chi-square/df index is also used to evaluate the model fit in detail. A Chi-square/df or χ^2/df value < 5 (with a sample size N > 200) indicates a good model fit (Hair et al., 2019). The results from Table 6 show that the Chi-square/df values for the saturated model and the estimated model are 2.888 and 3.136, respectively. Therefore, the model exhibits a good overall fit.

Table 6. Results of mediation effect estimation in the structural model

Indicators	*Saturated model*	*Estimated model*	*Acceptance threshold*	*Assess suitability*
SRMR	0.056	0.076	< 0 08	Acceptable
Chi-square	909.628	987.706		Acceptable
Chi-square/df	2.888	3.136	< 5 (if sample higher than 200)	Overall suitability

Source: Authors' elaboration.

5. DISCUSSION

5.1. Direct influence of technological factors on digital transformation and indirect impact on business models

Digital transformation is not simply about applying new technologies in isolation, but rather a comprehensive and profound change in BMs, operational processes, corporate culture, and customer interactions (Liu et al., 2024). The research results affirm the vital role of new technologies and the level of IT-infrastructure investment, and they emphasize the level of information integration between internal information systems and external partners in the DT process (Nguyen et al., 2022; Zhang, Xu, et al., 2023). This integration helps improve operational efficiency, reduce transaction costs, and enhance collaboration. Cloud-computing systems and enterprise resource planning platforms are crucial in scaling operations and integrating business processes (Rane et al., 2024).

The impact of technology is not limited to automating operational processes but also leads to fundamental changes in BMs. DT enables businesses to shift to platform-based or service-oriented BMs (Tonder et al., 2023). While Liu et al. (2024) emphasize the lack of technological resources as a significant barrier for SMEs, this study shows that the readiness and ability to integrate technology into business strategies are decisive factors, similar to the digital-maturity model in Industry 4.0 (Li et al., 2024).

The level of integration of software and information systems has a high exploratory factor analysis (EFA) weight (4.310), indicating that DT requires the synchronous coordination of multiple technologies (Rane et al., 2024), which creates challenges and costs related to change management and system integration that traditional IT studies rarely address. Recent evidence from listed Chinese firms confirms that technology-enabled integration significantly improves innovation output and market performance, reinforcing the positive technology-performance linkage reported in this study (Chen et al., 2023). Moreover, our structural model aligns with the reporting standards for PLS-SEM recommended by Hair et al. (2019), supporting the robustness of the estimated path coefficients.

5.2. Direct impact of organizational factors on digital transformation and indirect influence on business models

The research findings confirm the crucial role of organizational factors, directly impacting the degree of DT and indirectly influencing changes in BMS. Organizational agility, leadership competence, and a culture of innovation are critical factors in DT (Tonder et al., 2023). The results indicate that agility enables businesses to transition from traditional hierarchical models to digital models more effectively, empowering autonomous work teams and facilitating rapid decision-making (Alasiri & AlKubaisy, 2022).

While previous studies have often emphasized the strong impact of corporate culture alignment on DT (Tonder et al., 2023; Xu et al., 2024), this study reveals a more complex picture. Leadership commitment, awareness of DT, and organizational structural agility emerge as the two most influential factors, followed by the alignment of corporate culture and the degree of digitalization of business processes. This highlights the crucial role of

leadership commitment in developing countries, such as Vietnam. Without support from the highest levels, DT initiatives are at risk of stagnation due to cultural and procedural barriers (Nguyen et al., 2022).

Leadership shapes the direction, investment level, and speed of DT implementation, while supporting the development of digital capabilities and fostering a culture of innovation. Businesses with clear digitalization strategies and strong commitment from leadership often achieve a higher degree of DT than those with a passive approach (Teng et al., 2022). The present findings echo Kovtunenko and Lozan's (2024) argument that digitalization accelerates innovation-driven growth when leadership embeds learning routines into daily operations. Strategic DT programs outperform ad-hoc initiatives in sustaining long-term competitiveness.

5.3. Direct impact of environmental factors on digital transformation and indirect impact on business models

The present analysis aligns with Nguyen et al. (2022), which suggests that market-competition pressure, the level of policy support, government assistance, and the legal framework for technology adoption all directly influence the success of DT. The findings also reveal varying degrees of influence of each environmental factor across different industries.

In the context of SMEs, the development and interconnectedness of the innovation ecosystem is more critical than competitive pressure (Tonder et al., 2023; Zhang, Wang, et al., 2023). Policies and regulations sometimes become barriers rather than drivers for DT, especially in developing economies, where bureaucracy and administrative procedures can slow down the digitalization process of businesses. This suggests that while environmental factors promote DT, their impact depends on the specific context of each type and size of business (Teng et al., 2022).

5.4. Impact of digital transformation on business models

The results reveal that DT has a positive impact on BM innovation (Agustian et al., 2023; Bouncken et al., 2021; Shostak et al., 2024). Businesses with a high degree of digital customer orientation tend to innovate their BMs faster than those focused solely on internal transformation. This facilitates the innovation of products, services, and management processes, thereby increasing productivity and profitability (Teng et al., 2022). This suggests that adopting digital technologies and their integration into core business processes can foster creativity and generate new customer value.

DT, through its mediating role, impacts BMs in various ways: creating new BMs based on technology applications across the value chain (Agustian et al., 2023), constructing new business values and distribution channels through customer participation in the value-creation process (Cennamo et al., 2020), and providing new support services and personalized customer care (Agustian et al., 2023). Research results demonstrate that TOE factors have an indirect impact on BMs (Liu et al., 2024; Nguyen et al., 2022). Specifically, managing and effectively leveraging big data allows businesses to gain deep insights into customer needs and predict market trends, thereby making more informed business decisions (Chen et al., 2023). Empirical studies now report that firms adopting subscription-based and data-driven services capture higher customer lifetime value, confirming the scalability advantages highlighted in recent Association of Southeast Asian Nations (ASEAN) surveys (Kovtunenko & Lozan, 2024).

Furthermore, the flexibility of the organizational structure and the dynamism of the business environment play a moderating role in the relationship between DT and BM innovation. Companies with a high adaptive capacity and operating in stable environments often find it easier to implement DT and innovate BMs (Agustian et al., 2023). These research findings complement and extend those of previous studies, which primarily focused on large-scale enterprises, emphasizing the role of organizational factors (Alasiri & AlKubaisy, 2022). This study, mainly conducted among SMEs, reveals that technological factors have a significant influence on the level of DT (Tonder et al., 2023). This aligns with the views of Liu et al. (2024), who suggest that SMEs often encounter more challenges in changing their BMs due to limited technological resources. The application of digital technologies to collect and analyze customer data, create new interaction channels, and thereby build new business ecosystems demonstrates the indirect impact of technological factors on BMs (Bouncken et al., 2021).

6. CONCLUSION

Digital transformation has a profound impact on the BMs of firms. It is not merely a technological process but a revolution in firm thinking and strategy. To thrive in the digital age, firms should adapt swiftly to changes and develop agile, innovative, and sustainable BMs. This study examined the relationship between TOE determinants and the levels of DT and BM innovation, utilizing the TOE framework. The SEM analysis reveals that TOE factors collectively explain 67.2% of the variance in DT levels ($R^2 = 0.672$), demonstrating substantial predictive power according to established thresholds for model evaluation. This finding aligns with previous research that has utilized the TOE framework in DT contexts, confirming the framework's robustness in explaining organizational technology adoption processes. The mediation analysis further demonstrates that DT serves as a complementary partial mediator, with both direct and indirect effects maintaining consistent positive directions, indicating that the three TOE factors influence BM innovation both directly and through their impact on DT levels.

The findings offer both theoretical and practical implications for researchers and firms. From a theoretical perspective, this investigation contributes to the expanding literature on DT-driven BM innovation by empirically validating the applicability of the TOE framework in emerging economy contexts. The study addresses a notable research gap in the DT field, specifically in

developing countries, where limited empirical evidence has been available despite the growing importance of digitalization in these markets. The complementary partial mediation effect discovered extends theoretical understanding of how external factors influence organizational outcomes through DT processes, providing nuanced insights into the mechanisms underlying BM innovation.

Practically, the results offer actionable insights for Vietnamese firms and similar emerging market organizations pursuing DT initiatives. The substantial variance explained (58.9%) in BM innovation by DT levels suggests that organizations should prioritize comprehensive DT strategies rather than piecemeal technology adoption. The positive influence of all three TOE dimensions indicates that successful DT requires simultaneous attention to technological capabilities, organizational readiness, and environmental pressures.

We acknowledge the limitations of this study, particularly the potential risk associated with surveying digitally transforming businesses from a single directory on the Ministry of Planning and Investment website. This sampling approach may introduce selection bias, as enterprises listed in government directories might represent more formalized or advanced organizations, potentially limiting the generalizability of findings to smaller or informal businesses undergoing DT. Furthermore, the sample size in this study is relatively small due to the difficulty of collecting responses from diverse companies and industries. The cross-sectional nature of the data collection prevents the establishment of causal relationships and temporal dynamics, which are particularly relevant in understanding DT as an ongoing organizational process.

Future study could expand the geographic scope by conducting comparative studies across multiple emerging economies to examine cultural and institutional variations in DT processes. Longitudinal research designs would enable a deeper understanding of the temporal dynamics of DT and its evolving impact on BM innovation over time. In addition, incorporating qualitative methodologies such as case studies or interviews could provide richer insights into the mechanisms through which TOE factors influence DT and BM innovation. Multi-level analyses examining both organizational and industry-level factors would enhance understanding of contextual influences on DT success.

REFERENCES

Agustian, K., Mubarok, E. S., Zen, A., Wiwin, W., & Malik, A. J. (2023). The impact of digital transformation on business models and competitive advantage. *Technology and Society Perspectives, 1*(2), 79–93. https://doi.org/10.61100/tacit.v1i2.55

Alasiri, N., & AlKubaisy, Z. (2022). Exploring the role of leadership, work environment, it alignment and company performance on the digital transformation: A study on the private sector companies in Western region, Saudi Arabia. *International Journal of Professional Business Review, 7*(2), Article 0500. https://doi.org/10.26668/businessreview/2022.v7i2.500

Al-Hmesat, M. M., Albloush, A., Lasassmeh, O., Albuainai, E. S. A., Al Graibeh, A. M. A., & Altarawneh, H. M. (2025). The impact of digital transformation strategy on human resource development in commercial banks. *Risk Governance & Control: Financial Markets & Institutions, 15*(1), 215–225. https://doi.org/10.22495/rgcv15i1sip7

Beulen, E., & Bode, R. (2021). An information technology and innovation committee to guide digital transformations. *Corporate Board: Role, Duties and Composition, 17*(2), 38–53. https://doi.org/10.22495/cbv17i2art4

Bouncken, R. B., Kraus, S., & Roig-Tierno, N. (2021). Knowledge- and innovation-based business models for future growth: Digitalized business models and portfolio considerations. *Review of Managerial Science, 15*(1), 1–14. https://doi.org/10.1007/s11846-019-00366-z

Cennamo, C., Dagnino, G. B., Di Minin, A., & Lanzolla, G. (2020). Managing digital transformation: Scope of transformation and modalities of value co-generation and delivery. *California Management Review, 62*(4), 5–16. https://doi.org/10.1177/0008125620942136

Chen, C., Zhang, Y., & Wang, S. (2023). Digital transformation and firm performance: A case study on China's listed companies in 2009–2020. *Digital Economy and Sustainable Development, 1*(1), 1–16. https://doi.org/10.1007/s44265-023-00018-x

Decision No. 749/QD-TTg of the Prime Minister: Approving the "National Digital Transformation Program to 2025, with a Vision to 2030". (2020). https://chinhphu.vn/default.aspx?pageid=27160&docid=200163

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39–50. https://doi.org/10.2307/3151312

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review, 31*(1), 2–24. https://doi.org/10.1108/EBR-11-2018-0203

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science, 43*(1), 115–135. https://doi.org/10.1007/s11747-014-0403-8

Kovtunenko, Y., & Lozan, A. (2024). Digitalization for ensuring innovative development of the enterprise. *Economics. Finances. Law, 9*, 17–20. https://doi.org/10.37634/efp.2024.9.4

Kraiwanit, T., & Terdpaopong, K. (2024). Digital transformation model: The study of the governmental agency in a developing country [Special issue]. *Journal of Governance & Regulation, 13*(1), 458–470. https://doi.org/10.22495/jgrv13i1siart18

Li, Z., Gong, P., Wang, Y., & Qu, S. (2024). The impact of digital transformation on enterprise organizational structure. *Highlights in Business, Economics and Management, 41*, 732–740. https://doi.org/10.54097/qt9jer93

Liu, K. P., Chung, K. W., Chiu, W., & Chen, G. (2024). Digital transformation driving SME business model innovation: A dynamic capabilities perspective. *Journal of Global Information Management, 32*(1), 1–23. https://doi.org/10.4018/JGIM.350191

Ministry of Information and Communication. (2021). Decision No. 1970/QD-BTTTT of the Ministry of Information and Communications: Approving the Project to Determine the Index to Assess the Level of Digital Transformation of Enterprises and Support to Promote Digital Transformation of Enterprises. https://chinhphu.vn/default.aspx?pageid=27160&docid=204725

Nguyen, T. H., Le, X. C., & Vu, T. H. L. (2022). An extended technology-organization-environment (TOE) framework for online retailing utilization in digital transformation: Empirical evidence from Vietnam. *Journal of Open Innovation: Technology, Market, and Complexity, 8*(4), Article 200. https://doi.org/10.3390/joitmc8040200

Rane, J., Kaya, Ö., Mallick, S. K., & Rane, N. L. (2024). Influence of digitalization on business and management: A review on artificial intelligence, blockchain, big data analytics, cloud computing, and internet of things. In *Generative artificial intelligence in agriculture, education, and business.* Deep Science Publishing. https://doi.org/10.70593/978-81-981271-7-4_1

Shostak, L., Lipych, L., Fedoniuk, A., Volynets, I., Ulyanytsky, A., & Morokhova, V. (2024). Business models of enterprises in the conditions of digital transformation: Global and domestic experience. *Economics, 12*(2), 243–261. https://doi.org/10.2478/eoik-2024-0027

Teng, X., Wu, Z., & Yang, F. (2022). Research on the relationship between digital transformation and performance of SMEs. *Sustainability, 14*(10), Article 6012. https://doi.org/10.3390/su14106012

Tonder, C. V., Hasanefendic, S., Bossink, B., Schachtebeck, C., & Nieuwenhuizen, C. (2023). Internal organizational factors driving digital transformation for business model innovation in SMEs. *Journal of Business Models, 11*(2), 86–109. https://doi.org/10.54337/jbm.v11i2.7403

Xu, J., Naseer, H., Maynard, S., & Filippou, J. (2024). Using analytical information for digital business transformation through DataOps: A review and conceptual framework. *Australasian Journal of Information Systems, 28*, 1–39. https://doi.org/10.3127/ajis.v28.4215

Zhang, G., Wang, T., Wang, Y., Zhang, S., Lin, W., Dou, Z., & Du, H. (2023). Study on the influencing factors of digital transformation of construction enterprises from the perspective of dual effects — A hybrid approach based on PLS-SEM and fsQCA. *Sustainability, 15*(7), Article 6317. https://doi.org/10.3390/su15076317

Zhang, X., Xu, Y. Y., & Ma, L. (2023). Information technology investment and digital transformation: The roles of digital transformation strategy and top management. *Business Process Management Journal, 29*(2), 528–549. https://doi.org/10.1108/BPMJ-06-2022-0254