

FACTORS AFFECTING ENTERPRISE'S DIGITAL TRANSFORMATION

Xiem Thuy Cao and The Doan Truong

National Economics University Hanoi Vietnam

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ABSTRACT

The purpose of this research is to address the questions of what constitutes enterprise digital transformation and what factors influence the digital transformation of enterprises in Vietnam. The research model was validated using survey data and the SmartPLS technology. Among the factors examined, three were found to have a statistically significant impact on the enterprise's digital transformation: corporate culture, digital business strategy, and technology infrastructure. However, the research did not find statistically significant effects for three other factors: employee competence in information technology, enterprise governance, and competitive pressure. This research contributes valuable insights on enterprise digital transformation in Vietnam to the existing literature and offers practical implications for enterprise management.

Keywords: Enterprise's digital transformation, employee competence in information technology, success of an enterprise's digital transformation.

1. Introduction

In recent years, especially after the COVID-19 pandemic, businesses in Vietnam have realized the importance of digital transformation and have applied digital technologies in internal management, input procurement, logistics, production, marketing, sales, and payment. I-Cloud is the most widely used tool in internal management, with 60.6% of enterprises in the survey sample conducted by VCCI in 2020, followed by online conferencing systems, task management systems, and processes, approximately 30% of enterprises. In the banking sector, digital transformation has been widely implemented, beginning with the adoption of Internet of Things (IoT) applications. These applications enable customers to conveniently access and utilize banking services, connect with various digital ecosystems on the Internet, and avail online banking services through mobile phone applications (Luong, 2020). Digital transformation has brought specific benefits to businesses, consumers, and society. The purpose of this research is to answer the question of what digital transformation is, and what factors affect the success of

businesses' digital transformation in Vietnam. Two main contents of the article are a literature review on digital transformation, and an empirical analysis of the factors determining the success of enterprise's digital transformation in Vietnam, then management and policy implications drawn.

2. Literature review on digital transformation and the research model

2.1. The concept of digital transformation

Digital transformation has received more and more attention, however, it is hard to find a unified definition of it in literature and in practice. Liu et al. (2011) argue that the digital transformation of enterprises is the integration of digital technologies into business processes. Bharadwaj et al. (2013) consider digital transformation as an organizational strategy built and implemented by leveraging digital resources to create differentiated value. According to Fitzgerald (2013), digital transformation is the use of digital technologies to create major improvements in business. Lucas et al. (2013) define digital transformation as fundamentally changing traditional ways of doing business by redefining business capabilities, processes, and relationships. According to Mithas et al. (2013), digital transformation is the extent to which an organization participates in an information technology activity. Westerman et al. (2014) define digital transformation as the use of technology to radically improve the operational efficiency or reach of an enterprise. Henriette et al. (2015) argue that digital transformation is a business model driven by changes associated with the adoption of digital technology in all aspects of human society. According to Piccinini et al. (2015) digital transformation is characterized by the use of new digital technologies to create great improvements in business. Schuchmann and Seufert (2015) define digital transformation as the process of restructuring technology and adopting new business models in order to better engage digital customers at every interaction point throughout the customer experience lifecycle. According to Chanias and Hess (2016), digital transformation signifies the comprehensive and wide-ranging changes brought about by digital technologies across an entire organization. Hess et al. (2016) refer to digital transformation as the changes that digital technology can bring in a company's business model, resulting in a changed product or organizational structure, or in automation of processes. According to Gobble (2018) digital transformation involves the strategic and prioritized transformation of an organization's business activities, processes, capabilities, and models in order to effectively harness the potential and opportunities presented by digital technologies. This transformation is driven by the increasingly rapid and impactful influence of these technologies on society.

In general, digital transformation is considered to be the incorporation of digital technology into all areas of an enterprise, fundamentally changing operations and management processes, transferring value to customers and company culture.

Digital transformation reduces costs in production and sales processes because the unified digital-based management helps smooth out information flow, eliminating unnecessary clues (Mikalef et al., 2020). Digital transformation increases labor productivity because automation reduces labor intensity (Brynjolfsson & Mitchell, 2017), supports dynamic decision-making based on data (Athey, 2017) and overall improvement due to optimization of organizational restructuring (Li et al., 2018). Digital transformation increases the efficiency of company assets. Björkdahl (2020) believes that the primary focus of digital transformation in companies is to optimize operational processes, resulting in the reduction of costs and the improvement of work efficiency in key business activities. By leveraging digital technologies, organizations strive to streamline their operations and achieve greater effectiveness in their core functions.

However, digital transformation also increases the operating costs of businesses because investment must be made in digital resources such as infrastructure (introducing software and hardware related to digital technologies and their maintaining and updating afterward to enable the digital transformation of business activities); outsourcing certain digital services; establish independent branches to exploit digital business in some cases. However, what we are interested in digital transformation is the net benefits to business operations. The research by Guo and Xu (2021) confirms the U-shaped relationship between digital transformation and the financial performance of profit organizations. When revenue reaches a certain level, it creates a synergy to improve the performance of the firm.

According to Morakanyane et al. (2017), the characteristics of digital transformation can be observed through its behavioral aspects. Digital transformation exhibits characteristics such as being radical, disruptive, evolutionary, continuous, and complex. Additionally, digital transformation drivers refer to the factors that influence and facilitate the process of digital transformation. These drivers play a significant role in shaping and enabling organizations to undergo successful digital transformation initiatives. Digital capabilities, maturity, digital technologies, strategies, and business models are among the drivers of digital transformation in organizations. These factors contribute to shaping and enabling the process of digital transformation. The impacts of digital transformation can be categorized as customer-focused and organization-focused. Customer-focused impacts pertain to the effects experienced by customers as a result of digital transformation initiatives. On the other hand, organization-focused impacts refer to the effects on the organization itself, encompassing changes in processes, operations, and overall business strategies brought about by digital transformation. These impacts can be either positive or negative, but the ultimate impact of digital transformation that organizations want to capitalize on is value creation – for both the organization and the customer. The company's three key transformational areas are customer experience, operational processes, and business models (Morakanyane et al., 2017).

According to the Digital Transformation 2017 Report conducted by Microsoft (Microsoft & QVARTZ, 2017), the four dimensions of digital transformation are strategy, people, process, and technology; There is a consensus among senior executives interviewed that customer engagement is the most important aspect of all aspects of digital transformation, and they all agreed that digital transformation has great potential in increasing operational effectiveness.

2.2. Factors affecting digital transformation

Numerous research studies have been conducted to identify the factors that influence the success of digital transformation in organizations. Mhlongu et al. (2019) found four groups of factors affecting the success of digital transformation initiatives in organizations, including customer-centricity, governance, innovation, and input procurement. These authors also noted that both IT and non-IT managers have a shared understanding of the factors that influence the overall success of an organization's digital transformation. Nguyễn and Bui (2021) identified five factors affecting the intention to implement digital transformation of small and medium-sized enterprises in Hanoi, level of technology use, the business culture, technological infrastructure, financial capacity of the enterprise, purpose, and goal of digital transformation. According to Tungpantong et al. (2022), factors affecting the success of digital transformation in universities include strategy, process, human product/service, data, and technology. Stanković et al. (2022) confirmed three groups of factors affecting the application of information technology in e-insurance, the first group is technological factors, and the second group is the e-insurance organizational factors, and the third group is environmental factors. According to Ko et al. (2021) digital innovations are strongly influenced by corporate and management commitment, less by strategy. In digital transformation, the role of information technology and services departments is less relevant. Nguyễn (2022) has drawn from previous studies factors (and scale) affecting the digital transformation of enterprises, including governance, digital business strategy, ability of employees, corporate culture, technology infrastructure, and pressures on the business.

2.3. Research model

Inheriting previous studies, we propose the research model shown in Figure 1.

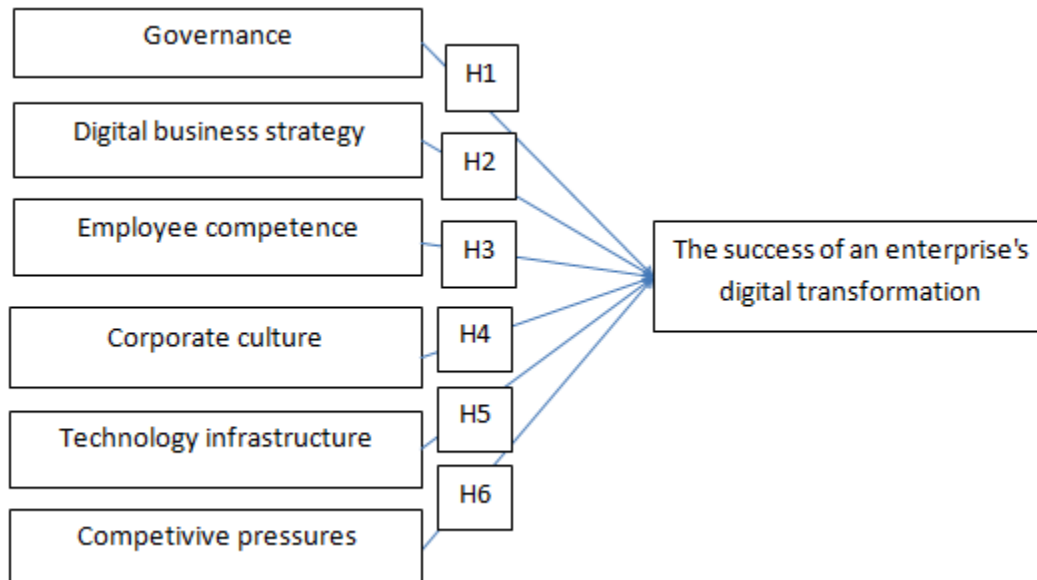


Figure 1. Research model

Governance

Governance is crucial to the success of an organization's digital transformation. Business leaders are those who are interested in and have a positive attitude towards business's digital transformation, use new digital applications in interacting with employees, constantly learn to develop competence to meet the requirements of digital transformation, and support any digital transformation initiatives and be ready to handle any concern arising from the dark side of the digital transformation process, then the success will be likely. Therefore we hypothesize that

H1: The enterprise governance is positively related to the success of an enterprise's digital transformation.

Digital business strategy

Strategy is the set of decisions made by leaders about the long-term objectives of the organization, and the means, ways, and how to achieve those objectives. If objectives of digital transformation are mentioned in the business strategy, aiming to change the operating model to create new value for customers and businesses, towards optimizing the customer experience on a

digital basis, the enterprise has the plan to set up (or has) an electronic office and use the database in decision making, the digital transformation will likely succeed.

Thus we hypothesize that

H2: Digital business strategy is positively related to the success of an enterprise's digital transformation.

Employee competence

Human resources are an important factor in any operation. Digital transformation requires hardware, software, and people to operate it. Therefore, enterprises need training programs to create staff specialized in IT, and competent in using IT applications, and employees have a positive attitude toward new technological applications in fulfilling jobs. Thus we hypothesize that

H3: Employee competence is positively related to the success of an enterprise's digital transformation.

Corporate culture

Digital transformation in organizations is influenced by organizational culture. In an enterprise, if the spirit of learning is always promoted, individuals are active in work, ready to share knowledge and experience with each other, and have cooperative behavior in work, all activities, including with digital conversion will be highly effective. Moreover, it is of great significance to the success of digital transformation if stored information is treated as an enterprise property, and its data is always verified before storing and sharing. Therefore we hypothesize that

H4: Corporate culture is positively related to the success of an enterprise's digital transformation.

Technology infrastructure

Digital transformation is impossible without a technology infrastructure. A technology infrastructure that allows businesses to use the website to post information and promote their image, employees to use personal electronic devices to do work, use internal interaction systems such as email, OTT tools (Zalo, Viber, Facebook...), and electronic office software to reduce direct communication. The technology infrastructure allows businesses to use i-Cloud in internal management and create a digital workspace. Thus we hypothesize that

H5: Technology infrastructure is positively related to the success of an enterprise's digital transformation.

Competitive pressures on businesses

In a fiercely competitive environment, to thrive businesses must attract and "retain" customers, not lose customers to competitors. Digital technologies will help businesses create better communication with customers so that they can provide goods/services that match customer needs, and in many cases, goods/services that businesses provided may be customized. Digital technology allows businesses to optimize business and management processes, create better linkages between departments, use resources more efficiently, and increase transparency and effectiveness in business. management, and innovation in creating products/services for customers. Therefore we hypothesize that

H6: Competitive pressures on enterprise is positively related to the its success of digital transformation.

3. Methodology

Six hypotheses were tested by a quantitative survey on the factors affecting digital transformation of enterprises in Vietnam, applying structural equation modeling. The research was designed as into the following sections. First, a description of the development of the survey instrument and an introduction of sample subjects. This is followed by identifying measures employed to assess the variables, and the scale reliability and validity are reported. Next, the structural modeling results associated with this survey are presented.

Survey instruments

Based on the extensive literature review, the survey questionnaire was built. The first part of the questionnaire includes questions about a participant's information and the second consists of six multivariate/item scales measuring factors that affect enterprise's digital transformation, using 5-point Likert scale with increasing agreement from "Not agree at all" to "Completely agree".

Data for this research are collected from a non-probability convenience sample. The online survey was conducted using Google Form application. The internet address (URL) of the survey was sent to participants via e-mail and uploaded to groups on social networks (Facebook, Zalo, i-Messeges, MS Teams...). The survey was carried out from January to February 2023, and 183 valid responses have been collected, which fulfills the requirement of sample size (Hair *et. al.*, 2014).

The majority of participants are SMEs, accounting for 52%. 135 enterprises have offices registered in Hanoi, 8 in HCM city, and the rest in northern provinces. 20 enterprises operate in the manufacturing industry, accounting for 10.9%, 43 in commerce accounting for 21.5%, 8 in

information and communication accounting for 4.4%, 14 in information technology, accounting for 7.7%, 35 in finance and insurance, accounting for 19.1%, and 63 in others, accounting for 34.4%.

Research methods

The research model (Figure 1) was tested by applying structural equation model-based PLS methodology (using SmartPLS software version 4.0.8.9).

Measurement model estimation

Model estimation is the first step in data analysis. An estimation of the internal consistency and the convergent and discriminant validity of the instrument items was conducted to test the measurement model. When reliability measures were above the level recommended of .70 internal consistency is demonstrated (Fornell & Bookstein, 1981; Nunnally & Bernstein, 1994). All reliability measures were above .70 (Table 1), indicating adequate internal consistency. The AVE ranging from 0.783 to 0.834 (Table 1) was above the target of .50 (Chin, 1998; Fornell & Larcker, 1981) The variance shared with the construct and its measures is greater than the error when $AVE > .50$. For all model constructs this level is reached.

When the item loads highly (loading is greater than .50) on their associated factors, convergent validity is demonstrated. If individual reflective measures correlate more than .70 with the construct they intend to measure then they are considered to be reliable.

Table 1. Convergent and discriminant validity of the model constructs

Variable	Outer loading	Variable	Outer loading
Governance		CUL1	0.875
IC = 0.96		CUL2	0.92
AVE = 0.834		CUL3	0.902
GOV1	0.919	CUL4	0.846
GOV2	0.922	CUL5	0.848
GOV3	0.898	CUL6	0.882
GOV4	0.915	Technology infrastructure	

GOV5	0.923	IC = 0.892	
GOV6	0.902	AVE = 0.687	
Digital business strategy		TEC1	0.848
IC = 0.924		TEC2	0.767
AVE = 0.764		TEC3	0.871
STR1	0.86	TEC4	0.794
STR2	0.857	Pressure on businesses	
STR3	0.881	IC = 0.936	
STR4	0.897	AVE = 0.757	
STR5	0.877	PRE1	0.788
Employee competence		PRE2	0.906
IC = 0.889		PRE3	0.88
AVE = 0.743		PRE4	0.889
COM1	0.875	PRE5	0.884
COM2	0.863	PRE6	0.868
COM3	0.863	Success of an enterprise's digital transformation	
COM4	0.848	IC = 0.908	
Corporate culture		AVE = 0.783	
IC = 0.942		SUC1	0.887
AVE = 0.773		SUC2	0.896
		SUC3	0.880
		SUC4	0.876

IC = internal consistency (Composite reliability (ρ_a)); AVE = average variance extracted

Source: authors extracted from the processed data

Discriminant validity was assessed by comparing the square root of the AVE for each construct with the correlation between the construct with other constructs in the model (Chin, 1998; Fornell & Larcker, 1981). All constructs in the estimated model satisfied the condition of discriminant validity (Table 2).

Table 2. Correlation among construct scores (Discriminant validity - Fornell-Larcker criterion)

	Corporate culture	Employee competence	Governance	Pressure on corporate	Digital business strategy	Success of a enterprise DT	Technology infrastructure
Corporate culture	0.879						
Employees' competence	0.792	0.862					
Governance	0.705	0.661	0.913				
Pressure on corporate	0.708	0.629	0.706	0.87			
Digital business strategy	0.758	0.8	0.776	0.625	0.874		
Success of a enterprise DT	0.742	0.725	0.679	0.654	0.777	0.885	
Technology infrastructure	0.654	0.669	0.752	0.666	0.719	0.739	0.829

Note: The boldface figures in the diagonal represent the square root of the AVE figures. They should be higher than the correlation figures.

Source: authors extracted from the processed data

Table 3. Collinearity statistics - VIF - inner model

	Success of an enterprise's digital transformation
Corporate culture	3.626
Employees' competence	3.695
Governance	3.579
Pressure on corporate	2.553
Digital business strategy	4.219

Technology infrastructure	2.809
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Source: authors extracted from the processed data

4. Structural model results

R² for dependent constructs

The results indicate that the structural model explains 70 percent of the variance in the success of an enterprise's digital transformation (Figure 2). The percentage of variance explained for the dependent variable was greater than 10 percent, indicating the satisfactory value of the PLS model (Falk & Miller, 1992).

Structural coefficients

The results of the estimated model show that three of six constructs hypothesized to affect the success of an enterprise's digital transformation were significant, which includes corporate culture (CUL), digital business strategy (STR), and technology infrastructure (TEC), and were supported at $p < .050$. The employees' competence in information technology (COM), governance (GOV), and competitive pressures on enterprise (PRE) were not significant (Table 4).

Table 4. Structure (inner) model results

	Path coefficients	T statistics (O/STDEV)	Sig. level
Effects on the success of a enterprise digital transformation (adjustedR = 0.70)			
Corporate culture	0.222	2.28	**
Employees' competence	0.067	0.722	ns
Governance	-0.082	0.944	ns
Pressure on corporate	0.102	1.404	ns
Digital business strategy	0.341	3.556	****
Technology infrastructure	0.298	3.679	****

**** $p < .001$, ** $p < .050$

ns = not significant

Source: authors extracted from the processed data

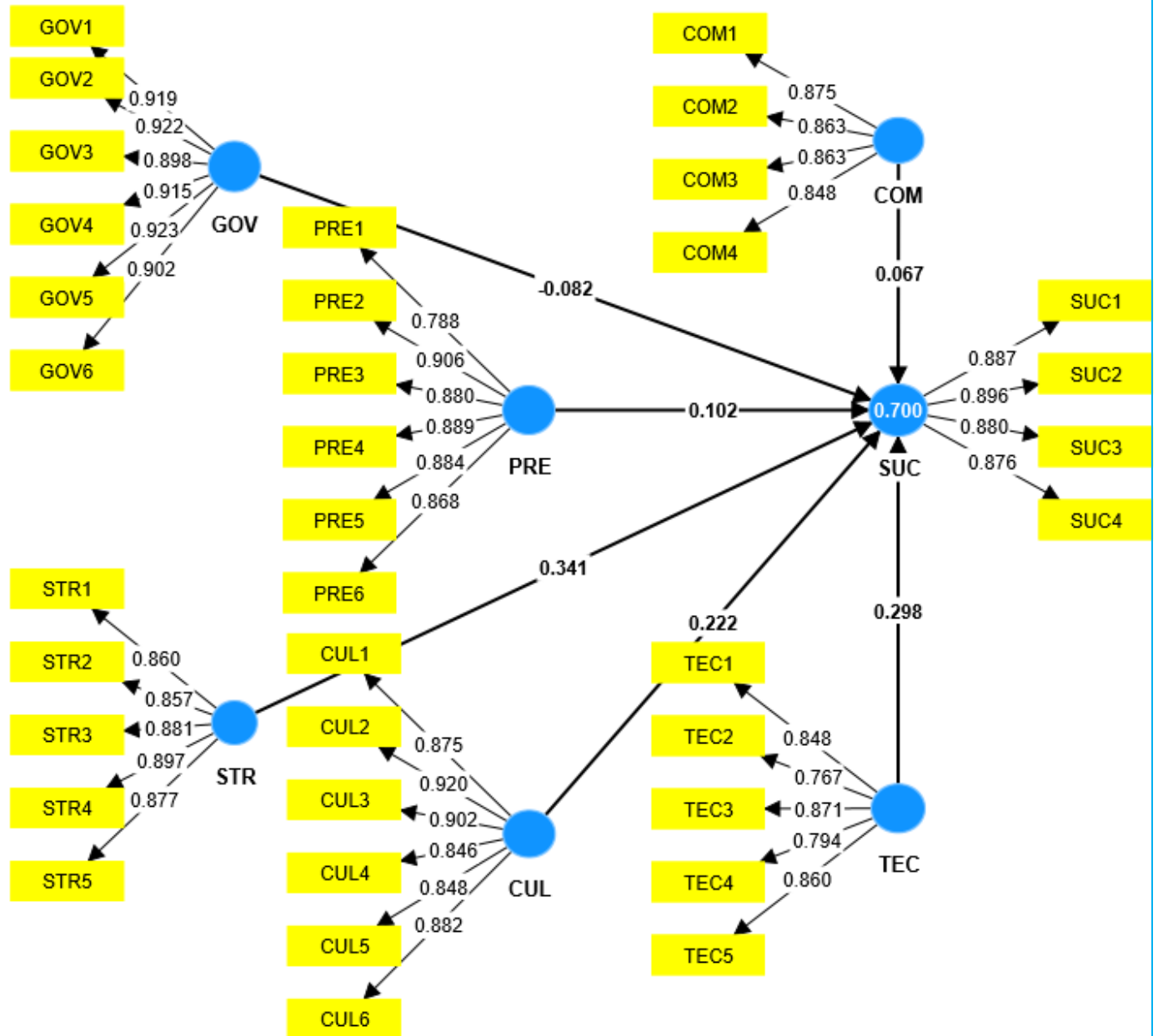


Figure 2. Structural (inner) model results

Effect size (f square)

f square indicates the effect size of independent variables on dependent variables. According to Cohen (1988), $f \text{ square} < 0.02$ indicates an extreme small effect, $0.02 \leq f \text{ square} < 0.15$: shows a small effect; $0.15 \leq f \text{ square} < 0.35$ implies a medium effect; and $f \text{ square} \geq 0.35$: represents a

large effect. In the estimated model results demonstrate that corporate culture, digital business strategy, and technology infrastructure have a medium effect, while employee competence, governance, and pressure on the enterprise have a small effect on the success of an enterprise's digital transformation (Table 4).

Discussion

This research examined factors affecting an enterprise's digital transformation. The model was tested on survey data using SmartPLS technology. Three of the six hypotheses were supported by the data. *Corporate culture*, *digital business strategy*, and *technology infrastructure* significantly affect the enterprise's digital transformation. This is partly in accordance with findings of Nguyễn and Bui (2021), Tungpantong et al. (2022), and Stanković et al. (2022).

In contrast with previous pieces of research, we found that *employees' competence*, *governance*, and *competitive pressures on enterprise* insignificantly influence its digital transformation. Mhlungu et al. (2019) found *governance* was one of four groups of factors affecting the success of digital transformation initiatives in organizations; Tungpantong et al. (2022) ascertained *strategy* significant success factor of digital transformation in universities; Stanković et al. (2022) confirmed *environmental factors* affect the application of information technology in e-insurance.

Practical implications

The research findings suggest that corporate culture, digital business strategy, and technology infrastructure play crucial roles in determining the success of an enterprise's digital transformation. As these factors are organizational in nature, enterprises must prioritize the development of a learning organization, fostering knowledge sharing within the organization, and treating stored information as valuable enterprise assets. Additionally, it is essential to ensure data verification before storage and sharing. To ensure the success of digital transformation, enterprises should also establish a robust digital business strategy and make necessary investments in their technology infrastructure.

Limitations and directions for further research

No grants were awarded for this research therefore data are collected from a non-probability convenience sample, which may cause bias. Moreover, employee competence, governance, and competitive pressures on enterprise theoretically have an impact on its digital transformation, therefore further research in future we would examine situations in which they affect enterprise's digital transformation.

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Appendix

Survey questions

Governance

GOV1 = Business leaders are very interested in digital transformation

GOV2 = Leaders have a positive attitude toward business digital transformation

GOV3 = Business leaders use new technology applications in interacting with employees

GOV4 = Business leaders strongly support the application of digitalization of operational and management processes in the enterprise

GOV5 = Leaders are constantly learning to develop their capacity to meet digital transformation requirements

GOV6 = Leaders are ready to address concerns arising from the dark side of digital transformation

Digital business strategy

STR1 = Digital transformation goals are mentioned in the enterprise's business strategy

STR2 = The enterprise determines the plan to establish an electronic office in its strategic plan

STR3 = The enterprise deploys the database system

STR4 = The enterprise's strategy is to change the operating model to create new value for customers

STR5 = The enterprise aims to optimize customer experience on digital platforms

Employee competence

COM1 = Employees have good skills in using information technology applications

COM2 = Enterprise has training programs, equipping employees to use process digitization applications

COM3 = Employees have a positive attitude towards new technology applications in their work

COM4 = Enterprise has employees specialized in the field of information technology

Corporate culture

CUL1 = Each individual in the business is willing to share knowledge and experience with colleagues

CUL2 = The spirit of learning is always appreciated

CUL3 = Each individual is active in the work

CUL4 = The stored information is a common property of the business

CUL5 = Your data is always verified before storing and sharing

CUL6 = The work coordination in the enterprise is very good

Technology infrastructure

TEC1 = Enterprise uses the website to give information and promote its images

TEC2 = Enterprise creates conditions for employees to use personal electronic devices to perform work

TEC3 = Enterprise uses internal interaction systems to reduce face-to-face communication (calling, meeting) such as email, OTT tools (Zalo, Viber, Facebook...), and electronic office software.

TEC4 = Enterprise uses iCloud (which is a computing model using computer technology developed based on the internet) for internal management

TEC5 = Enterprise has created a digital workspace in its working environment

Pressure on enterprise

PRE1 = Enterprise needs digital technologies to better communicate with customers

PRE2 = Enterprise needs optimization of business and management processes

PRE3 = Enterprise needs better alignment between departments

PRE4 = Enterprise needs the more efficient use of resources

PRE5 = Enterprise needs to increase transparency and efficiency in governance

PRE6 = Enterprise needs innovation in creating products/services for customers

Enterprise's digital transformation possibility

SUC1 = Enterprise is fully capable of digital transformation of all business and management processes

SUC2 = Enterprise can completely bring new values and experiences to customers on digital technology platforms

SUC3 = Enterprise is fully capable of successful digital transformation

SUC4 = Enterprise can achieve higher business efficiency after successful digital transformation