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Enhance Competitive Advantage of Vietnamese Enterprises: The Role of Digital Technology and Resilient Supply Chain

Nhu-Mai Thi NONG¹, Duc-Son HA²

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Abstract

Purpose: The study was conducted to investigate the role of digital technology and resilient supply chains in enhancing the competitive advantage of Vietnamese enterprises. **Research design, data, and methodology:** The research model was proposed with 08 hypotheses and tested on 217 representatives from enterprises in three regions: the North, the Central and the South. Data were processed using SmartPLS 3.0 software. **Results:** The results showed that digital technology directly affects the response capability and recovery capability of supply chains. Supply chain response and recovery capability and its performance also directly impact the competitive advantage of enterprises. On that basis, the research also proposed a number of policy and management implications to build an effective resilient supply chain and aim for better competition for enterprises based on the application of digital technology. **Conclusions:** Complex supply chain networks and volatile environments can weaken the stability of supply chains and make them vulnerable to disruption. The large-scale outbreak of the COVID-19 pandemic causing almost all global supply chains to experience varying degrees of disruption, seriously affecting the production of businesses, is a testament to reality. Therefore, businesses attach great importance to building an effective resilient supply chain to survive, compete and develop. This research has achieved its goals and has made certain contributions in both theory and practice.

Keywords : Competitive Advantage, Digital Technology, Resilient Supply Chain, Supply Chain Efficiency.

JEL Classification Code: C51, D24, L60, M11, O14

1. Introduction

The business environment is becoming increasingly complex, with fierce competition associated with globalization trends and ever-changing customer needs and satisfaction. With increasing pressure, how can businesses solve the above problems effectively and gain a competitive advantage? To answer the above question, according to Chan et al. (2017), businesses need to focus on improving supply chain elasticity and efficiency. Digital technology

(DT) is the driving force to improve supply chain capacity and efficiency to enhance businesses' competitive advantages (Nekmahmud et al., 2020; Oh et al., 2019). Practical application of Kiva robots and automatic warehouse management system at Amazon; using artificial intelligence (AI) in analyzing and predicting Walmart's customer needs; applying blockchain technology in supply chain management at Maersk; or Nike's supply chain management with IoT has shown the efficiency in the supply chain and certain competitive advantages they achieve when

1 First and Corresponding Author. Lecturer, Faculty of Commerce and Tourism, University of Finance - Marketing, Hochiminh city, Vietnam. Email: ntnmai@ufm.edu.vn

2 Second Author. Lecturer, Faculty of Business Administration, University of Finance - Marketing, Hochiminh city, Vietnam. Email: haducson@ufm.edu.vn

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applying digital technology. In particular, in the context of serious distribution and supply chain disruptions caused by the COVID-19 pandemic, resilient supply chains have proven to play a decisive role in ensuring the continuity and stability of businesses' business operations.

Several recent studies have also shown that digital technology enhances distribution and supply chain capacity and efficiency (Choi et al., 2020; Fatorachian & Kazemi, 2021; Saryatmo & Sukhotu, 2021; Unhelkar et al., 2022). The positive relationship between supply chain efficiency and competitive advantage of businesses has also been found by some authors (Lee et al., 2022; Putri et al., 2019; Sukati et al., 2012). However, most previous studies discuss the influence of digital technology or supply chain resilience on competitive advantage and supply chain performance. There is little published research discussing the effect of digital technology on business' competitive advantage related to resilient supply chains.

In Vietnam, there are also many studies related to resilient supply chains, recent examples include Nguyen Thi et al. (2023) studying the impact of input logistics capacity on the resilience of the supply chain: perspective from Vietnam's textile and garment industry; Huang et al. (2023) studied the impact of supply chain capacity, vision, and resilience on supply chain performance; Nguyen et al. (2023) identify elements of cross-border e-commerce supply chain resilience in Vietnam using the Delphi and DEMATEL models; Ngoc et al. (2023) explore the internal dynamics of SMEs' resilience: The case of SMEs in Ho Chi Minh City in the context of Covid-19; Dey et al. (2024) study the impact of artificial intelligence on supply chain resilience in SMEs. However, the authors have not found any research on the impact relationship between digital technology, resilient supply chains and businesses' competitive advantages.

To fill the above gap, this research examines the impact relationship between digital technology, resilient supply chains and competitive advantage in businesses in Vietnam. From there, policy and management implications in building resilient supply chains are recommended to improve supply chain efficiency and competitive advantage for businesses in the context of today's fiercely competitive, ever-changing and unpredictable environment.

2. Theoretical Background and Hypothesis Development

2.1 Theoretical Background

2.1.1 Digital Technology in the Supply Chain

The concept of digital technology has been widely mentioned through the coeval usage of several internet connection technologies (Ghobakhloo, 2020). Big data

analytics (Big data), Internet of Things (IoT), Cyber-physical systems (CPS), artificial intelligence (AI), and cloud computing (Cloud) are illustration of digital technologies that improve connectivity, integration and automation in operations of businesses (Ivanov et al., 2019). Supply chains must be integrated with digital technology to meet changing demands and consumer satisfaction (Christopher & Holweg, 2017). Transmitting data from and to various sensors, computers, and machines is conducted smoothly thanks to IoT technology. Cloud computing allows storing, sharing and analyzing data more effectively. According to Raji et al. (2020), to have better resilience in times of disruption, it is necessary to share information and cloud technology. Big data will help transmit data between members of the supply chain effectively, from which solutions can be found to reduce implementation time and improve operational efficiency. AI technology also allows for more efficient data processing (Verboven et al., 2020). Improved data processing capabilities have helped improve supply chain operations. Using digital technology in value chain analysis helps businesses review and prevent disruptions in business operations and can gain a competitive advantage (Linkov et al., 2020). Likewise, these data analytics technologies may be employed as digital systems to promote proactive resistance and recovery measures in the event of disruptions, thereby improving resilience and supply chain efficiency (Ivanov et al., 2019). Due to its improved transparency and accuracy, digital technology can assist in data-driven decision making about solutions against potential disruptions (Ivanov & Dolgui, 2020). Furthermore, digital technologies such as Big data or track and trace technology improve preparedness to respond to disruptions based on integrated supply chains designed to be proactive, making supply systems more resilient (Ivanov et al., 2019).

2.1.2 Resilient Supply Chain

A resilient supply chain is a supply chain that has the ability to return to its original or desired state after being disturbed by unexpected events, while preventing and minimizing the impact and recovering operations quickly from disruptions (Sheffi, 2008). The resilient supply chain consists of two main parts: response capability and recovery capability.

Response capability is the ability to proactively limit the impact of disruptions caused by changes in supply, production, and distribution of products and services to reduce the vulnerability of the supply chain, minimizing spillover effects (Dubey et al., 2021) by completely avoiding and shortening the time from the beginning of the supply chain disruption to recovery (Hasani & Khosrojerdi, 2016).

Recovery capability is the ability of a supply chain to return to normal operations after a reasonable period of

resistance. Resilience is characterized by having gone through a period of stability (Brandon-Jones, 2014).

A resilient supply chain is not only an important factor to ensure stability and continuity in business operations, but also an important tool to minimize the negative effects of risks. Building a resilient supply chain is not only an urgent task but also a long-term investment for businesses.

2.1.3. Competitive Advantage

Competitive advantage is the ability of a business to achieve a higher level of competitiveness compared to its competitors in the industry. Competitive advantage represents better control and superior performance (Dubey et al., 2021). Cutting operating and production costs, providing better products and services, and giving customers greater satisfaction can bring businesses a higher level of competitiveness (Chen, 2019). Elrefae and Nuseir (2022) argue that the way a business deals with competitors such as product innovation, competitive selling prices, improving product quality and improving distribution systems will bring competitive advantage. The ability to resist and cope with supply chain risks will improve sustainable business performance (Bi et al., 2013), creating a competitive advantage in an ever-changing market (Dehgani & Navimipour, 2019; Wu et al., 2017).

2.1.4. Resource - Based View and Dynamic Capability Theory

Today, manufacturing businesses are looking for opportunities to create advantages to gain overall efficiency within competitive and volatile conditions. In order to achieve a competitive advantage, businesses need resources to restructure costs, invest in technology, improve product quality, and respond quickly to capricious market fluctuation. Deploying technological resources is critical to improving supply chain efficiency. Resource theory (Resource-Based View - RBV) and Dynamic Capability theory (DC) are those applied to clarify the role of resources and capabilities of an enterprise in improving efficiency and creating competitive advantage.

According to RBV theory, businesses can achieve long-term competitive advantage as they have irreplaceable, valuable, rare, and difficult-to-imitate resources (Barney, 1991). In previous studies, RBV theory is widely used to explain the impact of digital technology in improving supply chain efficiency. Digital technology is a *corporeal* resource, deployed in an enterprise's strategy to improve capabilities (Chaudhuri et al., 2022). Digital technology improves the supply chain capacity and impacts directly enterprises' operations by developing new products, enhancing product quality, lessening operating costs, improving market share and meeting customer satisfaction (Ehie & Ferreira, 2019).

According to DC theory, DCs are the capacity to integrate and restructure all resources including both internal and external to cope with an ever-changing environment (Li, 2022; Teece et al., 1997). Supply chain resilience is a type of dynamic capacity that helps enterprises resist and recover from environmental changes, improving supply chain network efficiency (Chen, 2019). Concurrently, supply chain resilience quickly creates alternative and better systems for internal and external entities to respond to risky situations (Shekarian et al., 2020). Businesses that recover speedily are able to dominate the market before their competitors do, maintain existing competitive advantages or generate new competitive advantages (Ali et al., 2017; Kamalahmadi & Parast, 2016).

Digital technology is increasingly considered as a resource for creating greater capabilities. Digital technology enables supply chains to collaborate and share timely information in decision-making, helping to increase reliability and efficiency, influencing a business's competitive advantage.

2.2. Hypothesis Development

2.2.1. Digital technology and Resilient Supply Chain

To have an effective resilient supply chain, it is necessary to build processes with modern supply chain technology to forecast and respond quickly to supply chain risks and opportunities. To seize opportunities from disruptions and improve supply chains, businesses need to improve their resilience to withstand disruptions. Thanks to digital technology, tasks can be allocated to different departments or divisions at full speed, facilitating the integration of resources to achieve business goals. During the previous urban blockade period due to COVID-19, digital technology platforms have proven effective in addressing the need for remote working and supporting the rapid communication of business leaders' decisions. To meet changing market needs, applying digital technology to manufacturing can improve supply chain resource management, increase flexibility and agility in designing products and manufacturing, reduce transportation and manufacturing costs, and shorten time to launch new products, thereby preventing supply chain disruptions (Christopher & Holweg, 2017). With Blockchain technology, it allows businesses to diversify distribution channels and if one of the channels is interrupted, the supply chain can flexibly switch to other channels to provide products to customers on schedule, with the ability to recover quickly. Resilience may not be better without the cooperation of upstream and downstream partners involved in the supply chain. Digital technology platforms may define the role of each partner and enhance the sharing of partner capacity information, which will optimize the efficiency of

resource allocation and provide diverse collaboration capabilities in the supply chain (Tiwana, 2015; Wareham et al., 2014). Establishing digital technology platforms enables the supply chain connectivity from upstreams to downstreams, intertwining and integrating supply chain nodes to shape a supply chain network structure, which helps businesses maintain close communication with capable supply partners in the case of disruptions (Ivanov & Dolgui, 2020). Besides, the digital technology platform integrates the operational information of supply chain partners and enhances the level of trust, which will further promote resource allocation and cooperation at a comprehensive level in the supply chain to achieve high levels of resilience (Dubey et al., 2021; Yang et al., 2021). Based on these arguments, the hypothesis is proposed as follows:

H1: Digital technology has a positive impact on supply chain's response capability

Recovery capability is the capacity of a business, at a reasonable cost, to quickly recover to its original or even better operation state through the consolidation of both internal and external resources into the supply chain (Adobor & McMullen, 2018; Han et al., 2020; Raj et al., 2014). AI and machine learning technology helps businesses effectively review resources inside and outside the supply chain and redefine their supply chain network development plans. This reduces not only the cost and recovery time after a disruption, but also the scope of the disruption shock, and significantly improves the recovery efficiency of the supply chain (Wang & Wei, 2007). To restructure all resources in the supply chain requires strong connections within the supply chain. Digital technologies enable throughout connectivity of various partners in the supply chain and accelerate the process of reconfiguring upstream and downstream resources to enhance supply chain operational resilience (Cavalcante et al., 2019). At the same time, incorporating digital technologies such as AI and Big data into the supply chain process can better monitor and analyze supplier activities, eliminate poorly performing suppliers, and build a strong collaborative supply chain network, helping to enhance the resistance and resilience of supply chain operations, enhancing the innovation ability of enterprises (Sousa & Rocha, 2019). Innovative capabilities can bring about supply chain restructuring models, helping businesses turn back to their original or better operation state (Cui & Idota, 2018; Moshtari, 2016). Based on these arguments, the hypothesis is proposed as follows:

H2: Digital technology has a positive impact on supply chain's recovery capability

2.2.2. Digital Technology and Supply Chain Performance

Digital technology will bring widespread collaboration across the supply chain, increasing the level of information

sharing and data transparency of the whole supply chain to perfect processes such as: purchasing, manufacturing, sales and inventory management, and ultimately improve efficiency (Bai et al., 2020; Fatorachian & Kazemi, 2021). Applying digital technology in the supply chain can improve product quality and productivity, reduce production costs, thereby improving supply chain efficiency (Saryatmo & Sukhotu, 2021). Incorporating digital technology in purchasing, manufacturing, sales and logistics operations can extend product life cycles and improve sustainability performance (Holmström & Partanen, 2014). Digital technology can integrate data from supply chain system platforms and users through powerful, accurate data and market analysis capabilities. This will accelerate the development of new products and services, helping businesses increase market share, maintain market leadership, and ultimately achieve greater efficiency in a competitive environment (Hallikas et al., 2021). Unhelkar et al. (2022) found that digital technologies, especially RFID implementation, will help businesses track processes, reduce supply time and costs, and help improve supply chain efficiency. The application of Blockchain technology and other digital technologies in product production and distribution will upgrade the level of product information disclosure, thereby enhancing the trust of sensitive consumers, stimulating their desire to purchase, thereby improving supply chain efficiency (Choi et al., 2020). Based on these arguments, the hypothesis is proposed as follows:

H3: Digital technology positively impacts a company's supply chain performance

2.2.3. Resilient Supply Chain and Supply Chain Performance

Response capability emphasizes the supply chain's ability to withstand market changes when disruptive events occur (Ali et al., 2023; Furstenau et al., 2022). Previous studies as well as practice have demonstrated that appropriate risk management decisions can lead to quick and flexible responses to disruption risks, contributing to increased supply chain efficiency (Dubey et al., 2021). A more resilient supply chain allows for quick allocation of internal resources, continuously improving product and service quality, improving responsiveness to market demand, increasing supply chain efficiency (Chowdhury & Quaddus, 2017; Han et al., 2020). At the same time, highly resilient enterprises tend to cooperate both vertically and horizontally with their supply chain partners to build a stronger collaborative supply chain network, which may lessen supply chain vulnerability (Skipper & Hanna, 2009). Collaboration helps partners inside the supply chain jointly develop business plans to diminish the level of internal risk. This will strengthen the internal control of the supply chain, jointly protect against exogenous risks, and perk up the synergistic advantage of the supply chain, thus improving

supply chain efficiency during disruption (Revilla & Saenz, 2017; Shekarian & Mellat Parast, 2021).

Improved recovery capability can reduce supply chain losses and lead to more significant operational efficiency (Ponomarov & Holcomb, 2009). Rapid supply chain recovery allows businesses to restructure their resources to create new opportunities for growth, contributing to increased supply chain value and efficiency (Carlucci et al., 2004). Supply chain efficiency depends largely on the speed and scale of recovery actions. Increasing supply chain resilience means reducing disruption times, which will reduce threats from supply chain resistance and promote improved supply chain efficiency (Han et al., 2020; Manupati et al., 2022). In addition, improved resilience can accelerate the development of quality products, promptly introduce new products to the market, and help enterprises gain higher market shares, thereby directly impacting business performance (Cegarra-Navarro et al., 2016; Rui et al., 2008). Based on these arguments, the following hypotheses are proposed:

H4: Response capability has a positive impact on supply chain performance

H5: Recovery capability has a positive impact on supply chain performance

2.2.4. Resilient Supply Chain and Competitive Advantage

A company's response and recovery capability can be observed through its financial capacity and robustness (Siagian et al., 2022). Measuring a business's competitive advantage requires a strong supply chain (Abeysekara et al., 2019; Çağhyan et al., 2022). A business with a highly resistant and resilient supply chain will become strong and grow significantly in the face of crisis, thereby minimizing losses and maintaining a competitive advantage (Eltantawy, 2016; Liu et al., 2018; Zhou et al., 2024). Continuous innovation will help businesses win over competitors through profitability and efficiency (Behl, 2022; Zhou et al., 2024). Businesses with good supply chain resistance and resilience will have a competitive advantage, so they can grow faster and win against competitors (Çağhyan et al., 2022). Research by Abeysekara and colleagues (2019); Behl (2022) shows that supply chain resistance and resilience affect supply chain performance as well as a business's competitive advantage. Based on this explanation, the proposed hypotheses are as follows:

H6: Response capability positively impacts a company's competitive advantage

H7: Recovery capability positively impacts a company's competitive advantage

2.2.5. Supply Chain Performance and Competitive Advantage

Supply chain efficiency and competitive advantage are closely related. Supply chain efficiency affects the long-

term relationships between upstream suppliers and downstream customers. Good relationships with suppliers and customers improve supply chain resilience. Supply chain resilience improves business competitiveness. Businesses have realized that to have a competitive advantage they need to improve supply chain efficiency. According to Li et al. (2006), the efficiency of supply chain factors such as logistics, inventory... has a significant impact on the competitive environment. The goal of a supply chain is to move materials and information throughout the supply chain in a competitive, uninterrupted manner, so supply chain efficiency is essential to achieving competitive advantage (Childerhouse & Towill, 2003). Sukati and colleagues (2012) also confirmed that supply chain efficiency has a positive effect on competitive advantage. Lee et al. (2022) also found a high correlation between supply chain efficiency and a business's competitive advantage. Therefore, the proposed hypothesis is as follows: **H8:** Supply chain performance has a positive impact on the competitive advantage of businesses

The proposed research model with 08 hypotheses (Figure 1).

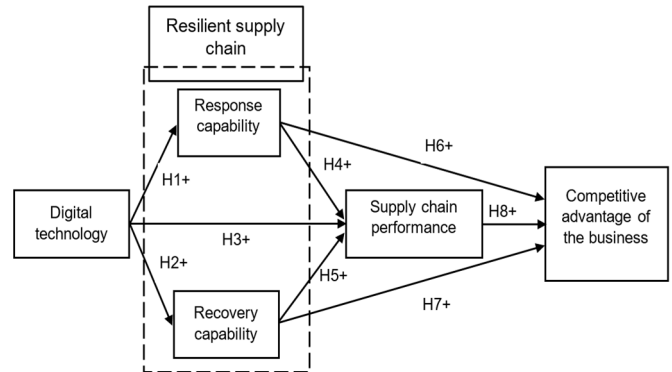


Figure 1: Proposed Research Model

3. Research Methodology

To clearly determine the impact of digital technology and resilient supply chains on the competitive advantage of businesses, this study uses a combination of qualitative and quantitative research methods. Qualitative research was conducted through group discussions including 03 conveniently selected experts working in management in businesses in different fields in Ho Chi Minh City to explore and preliminarily confirm the impact relationships between factors in the proposed research model. The scale of factors is proposed based on relevant previous studies. Quantitative research is used to evaluate the reliability of the scales, Test hypotheses and measure impact relationships in the research model.

3.1 Measurement Scale

Each concept in the research model includes 5 observed variables. The observational scales are inherited with adjustments from previous studies, specifically: digital technology (Zhou & Wang, 2021), resistance capacity (Zhao, 2023), resilience (Zhao, 2023), supply chain efficiency (Zhao, 2023; Sheel & Nath, 2019), competitive advantage (Zhao, 2023; Sheel & Nath, 2019). A 5-point Likert scale is applied to all observed variables.

3.2. Sample Size and Research Data

Hair and colleagues (2021) proposed a 10-fold rule to determine the minimum sample in PLS-SEM, according to which the minimum sample size for this study is 10 times the number of observed variables of a causal scale structure with the most observed variables of 30. The sample includes managers in businesses in different fields in three regions: North, Central, and South. The survey was sent directly in a convenient method through students interning at businesses, combined with the snowball technique during the period from March to November 2024. The authors received 221 responses, of which 217 were valid responses, the remaining 4 were not used because businesses have not applied digital technology in the supply chain. Detailed information about the study sample is shown in Table 1.

4. Research Findings

4.1. Reliability, Convergence, and Discrimination

After evaluating the quality of observed variables, variable DT2 has an external factor loading coefficient of 0.628, less than 0.7, so it is eliminated. The remaining observed variables are all meaningful in the model so they are used to test the measurement model.

According to Nunnally (1978), a good scale should have Cronbach's Alpha reliability of 0.7 or higher. Hair et al. (2010) also said that a scale that ensures unidimensionality and reliability should have a Cronbach's Alpha reliability of 0.7 or higher. According to Fornell and Larcker (1981), composite reliability values are accepted if greater than 0.60. Table 2 shows that Cronbach's Alpha and CR of the scales are all greater than 0.7, so the scales ensure good reliability. The AVE values are all greater than 0.5, so the scales ensure convergence (Table 2).

Table 1: Demographic Information of Respondents

Characteristic	Descriptive	Frequency	Percentage (%)
Gender	Gender	143	65.9
	Gender	74	34.1
Academic qualifications	Bachelor or less	179	82.5
	Postgraduate	38	17.5
Career position	Departmental Management	173	79.7
	Board of Directors	44	20.3
Field	Textiles	88	40.6
	Automotive	6	2.8
	Construction	21	9.7
	Electrical - Electronic	12	5.5
	Chemical	11	5.1
	Footwear	30	13.8
	Seafood	20	9.2
	Other	29	13.4
Possession	Government	15	6.9
	Private	102	47.0
	Foreign	100	46.1
Region	North	40	18.4
	Central	21	9.7
	Southern	156	71.9
Total		217	100

Table 2: Construct Reliability and Validity

Constructs	Items	Indicators	Citation sourcing	Factor Loading	Cronbach's alpha	CR	AVE
Digital technology (DT)	DT1	adopted digital products and services	Zhou & Wang (2021); Zhao et al. (2023)	0.830	0.862	0.906	0.707
	DT3	adopted a digital business model		0.856			
	DT4	accelerated the construction of digital infrastructure		0.822			
	DT5	established a strategy for developing a digital supply chain		0.854			
Response capability (RSC)	RSC1	right risk management decisions during disruptions	Zhao et al. (2023)	0.878	0.893	0.921	0.700
	RSC2	respond quickly to SC disruptions		0.786			
	RSC3	maintaining connectivity and collaboration in the SC during disruptions		0.846			
	RSC4	quickly reacting or adapting to disruptions		0.826			
	RSC5	rapid disruption alerts		0.845			

Constructs	Items	Indicators	Citation sourcing	Factor Loading	Cronbach's alpha	CR	AVE
Recovery capability (RCC)	RCC1	swift return to normal operations after disruptions.	Zhao et al. (2023)	0.857	0.890	0.919	0.696
	RCC2	restructuring resources and developing new SCs after disruptions		0.776			
	RCC3	improved SC operations after disruptions		0.813			
	RCC4	sufficient resources to handle SC disruptions		0.862			
	RCC5	ability to customize products after disruptions		0.858			
Supply chain performance (SCP)	SCP1	greater operational cost savings.	Sheel & Nath (2019)	0.840	0.876	0.910	0.669
	SCP2	SC operating costs will be reduced by using DT		0.867			
	SCP3	shorter lead times		0.805			
	SCP4	meeting diverse customer product requirements.		0.824			
	SCP5	better return on investment		0.750			
Competitive advantage of the business (CA)	CA1	lower production costs and prices than competitors	Abeysekara et al. (2019); Sheel & Nath (2019)	0.802	0.859	0.899	0.640
	CA2	better quality than competitors		0.805			
	CA3	greater customer loyalty compared to competitors		0.860			
	CA4	faster and more effective response to changing SC strategies than competitors		0.769			
	CA5	faster and more effective response to changing customer demands than competitors		0.759			

The square root of AVE is larger than the correlations between the latent variables and all HTMT values are less than 0.9, so discrimination is guaranteed (Table 3).

Table 3: Discriminant Validity with Fornell-Larcker Criterion and HTMT

	Fornell-Larcker Criterion					HTMT				
	CA	DT	RCC	RSC_	SCP	CA	DT	RCC	RSC_	SCP
CA	0.800									
DT	0.628	0.841				0.725				
RCC	0.673	0.710	0.834			0.764	0.809			
RSC_	0.602	0.636	0.563	0.837		0.680	0.717	0.625		
SCP	0.634	0.626	0.668	0.562	0.818	0.726	0.719	0.755	0.629	

Note: Coding of variables is presented in Table 2.

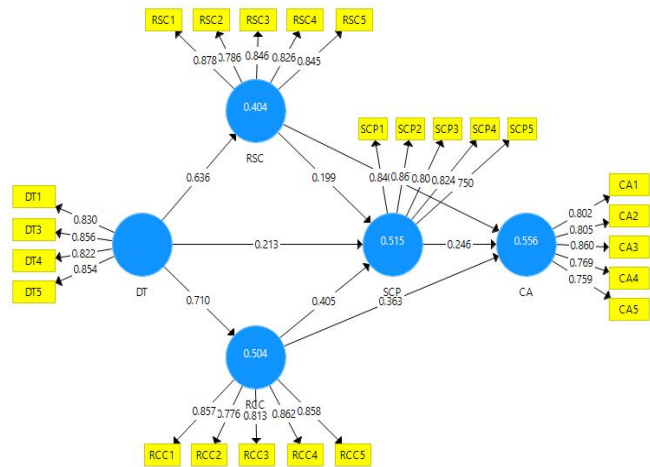
4.2. Structural Model

The structural model consists of relationships built through hypotheses. Bootstrapping technique was performed to test the research hypothesis, with results presented in Figure 2.

Table 4: Summary of the Hypothesis Test Results

Hypotheses	Relationship	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values	Result
H1	DT → RSC_	0.636	0.638	0.040	15.703	0.000	Supported
H2	DT → RCC	0.710	0.711	0.046	15.499	0.000	
H3	DT → SCP	0.213	0.218	0.082	2.592	0.010	
H4	RSC_ → SCP	0.199	0.203	0.084	2.363	0.018	
H5	RCC → SCP	0.405	0.395	0.078	5.199	0.000	
H6	RSC_ → CA	0.259	0.260	0.060	4.345	0.000	
H7	RCC → CA	0.363	0.358	0.066	5.524	0.000	
H8	SCP → CA	0.246	0.253	0.077	3.194	0.001	

Note: Coding of variables is presented in Table 2.



Note: Coding of variables is presented in Table 2.

Figure 2: Structural Modeling Results

Table 4 shows that all effects in the model are significant because the t-test's p-values are all less than 0.05.

The VIF values of the structural equation model in this study are all less than 5, ranging from 1 to 2.412, showing that there is no homogeneity between the scales, so no multicollinearity occurs in the model (Table 5).

Table 5: Inner VIF Values

	CA	DT	RCC	RSC_	SCP
CA					
DT			1.000	1.000	2.412
RCC	1.989				2.104
RSC_	1.612				1.753
SCP	1.986				

Note: Coding of variables is presented in Table 2.

4.3. Impact level

The adjusted R Square value was used to evaluate the explanatory power of the multivariate model. According to Falk and Miller (1992), an R Square value greater than 0.10 for any dependent variable is acceptable and sufficient to be explained by the independent variables. The higher the adjusted R Square value, the greater the model's explanatory power.

Table 6: Explanatory Results for Dependent Variable

	R Square	Adjusted R Square
CA	0.556	0.550
RCC	0.504	0.501
RSC_	0.404	0.402
SCP	0.515	0.508

Note: Coding of variables is presented in Table 2.

The adjusted R Square values of the dependent variables in Table 6 all exceed the threshold of 0.1, showing that the independent variables impact and explain 40.2% of the variation in RSC; 50.1% variation of RCC; 50.8% of the variation in SCP and 55% of the variation in CA.

Table 7: Effect Size

	CA	DT	RCC	RSC_	SCP
CA					
DT			1.015	0.679	0.039
RCC	0.149				0.160
RSC_	0.094				0.047
SCP	0.069				

Note: Coding of variables is presented in Table 2.

The value of function f^2 represents the influence of exogenous variables in the model. Structures with f^2 values less than 0.02 demonstrate no influence from exogenous variables. If the value ≥ 0.02 has a small influence, the value

≥ 0.15 is medium and ≥ 0.35 is large (Cohen, 1988). Table 7 shows that the f^2 coefficients are all greater than 0.02, meaning that each independent variable has an influence on the dependent variable. In particular, digital technology has a huge impact on the resistance and resilience of the supply chain.

5. Discussion

Empirical research on the relationship between digital technology, resilient supply chains and competitive advantages of businesses has been previously researched by a number of domestic and foreign authors. The hypotheses in this study are all accepted, contributing to strengthening and clarifying the relationships that have been confirmed in previous studies.

The study confirms that digital technology has a huge impact on the response and recovery capability of supply chains. Supply chain resilience depends heavily on investment and application of digital technology. This result supports the view of Moshtari (2016); Sousa and Rocha (2019); and Zhao et al. (2023). At the same time, along with digital technology, elastic supply chains also directly impact supply chain efficiency as shown by Ivanov and Dolgui (2020); Han et al. (2020); Dubey et al. (2021); Zhao et al. (2023) once confirmed. Improving supply chain efficiency also depends on the response and recovery capability of the supply chain. The better the supply chain resilience, the lower the likelihood of supply chain loss due to disruption, which will have a positive impact on supply chain efficiency (Tukamuhabwa et al., 2015). Digital technology is a resource for restructuring, while supply chain resilience is a dynamic capability. Applying digital technology in the supply chain will increase resilience, resist disruption, and improve supply chain efficiency.

Some previous studies confirm that supply chain elasticity and efficiency affect the competitive advantage of the supply chain, but the impact on the competitive advantage of businesses has not been studied much. Along with Abeysekera et al. (2019); Cagliyan et al. (2022); Zhou et al. (2021) results of this study contribute to affirming that an efficient and highly resilient supply chain has an impact on a business's competitive advantage. With strong supply chain resilience, businesses will adapt faster to supply chain disruptions, resist immediately and return to normal conditions. Therefore, customer satisfaction with the business is strengthened, and the competitiveness of the business also increases. Therefore, it is necessary to increase innovation and application of digital technology to improve the efficiency of resilient supply chains and gain competitive advantage.

6. Conclusion and Suggested Implications

6.1. Conclusion

Complex distribution and supply chain networks and volatile environments can weaken the stability of supply chains and make them vulnerable to disruption. The large-scale outbreak of the COVID-19 pandemic causing almost all global supply chains to experience varying degrees of disruption, seriously affecting the production of businesses is a testament to reality. Therefore, businesses attach great importance to building an effective resilient supply chain to survive, compete and develop. This research has achieved its goals and has made certain contributions in both theory and practice.

- First, the research contributes to strengthening the theory: digital technology is considered a resource and the response and recovery capability of the supply chain is the dynamic capacity of the enterprise. Research shows that the effective integration of digital technology resources in the supply chain has shaped the resilient supply chain, and when the supply chain is resilient, it will be a source of dynamic capacity necessary to maintain and improve the efficiency of the supply chain. This study has strengthened the theory and enriched theoretical research literature based on the perspective of dynamic resources and capabilities by adding empirical evidence on the impact relationship of dynamic resources and capabilities on performance.

- Second, the research contributes to theory development: previous studies mainly mentioned the relationship between elastic supply chain, competitive advantage and supply chain efficiency, while research on the relationship between elastic supply chain impact, supply chain efficiency and competitive advantage of enterprises is still limited. This research was conceived and tested to explain the impact relationship between elastic supply chains, supply chain efficiency and competitive advantages of businesses. Therefore, this research provides a reference for future research in enhancing the competitive advantage of enterprises by improving the resilience of the supply chain. Digital technology is the premise for forming resilience, and a resilient supply chain plays an intermediary role in the relationship between digital technology, supply chain efficiency and competitive advantage of businesses.

- Third, the results of this research can be used as a basis for business administrators in making decisions in applying digital technology to help businesses recover quickly from risks, improve distribution and supply chain efficiency and enhance competitive advantage.

Besides the results achieved, limitations of this study include a small sample size and only study businesses in certain sectors. The research is also only based on the impact of digital technology, without analyzing the regulatory or

control role by field, scale, type of ownership... of the business.

6.2. Suggested Implications

Digitizing the supply chain is a solid foundation for businesses to have a long-term and sustainable competitive advantage over their competitors. To build a resilient and efficient supply chain, aiming for better competition, the authors propose some policy and management implications as follows:

- Firstly, businesses need to invest and apply digital technology strategically to optimize resources and activities, minimize risks and increase the ability to respond to changes, creating sustainable value, thereby enhancing competitive position. Currently, there are many technologies that can be applied to the supply chain such as AI, IoT, Blockchain, big data analysis, and automation. Businesses need to allocate budget for digital technology development needs, choose appropriate technologies and combine them properly so as not to cause system conflicts, the supply chain, from upstream to downstream, from materials procurement to finished product distribution, will become more efficient, more transparent and resilient to market fluctuations.

- Second, businesses need to improve the response and recovery capability of their supply chains to survive the crisis and quickly return to their original state or even better. To improve this ability, it is necessary to accelerate the digital transformation process, apply technology throughout the supply chain to track and monitor the entire supply chain transparently in real time from suppliers, warehouses, to transportation and distribution in real time, increasing transparency and minimizing errors. This helps businesses optimize operations, better predict market demand, detect disruptions early and provide timely response measures.

- Third, because most competitors know the importance of competitive advantage, businesses need to maintain and enhance their competitive advantage by developing breakthrough supply strategies and advanced supply models based on digital technology to meet the increasing needs of customers and enhance the ability to adapt to market fluctuations.

- Fourth, businesses need to recruit digital talents, develop employees' digital skills and proactively adjust the digital supply chain structure. This will help businesses take advantage of the benefits of digital technology, adapt quickly to market fluctuations and customer needs and improve competitiveness. This is not only a factor that helps businesses achieve success in the digital transformation process but also lays the foundation for sustainable development in the future.

- Finally, government support is of extreme importance in the digitalization process of businesses, especially in the

current digital transformation period. By creating a strong infrastructure, issuing appropriate policies and providing financial support, the government will help businesses be more confident in deploying digital technology, thereby improving supply chain efficiency, competitiveness and better meeting market needs.

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References

- Abeyssekara, N., Wang, H., & Kurupparachchi, D. (2019). Effect of supply-chain resilience on firm performance and competitive advantage: A study of the Sri Lankan apparel industry. *Business Process Management Journal*, 25(7), 1673-1695.
- Adobor, Henry, and Ronald S. McMullen. (2018). "Supply chain resilience: a dynamic and multidimensional approach." *The International Journal of Logistics Management* 29.4:1451-1471.
- Ali, A., Mahfouz, A., & Arisha, A. (2017). Analysing supply chain resilience: integrating the constructs in a concept mapping framework via a systematic literature review. *Supply chain management: an international journal*, 22(1), 16-39.
- Ali, I., Sadiddin, A., & Cattaneo, A. (2023). Risk and resilience in agri-food supply chain SMEs in the pandemic era: a cross-country study. *International Journal of Logistics Research and Applications*, 26(11), 1602-1620.
- Bai, C., Dallasega, P., Orzes, G., & Sarkis, J. (2020). Industry 4.0 technologies assessment: A sustainability perspective. *International journal of production economics*, 229, 107776.
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of management*, 17(1), 99-120.
- Behl, A. (2022). Antecedents to firm performance and competitiveness using the lens of big data analytics: a cross-cultural study. *Management Decision*, 60(2), 368-398.
- Bi, R., Davidson, R., Kam, B., & Smyrnios, K. (2013). Developing organizational agility through IT and supply chain capability. *Journal of Global Information Management (JGIM)*, 21(4), 38-55.
- Brandon-Jones, E., Squire, B., Autry, C. W., & Petersen, K. J. (2014). A contingent resource-based perspective of supply chain resilience and robustness. *Journal of Supply Chain Management*, 50(3), 55-73.
- Çağhyan, V., Attar, M., & Abdul-Kareem, A. (2022). Assessing the mediating effect of sustainable competitive advantage on the relationship between organisational innovativeness and firm performance. *Competitiveness Review: An International Business Journal*, 32(4), 618-639.
- Carlucci, D., Marr, B., & Schiuma, G. (2004). The knowledge value chain: how intellectual capital impacts on business performance. *International Journal of Technology Management*, 27(6-7), 575-590.
- Cavalcante, I. M., Frazzon, E. M., Forcellini, F. A., & Ivanov, D. (2019). A supervised machine learning approach to data-driven simulation of resilient supplier selection in digital manufacturing. *International Journal of Information Management*, 49, 86-97.
- Cegarra-Navarro, J. G., Soto-Acosta, P., & Wensley, A. K. (2016). Structured knowledge processes and firm performance: The role of organizational agility. *Journal of Business Research*, 69(5), 1544-1549.
- Chan, A. T., Ngai, E. W., & Moon, K. K. (2017). The effects of strategic and manufacturing flexibilities and supply chain agility on firm performance in the fashion industry. *European Journal of Operational Research*, 259(2), 486-499.
- Chaudhuri, A., Subramanian, N., & Dora, M. (2022). Circular economy and digital capabilities of SMEs for providing value to customers: Combined resource-based view and ambidexterity perspective. *Journal of Business Research*, 142, 32-44.
- Chen, C. J. (2019). Developing a model for supply chain agility and innovativeness to enhance firms' competitive advantage. *Management Decision*, 57(7), 1511-1534.
- Childerhouse, P., & Towill, D. R. (2003). Simplified material flow holds the key to supply chain integration. *Omega*, 31(1), 17-27.
- Choi, T. M., Feng, L., & Li, R. (2020). Information disclosure structure in supply chains with rental service platforms in the blockchain technology era. *International Journal of Production Economics*, 221, 107473.
- Chowdhury, M. M. H., & Quaddus, M. (2017). Supply chain resilience: Conceptualization and scale development using dynamic capability theory. *International journal of production economics*, 188, 185-204.
- Christopher, M., & Holweg, M. (2017). Supply chain 2.0 revisited: a framework for managing volatility-induced risk in the supply chain. *International Journal of Physical Distribution & Logistics Management*, 47(1), 2-17.
- Cohen, S. (1988). Perceived stress in a probability sample of the United States. *The social psychology of health/Sage*.
- Cui, Y., & Idota, H. (2018, July). Improving supply chain resilience with establishing a decentralized information sharing mechanism. In *Proceedings of the 5th multidisciplinary international social networks conference* (pp. 1-7).
- Dehgani, R., & Jafari Navimipour, N. (2019). The impact of information technology and communication systems on the agility of supply chain management systems. *Kybernetes*, 48(10), 2217-2236.
- Dey, P. K., Chowdhury, S., Abadie, A., Vann Yaroson, E., & Sarkar, S. (2024). Artificial intelligence-driven supply chain resilience in Vietnamese manufacturing small-and medium-sized enterprises. *International Journal of Production Research*, 62(15), 5417-5456.
- Dubey, R., Gunasekaran, A., Childe, S. J., Fosso Wamba, S., Roubaud, D., & Foropon, C. (2021). Empirical investigation of data analytics capability and organizational flexibility as complements to supply chain resilience. *International Journal of Production Research*, 59(1), 110-128.
- Ehie, I., & Ferreira, L. M. D. (2019). Conceptual development of supply chain digitalization framework. *IFAC-PapersOnLine*, 52(13), 2338-2342.

- Elrefae, G., & Nuseir, M. (2022). Blockchain in global finance make-over: Exploring the mediating role of supply chain flexibility. *Uncertain Supply Chain Management*, 10(3), 983-992.
- Eltantawy, R. A. (2016). The role of supply management resilience in attaining ambidexterity: a dynamic capabilities approach. *Journal of Business & Industrial Marketing*, 31(1), 123-134.
- Falk, R. F. (1992). A primer for soft modeling. *Ohio University of Akron Press*.
- Fatorachian, H., & Kazemi, H. (2021). Impact of Industry 4.0 on supply chain performance. *Production Planning & Control*, 32(1), 63-81.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, 18(1), 39-50.
- Furstenau, L. B., Zani, C., Terra, S. X., Sott, M. K., Choo, K. K. R., & Saurin, T. A. (2022). Resilience capabilities of healthcare supply chain and supportive digital technologies. *Technology in Society*, 71, 102095.
- Ghobakhloo, M. (2020). Determinants of information and digital technology implementation for smart manufacturing. *International Journal of Production Research*, 58(8), 2384-2405.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate Data Analysis* (7th ed.). Upper Side River, NJ: Prentice Hall.
- Hair Jr, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). *Partial least squares structural equation modeling (PLS-SEM) using R: A workbook* (p. 197). Springer Nature.
- Hallikas, J., Immonen, M., & Brax, S. (2021). Digitalizing procurement: the impact of data analytics on supply chain performance. *Supply Chain Management: An International Journal*, 26(5), 629-646.
- Han, Y., Chong, W. K., & Li, D. (2020). A systematic literature review of the capabilities and performance metrics of supply chain resilience. *International Journal of Production Research*, 58(15), 4541-4566.
- Hasani, A., & Khosrojerdi, A. (2016). Robust global supply chain network design under disruption and uncertainty considering resilience strategies: A parallel memetic algorithm for a real-life case study. *Transportation research part e: logistics and transportation review*, 87, 20-52.
- Holmström, J., & Partanen, J. (2014). Digital manufacturing-driven transformations of service supply chains for complex products. *Supply Chain Management: An International Journal*, 19(4), 421-430.
- Huang, Y. F., Phan, V. D. V., & Do, M. H. (2023). The Impacts of Supply Chain Capabilities, Visibility, Resilience on Supply Chain Performance and Firm Performance. *Administrative Sciences*, 13(10), 225.
- Ivanov, D., Dolgui, A., & Sokolov, B. (2019). The impact of digital technology and Industry 4.0 on the ripple effect and supply chain risk analytics. *International journal of production research*, 57(3), 829-846.
- Ivanov, D., & Dolgui, A. (2020). Viability of intertwined supply networks: extending the supply chain resilience angles towards survivability. A position paper motivated by COVID-19 outbreak. *International journal of production research*, 58(10), 2904-2915.
- Kamalahmadi, M., & Parast, M. M. (2016). A review of the literature on the principles of enterprise and supply chain resilience: Major findings and directions for future research. *International journal of production economics*, 171, 116-133.
- Lee, K., Azmi, N., Hanaysha, J., Alzoubi, H., & Alshurideh, M. (2022). The effect of digital supply chain on organizational performance: An empirical study in Malaysia manufacturing industry. *Uncertain Supply Chain Management*, 10(2), 495-510.
- Li, G. (2022). Research on the relationships between knowledge-based dynamic capabilities, organizational agility, and firm performance. *Journal of Risk and Financial Management*, 15(12), 606.
- Li, S., Ragu-Nathan, B., Ragu-Nathan, T. S., & Rao, S. S. (2006). The impact of supply chain management practices on competitive advantage and organizational performance. *Omega*, 34(2), 107-124.
- Linkov, I., Carluccio, S., Pritchard, O., Ní Bhreasail, Á., Galaitsi, S., Sarkis, J., & Keisler, J. M. (2020). The case for value chain resilience. *Management Research Review*, 43(12).
- Manupati, V. K., Schoenherr, T., Ramkumar, M., Panigrahi, S., Sharma, Y., & Mishra, P. (2022). Recovery strategies for a disrupted supply chain network: Leveraging blockchain technology in pre-and post-disruption scenarios. *International Journal of Production Economics*, 245, 108389.
- Moshtari, M. (2016). Inter-organizational fit, relationship management capability, and collaborative performance within a humanitarian setting. *Production and Operations Management*, 25(9), 1542-1557.
- Nekmahmud, M. D., Rahman, S., Sobhani, F. A., Olejniczak-Szuster, K., & Fekete-Farkas, M. (2020). A systematic literature review on development of green supply chain management. *Polish Journal of Management Studies*, 22(1), 351-370.
- Nguyen Thi, B., Nguyen Do Khanh, L., Ha Minh, H., Do Thi Thuy, L., & Ngo Tien, D. (2023). Impacts of inbound logistics capabilities on supply chain resilience: insight from Vietnamese textile industry. *Measuring Business Excellence*, 27(3), 501-518.
- Nguyen, P. H., Chau, N. N. M., Ha, N. T., Anh, T. H., & Linh, P. T. K. (2023). Identifying factors of cross-border e-commerce supply chain resilience in Vietnam using a fuzzy Delphi and DEMATEL model. *ICB 2023*, 504.
- Ngoc, T. M., & Vy, H. D. B. (2023). Exploring the internal drivers of SMEs' resilience: The case of Ho Chi Minh City SMEs in the context of Covid-19. *Ho Chi Minh City Open University Journal Of Science-Economics And Business Administration*, 13(1), 103-120.
- Nunnally, J. C. (1978). *Psychometric Theory 2nd edition*. New York: McGraw-Hill
- Oh, S., Ryu, Y. U., & Yang, H. (2019). Interaction effects between supply chain capabilities and information technology on firm performance. *Information Technology and Management*, 20, 91-106.
- Ponomarev, S. Y., & Holcomb, M. C. (2009). Understanding the concept of supply chain resilience. *The international journal of logistics management*, 20(1), 124-143.
- Putri, Y. D., Huda, L. N., & Sinulingga, S. (2019, May). The

- concept of supply chain management performance measurement with the supply chain operation reference model (Journal review). In *IOP Conference Series: Materials Science and Engineering* (Vol. 505, No. 1, p. 012011). IOP Publishing.
- Raj, R., Wang, J. W., Nayak, A., Tiwari, M. K., Han, B., Liu, C. L., & Zhang, W. J. (2014). Measuring the resilience of supply chain systems using a survival model. *IEEE Systems Journal*, 9(2), 377-381.
- Raji, Ibrahim Oluwole, Eduard Shevtshenko, Tommaso Rossi, and Fernanda Strozzi. (2020). Industry 4.0 technologies as enablers of lean and agile supply chain strategies: An exploratory investigation. *The International Journal of Logistics Management* 32: 1150–89
- Revilla, E., & Saenz, M. J. (2017). The impact of risk management on the frequency of supply chain disruptions: a configurational approach. *International Journal of Operations & Production Management*, 37(5), 557-576.
- Rui, M., Yang, J., Hutchinson, J., & Wang, J. (2008). Managing knowledge for new product performance in the high technology industry. *International Journal of Technology Management*, 41(1-2), 96-108.
- Saryatmo, M. A., & Sukhotu, V. (2021). The influence of the digital supply chain on operational performance: a study of the food and beverage industry in Indonesia. *Sustainability*, 13(9), 5109.
- Siagian, H., Tarigan, Z. J. H., & Basana, S. R. (2022). *The role of top management commitment in enhancing competitive advantage: The mediating role of green innovation, supplier, and customer integration* (Doctoral dissertation, Petra Christian University).
- Sheel, A., & Nath, V. (2019). Effect of blockchain technology adoption on supply chain adaptability, agility, alignment and performance. *Management Research Review*, 42(12), 1353-1374.
- Sheffi, Y. (2008). Resilience: What it is and how to achieve it. Retrieved October, 1, 2013.
- Shekarian, M., Nooraie, S. V. R., & Parast, M. M. (2020). An examination of the impact of flexibility and agility on mitigating supply chain disruptions. *International Journal of Production Economics*, 220, 107438.
- Shekarian, M., & Mellat Parast, M. (2021). An Integrative approach to supply chain disruption risk and resilience management: a literature review. *International Journal of Logistics Research and Applications*, 24(5), 427-455.
- Skipper, J. B., & Hanna, J. B. (2009). Minimizing supply chain disruption risk through enhanced flexibility. *International Journal of Physical Distribution & Logistics Management*, 39(5), 404-427.
- Sousa, M. J., & Rocha, Á. (2019). Strategic knowledge management in the digital age: JBR special issue editorial. *Journal of Business Research*, 94, 223-226.
- Sukati, I., Hamid, A. B. A., Baharun, R., Alifiah, M. N., & Anuar, M. A. (2012). Competitive advantage through supply chain responsiveness and supply chain integration. *International Journal of Business and Commerce*, 1(7), 1-11.
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic management journal*, 18(7), 509-533.
- Tiwana, A. (2015). Evolutionary competition in platform ecosystems. *Information Systems Research*, 26(2), 266-281.
- Tukamuhabwa, B. R., Stevenson, M., Busby, J., & Zorzini, M. (2015). Supply chain resilience: definition, review and theoretical foundations for further study. *International journal of production research*, 53(18), 5592-5623.
- Unhelkar, B., Joshi, S., Sharma, M., Prakash, S., Mani, A. K., & Prasad, M. (2022). Enhancing supply chain performance using RFID technology and decision support systems in the industry 4.0—A systematic literature review. *International Journal of Information Management Data Insights*, 2(2), 100084.
- Wang, E. T., & Wei, H. L. (2007). Interorganizational governance value creation: coordinating for information visibility and flexibility in supply chains. *Decision Sciences*, 38(4), 647-674.
- Wareham, J., Fox, P. B., & Cano Giner, J. L. (2014). Technology ecosystem governance. *Organization science*, 25(4), 1195-1215.
- Wu, K. J., Tseng, M. L., Chiu, A. S., & Lim, M. K. (2017). Achieving competitive advantage through supply chain agility under uncertainty: A novel multi-criteria decision-making structure. *International Journal of Production Economics*, 190, 96-107.
- Verboven, P., Defraeye, T., Datta, A. K., & Nicolai, B. (2020). Digital twins of food process operations: the next step for food process models?. *Current Opinion in Food Science*, 35, 79-87.
- Yang, M., Fu, M., & Zhang, Z. (2021). The adoption of digital technologies in supply chains: Drivers, process and impact. *Technological Forecasting and Social Change*, 169, 120795.
- Zhao, N., Hong, J., & Lau, K. H. (2023). Impact of supply chain digitalization on supply chain resilience and performance: A multi-mediation model. *International Journal of Production Economics*, 259, 108817.
- Zhou, J., Hu, L., Yu, Y., Zhang, J. Z., & Zheng, L. J. (2024). Impacts of IT capability and supply chain collaboration on supply chain resilience: empirical evidence from China in COVID-19 pandemic. *Journal of Enterprise Information Management*, 37(2), 777-803.
- Zhou, Q., & Wang, S. (2021). Study on the relations of supply chain digitization, flexibility and sustainable development—A moderated multiple mediation model. *Sustainability*, 13(18), 10043.