

Strategy, Culture, Human Resource, IT Capability, Digital Transformation and Firm Performance—Evidence from Vietnamese Enterprises



Nguyen Van Thuy

Abstract Digital transformation is the application of technology to all aspects of the business. If this process is effective, it will completely transform the business operation, then it will increase the business efficiency. The study measures the factors affecting digital transformation and the impact of digital transformation on innovation and firm performance. Using quantitative methods based on data of 180 Vietnamese enterprises with digital transformation, the results show that there are four factors that influence Digital Transformation: IT Capability, Digital Business Strategy, Human resource capability, Organizational Culture. Among these four factors, the research findings also confirm that digital transformation has a direct impact on innovation and firm performance. Based on these findings, some specific policy implications will be proposed in order to make firm performance more effective.

1 Introduction

Digital Transformation has gained great research interests in both academia and practice. There are many concepts of digital transformation. According to Hess [13], “*Digital transformation is concerned with the changes digital technologies can bring about in a company’s business model, which result in changed products or organizational structures or in the automation of processes. These changes can be observed in the rising demand for Internet-based media, which has led to changes of entire business models*”. Another concept of digital transformation from Gartner, digital transformation is the use of digital technologies to change business models, create new opportunities, revenue and value. According to Microsoft, digital transformation is a rethinking of how organizations gather people, data, and processes to create new values. *This research uses the concept of digital transformation in enterprises as the process of changing from the traditional model to digital businesses by*

N. V. Thuy (✉)
Banking Academy, Hanoi, Vietnam
e-mail: thuynv@hvn.edu.vn

© The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Switzerland AG 2021
S. Sriboonchitta et al. (eds.), *Behavioral Predictive Modeling in Economics*, Studies in Computational Intelligence 897,
https://doi.org/10.1007/978-3-030-49728-6_16

237

applying new technologies such as big data (Big Data), Internet of Things (IoT), Cloud computing ... change the way of management, leadership, work processes, corporate culture to create new opportunities and values. The wave of digital transformation has been promoting very strongly in organizations and business in many countries around the world. Successful digital transformation can bring organizations closer to customers and help create new values for business development by creating new business opportunities and new strategies (Berman) [3]. Digital transformation has helped businesses in improving production and profit growth. It not only supports business, but also promotes growth and it is a source of competitive advantage. Nowadays, digital transformation (DT) is an inevitable trend because of the rapid change in customers' demands due to the level of technological changes and market competition. This trend not only creates opportunities for countries and organization to move forward but also poses a risk of being left behind in the 4.0 industries. However, digital transformation in businesses is a difficult, complex process with low success rate. The fact that only 11% of surveyed enterprises succeed in DT (Forrester's 2016) has posed a big question of what makes some businesses digitize successfully and become prosperous while many other businesses are left behind in the digital transformation race for both researchers and business executive. For transition economy like Vietnam now a days, technology development is currently at an early stage. Vietnamese businesses have initially invested in technology to carry out digital transformation but the level of success is not high. At present, there have not been many specific studies on digital transformation, the impact of digital transformation on innovation and operational efficiency. This study is conducted in the context of Vietnamese businesses, in order to identify and evaluate the influence of factors affecting the successful digital transformation. At the same time, this research also assesses the impact of digital transformation on innovation and performance in businesses at firm level.

2 Model and Research Hypotheses

2.1 Critical Success Factors in Digital Transformation

Digitalization has fundamentally changed the business, human resource as well as social models. Therefore, digital transformation is inevitable. Businesses must cope with challenges and take advantage of opportunities with an appropriate strategy. Many factors influencing the success of digital transformation in businesses such as *strategy, human resource, culture, and Information Technology (IT) capability* have been pointed out by many previous studies. Kane [16] found out that it is the strategy, not technology, that leads the digital transformation process. Strategy plays an important role in the digital transformation process of enterprises. Strategy to lead a digital transformation process towards success as vision, scope, goals, roadmap of implementation. Some other studies have shown that *corporate culture* considerably affects

the success of digital transformation. According to the findings of Hartl and Hess [12], businesses with a high degree of openness (openness to new ideas, willingness to change, customer centered) will promote the willingness to accept, implement, change thinking, thereby helping businesses master the digital transformation process successfully. *Human resources* also have the impact on the success of the digital transformation process. According to Horlacher [14], the most important influencing factor in the personnel group is chief digital officer, who directs and manages the process of digital transformation. Then, factors affecting digital transformation in the company are ability, skills and resistance (Petrikina et al.) [21]. Additionally, Piccinini [22] showed the importance of attracting, recruiting, and keeping people with new talents and the ability to proficiently integrate digital technology with business know-how. Technology also plays an important role in digital transformation. Technology creates new business opportunities and new strategies. It not only supports business, but also promotes growth and is a source of competitive advantage. Technology in DT is *IT capability*. IT capability included IT Infrastructure capability, IT business spanning capability, and IT proactive stance. IT capability is the basic platform for digital transformation. The study of Nwankpa and Roumani [19] affirmed the impact of IT capability to the success of digital transformation in businesses. By overview, the main Critical Success Factors (CSFs) are *IT Capability*, *Digital Business Strategy*, *Human resource capability*, *Organizational Culture*. In the context of Vietnamese enterprises in the early stages of digital transformation. According to the report “*Readiness for the Future of Production Report 2018*” published by the World Economic Forum (WEF) in January 2018 [17], Vietnam is not in the group of countries ready for the future production. In particular, some indexes are weakly evaluated such as “*Technology and innovation index*” ranked 90/100; The index “*Human capital*” is ranked 70/100. Component indicators such as “*Firm-level technology absorption*”, “*Impact of ICTs on new services and products*”, “*Ability to Innovate*” ranked 78/100, 70/100 and 77/100. There will be many factors that affect successful digital transformation’firm in Vietnam that need to be tested. Therefore, it can be hypothesized:

H₁: IT capability of businesses has a positive relationship with digital transformation.

H₂: Corporate culture has a positive relationship with digital transformation.

H₃: Enterprise human resources have a positive relationship with digital transformation.

H₄: Enterprise strategy has a positive relationship with digital transformation.

2.2 The Relationship Between Digital Transformation and Innovation in Firms

According to Daft [10], *innovation* is the creation and discovery of new ideas, practices, processes, products or services. In the context of increasingly competitive

business, innovation is recognized as a key determinant for businesses to create sustainable values and competitive advantages (Wang and Wang) [25]. Innovation can be classified into two levels: improvements and new directions (Verganti) [24]. Díaz-Chao [11] shows that businesses which have implemented digital transformation can introduce new practices and innovation initiatives in their business operations. This relationship in the context of Vietnamese enterprises will be verified through the hypothesis:

H₅: Digital transformation has a positive effect on innovation in businesses

2.3 The Relationship Between Digital Transformation and Firm Performance

Firm performance is a general quality indicator that involves many different factors, and it reflects the level of input usage of the business. The firm performance is often expressed through characteristic indicators such as profit, growth and market value (Cho and Pucik) [9]. In other words, firm performance is a measure of how businesses can meet their goals and objectives compared to their competitors (Cao and Zhang) [8]. When digital transformation is successful at higher levels, businesses can achieve the goal of improvement in providing products and services to customers through the enhancement in the ability to customize products or services to each customer, thereby improving customer satisfaction and reducing selling costs. That equals increased business efficiency (Brynjolfsson and Hitt), (Nwankpa and Roumani) [6, 19]. Therefore, the hypothesis is:

H₆: Digital transformation has a positive effect on firm performance

2.4 The Relationship Between Innovation and Firm Performance

The impact of innovation on firm performance has been shown by many studies. Innovation improves firm performance, adds potential value and brings invisible resources to businesses (Wang and Wang) [25]. The more creative businesses are the more responsive to customer needs and can develop more possibilities that lead to better performance (Calantone) [7]. Therefore, the hypothesis is:

H₇: Innovation has a positive effect on firm performance

The research model is proposed in Fig. 1:

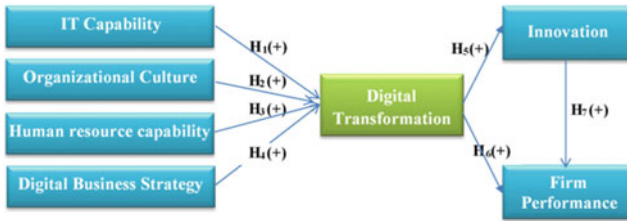


Fig. 1 Proposed research model

3 Data and Methodology

3.1 Data Measurement

In this study, these concepts including IT Capability, Digital Business Strategy, Human resource capability, Organizational Culture, Digital Transformation, Innovation, Firm Performance will be used as variables in research model. All the scales of these variables are inherited from previous studies and adapted to the context of Vietnam. 5-point Likert scale is used to evaluate these above variables, where 1 is completely disagree and 5 is completely agree. The scale of the variable *IT Capability (IT)* is inherited from the scales of Bharadwaj [5], Nwankpa and Roumani [19] which include 03 observed sub-variables. The scale of the variable *Digital Business Strategy (DS)* is inherited from the scales of Bharadwaj et al. [4] which include 04 sub-variables. The scale of the variable *Human resource capability (HR)* consists of 04 observed sub-variables is inherited from the findings of the study by Kane (2015) [16]. The scale of the variable *Organizational Culture (OC)* is inherited from the research findings of Hartl and Hess [12] which including 05 scales. The scale of the variable *Digital Transformation (DT)* consists of 03 observed variables inherited from the research findings of Aral and Weill (2007) [2]. The scale of the variable Innovation (IN) consists of 02 observed variables inherited from the research findings of (Hsu & Sabherwal, 2012) [15]. The scale of the variable *Firm Performance (FP)* variable is inherited from the research findings of Nwankpa and Roumani [19]. The measurement scale and references are shown in Table 1.

The survey questionnaire was designed based on the observed variables measured in the model. In addition, the survey also had other questions such as business size, business lines, . . .

Table 1 Measurements

Variable	Scale
IT Capability Bharadwaj (2000), Nivardipa and Rouman (2016)	Relative to other firms in your industry, please evaluate your firm's IT Capability in the following area on a scale of 1 - 5 (1 = poorer than most; 5 = superior to most).
	The enterprise always invests in the latest technology infrastructure (IT ₁)
	The enterprise always integrates business strategic planning and IT planning. (IT ₂)
	The enterprise constantly seek new ways to enhance the effectiveness of IT use (IT ₃)
Digital Business Strategy Bharadwaj, Omar A Pavlou, Paul A Venkatraman N, (2013)	Relative to other firms in your industry, please evaluate your firm's Digital Business Strategy in the following area on a scale of 1 - 5 (1 = poorer than most; 5 = superior to most).
	The enterprise clearly defined scope of digital business strategy (DS ₁)
	The enterprise clearly defined speed of digital business strategy (DS ₂)
	The enterprise clearly defined speed of decision making (DS ₃)
	The enterprise clearly defined sources of value creation and capture (DS ₄)
Human resource capability Oumundsen (2018)	Relative to other firms in your industry, please evaluate your firm's Human resource capability in the following area on a scale of 1 - 5 (1 = poorer than most; 5 = superior to most).
	The enterprise has a chief digital officer in digital transformation process (HR ₁)
	Employees' firm fully participate in the digital transformation process (HR ₂)
	The degree of employees interest in the digital transformation process (HR ₃)
	The enterprise has policies to attract people with new talent and the ability to integrate digital technology expertise with business know-how (HR ₄)
Organizational Culture Hess, Thomas (2017)	Relative to other firms in your industry, please evaluate your firm's culture in the following area on a scale of 1 - 5 (1 = poorer than most; 5 = superior to most).
	The enterprise has an openness towards change (OC ₁)
	All activities of the enterprise are customer-centered (OC ₂)
	The enterprise is constantly improving (OC ₃)
	The enterprise is always ready to adapt to change (OC ₄)
Digital Transformation Aral and Weill (2007)	Relative to other firms in your industry, please identify the degree to which your company uses digital technologies on a 1 to 5 scale (1 = strongly disagree, 5 = strongly agree)
	Our firm is driving new business processes built on technologies such as big data, analytics, cloud, mobile and social media platform (DT ₁)
	Our firm is integrating digital technologies such as social media, big data, analytics, cloud and mobile technologies to drive change (DT ₂)
	Our business operations is shifting toward making use of digital technologies such as big data, analytics, cloud, mobile and social media platform (DT ₃)
Innovation Hsu and Sabbherwal (2012)	Please identify the degree to you agree with the statement on a scale of 1 to 5 (1 = strongly disagree, 5 = strongly agree).
	Our firm develops and produces new products or services continually (IN ₁)
	Our firm gives priority to making efforts to increase the quality of products or services (IN ₂)
Firm Performance Nivardipa and Rouman (2016)	Relative to other direct competitors, indicate how well your firm performed during the last 5 years on a scale of 1 to 5 (1 = poorer than most; 5 = superior to most).
	Profitability is high (FP ₁)
	Customer retention rate is high (FP ₂)
	Return on Investment is high (FP ₃)
	Sales growth is high (FP ₄)

3.2 Data Collection

The sample of the survey are Vietnamese firms which have been implementing digital transformation from January 2019 to March 2019 by direct survey. The subjects of these firms' surveys are chief digital officers or project leaders of digital transformation. The sample results include are 180 valid forms included in the analysis. Sample characteristics are shown in Table 2.

3.3 Methodology

After having the data, SPSS 20 & AMOS 20 were used to test the hypothesized relationships in the research model as well as evaluate the reliability of measurement scale based on Cronbach Alpha reliability coefficients, EFA and CFA, SEM Bayesian.

Table 2 Sample characteristics

Classification		(%) Respondent
Industry	Retail Trade	11
	Information Technology	22
	Finance and Insurance	17
	Entertainment	15
	Manufacturing	11
	E-commerce	18
	Others	6
Firm's size (Number of employees)	Less than 100	38
	100-200	24
	200-500	12
	500-1000	5
	Above 1000	1
Digital Transformation maturity	Beginner	38
	Intermediate Level	42
	Advanced	15
	Expert	5

4 Results

4.1 Reliability of Measurement Scales

A reliability test of scales is performed with Cronbach's Alpha reliability coefficient and 02 scales— DS_4 and OC_5 are eliminated because their item-total correlations are less than 0.3. Removing these 2 scales to test the reliability of the remaining scales with the Cronbach's Alpha reliability coefficient, all observed variables are found to have item-total correlations greater than 0.3 and the Cronbach's Alpha reliability coefficient of all factors is greater than 0.6 so the scales of the components DS, OC, HR, IT, DT, IN, FP are all accepted and included in the next factor analysis. Detailed results assessing measurement scale by Cronbach Alpha reliability for the 2th time is shown in Table 3.

Table 3 Results assessing measurement scale by Cronbach Alpha reliability

ID	Variable	Number of observed variables	Cronbach's Alpha
1	IT Capability	3	0,860
2	Digital Business Strategy	3	0,870
3	Human resource capability	4	0,830
4	Organizational Culture	4	0,861
5	Digital Transformation	3	0,789
6	Innovation	2	0,693
7	Firm Performance	4	0,819

Table 4 KMO and Bartlett’s test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy:		0.787
Bartlett's Test of Sphericity	Approx. Chi-Square	2067.430
	df	276
	Sig.	0.000

Table 5 Total variance explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.554	24.149	24.149	5.554	24.149	24.149
2	2.698	11.732	35.882	2.698	11.732	35.882
3	2.269	9.865	45.746	2.269	9.865	45.746
4	2.062	8.967	54.713	2.062	8.967	54.713
5	1.800	7.828	62.541	1.800	7.828	62.541
6	1.324	5.755	68.296	1.324	5.755	68.296
7	1.079	4.692	72.987	1.079	4.692	72.987
8	.733	3.187	76.174			
9	.634	2.755	78.929			

4.2 Exploratory Factor Analysis

The exploratory factor analysis (EFA) is used to reassess the degree of convergence of observed variables by components. Research on the implementation of KMO test and Bartlett’s test in factor analysis shows that KMO coefficient = 0.787 > 0.5, Bartlett’s test value is significant (Sig.=0.000 < 0.05) indicates that an EFA factor analysis is appropriate (Table 4).

Indicators all have factor loadings “Factor loading” > 0.5. At Eigenvalues greater than 1 and with factor extraction used as Principal Axis Factoring (PAF) with Varimax orthogonal rotation, factor analysis extracted 7 factors from 24 observed variables and with the extracted variance at 72% (greater than 50%), which is satisfactory (Tables 5 and 6).

4.3 Confirmatory Factor Analysis (CFA) and Structural Equation Model (SEM)

Confirmatory Factor Analysis (CFA): Based on the result of EFA: 4 factors (14 observed variables) affecting successful Digital Transformation (3 observed variables), Digital Transformation impacts on Firm Performance (4 observed variables), Digital Transformation impacts on Innovation (2 observed variables), Innovation impacts on Firm Performance, study Confirmatory factor analysis (CFA) the first time by AMOS 20 software. Result of the CFA has all observed variables’s weight are allowed standard (≥ 0.5) so that scale achieves convergence value (Anderson and Gerbing)[1]. The Result of CFA is shown in the following Fig. 2 and Table 7:

Table 6 Result of explore factor analysis EFA

	Component						
	1	2	3	4	5	6	7
OC2	.871						
OC3	.845						
OC4	.799						
OC1	.739						
HR4		.841					
HR1		.841					
HR3		.785					
HR2		.714					
FP1			.853				
FP2			.808				
FP4			.804				
FP3			.689				
DS3				.894			
DS1				.892			
DS2				.799			
IT3					.892		
IT1					.878		
IT2					.845		
DT2						.777	
DT1						.770	
DT3						.710	
IN1							.839
IN2							.814

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.
 a. Rotation converged in 6 iterations.

SEM Structural Equation Model: SEM analysis was performed on AMOS 20 software of which the results are shown in Fig. 3.

The SEM results (Fig. 2) show that the weights of the observed variables all reached the standard level allowed (≥ 0.5) and statistically significant with the p-values all equal to 0.000. Thus, it is possible to conclude that the observed variables used to measure the component variables of the scale achieved convergent validity. SEM shows that the model has 223 degrees of freedom, chi-squared test statistic = 274.933 with p-value = 0,000 < 0.05; Chi-square/df = 1.233 which satisfies the <3 requirement and indicators show that the model is compatible with market data (CFI=0.971; TLI=0.967; GFI=0.885 and RMSEA = 0.036 < 0.08). The components of the variables DS, OC, HR, IT, DT, IN, FP have no correlation between the errors of the observed variables, so they all achieve the unidirectional property. In addition, the study examined the discriminant value of concepts in the model. The results show that the concepts in the model achieve discriminant validity.

4.4 Hypothesis Testing

In order to test the hypotheses of the research model, the research conducted tests by using Bayesian SEM. In Bayesian SEM, all estimated coefficients are reported in terms of posterior distribution. Parameters significance testing can be conducted by using 95% confidence interval which is the lower limit percentiles of 2.5% and the upper limit percentiles of 97.5% of the posterior distribution (Ntzoufras) [18]. The significance of a parameter depends on whether or not a zero value lies in a confidence interval (Sari, Wardhani and Astutik) [23]. If a confidence interval does not contain a zero value, the parameter is significant. Otherwise, if the zero value is included

Fig. 2 CFA Model

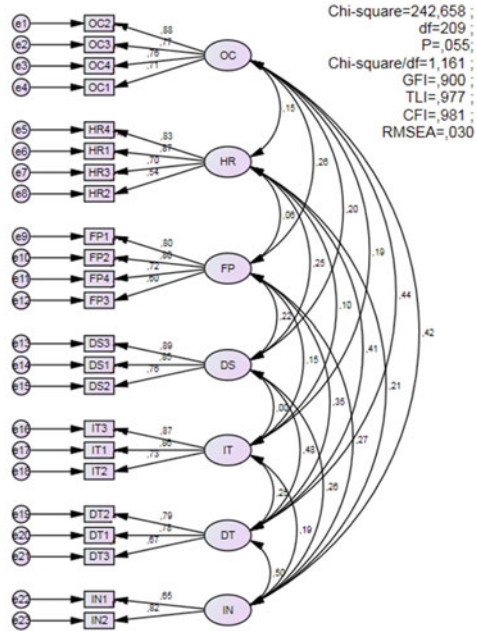


Table 7 Synthetic reliability and extracted variance

	Factor	Estimate	S.E.	C.R.	P
OC	Organizational Culture	0.649	0.092	7.047	***
HR	Human resource capability	0.716	0.112	6.398	***
FP	Firm Performance	0.519	0.088	5.878	***
DS	Digital Business Strategy	1.06	0.147	7.209	***
IT	IT Capability	0.707	0.105	6.741	***
DT	Digital Transformation	0.442	0.077	5.757	***
IN	Innovation	0.405	0.119	3.398	***

in the confidence interval, the parameter is not significant or has no effects on the dependent variable. The parameter significance testing can be carried out on both the measurement model and the structural model. In the measurement model, a significant indicator means it is acceptable to measure the corresponding latent construct. In the structural model, the parameter significance testing can determine whether there is significant influence between the latent constructs. The regression weights and the associated 95% confidence intervals between the measurement indicators and corresponding latent constructs and between the latent constructs are shown in Tables 8 and 9, respectively. From the results presented in Table 9, the factor loadings are all significant at the 5% level. While, from the results of the structural model as shown in Table 9, it is known that of the seven parameters tested, six parameters were recognized as significant. It can be concluded that hypotheses 1, 2, 3, 4, 5 and 6 were supported, while hypothesis 7 was not supported. Hypothesis 7, stating that Innovation has a significant effect on Firm Performance, is not supported

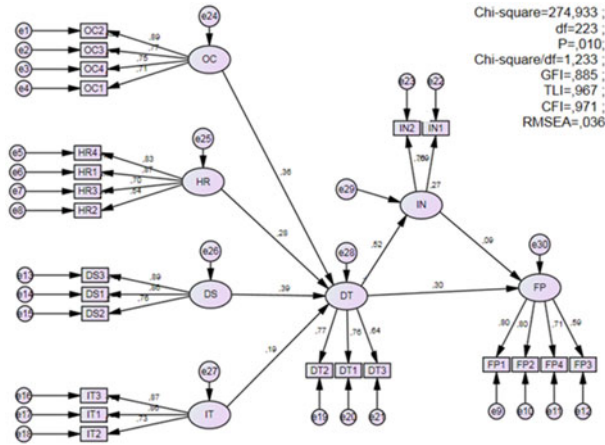


Fig. 3 Analysis results structural equation model

by the regression weight of IN on FP with a confidence interval from -0.114 to 0.365 . For Hypothesis 1, which addressed that IT Capability has a significant effect on Digital Transformation, the confidence interval for the regression parameter is from 0.043 to 0.265 , significantly larger than zero. Hypothesis 2, which asserted that Organizational Culture has a significant effect on Digital Transformation, has a confidence interval between 0.144 and 0.383 , a parameter significantly greater than zero. Support was found for Hypothesis 3, stating that Human resource capability can significantly affect Digital Transformation, with the confidence interval range from 0.098 to 0.363 . Hypothesis 4, which asserted that Digital Business Strategy has a significant effect on Digital Transformation, has a confidence interval between 0.143 and 0.337 , a parameter significantly greater than zero. Support was found for Hypothesis 5, stating that Digital Transformation can significantly affect Innovation, with the confidence interval range from 0.355 to 0.748 . Finally, Hypothesis 6 was supported, which said that Digital Transformation has a significant effect on Firm Performance, with a confidence interval between 0.09 and 0.572 . So, these six hypotheses are supported. The final research model is shown in Fig. 4 and the standardized weights SEM are shown in Table 10.

Table 8 Bayesian SEM measurement model results

Path	Mean	S.D.	95% Lower bound	95% Upper bound
OC3<-OC	0.835	0.078	0.686	1
OC4<-OC	0.891	0.091	0.723	1.068
OC1<-OC	0.772	0.073	0.623	0.909
HR1<-HR	1.056	0.093	0.894	1.256
HR3<-HR	0.81	0.097	0.651	1.085
HR2<-HR	0.553	0.091	0.388	0.76
FP2<-FP	0.981	0.099	0.801	1.175
FP4<-FP	0.833	0.089	0.67	1.014
FP3<-FP	0.668	0.09	0.488	0.847
DS1<-DS	0.904	0.069	0.779	1.048
DS2<-DS	0.669	0.06	0.551	0.78
IT1<-IT	1.032	0.094	0.877	1.245
IT2<-IT	0.795	0.085	0.645	0.988
DT1<-DT	1.051	0.093	0.887	1.246
DT3<-DT	0.733	0.078	0.596	0.899
IN2<-IN	1.039	0.161	0.741	1.354

Table 9 Bayesian SEM results hypotheses testing

Path	Mean	S.D.	95% Lower bound	95% Upper bound
DT<-HR	0.216	0.063	0.098	0.363
DT<-DS	0.229	0.048	0.143	0.337
DT<-IT	0.153	0.058	0.043	0.265
DT<-OC	0.268	0.061	0.144	0.383
IN<-DT	0.542	0.1	0.355	0.748
FP<-DT	0.328	0.128	0.09	0.572
FP<-IN	0.124	0.122	-0.114	0.365

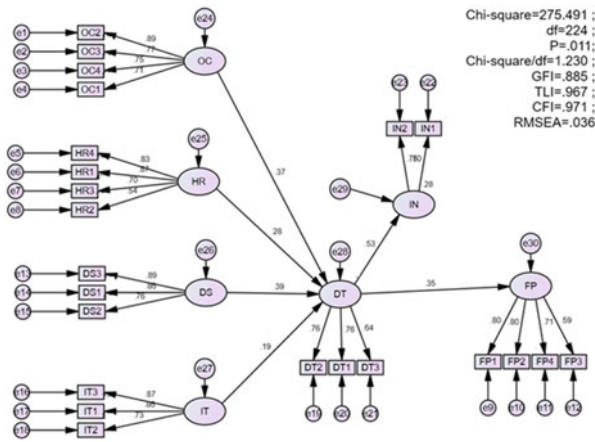


Fig. 4 The final research model

Table 10 The standardized weights SEM

Path	Estimate
DS → DT	0.387
OC → DT	0.366
HR → DT	0.280
IT → DT	0.188
DT → FP	0.351
DT → IN	0.528

5 Discussion

This study explores the factors affecting successful digital transformation and tested the relationship between digital transformation, and innovation and business efficiency. IT Capability, Digital Business Strategy, Human resource capability, Organizational Culture all positively affect Digital Transformation. Digital Transformation positively affect Innovation and Firm Performance. Innovation also positively affects Firm Performance. This result is consistent with published studies (Osmundsen, Nwankpa and Roumani, Kane and Díaz-Chao) [11, 16, 19, 20].

Research results show that the 04 factors including *Digital Business Strategy*, *Organizational Culture*, *Human resource capability*, *IT Capability* affect *Digital Transformation* in descending levels of impact. Among four factors, *Digital Business Strategy* has the greatest positive impact on Digital Transformation at coefficient of 0.387 (Table 10). *Organizational Culture* has the second greatest positive impact on Digital Transformation at 0.366 standard units (Table 10). This result is consistent with the research findings of Kane, Hartl and Hess [12, 16]. For businesses, if strategy is like the “Seed” then culture can be considered the “Land”. If the “Land” is not favorable, no matter how hard one tries, the “Seed” cannot germinate and grow, and vice versa. In Digital Transformation, if these two factors are not combined well in businesses will lead to disorientation and the digital transformation process of businesses will inevitably fail.

Human resource capability is the third factor affecting digital transformation at coefficient of 0.280. And an interesting result is that *IT Capability* is the factor least affecting digital transformation at coefficient of 0.188 (Table 10). These results are consistent with the research findings of Horlacher, Petrikina et al. Piccinini, Nwankpa and Roumani and Kane [14, 16, 19, 22]. Everything is based on technology foundation. No matter what product or service is created, technology should be applied. The beginning of the technology era with new rules has reset the definitions of demand and market for all industries. In the digital business model, technology creates new opportunities and brings value to the business vision for each business segment. Technology creates a competitive advantage through which business practice and management will have a clearer view of the market and the current capabilities of the company. However, digital transformation must be executed in not only the employees’ mindsets but also, in the way they approach and solve problems daily and hourly. At a business whose employees do not have digital thinking, and culture does not foster innovation, modern technology cannot create sustainability and development for the business.

The research findings also show that successful Digital Transformation has a significant impact on Innovation at coefficient of 0.528 (Table 10). This result is consistent with the research findings of Díaz-Chao [11], Nwankpa and Roumani [19]. Successful digital transformation helps businesses promote innovation and creation of products and services. Digitizing businesses helps business leaders analyze and measure markets and customers, and compete better. Based on the information, businesses can create better products and services than the current ones. The research

findings show that successful Digital Transformation has an immense impact on Firm Performance at coefficient of 0.351. This result is consistent with the research findings of Nwankpa and Roumani [19], Brynjolfsson and Hitt [6]. Digital transformation helps businesses achieve many encouraging results such as: Cost reduction; Customer strategy improvement; Operating system consolidation; Better analysis; More focus on potential customers; New products/services; Accurate market segmentation; Global customer experience; Increase in agility and innovation. These research findings are empirical evidences demonstrating the benefits of digital transformation on firm performance.

6 Conclusions

These research findings are empirical evidence showing the strong impact of many factors on digital transformation success in businesses including *Digital Business Strategy, Organizational Culture, Human resource capability, IT Capability*. Among all factors, strategic and cultural factors have greater impacts than technology capability. The study also measured the effect of digital transformation on corporate performance and innovation and the effect of innovation on firm performance.

Based on the research results, some solutions should be recommend to help Vietnamese enterprises convert successfully to contribute to promoting innovation and improving operational efficiency as follows:

Firstly, Vietnamese enterprises need to be well aware and appreciate the role of digital transformation in the current industrial revolution 4.0. Shifting numbers is not only an indispensable trend, in today's digital era, which is an opportunity for businesses to surpass the industrial revolution 4.0, but also a risk of being left behind and being left further away for those are not related to it . Digital transformation is not simply a higher level of application and development of information and communication technology (ICT), but a strategy for digital data and technology to transform of model, process, product as well as output of production and business processes in the enterprise.

Secondly, strategy is a key factor determining the success of the digital transformation process of the business. Traditional strategy is no longer appropriate. Instead, an effective digital technology strategy creates initial experiences and integrates those experiences into the strategic process. In addition, high-ranking leaders of enterprises need to change their thinking about the digital transformation of enterprises, and also orient digital strategy thinking to create new opportunities, new business strategies to promote growth and creation that, in turn, create competitive advantage for businesses.

Thirdly, digital transformation is not only an activity to optimize workflows, increase productivity, generate profits but also be the cultural foundation of a business. And that culture must be built and practiced within a long and persistent strategy. In Vietnam, the coordination between strategy and culture in general and in digital transformation in particular has many difficult problems. In digital transformation,

businesses need to build an effective cultural strategy according to these steps: (1) The enterprises should identify the “Objectives—Vision—Core values” of the business in digital transformation and put them into practice. The strategy is built with clear scope and objectives, supported by leaders—visionaries, who always promote and build a variable and innovative corporate culture; (2) They should recruit employees who are capable of complementing each other. Upon corporate culture established to promote innovation, risk tolerance, businesses need to focus on recruiting, attracting and retaining talents with the deepest commitment to digital progress (deeply committed to digital progress); (3) they should use tools to measure and evaluate results. When the strategy is established, the business needs to review how the established goals are performed to evaluate the results and effectiveness. Digital transformation is not only an activity to optimize workflows, increase productivity, create profits but above all, it must be the cultural foundation of a business. And that culture must be built and practiced within a long and persistent strategy.

Fourthly, in order to transform successful, it is also necessary to implemented supporting policies from the government to have a synchronous, connected and efficient digital transformation. These solutions on transforming the digital economy, developing digital infrastructure, developing a digital work force, building a legal environment will ensure safety and reliability for enterprises to carry out digital conversion.

Despite the extreme effort in doing research, it still has many obvious limitations. The biggest and most obvious limitation is that the sample size is quite small due to the small number of businesses involved in digital transformation and surveyed. In the future, when the number of businesses implementing digital transformation successfully increases, the next research will focus on developing in the direction of: (1) Research on different types of businesses. (2) Additional research on factors affecting digital transformation in businesses.

Acknowledgments This work was supported by the CDOs of Vietnamese enterprises. We also acknowledge the partial support of the Vietnam Association of Small and Medium Enterprises during the survey.

References

1. Anderson, J.C., Gerbing, D.W.: Structural equation modeling in practice: a review and recommended two-step approach. *Psychol. Bull.* **103**, 411 (1988)
2. Aral, S., Weill, P.: IT assets, organizational capabilities, and firm performance: how resource allocations and organizational differences explain performance variation. *Organ. Sci.* **18**, 763–780 (2007)
3. Berman, S.J.: Digital transformation: opportunities to create new business models. *Strategy Leadersh.* **40**, 16–24 (2012)
4. Bharadwaj, A., El Sawy, O.A., Pavlou, P.A., Venkatraman, N.: Digital business strategy: toward a next generation of insights. *Manage. Inf. Syst. Q.* **37**, 471–482 (2013)
5. Bharadwaj, A.S.: A resource-based perspective on information technology capability and firm performance: an empirical investigation. *Manage. Inf. Syst. Q.* **24**, 169–196 (2000)

6. Brynjolfsson, E., Hitt, L.M.: Beyond computation: information technology, organizational transformation and business performance. *J. Econ. Perspect.* **14**, 23–48 (2000)
7. Calantone, R.J., Cavusgil, S.T., Zhao, Y.: Learning orientation, firm innovation capability, and firm performance. *Ind. Mark. Manage.* **31**, 515–524 (2002)
8. Cao, M., Zhang, Q.: Supply chain collaboration: impact on collaborative advantage and firm performance. *J. Oper. Manage.* **29**, 163–180 (2011)
9. Cho, H.J., Pucik, V.: Relationship between innovativeness, quality, growth, profitability, and market value. *Strateg. Manage. J.* **26**, 555–575 (2005)
10. Daft, R.L.: A dual-core model of organizational innovation. *Acad. Manage. J.* **21**, 193–210 (1978)
11. Díaz-Chao, Á., Sainz-González, J., Torrent-Sellens, J.: ICT, innovation, and firm productivity: new evidence from small local firms. *J. Bus. Res.* **68**, 1439–1444 (2015)
12. Hartl, E., Hess, T.: The role of cultural values for digital transformation: insights from a Delphi Study (2017)
13. Hess, T., Matt, C., Benlian, A., Wiesböck, F.: Options for formulating a digital transformation strategy. *Manage. Inf. Syst. Q. Executive* **15**, 123–129 (2016)
14. Horlacher, A., Klarner, P., Hess, T., Thomas, T.: Crossing boundaries: Organization design parameters surrounding CDOs and their digital transformation activities (2016)
15. Hsu, I.C., Sabherwal, R.: Relationship between intellectual capital and knowledge management: an empirical investigation. *Decis. Sci.* **43**, 489–524 (2012)
16. Kane, G.C., Palmer, D., Phillips, A.N., Kiron, D., Buckley, N.: Strategy, not technology, drives digital transformation. *MIT Sloan Manage. Rev.* **14**, 1–25 (2015). Deloitte University Press
17. Martin, C., Samans, R., Leurent, H., Betti, F., Drzeniek-Hanouz, M., Geiger, T.: Readiness for the Future of Production Report 2018, World Economic Forum (2018)
18. Ntzoufras, I.: *Bayesian Modeling Using WinBUGS*. Wiley, Hoboken (2011)
19. Nwankpa, J.K., Roumani, Y.: A firm performance perspective, Yaman, IT capability and digital transformation (2016)
20. Osmundsen, K., Iden, J., Bygstad, B.: Digital Transformation: Drivers, Success Factors and Implications, In: *Mediterranean Conference on Information Systems (MCIS)*, vol. 37 (2018)
21. Petrikina, J., Krieger, M., Schirmer, I., Stoeckler, N., Saxe, S., Baldauf, U.: Improving the readiness for change-Addressing information concerns of internal stakeholders in the smartPORT Hamburg (2017)
22. Piccinini, E., Hanelt, A., Gregory, R., Kolbe, L.: Transforming industrial business: the impact of digital transformation on automotive organizations (2015)
23. Sari, D.K., Wardhani, N.W.S., Astutik, S.: Parameter estimation of structural equation modeling using bayesian approach. *CAUCHY* **4**, 86–94 (2016)
24. Verganti, R.: The innovative power of criticism. *Harvard Bus. Rev.* **94**, 18 (2016)
25. Wang, Z., Wang, N.: Knowledge sharing, innovation and firm performance. *Expert Syst. Appl.* **39**, 8899–8908 (2012)