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The Impact of Innovation-Driven Digital Transformation on Export Performance of SMEs

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Abstract

This study uses quantitative research methods to analyze the impact of innovation-driven digital transformation on the export performance of small and medium-sized enterprises in Vietnam. Data was collected from 403 valid responses from exporting enterprises and analyzed using the partial least squares structural equation model (PLS-SEM). The factors considered include management capacity, corporate culture, competitive pressure, enterprise resources, and government support. Digital transformation was identified as an intermediary variable between these factors and export performance. The research results indicate that digital transformation directly and significantly impacts export performance ($\beta = 0.523$, $p < 0.01$). At the same time, management capacity ($\beta = 0.296$, $p < 0.01$) and competitive pressure ($\beta = 0.295$, $p < 0.01$) are important factors promoting the digital transformation process, while enterprise resources ($\beta = 0.274$, $p < 0.01$) and enterprise culture ($\beta = 0.145$, $p < 0.01$) also positively support it. Despite having a lower impact, government support ($\beta = 0.118$, $p < 0.01$) still encourages enterprises to apply digital technology. The study provides practical insights for policymakers and businesses to optimize digital transformation strategies, emphasizing the need for more substantial managerial capabilities and competitive adaptability. Unlike previous research, this study highlights corporate culture and competitive pressure as crucial factors shaping digital transformation in Vietnam's export sector. Based on the results, the study proposes solutions to enhance competitiveness and export efficiency for small and medium-sized enterprises in Vietnam.

Keywords:

Digital Transformation;
Export Performance;
Competitive Pressure;
Management Capacity;
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1- Introduction

In the context of globalization and the 4.0 industrial revolution, digital transformation has become an inevitable trend to help businesses improve their competitiveness and optimize their performance. In Vietnam, small and medium-sized enterprises (SMEs) account for about 98% of the total number of enterprises, employ 85% of the workforce and contribute more than 40% of GDP [1]. Therefore, promoting digital transformation in the SME sector is an urgent need and an important driving force for national economic development.

Digital transformation can be defined as the process of integrating digital technology into all areas of a business, changing the way of operating and creating new value for customers. For SMEs, digital transformation not only helps optimize processes and reduce costs but also opens up opportunities to access international markets, thereby improving their export efficiency. Applying technology solutions in supply chain management, marketing and online sales has helped many small and medium enterprises in Vietnam expand their markets, increase revenue and improve business efficiency. Digital transformation has a strong impact on the export performance of SMEs. Technological tools such as

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e-commerce, customer relationship management systems, and digital marketing solutions help businesses access international markets more quickly. In other words, digital transformation helps businesses find partners, promote products, and manage orders effectively. Applying technology in supply chain management also helps minimize risks, optimize inventory and ensure product quality, thereby enhancing reputation and competitiveness in the international market.

Recognizing the important role of digital transformation, the Vietnamese Government has issued many support policies for businesses, especially SMEs. For example, the digital transformation support program for the period 2021-2025 implemented by the Ministry of Planning and Investment focuses on providing overview information and strategic orientation for businesses. Similarly, the Ministry of Information and Communications has also implemented a digital transformation support program for small and medium-sized enterprises in order to promote the application of digital platforms in business. These policies are expected to create a big push, helping Vietnamese enterprises improve their competitiveness in the digital age. However, many SMEs in Vietnam still face difficulties in implementation due to limitations in financial, human and technological resources. According to the 2022 Annual Report on Enterprise Digital Transformation, most enterprises have only stopped at the level of digitizing data and processes, and only 2.2% of enterprises have achieved effective automation and data analysis. Enterprise resources for digital transformation have not met the demand, with 56.3% of enterprises having less than 3 specialized personnel and 63.3% of enterprises not having enough investment budget [2]. In 2023, many SMEs will still face budget and human resources difficulties. The 2023 Annual Report on Enterprise Digital Transformation shows that more than 40% do not have strong enough financial resources and 56% have less than 3 specialized personnel for digital transformation. Limited management capacity causes businesses to lack specific plans and synchronization in technology deployment. At the same time, corporate culture does not really support the digital transformation process when many leaders lack vision and awareness of the strategic role of technology in the long term. These factors create major barriers in the comprehensive digital transformation journey of SMEs in Vietnam [3].

Digital transformation brings many opportunities but also poses significant challenges. However, studies on the digital transformation of SMEs in Vietnam are still limited. Some studies have focused on the application of digital transformation in specific sectors, using analytical models to assess the impact of technological, organizational, and environmental factors on performance. However, most of these studies are mainly limited to creative industries, have not been extended to SMEs in the export sector, and have not fully considered the role of innovation in the digital transformation process. In addition, some other studies have analyzed the relationship between digital transformation, innovation capacity, and SMEs' business performance, but most focus on overall performance without explicitly assessing the impact on export performance. In addition, existing studies have not yet delved into analyzing barriers to digital transformation implementation, including financial constraints, management capacity, corporate culture, and the effectiveness of government support policies. Therefore, the study *Innovation-Driven Digital Transformation and Export Performance: Evidence from Vietnamese SMEs* was conducted to fill the existing research gaps. This study aims to evaluate the direct influence of digital transformation on export performance while also exploring its mediating role in the interplay between internal enterprise factors and export capability. Specifically, the study analyzes the impact of management capacity, corporate culture, competitive pressure and enterprise resources on the digital transformation process, thereby clarifying how digital transformation contributes to improving export performance. In addition to evaluating these relationships, the study provides an overview of theoretical frameworks and prior research on digital transformation and export performance, followed by a detailed explanation of the research methodology, data collection procedures, and analytical techniques. The study then presents empirical findings serving as the foundation for discussing managerial implications and policy recommendations to enhance SME competitiveness and export performance. Finally, the study concludes with limitations and suggestions for future research, providing a foundation for further exploration of digital transformation's role in SME export success.

2- Literature Review

2-1- Digital Transformation

Digital transformation can be briefly defined as the process of integrating digital technology into all areas of a business, changing the way of operating and creating new value for customers. This transformation is not just about the adoption of new technologies but also involves comprehensively rethinking business models and strategies to effectively leverage digital capabilities [4, 5]. The essence of digital transformation is to reshape organizational foundations and implement new ways of working.

Nowadays, digital transformation is considered an important factor in improving the competitiveness of SMEs in the export sector. Studies have shown that applying advanced technologies, such as automation, data analytics, and blockchain, helps SMEs simplify processes, reduce costs, improve labor productivity, and enhance competitiveness in the global market [6]. Digital transformation enhances supply chain transparency, helping SMEs build trust with international customers and partners [7]. The leverage of digital marketing tools, social media, and other online platforms

helps SMEs maintain relationships with international partners and flexibly respond to market fluctuations [8]. In addition, effective data analytics capabilities enable SMEs to tailor marketing strategies to customer needs, thereby improving customers' satisfaction and engagement [9].

However, SMEs need a well-planned strategy, including investing in the right technology and training employees in digital skills, in order to maximize the benefits of digital transformation [6, 10]. This process requires not only implementing new technology but also building a culture of innovation and continuous improvement within the organization [11]. As organizations embark on this process, they must develop specific capabilities and competencies that align with digital technologies and the evolving market landscape [4, 12, 13]. In other words, the successful implementation of digital transformation requires a blend of technological adoption and strategic management, emphasizing the need for dynamic capabilities that facilitate continuous adaptation and innovation [12, 14].

2-2- Export Performance

Export performance is an important concept in international business, reflecting the level of success in the export activities of a business, industry, or country. In other words, this concept measures the effectiveness of exploiting foreign markets through quantitative and qualitative indicators to assess the competitiveness, growth, and sustainable development in the export sector of a business, industry, or country. At the same time, this concept also demonstrates the ability to adapt to fluctuations in the international market and the ability to take advantage of opportunities from global economic integration. Export performance is not only an economic measure but also a manifestation of the position and prestige of a business or country in the international arena.

The assessment of export performance is often viewed from many perspectives. In quantitative terms, also known as financial factors, export performance can be assessed through indicators such as export revenue, export growth rate, international market share, or export profit. These indicators reflect the ability of a business or country to create value and capture the market in the export sector [15, 16]. On the other hand, qualitatively, export performance is also related to the ability to maintain customer relationships, foreign market satisfaction, the level of compliance with international standards, and creativity in developing products or services that meet international needs [15, 17, 18]. These are non-financial factors but play an important role in maintaining stability and long-term development.

3- Hypotheses Development

3-1- Factors affecting Digital Transformation

Management capacity is a key factor in determining the success of digital transformation in organizations. Leaders need to have a strategic vision and the ability to effectively analyze data and make decisions based on those analyses to identify opportunities and risks from digital technology [19, 20]. In addition, the ability to lead change and manage internal resistance is necessary to ensure a smooth transformation process. Leaders who create an open corporate culture encouraging innovation and collaboration among employees will help reduce resistance and promote active participation in transformation initiatives [21, 22]. Organizations with strong leadership often quickly face the challenges of digital transformation, thanks to their ability to motivate and guide employees to adapt to new technologies and processes [22]. Therefore, the study predicts that the management capacity of leaders is a key factor determining the success of digital transformation in small and medium-sized enterprises in the export sector in Vietnam.

Hypothesis H1: Management capacity positively impacts the digital transformation of SMEs in the export sector in Vietnam

Corporate culture is an important factor that determines the readiness and success of an organization in the digital transformation process. An open and innovative culture not only encourages experimentation and acceptance of change but also promotes continuous learning, helping businesses quickly adapt to technological advances and market demands [23, 24]. On the contrary, a conservative and risk-averse culture can slow down the digital transformation process, making it challenging to implement new technologies and reducing employee motivation and engagement [25]. Studies show that the alignment between corporate culture and digital transformation goals is a key success factor, with a focus on collaboration, digital awareness, and knowledge sharing [23, 26]. SMEs must build a working environment that encourages innovation and collaboration to ensure successful digital transformation. This culture should enable employees to share ideas, participate in digital initiatives, and feel empowered [24, 27]. Therefore, the study proposes the following hypothesis:

Hypothesis H2: Corporate culture positively impacts the digital transformation of SMEs in the export sector in Vietnam

Effective digital transformation in SMEs depends on the close coordination of three primary resources: finance, human resources, and technology. Financial resources are the foundation for SMEs to invest in technology infrastructure, software, and support services, but capital constraints often make this process difficult. This financial limitation can hinder their ability to effectively adopt and integrate new technologies [19, 28]. Therefore, businesses must take advantage of financial support policies, tax incentives, and government initiatives to reduce capital pressure while focusing capital on investment items that bring the highest value [29]. Moreover, human resources are decisive in

implementing and exploiting digital technology. SMEs need to continuously improve the digital skills of their staff, build a culture of continuous learning, and encourage innovation to create a solid human resource foundation for the digital transformation process [30, 31]. In addition, a modern technological infrastructure, complemented by synchronously integrated digital solutions, is vital for SMEs to optimize processes and improve operational efficiency. When technology is integrated synchronously and aligned with business strategy, SMEs can increase their competitiveness and adapt flexibly to market changes [32, 33]. These three resources are closely linked and complement each other, creating conditions for SMEs to succeed in their digital transformation process.

Hypothesis H3: Enterprise resources positively impact the digital transformation of SMEs in the export sector in Vietnam

Competitive pressure in the market is the main driving force for SMEs in the export sector to implement digital transformation. The increasing demand from customers for fast, personalized, and high-quality products and services forces SMEs to apply digital technology to improve operational efficiency and responsiveness [19, 14]. Moreover, the trend toward online shopping and the use of digital platforms has increased the urgency for SMEs to invest in technology to enhance customer experience [34]. In the context of rapid technological development, businesses must adapt promptly to avoid falling behind their competitors who have successfully implemented digital transformation, which often dominates with superior products, increase market share, and strengthen customer loyalty [35]. Leveraging customer data to optimize products and services not only helps SMEs meet increasing customer expectations but also enhances their competitiveness in the digital market [36]. SMEs in the export sector in Vietnam are also facing increasingly fierce domestic and international competition. Therefore, the need for these SMEs to apply digital technology has become extremely urgent to continue to maintain and improve their position in the market.

Hypothesis H4: Competitive pressures positively impact the digital transformation of SMEs in the export sector in Vietnam

Small and medium-sized export enterprises in Vietnam face many barriers in the digital transformation process, especially in terms of finance, digital skills and technology infrastructure. Therefore, government support plays an important role in promoting the digital transformation of SMEs through policies and incentive programs. Lack of capital is a major obstacle as many SMEs find it difficult to access resources to invest in digital infrastructure and modern technology. Governments can provide financial support, such as low-interest loans, tax exemptions, or grants, to help SMEs invest in the technology and infrastructure needed for digital transformation [29, 37]. In addition, the development of digital infrastructure, including standard technology platforms and modern data systems, facilitates SMEs' easy access to and application of technology, improving their competitiveness in the digital market [38]. In addition, the government can organize training programs, workshops, and communication campaigns to raise awareness and skills on digital transformation, helping SMEs adapt and innovate effectively [39, 40]. Studies show that public-private partnership initiatives contribute to knowledge transfer and resource sharing, and promote innovation and inclusive economic growth [41]. Therefore, the study proposes the following hypothesis:

Hypothesis H5: The government supports positively impact the digital transformation of SMEs in the export sector in Vietnam

3-2- Digital Transformation and Export Performance

Many studies have shown that digital transformation affects business performance for enterprises, helping to improve operational efficiency, promote innovation, and increase adaptability, especially for small and medium enterprises. For example, Faraz Mubarak et al. (2019) [42] demonstrated that business model restructuring through digital transformation improved the performance of SMEs in Pakistan. Research by Lazić & Jović (2019) [43] points out that digital transformation strategies not only increase sales and productivity but also open up new forms of customer interaction, thereby improving overall organizational performance. Barmuta et al. (2020) [44] add that transforming business processes through digital technologies contributes to improved integration between organizational units and enhanced customer service processes, which are key to optimizing performance in the digital economy. More recently, Sidabutar & Siswanto (2024) [45] emphasized that digital transformation positively affects SMEs' production and business performance in Indonesia's food and beverage industry. Among them, leadership and organizational agility are the key factors that determine the success of digital transformation in these enterprises.

Thus, studies have demonstrated that organizations that effectively leverage digital technologies can enhance operational efficiency, improve customer satisfaction, and achieve better environmental performance [46-48]. This relationship highlights the importance of integrating digital transformation initiatives with corporate strategies to maximize the impact of digital transformation on organizational success and stakeholder value [49, 50]. Therefore, the study also suggests that digital transformation will positively impact the business performance of Vietnam's small and medium-sized export enterprises.

Hypothesis H6: Digital transformation positively impacts the export performance of SMEs in the export sector in Vietnam

The proposed research model is shown in Figure 1.

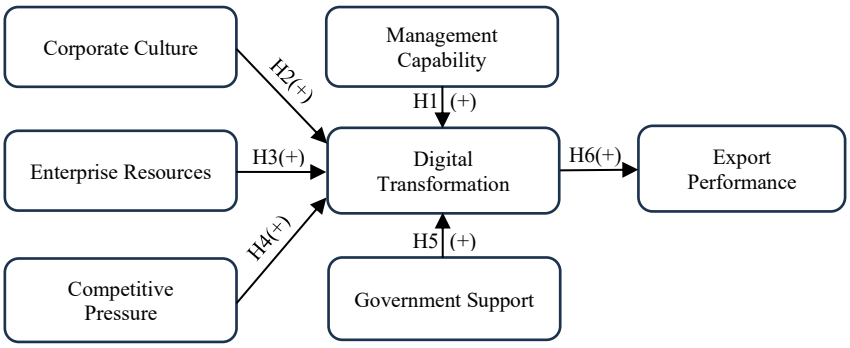

Figure 1. Proposed Research Model

4- Research Methodology

4-1- Data Analysis Techniques

The partial least squares structural equation model (PLS-SEM) is utilized to test the hypotheses and evaluate the suitability of the proposed research model. The analysis is performed using SmartPLS software. Key coefficients and indicators analyzed in this study include:

- *Outer Loading Coefficient*: Values greater than 0.7 are considered acceptable for individual item reliability.
- *Convergent Validity Assessment*: Cronbach's Alpha and Composite Reliability (CR) coefficients should meet the threshold of ≥ 0.7, the Average Variance Extracted coefficient (AVE) ≥ 0.5.
- *Multicollinearity Analysis*: Assessed using the collinearity statistics coefficient ($1 < VIF < 3$).
- *Model Fit and Variable Relationships*: Evaluated through Bootstrap analysis, R^2 and f^2 values.

4-2- Questionnaire Design, Sampling and Data Collection

The structured questionnaire comprises two parts: Part 1 collects basic demographic information, including age, gender, and job position, while Part 2 comprises 35 items designed to measure the impact of factors on digital transformation as well as the impact of digital transformation on the export performance of SMEs in Vietnam. Respondents evaluate each item using a 5-point Likert scale, ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree"). The questions are adapted from prior validated scales and modified to fit the Vietnamese export SME context.

Sampling is a critical process in quantitative research. The study targets managers and employees of SMEs involved in export activities across Vietnam to achieve representativeness. Convenience sampling is employed due to accessibility constraints. Participants are selected based on their willingness and availability to participate. Based on the formula by Hair et al. (2019) [51], a reasonable minimum sample size is ten times the number of observed variables. With 35 observed variables, the minimum required sample size is 350.

The study collected data through a combination of online and direct surveys from October to December 2024. The study collected data through a combination of online and direct surveys from October to December 2024. Online survey links were sent to SME associations and SME managers via email and social media platforms. This approach reduced costs and accelerated the data collection process. In addition, the questionnaires were sent directly to managers or employees who were accessible. The study collected 417 responses, of which 403 were valid for analysis, meeting the criteria of reliability and completeness (see Table 1).

Table 1. Survey Sample Description

	Value	Number/403	Percentage
Gender	Male	212	52.6%
	Female	191	47.4%
Age	19 - 25	97	24.1%
	26 - 35	147	36.5%
	36 - 45	135	33.5%
	>46	24	6.0%
Education level	College	34	8.4%
	University	311	77.2%
	Postgraduate	58	14.4%

The survey sample has a gender balance, with 52.6% male and 47.4% female, ensuring the representativeness and multidimensionality of the sample in assessing factors affecting digital transformation and export efficiency of SMEs. In terms of age, the majority of participants are in the 26-35 (36.5%) and 36-45 (33.5%) groups, showing that the majority of survey participants are of mature working age, consistent with the research objective of digital transformation. The majority of respondents have university degrees (77.2%), and postgraduate degrees account for 14.4%, reflecting the high level of education and good access to the technology of the sample group. Overall, the survey sample is diverse and consistent with the research objective of digital transformation and export efficiency of SMEs in Vietnam.

5- Data Analysis

The results of running the PLS-SEM algorithm are shown in Table 2.

Table 2. Construct Reliability and Validity

Variables	Items	Descriptions	Loadings	α	CR	AVE
Management Capability (MC)	MC1	Your company has the ability to quickly implement innovative ideas into practice [52, 53].	0.838	0.882	0.915	0.685
	MC2	Your company leaders have a clear strategic vision for applying digital technology to optimize business operations [54, 55].	0.720			
	MC3	Your company regularly organizes training programs to improve human resources skills in using new technology [56].	0.791			
	MC4	Your company is willing to invest in new technology even when the results are not guaranteed [53].	0.837			
	MC5	Departments within your company coordinate closely to effectively implement digital technology-related initiatives [52, 53].	0.936			
Corporate Culture (CC)	CC1	Employees in your company are always ready to accept the changes brought by digital transformation [57].	0.817	0.897	0.924	0.709
	CC2	Your company manager actively promotes a culture of creativity and innovation at work [58].	0.857			
	CC3	Your company has a working environment that supports and encourages collaboration between departments [59].	0.872			
	CC4	Your company regularly organizes training and raises awareness about digital transformation [60].	0.858			
	CC5	Your company views failures in trying new technologies as an opportunity to learn [61].	0.802			
Enterprise Resources (ER)	ER1	Your company has sufficient financial resources to invest in digital transformation technologies to support export activities [62].	0.848	0.909	0.932	0.735
	ER2	Your company's human resources have the appropriate skills and knowledge to operate digital technology systems for export [6].	0.843			
	ER3	Your business has built a modern technology infrastructure system to meet the digitalization needs in export activities [63].	0.741			
	ER4	Your company maintains close cooperative relationships with international suppliers, customers, and technology partners to improve export efficiency [19, 64].	0.888			
	ER5	Your company has the ability to effectively manage and implement digitalization projects to enhance export performance [65].	0.951			
Competitive Pressure (CP)	CP1	Your customers are increasingly demanding digital products and services [66].	0.789	0.839	0.884	0.605
	CP2	Your company faces fierce competition from businesses that have successfully transformed digitally [67].	0.730			
	CP3	Entering international markets requires your company to meet higher technology standards [20].	0.782			
	CP4	Competitors often use digital technology to increase their competitive advantage [68].	0.787			
	CP5	Rapid changes in customer needs force your company to improve its digital processes [69].	0.799			
Government Support (GS)	GS1	Your company receives financial support from the government to implement digital transformation [70, 71].	0.782	0.865	0.902	0.648
	GS2	The government provides training programs to improve your business's technological capacity [72].	0.790			
	GS3	Your company receives specific instructions from government agencies on how to implement digital transformation [73].	0.753			
	GS4	Tax support policies help your company reduce costs in implementing digital technology [70, 71].	0.862			
	GS5	Government incentive programs have motivated your company to implement digital transformation [70, 71].	0.833			
Digital Transformation (DT)	DT1	Your company has integrated Big Data technology to analyze and predict export market trends [19].	0.852	0.856	0.897	0.635
	DT2	Internet of Things systems have been applied in supply chain management and production at your company [74].	0.792			
	DT3	Your company applies AI technology to optimize operational processes and increase productivity [45].	0.721			
	DT4	Your company has applied Blockchain to improve transparency and security in international transactions [75].	0.833			
	DT5	Your company regularly evaluates and updates its digitalization strategy to meet the requirements of the international market [76].	0.780			

Export Performance (EP)	EP1	Your company has achieved export revenue growth thanks to the application of digital technology [53, 77].	0.843			
	EP2	The implementation of digital solutions has helped your company expand its export markets [19, 53].	0.817			
	EP3	Digital processes have significantly improved the operational efficiency of your company's exports [19, 53].	0.719	0.890	0.919	0.696
	EP4	Digital transformation has helped improve the quality of your company's export products [53].	0.867			
	EP5	Your company has seen an increase in international customer satisfaction thanks to new digital technologies [19, 53].	0.915			

Table 2 shows that all variables meet the criteria for reliability and validity. Specifically, all outer loadings are greater than 0.7, and Cronbach's Alpha and CR coefficients are above 0.7, ensuring internal consistency and high composite reliability. The AVE values of all variables are greater than 0.5, confirming the convergence of the scales. These results demonstrate that the scales are well constructed, ensuring reliability and validity, and are suitable for subsequent analyses in the study.

Table 3 presents the results of measuring the discriminant validity between variable structures, with the values of all HTMT indexes being less than 0.85, ensuring no serious multicollinearity and confirming the discriminant validity between variables. This result confirms that the concepts are well differentiated, ensuring independence and suitability for the next step: testing the proposed research model.

Table 3. Discriminant Validity

	CC	CP	DT	EP	ER	GS	MC
CC							
CP	0.343						
DT	0.474	0.609					
EP	0.354	0.312	0.586				
ER	0.322	0.413	0.625	0.525			
GS	0.185	0.126	0.368	0.274	0.268		
MC	0.342	0.303	0.621	0.428	0.397	0.346	

Bootstrapping analysis (with 5,000 samples at a 5% significance level) is used to evaluate the impact relationships between factors. The results of the direct Bootstrapping analysis are presented in Table 4 as follows:

Table 4. Bootstrapping Analysis Results of Direct Effects

Hypothesis	Paths	Original Sample	P values	VIF	f^2	Hypothesis Conclusion
H1	MC → DT	0.296	0.000	1.289	0.161	Accepted
H2	CC → DT	0.145	0.000	1.202	0.042	Accepted
H3	ER → DT	0.274	0.000	1.332	0.133	Accepted
H4	CP → DT	0.295	0.000	1.243	0.165	Accepted
H5	GS → DT	0.118	0.001	1.132	0.029	Accepted
H6	DT → EP	0.523	0.000	1.000	0.376	Accepted

Table 4 indicates that all P-values for the effects are less than 0.01, confirming that these relationships are statistically significant. In addition, all VIF coefficients are below 3, indicating that the model is free of multicollinearity. Therefore, the research findings validate and support all the proposed hypotheses.

Hypothesis H1: Management capacity positively impacts the digital transformation of SMEs in the export sector in Vietnam (β= 0.296, p <0.01). This result shows that effective management practices, including strategic vision and organizational capabilities, significantly impact digital technology adoption and implementation of SMEs in the export sector in Vietnam.

Hypothesis H2: Corporate culture positively impacts the digital transformation of SMEs in the export sector in Vietnam (β= 0.145, p <0.01). This means that an organization's values, openness to innovation and adaptability play a supporting role in driving digital transformation. Although the effect size is relatively lower than other factors, this result highlights the importance of cultivating a culture that encourages experimentation and accepts change in in Vietnamese export SMEs.

Hypothesis H3: Enterprise resources positively impact the digital transformation of SMEs in the export sector in Vietnam (β= 0.274, p <0.01). This finding highlights that sufficient financial, technological and human resources are essential for SMEs to effectively implement and maintain digital strategies.

Hypothesis H4: Competitive pressures positively impact the digital transformation of SMEs in the export sector in Vietnam (β= 0.295, p <0.01). This result supports the view that market competition, increasing customer demands, and competitors' progress strongly drive SMEs' digital innovation.

Hypothesis H5: The government supports positively impact the digital transformation of SMEs in the export sector in Vietnam (β= 0.118, p <0.01). Although the impact size of this factor is the smallest, this shows the importance of government policies, financial incentives, and digital infrastructure in helping SMEs transition to digital platforms.

Hypothesis H6: Digital transformation positively impacts the export performance of SMEs in the export sector in Vietnam (β= 0.523, p <0.01). The results confirm that digital transformation is an important driving force to boost the export performance of Vietnamese SMEs, helping SMEs achieve higher efficiency, better access to international markets and enhance customer satisfaction.

According to Cohen (1988) [78], the f^2 coefficient evaluates the impact size of exogenous latent variables as small (0.02), medium (0.15), or large (0.35), and values below 0.02 indicate no effect. Table 4 demonstrates that all exogenous variables significantly influence the endogenous variables. Management Capability (MC) and Competitive Pressure (CP) show medium impacts on Digital Transformation (DT), with f^2 values of 0.161 and 0.165, respectively. Such the influence of Management Capability (MC) and Competitive Pressure (CP) reinforces the argument that SMEs with strong leadership and external market responsiveness are better positioned to integrate digital technologies effectively. This result aligns with prior studies emphasizing that strategic leadership and competitive adaptability are crucial in overcoming digitalization barriers and enhancing export competitiveness. Moreover, Enterprise Resources (ER) has a near-medium impact (f^2 = 0.133) on Digital Transformation (DT). This result further suggests that improving access to digital infrastructure and skilled talent could amplify the benefits of digital transformation.

The study results show that Corporate Culture (CC) and Government Support (GS) have small impacts on Digital Transformation (DT), with f^2 values of 0.042 and 0.029, respectively. Such a relatively small effect of corporate culture highlights potential challenges in fostering a strong digital transformation mindset within organizations. The result also suggests that existing policies may not be well suited to the needs of SMEs, or many SMEs remain unaware of available government programs and how to access them. Moreover, complex application procedures for financial aid and training may discourage the participation of SMEs. In practice, government support can help SMEs to overcome financial and technical barriers to adopt digital technology more effectively. Therefore, government financial incentives and digital training programs must be strengthened to enhance SMEs' readiness for digital transformation. The government should increase awareness campaigns through industry associations and digital platforms, simplify application processes, and provide stronger direct incentives such as tax breaks, grants, and low-interest loans. Furthermore, public-private partnerships should be fostered to facilitate technology transfer and training, ensuring SMEs can effectively leverage government support for digital transformation.

In addition, Digital Transformation (DT) substantially and significantly impacts Export Performance (EP), with an f^2 value of 0.376. This result confirms that digital technology helps SMEs improve operational efficiency, expand market presence, and enhance global competitiveness. Accordingly, SMEs need to view digital transformation not only as a short-term technological improvement but also as a long-term strategic imperative in the context of continued digitalization of international trade. The research results provide a more comprehensive perspective on the important role of digital transformation in improving the performance of Vietnamese exporting SMEs. The study emphasizes the importance of building a digital transformation strategy based on an integrated approach, closely linking internal capabilities (such as management capabilities and business resources) with external pressures (such as competition and changes in trade regulations), ensuring a balance between technology investment, organizational readiness, and external support mechanisms.

Table 5 shows that all P-values for the indirect effects are less than 0.01, and the confidence intervals do not include 0, confirming that these mediating relationships are statistically significant. Specifically, Management Capability (MC), Enterprise Resources (ER), and Competitive Pressure (CP) have medium indirect effects on Export Performance (EP) through the mediator variable Digital Transformation (DT), with indirect path coefficients of 0.155, 0.143, and 0.154, respectively. This indicates that well-developed management capacity, sufficient resources, and competitive pressure significantly contribute to SMEs' export performance by fostering digital transformation.

Table 5. Bootstrapping Analysis Results of Indirect Effects

Paths	Original Sample	P values	Confidence Intervals
MC → DT → EP	0.155	0.000	0.106 - 0.207
CC → DT → EP	0.076	0.000	0.040 - 0.115
ER → DT → EP	0.143	0.000	0.100 - 0.192
CP → DT → EP	0.154	0.000	0.114 - 0.199
GS → DT → EP	0.062	0.001	0.025 - 0.101

Similarly, Corporate Culture (CC) and Government Support (GS) have small but significant indirect effects on Export Performance (EP) through Digital Transformation (DT), with path coefficients of 0.076 and 0.062, respectively. These findings confirm the important mediating role of Digital Transformation (DT) in translating internal and external factors into improved Vietnamese SMEs' export performance. In addition, the results suggest a complex interaction between the variables, where factors like management capability and enterprise resources directly enhance digital transformation, which in turn drives export performance. This emphasizes that digital transformation acts as a critical conduit linking organizational capabilities and external pressures to enhanced export outcomes for SMEs in Vietnam.

The adjusted R^2 coefficient evaluates the effect of independent variables on dependent variables. Table 6 shows that the adjusted R^2 value for Digital Transformation (DT) is 0.571, indicating that the independent variables (Management Capability, Corporate Culture, Enterprise Resources, Competitive Pressure, and Government Support) collectively explain 57.1% of the variation in DT. The remaining 42.9% is attributed to other factors outside the model. Similarly, the adjusted R^2 value for Export Performance (EP) is 0.272, suggesting that the independent variable DT explains 27.2% of the variation in EP, with the remaining 72.8% arising from other unexplored factors. These results demonstrate that while DT is influenced by multiple organizational and environmental factors, its role as a predictor of EP is significant but requires additional exploration of external variables to fully capture the export performance drivers of Vietnamese SMEs.

Table 6. R-square Coefficients

	R-square	R-square adjusted
DT	0.576	0.571
EP	0.273	0.272

Figure 2 depicts the confirmed research model. The path coefficients and corresponding p-values, shown on the paths between endogenous and exogenous variables, indicate the strength and significance of relationships between these variables. Outer loadings and p-values are shown on the path between observed variables and their corresponding latent constructs. Additionally, the adjusted R^2 values displayed within the endogenous variables reflect the proportion of variance explained by the independent variables in the model.

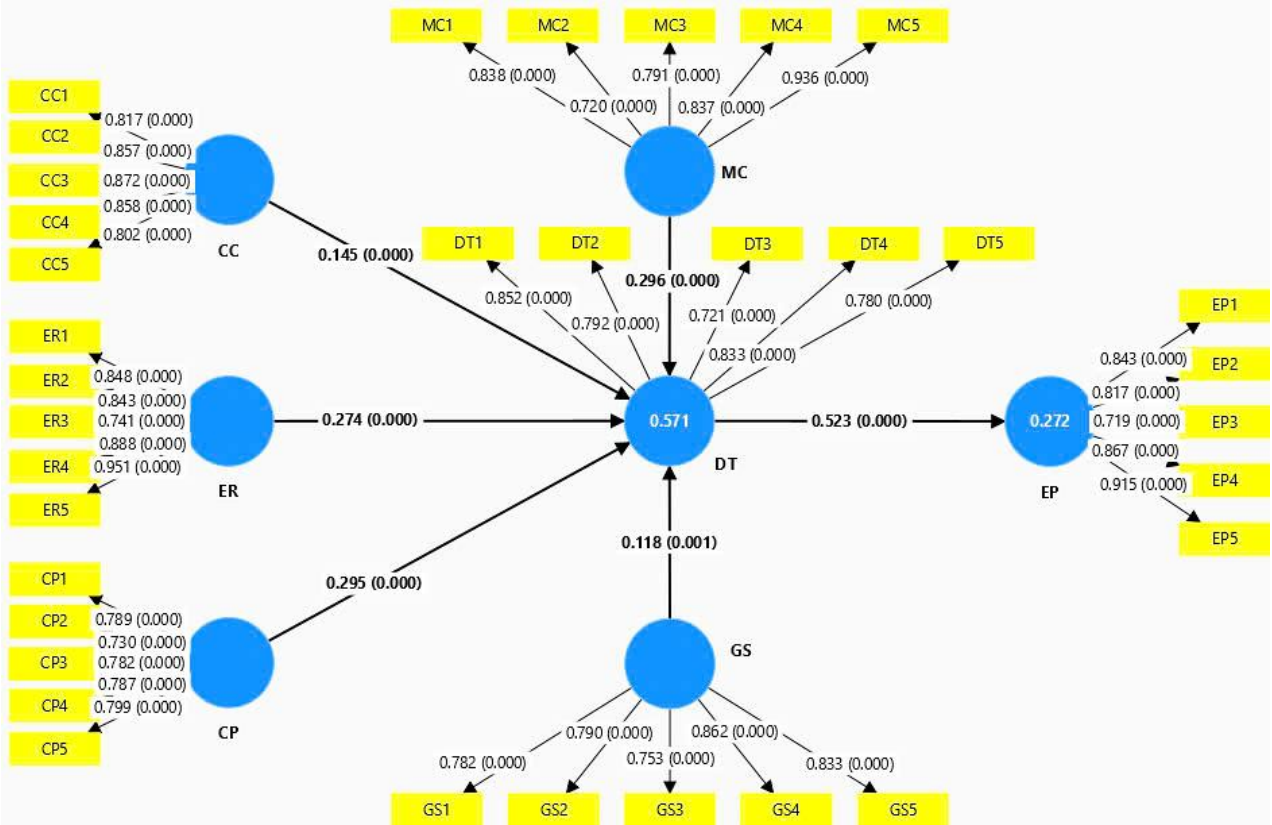

Figure 2. The confirmed research model

6- Discussion

The study results have clarified the relationship between innovation-driven digital transformation and the export performance of SMEs in Vietnam. Specifically, digital transformation is determined to positively and strongly impact export performance ($\beta = 0.523$, $p < 0.01$) through improving management capacity, optimizing processes, and expanding access to international markets. Factors such as management capacity, corporate culture, resources, competitive pressure, and government support all contribute to promoting digital transformation, thereby improving export performance.

This study builds upon and extends the findings of Omrani et al. (2024) [6] and Sidabutar & Siswanto (2024) [45] by emphasizing the role of corporate culture and competitive pressure in shaping the digital transformation roadmap of SMEs in Vietnam's export sector. While Omrani et al. (2024) [6] highlight that digital transformation is primarily driven by internal factors such as IT infrastructure, innovation levels, internal regulations, and digital skills, this study further clarifies that corporate culture plays a central role in enhancing SMEs' readiness for digital adoption. SMEs with a strong culture of innovation, clear digital strategies, and well-developed digital capabilities tend to adopt technology more effectively. Additionally, this study expands on Sidabutar & Siswanto (2024) [45] conclusions regarding the importance of leadership and organizational agility by demonstrating that competitive pressure is also a crucial driver of digital transformation. In market globalization, Vietnamese export SMEs are forced to adopt effective digital solutions and maintain their competitive advantage under tremendous pressure from international competitors. Therefore, instead of focusing solely on leadership capabilities, this study emphasizes integrating organizational culture and market drivers to develop a sustainable digital transformation strategy. In short, the digital transformation process is not simply a technological upgrade but a strategic change influenced by the enterprise's internal capabilities and external market pressures.

The research results propose specific managerial implications to help SMEs in Vietnam optimize the digital transformation process and improve export performance. The implications focus on improving the internal capabilities of enterprises as well as emphasize the importance of leveraging external support factors, especially support from the government, as follows:

- *Develop a long-term digital transformation strategy:* Managers need to clearly define the vision and strategic goals for the digital transformation process while ensuring the allocation of sufficient financial, technological, and human resources.
- *Develop a corporate culture that supports innovation*: A working environment that encourages creativity, experimentation and acceptance of change is key. Enterprises need to promote continuous learning and facilitate employees' participation in digitalization initiatives.
- *Take advantage of government support*: Businesses should proactively learn about and access support policies, training programs, and financial incentives from government agencies and business support organizations. For example, digital transformation support programs from the Ministry of Planning and Investment and the Ministry of Information and Communications can help businesses reduce resource barriers, especially technology costs. At the same time, participating in innovation seminars or events also helps businesses raise awareness and update new technology trends.
- *Manage competitive pressure:* SMEs need to apply further advanced technologies, such as artificial intelligence, big data analysis, and e-commerce, to optimize internal operations, improve customer service, and quickly respond to market demands, thereby building customer trust and loyalty.

These implications are highly practical and can be widely applied in the context of fierce competition in the international market and the need for constant innovation to adapt to technological developments.

7- Conclusion

The findings of this study confirm that innovation-driven digital transformation plays a critical role in enhancing the export performance of Vietnamese SMEs. By integrating digital technologies, SMEs can optimize operations, expand market access, and strengthen competitiveness in the global economy. The results confirm that factors such as management capacity, corporate culture, competitive pressure, corporate resources, and government support positively impact the digital transformation process of SMEs. Notably, management capacity and competitive pressure emerged as the most influential factors, reinforcing the need for strategic leadership and adaptability in a rapidly evolving digital landscape. In addition, enterprise resources and corporate culture also play a crucial role in shaping SMEs' ability to adopt and leverage digital technologies. Although government support has a comparatively lower impact, its role in facilitating SMEs' transition to digital platforms remains essential. These findings suggest that successful digital transformation requires a balanced approach in which internal capabilities and external support mechanisms work together to drive business growth. In short, digital transformation helps Vietnamese SMEs mitigate export challenges, improve efficiency, take advantage of international trade opportunities, and contribute to the national economy's sustainable development.

Despite its valuable contributions, this study has several limitations that should be addressed in future research. First, convenience sampling may limit the generalizability of the study's results, as the sample may not accurately reflect the varied landscape of SMEs across different industries and regions in Vietnam. Future studies should consider randomized or stratified sampling methods to enhance representativeness. Second, this study primarily focuses on internal factors and the domestic support environment without exploring external macroeconomic conditions, such as global economic fluctuations, trade policies, or geopolitical risks, which could significantly influence the digital transformation process. Expanding the research scope to include these external elements would provide a more holistic perspective on the challenges and opportunities SMEs face in digital transformation. Additionally, sector-specific studies could offer deeper insights into how digital transformation impacts different industries within the export sector. By addressing these limitations, future research can contribute to a more comprehensive understanding of the role of digital transformation in enhancing SME competitiveness in the global market.

8- Declarations

8-1- Author Contributions

Conceptualization, T.T.T. and D.T.T.; methodology, T.T.T., D.T.T., and T.K.; software, T.T.T. and D.T.T.; validation, T.T.T., D.T.T., and T.K.; formal analysis, T.T.T., D.T.T., and T.K.; investigation, T.T.T., D.T.T., and T.K.; resources, T.T.T. and D.T.T.; data curation, T.T.T., D.T.T., and T.K.: writing—original draft preparation, T.T.T., D.T.T., and T.K.; writing—review and editing, T.T.T., D.T.T., and T.K.; visualization, T.T.T., D.T.T., and T.K.; supervision, T.T.T., D.T.T., and T.K.; project administration, T.T.T. and D.T.T.; funding acquisition, T.T.T. and D.T.T. All authors have read and agreed to the published version of the manuscript.

8-2- Data Availability Statement

The data presented in this study are available on request from the corresponding author.

8-3- Funding

The authors received no financial support for the research, authorship and publication of this article.

8-4- Institutional Review Board Statement

Not applicable.

8-5- Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

8-6- Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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