



**FACTOR ANALYSIS METHODOLOGY DISCOVERED
THE FACTORS AFFECTING THE DIGITAL CONVERTER PROCESS OF SMALL
AND MEDIUM ENTERPRISE IN HAI DUONG PROVINCE**

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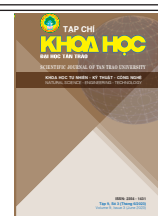
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Keywords:

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Abstract:

Digital transformation is inevitably for businesses to improve their productivity and operational efficiency, but for digital transformation. Success requires many factors. Using exploratory factor analysis techniques, the study identified 6 factors affecting the digital transformation ability of enterprises, including: staff capacity, technology platform, pressure of enterprises, leadership, digital business strategy and corporate culture. Through exploratory factor analysis and multiple regression analysis with a survey sample of small and medium-sized enterprises in Hai Duong province, the study shows that the two factors that have the strongest impact on digital transformation are human capacity members and technology platforms. In addition, there is no difference in digital transformation ability between enterprises of different sizes, business fields and ownership types.



PHƯƠNG PHÁP PHÂN TÍCH NHÂN TỐ KHÁM PHÁ XÁC ĐỊNH CÁC NHÂN TỐ ẢNH HƯỞNG ĐẾN QUÁ TRÌNH CHUYỂN ĐỔI SỐ CỦA CÁC DOANH NGHIỆP NHỎ VÀ VỪA TRÊN ĐỊA BÀN TỈNH HẢI DƯƠNG

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Thông tin bài viết	Tóm tắt
<p>Ngày nhận bài: 25/12/2022</p> <p>Ngày sửa bài: 18/03/2023</p> <p>Ngày duyệt đăng: 16/5/2023</p> <p>Từ khóa:</p> <p><i>Chuyển đổi số, doanh nghiệp nhỏ và vừa, các nhân tố ảnh hưởng đến chuyển đổi số.</i></p>	<p>Doanh nghiệp nhỏ và vừa (DNNVV) có vị trí đặc biệt quan trọng trong nền kinh tế. Muốn vượt qua khó khăn hiện tại DNNVV cần có bước đi chắc chắn để phát triển nhanh và bền vững. Chuyển đổi số là tất yếu đối với doanh nghiệp để nâng cao năng suất, hiệu quả điều hành của mình, nhưng để chuyển đổi số thành công thì cần rất nhiều yếu tố. Bằng kỹ thuật phân tích nhân tố khám phá, nghiên cứu xác định 6 nhân tố ảnh hưởng đến khả năng chuyển đổi số của các doanh nghiệp gồm: năng lực nhân viên, nền tảng công nghệ, áp lực của doanh nghiệp, lãnh đạo, chiến lược kinh doanh số và văn hóa doanh nghiệp. Thông qua phương pháp phân tích nhân tố khám phá và phân tích hồi quy bội với mẫu khảo sát các doanh nghiệp nhỏ và vừa tỉnh Hải Dương, nghiên cứu cho thấy 2 nhân tố có tác động mạnh nhất đến chuyển đổi số là năng lực nhân viên và nền tảng công nghệ. Ngoài ra, không có sự khác nhau về khả năng chuyển đổi số giữa các doanh nghiệp có quy mô, lĩnh vực kinh doanh và loại hình sở hữu khác nhau.</p>

1. Introduction

Digital transformation (digital transformation) is a matter of great concern in the practice of governments, businesses and also in scientific research. Digital transformation is a series of activities, a complete process of applying digitization and applying digitization but at a higher level to create a new way of working. According to this understanding, digital transformation goes through three levels: digitization, digital application - digital operations and digital transformation. In theory, a number of studies focus on the digital transformation strategy of enterprises such

as Matt et al. (2015), Zinder & Yunatova (2016), Hess et al (2016). Other studies focus on understanding the factors affecting the digital transformation process such as those of Gamache et al [9], Eller et al [6]

According to the report of Hai Duong Department of Planning and Investment as of December 31, 2021, the province has 4,797 enterprises operating under the Enterprise Law that have been granted business registration certificates with a total registered capital of 31,158 billion 784 million VND (including: 1,094 private enterprises, registered investment capital is

1,753 billion 692 million VND; 2,193 limited liability companies, charter capital is 8,092 billion 390 million VND and 1,410 joint stock companies, charter capital amount rate is 21,312 billion 702 million dong), on average each enterprise has a registered capital of 6 billion 495 million dong/1 enterprise. Of these, over 98% are small and medium enterprises. After two stressful years by the Covid-19 pandemic, most of the small and medium-sized businesses fell into a difficult situation, many of which stopped exporting or went bankrupt. Businesses hardly know where to start, their awareness and ability to access digital technology are still limited, and they lack the courage to invest in information technology infrastructure. Therefore, it is necessary to study the internal factors affecting the digital transformation ability of businesses, from which to prepare orientations for businesses and propose appropriate support from the government. The article has reviewed digital transformation, identified the factors affecting the digital transformation ability of businesses, thereby proposing support recommendations from local authorities, efforts from businesses. in order to increase the probability of success in digital transformation of enterprises in Vietnam in general and Hai Duong in particular.

2. Overview of digital transformation and factors affecting the digital transformation ability of enterprises

a. The concept of digital transformation and the ability of businesses to digitally transform

Digital transformation has been studied for many years, but up to now, there is still no unified concept. At each stage associated with a different perspective, the authors give different concepts. From a business perspective, the authors share the view that digital transformation is the application of new technology to optimize resources and operational processes and better satisfy customer needs. According to Stolterman & Fors [12], digital transformation is the use of technology to radically improve the performance or reach of an enterprise. McDonald & Rowsell [19] argues that digital transformation is not only about digitizing

resources, but also creating business values on the basis of digital assets. In this same view, Fitzgerald et al. [18] define digital transformation in business as the use of new digital technologies such as social media, new analytical techniques, or automated linking system to make big changes in business operations such as improving customer experience, optimizing operations and creating new business models. Hess et al. [10] argue that digital transformation is the changes that digital technology can bring in the business model, leading to changes in products or organizational structure or automation of processes. enterprise program. Thus, digital transformation in enterprises is not simply a matter of digitizing data, operational processes or information about the organization, but more importantly, applying technology to analyze data. has been digitized to thereby change the way to create value for businesses.

Enterprise's digital transformation capability is the ability to apply new digital technologies in organization, operation and management, and at the same time create valuable assets from digital technology application to help businesses optimize resources, better meet market demand and create added value for businesses.

b. Business digital transformation

For Hinchcliffe [11], the digital transformation of enterprises consists of three issues. The first is to transform the operating process. Building and using an electronic data exchange system will help businesses save time and be more efficient. The second is transforming the operating model, that is, changing the way it operates to create value for the business. Finally, change the customer experience, which is the result of customer-business interactions that customers experience and perceive.

According to Li et al. [15], digital transformation of enterprises goes through 3 stages. Phase 1 is strategic direction. In this phase, businesses need to take advantage of technology solutions, improve customer experience to achieve goals. Enterprises often use available or accessible resources at a reasonable cost and in accordance with the enterprise's ability to

deploy. Phase 2 is the digital transformation of business models. At this stage, businesses focus on applying digital technology on a large scale, with the connection between functions. This stage often focuses on changing the governance model to bring about optimal efficiency in running the business. Phase 3 is the digital transformation of management capacity. This is a period of complete digital transformation, focusing on connecting and synchronously integrating business systems and corporate governance. Information will be shared across departments and in real time. Digital transformation of management capacity will help businesses manage and perform activities more economically and with outstanding efficiency.

c. Factors affecting the ability of enterprises to digital transformation

Lanzolla & Anderson [14] emphasize the application of digital technologies as a driver of digital transformation. Digital technologies may include big data, mobile, cloud computing or search-based applications (White, [27]). Another point of view, Chatterjee et al [2] argues that for digital transformation to be successful, leaders must believe in the value and benefits of new technologies and support their implementation in their operations. organization. Also from this point of view, Hess et al. [10] emphasized the role of the human factor in promoting transformation processes, there should be a match between human capacity and digital technology applications.

Swen & Nadkarni [25] synthesized from previous studies and showed that the internal factors affecting the digital transformation ability of enterprises are divided into 3 groups: 33% focus on technology, 34% focus on organization organization and 33% focus on both technology and organization. In organizational-focused studies, the four factors that are mentioned a lot and directly affect the expected results of enterprises' digital transformation are: (1) leadership, (2) digital business strategy, (3) staff capacity and (4) corporate culture. For technology-focused research, the use of technology platforms for business activities such as systematically storing data, interacting with customers, communicating and communicating internally. departments and other activities affecting the digital transformation of enterprises. In this article call it (5) technology platform.

Leadership: The change in leaders' thinking and actions greatly affects the digital transformation ability of enterprises. Those changes include: rapid optimization of leadership decision-making through instant access to information and open data (Mazzei & Noble) [18] and changes in learning and leadership development (Sia et al.) [21] Furthermore, leaders need a digital mindset to lead the digital transformation journey.

Digital business strategy: Bharadwaj (2000) believes that information technology plays an important role in business activities. It not only supports governance, but develops into an essential element in building corporate strategy. The development and implementation of a business strategy to achieve long-term goals on a digital technology platform is called a digital business strategy.

Employee capacity: For employees and management levels, there needs to be a process to perform operations with speed, accuracy and efficiency in digital transformation. Therefore, employees must be capable, ready to access, develop and use new technologies in improving and performing work. Furthermore, depending on business conditions, employees as well as managers must develop the ability to perceive and be flexible in exploiting networks and interconnectivity in a digital environment (Daniel & Wilson, [...] 4).

Corporate culture: Digital transformation requires a corporate culture that is always verifying and sharing

data (Dremel et al., [5]). This will require a high degree of transparency in workflow and business as well as data thinking among employees. In addition, digital transformation can cause cultural conflicts between young employees who are digitally savvy but inexperienced and older employees who have a long track record of success in traditional businesses but lag behind in terms of technology. technology (Kohli & Johnson, 2011).

Technology platform: Digital transformation will change job structure (Loebbecke & Picot, [16]), job roles and requirements in the workplace (White, [27]). Digital interoperability allows cross-site groups to appear across the entire enterprise. In this context, the traditional hierarchical work structure gradually disappears and new opportunities emerge beyond the enterprise (Loebbecke & Picot, [16]). According to White [27], a digital workplace must be relevant,

principled, imaginative and location-independent. Thus, how businesses have a background in applying technology in their current operations will greatly affect their ability to successfully transform digitally in the future.

3. Research Methods

a. Qualitative research

The research has systematically clarified the concept, process and factors affecting the digital transformation ability of enterprises. Then, collect documents to find data related to factors affecting digital transformation. The study is arranged by group of factors, in which there is a group of independent variables belonging to the internal environment of the enterprise affecting the ability to switch arguments and a group of control variables belonging to the characteristics of the enterprise. Besides, the study learns about some business information, combined with expert survey and group discussion to come up with a proposed research model (Figure 1) and build a scale for the model's variables.

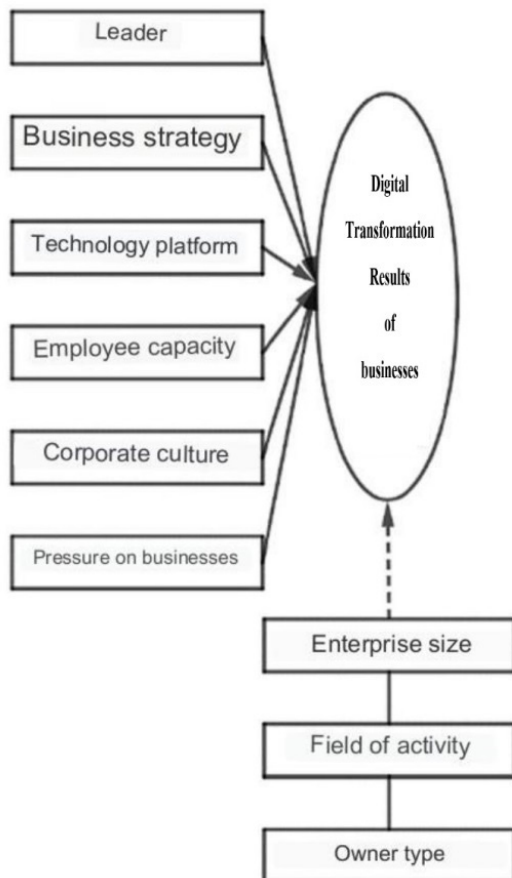


Figure 1. Proposed research model

On the basis of a system of documents on previous domestic and foreign studies, the research has identified five internal factors affecting the digital transformation of enterprises: Leadership, digital business strategy, staff capacity, corporate culture and technology background. In addition, during the group discussion, experts and business managers all said that the pressures facing businesses are forcing businesses to improve the way they operate and towards changing business models. Managers also share that the digital platform makes internal and external interactions much more convenient and effective. In addition, the digitization of information systems in management and customers along with modern analytical techniques help the proposed solutions to be more clearly grounded and more effective in implementation. Therefore, the study adds factor (6) pressure on enterprises.

On the basis of previous studies (Putthipat et al., 2021; Stoianova et al. [20]), Project 170 of the Ministry of Information and Communications in 2021, combining discussion and consultation with experts and experts In business management, research has built and adjusted the scales, the results of the scale of 6 factors affecting the digital transformation ability of enterprises are presented in Table 1. Group discussion was conducted with 5 people, in which: 1 expert in the field of digital transformation consulting services, 2 managers working in businesses that have successfully converted, 2 leaders who are oriented towards digital transformation in their businesses. Based on the discussion results, the research team built a scale of digital transformation capabilities and a scale of factors affecting the digital transformation ability of enterprises. To obtain diverse opinions in enterprises of different industries and sizes, the scale was sent to 27 managers of 27 enterprises in the fields of industry, agriculture, commerce and services. different scale to survey and get opinions. Then calibrate to give the recommended scale.

Table 1. Scale of factors affecting the digital transformation ability of enterprises

STT	Code	Factor/Scale	Study overview
(1)	LD	Leader	
1	LD1	Business leaders are very interested in digital transformation	Putthipat & associates (2021)
2	LD2	Leaders have a positive attitude towards business digital transformation Karma	Stoianova & Associates (2020)
3	LD3	Leaders use new technology applications in interact	Qualitative research
4	LD4	Leaders are very supportive of technology application proposals to Digitization of business and management processes	Qualitative research
(2)	CLKDS	Digital business strategy	
1	CL1	The goal of digital transformation is mentioned in the business strategy of the enterprise	Ministry of Information and Communications (2021); Chu Ba Quyet (2021); Stoianova & associates (2020);
2	CL2	Enterprises determine the establishment of an electronic office in the plan corporate strategic planning	Ministry of Information and Communication pine (2021)
3	CL3	Does the enterprise deploy the database system?	Ministry of Information and Communication pine (2021)
4	CL4	Corporate strategy towards model change activity picture	Putthipat & associates (2021)
(3)	NLNV	Employee capacity	
1	NL1	Employees make good use of information technology applications	Qualitative research
2	NL2	Does the company provide training for employees to use applications? use digitization	Ministry of Information and Communication pine (2021)
3	NL3	Employees have a positive attitude towards public applications new technology	Putthipat & associates (2021)
4	NL4	Employees in the enterprise are given autonomy	Qualitative research
(4)	VHDN	Corporate culture	
1	VH1	Each individual in the enterprise is willing to share knowledge and experience with each other	Putthipat et al (2021); Stoianova & plus the (2020)
2	VH2	The spirit of mutual learning is always appreciated	Qualitative research
3	VH3	Each individual is always proactive at work	Qualitative research
4	VH4	Stored information is a common property of the business	Qualitative research
(5)	NTCN	Technology platform	
1	CN1	Businesses are using the website to provide information	Ministry of Information and Communication pine (2021)
2	CN2	Enterprises create conditions for employees to use devices Personal electronics for work	Qualitative research
3	CN3	The business is using an internal interaction system to reduce direct assignment	Ministry of Information and Communication pine (2021)
(6)	AL	Pressure on businesses	
1	AL1	Businesses need to use digital technology applications to better interact with customers	Putthipat & associates (2021)

2	AL2	Enterprises need to optimize business processes and manage	Qualitative research
3	AL3	Businesses need better alignment between departments	Qualitative research
4	AL4	Businesses need to use resources more efficiently	Putthipat & associates (2021)
(7)	KNCD5	Enterprise's ability to transform digitally	
1	CDS1	Enterprises are fully capable of digitizing all business process and management	Putthipat & associates (2021)
2	CDS2	Enterprises can completely bring new values and experiences to customers on technology platforms number	Putthipat & associates (2021)
3	CDS3	Enterprises can completely optimize in segmentation distribution and use of resources on a digital technology platform	Qualitative research
4	CDS4	Enterprises are fully capable of technical transformation success number	Qualitative research
5	CDS5	Businesses can achieve higher business efficiency after converting the number	Putthipat & associates (2021)

Source: Author's compilation.

b. Quantitative research

In multiple regression analysis, the minimum sample size is $50+8*m$ (m is the number of independent variables) (Tabachnick & Fidell, 1996), this study has 6 independent variables so the minimum sample size is 98. To ensure reliability and perform analytical techniques, the study surveyed 150 enterprises. Combination of sending surveys through google form and directly to collect.

In order to facilitate the survey, save time and costs, the study chose to survey businesses in Hai Duong because by the end of 2021, Hai Duong has socio-economic indicators similar to those of Hai Duong. the average rate of the whole country such as: the proportion of small and medium enterprises in the total number of enterprises (98%), the average income per employee in the enterprise (6.5 million VND/person/month), the rate of untrained workers (more than 75%) and converting the number of enterprises is the goal to be achieved clearly stated in Resolution 05 of Hai Duong Provincial People's Committee.

Of the 150 surveyed enterprises, 44.6% are small and micro enterprises, 38.7% are medium sized, and the rest are large enterprises. By business sector, out of 150 surveyed enterprises, there are 31.3% commercial enterprises, 24% industrial enterprises, the rest are agricultural and service enterprises.

After testing the scale by Cronbach's Alpha coefficient, the study analyzes exploratory factors to determine the factors affecting the digital transformation ability of enterprises. Then, test multiple regression models to measure the influence of those factors. In addition, the study examines whether or not there is a difference in digital transformation ability between enterprises of different sizes, types of ownership and business fields through Anova deep analysis technique.

4. Results and discussion

The scale of 6 independent variables is expressed through 33 observed variables and the scale of 1 dependent variable is expressed through 5 observed variables. The results of the reliability test by Cronbach's Alpha coefficient have 1 observed variable of the independent variable "Corporate culture" that does not satisfy the condition (correlation with the total variable is less than 0.3) is "The real cooperation work in the business is very good" was disqualified. Cronbach's Alpha value of the variables in the model in the range 0.745 to 0.922 shows the consistency within the scale structure of each variable.

In the first factor analysis, the results showed that two observed variables LD4 and VH4 had the distance between the two-factor upload coefficients greater than 0.3, so they were eliminated, respectively. The remaining 30 observations continued to be tested for the satisfactory scale before the second factor analysis, the

results had 6 factors extracted with the KMO coefficient of 0.905 and the percentage of 71.29% extracted. This result shows that the observed variables of the scale explained 71.29% of the variation of the data. With the varimax rotation, all transmission coefficients are greater than 0.5 and the transfer coefficient difference between the two factors is less than 0.3. Thus, the scale of factors affecting digital conversion has met the requirements of discriminant value and convergence properties.

Similarly, the EFA analysis for the dependent variable “enterprise’s digital transformation ability” with a KMO index of 0.860 proves that the factor analysis data is appropriate. Bartlett’s test has sig. less than 0.05. The factor loading coefficients are all greater than 0.5, so the convergence and discriminant values are ensured. The total value of variance extracted is 68.65% ie 5 observed variables are extracted to 1 factor with Eigenvalues equal to 3.432 and extracted variance 68.65%.

The linear relationship between the independent and dependent variables was tested by single correlation coefficient analysis (Pearson). The results show that

“enterprise digital transformation” is correlated with all independent variables with correlation coefficient greater than 0 and significance level less than 0.05 and no significant multicollinearity. between the independent variables.

The regression results have an R value of 0.703 , proving that the independent and dependent variables are related to 70.03% of the variation in the digital transformation ability of enterprises, which is explained by 6 factors in the model. , the remaining 29.97% is explained by other factors. F value equals 59,667 with sig. less than 5%.

Regression results show that 6 factors that have a positive impact on the digital transformation ability of enterprises have satisfactory statistical significance (less than 0.05). The relationship between the variables is expressed through the regression equation according to the standardized Beta coefficient:

$$CDS = 0.502 NL + 0.384 CN + 0.334 AL + 0.322 LD + 0,259 CLKDS + 0.179 VH (1)$$

Checking the defects of the regression model gives the results: Durbin - Watson coefficient is equal to 1.782

Table 2. Regression results with dependent variable “Digital transformation capability of enterprises”

Model	Unnormalized coefficients		Normalization coefficient	Test value t	Level of significance	Multicollinear Statistics	
	Coefficient B	Standard deviation	Beta coefficient			Tolerance	VIF coefficient
Constant	3.51	0.03		133.9	0.00		
Pressure from business	0.19	0.03	0.33	7.48	0.00	0.537	1.86
Leader	0.19	0.03	0.32	7.21	0.00	0.480	2.08
Digital business strategy	0.15	0.03	0.26	5.79	0.00	0.689	1.45
Employee capacity	0.29	0.03	0.50	11.24	0.00	0.512	1.96
Technology platform	0.23	0.03	0.38	8.60	0.00	0.602	1.66
Corporate culture	0.11	0.03	0.18	4.00	0.00	0.694	1.44

Source: extracted from data processing results, 2022.

there is no change in the variance of the error; Kolmogorow-Smirnov test shows that sig. greater than 0.05, so the residuals are normally distributed. Thus, it can be concluded that the regression function perfectly fits the data.

The average value of digital transformation ability between enterprises of different sizes, business fields and types of ownership is assessed at a level of 3.4-3.6 on a 5-level scale. Moreover, the Anova analysis testing the difference in digital transformation ability according to Levene Statistic between groups of enterprises according to the above criteria has sig value. greater than 0.05. Thus, it can be concluded that there is no difference in digital transformation ability among enterprises in Binh Dinh by type of ownership, size and business sector.

so the error part has no first order autocorrelation; the variance exaggeration coefficient VIF of all variables is less than 2.1, so multicollinearity between variables is not significant; White's test has no cross product, the results show that

This result is quite similar to some previous studies because internal factors such as technology background, leadership, employee capacity, corporate culture, digital transformation-oriented business strategy have significant impact on the business environment. affects the ability of enterprises to digitally transform (Kane et al. , 2019; Ferreira et al., 2019). However, previous studies have suggested that large-scale enterprises are often more mature in terms of digital, they have sufficient human and financial resources, so they will have a higher chance of successful digital transformation than other businesses. small and medium enterprises, in this study did not find that difference. This problem may be due to the prolonged epidemic situation in recent years, which has changed a lot in the way and operating model of businesses.

large or small scale. Facing the conditions of social distancing, working from home, medical isolation, along with the strong communication and promotion of the state, especially in the field of public administration.. have forced businesses to must increase the application of technology, digitize data, and improve employees' digital working skills. Therefore, businesses have closed the gap in digital transformation capabilities. That is also why pressure on businesses is one of the

factors affecting digital transformation found in this study.

The results also show that for businesses, for successful digital transformation, staff capacity is the most important issue. The quality of labor in enterprises in Hai Duong in particular and the whole country in general is still quite low. The proportion of untrained workers without professional and technical qualifications accounts for more than 75%. This is the biggest barrier to the digital transformation of businesses in Hai Duong. In the process of digital transformation, automation systems will gradually replace manual processes, so a part of labor will be reduced because some jobs may disappear immediately but at the same time require Labor quality questions must be raised to meet more complex job requirements. Workers need technical skills as well as a combination of digital capabilities such as big data analysis, social media,.. with soft skills to improve responsiveness, flexible replacement between jobs and tasks. In

At that time, the labor force in Hai Duong enterprises had a great change and lack of cohesion, so the training and development of human resources to meet the requirements of digital transformation human resources faced many difficulties.

Besides, the technology platform is one of the main agents of digital transformation for businesses in Hai Duong. The process of transforming digital technology platforms will not be successful without choosing the right technology, but without change, businesses will certainly not be able to stay in the market.

5. Conclusions and recommendations

Digital transformation is inevitable and a mandatory requirement for businesses in any field to survive and develop in the current context. However, each business with different backgrounds and capabilities, to be successful in digital transformation, needs to be aware of the factors affecting the ability of digital transformation, from which to have appropriate improvement and innovation directions for each individual business. specific stage of the process. For enterprises in Hai Duong province, there is no difference in digital transformation ability between enterprises of different sizes, business fields and ownership types and the research results show that there are Six factors affecting the digital transformation ability of enterprises include: staff capacity, technology

background, corporate pressure, leadership, digital business strategy and corporate culture.

With the above research results, for successful digital transformation, businesses in Hai Duong need to build a specific roadmap, in which staff capacity is a matter of concern and top priority. Enterprises need to have reasonable human resource training and development policies and be ready for the application of technology platforms in all business activities from management to operation. In addition, leadership must be the starting point in orienting, promoting and reducing pressure on the enterprise, turning pressure into a driving force for action of each individual and the entire system of the enterprise towards the direction of the enterprise. to digital conversion. In addition, the state together with local authorities need to quickly and drastically assess the level of business digital transformation and support to promote digital transformation businesses under Project 170 of the Ministry of Information and Communications. communication (2021) to improve digital transformation and successful digital transformation in each enterprise.

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