

The impact of digital supply chain application on enterprise competitive advantage

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Abstract

Purpose: This paper delves into the multifaceted impact of digital technology on the competitive landscape of contemporary businesses. It unveils the intricate interplay between innovation, information, and strategic advantage, dissecting the ways in which organizations harness the power of technology not only to survive but thrive in an increasingly globalized and hyper-connected world.

Design/methodology/approach: Based on literature review, this paper starts with the importance of digital supply chain management, gradually discusses the role of digital supply chain in organizations, and delves into the impact of digital technology progress on the competitiveness and competitive advantage of various types of enterprise organizations. Finally, conclusions are drawn.

Findings: This paper collectively provide a comprehensive overview of how digital technology and digital transformation impact competitiveness at various levels, from supply chains and national economies to specific industries and SMEs. This paper also highlights this relationship's multifaceted and dynamic nature, emphasizing the critical role of digital advancements in driving competitiveness in the modern business landscape.

Research limitations/implications: This paper has two key limitations. First, its findings may be limited by a narrow geographic and industrial focus, which reduces its broader applicability. Second, the research is heavily reliant on literature review, potentially lacking originality and empirical depth, and may not adequately address the impact of cultural differences or organizational readiness for digital transformation.

Practical implications: This paper's theoretical strengths lie in its integration of frameworks and deep dive into competitive advantage theory, offering a comprehensive analysis of digital supply chain's influence on business success. It highlights the importance of leveraging unique capabilities, mediating risks through digital innovation, and ensuring organizational readiness for sustainable advantage. The emphasis on dynamic capabilities underscores adaptability's role in navigating the digital landscape. The study also discusses strategic implications of digital supply chain applications and identifies future research gaps, enriching our understanding of how digitalization drives competitive edge.

Originality/value: The significance of this paper is reflected in two aspects: firstly, it provides new ideas for various types of enterprises to enhance their competitive advantages in the digital economy wave, laying the foundation for manufacturing enterprises that are preparing or about to prepare for the digital transformation of the supply chain; Secondly, we need to help various types of enterprises focus on cultivating their digital supply chain capabilities, emphasizing the

key relationship between digital technology and competitive advantages in the supply chain management process.

Keywords: Supply Chain Management, Digital Supply Chain, Competitive Advantage

Introduction

In the dynamic landscape of the 21st century, the relentless march of technology has revolutionized every facet of human existence. From how we communicate and conduct business to how we access and disseminate information, the digital revolution has left an indelible mark on our societies. Nowhere is this transformation more palpable than in the realm of commerce and industry, where the convergence of digital technologies has ushered in an era of unprecedented change and opportunity. This paper delves into the multifaceted impact of digital technology on the competitive landscape of contemporary businesses. It unveils the intricate interplay between innovation, information, and strategic advantage, dissecting the ways in which organizations harness the power of technology not only to survive but thrive in an increasingly globalized and hyper-connected world.

This paper will through the literature review method to deeply elaborate on the competitive advantage, digital supply chain, and digital supply chain application on enterprise competitive, in order to explain the important role and application significance of digital supply chain on enterprise development as much as possible.

Theoretical background

Competitive advantage

Competitive advantage refers to the superior competitive position formed by a company's uniqueness relative to its industry competitors. Superior competitive position can be described as a company having better projects, products, or profitability compared to other companies, including a higher market share. For a company, the establishment of a competitive advantage can determine its success or failure.

In order for a company to establish a competitive advantage, it must have a lasting competitive advantage in order to have substantive significance (David, 1984). The so-called "sustainable competitive advantages: SCAs" refer to the following three characteristics: ① a lasting competitive advantage must cover the key success factors of the industry; ② Persistent competitive advantage is a competitive advantage that differs significantly from competitors; ③ Persistent competitive advantage must be able to respond to changes in the environment and have the ability to resist competitive actions from competitors.

The existing research mainly develops in depth from Porter's theory. Porter believes that from the perspective of the strength of the competitors, competitive advantages include products, marketing channels, operating costs, marketing capabilities, research and development, comprehensive costs, finance, organization, general management, company portfolio, core capabilities, growth ability, rapid response ability, adaptability to change, persistence, technical ability, etc. The competitive strategy is to enable enterprises to find favorable competitive positions in the most basic industries (Porter, 1985).

Therefore, the purpose of competitive strategy is to establish a competitive position that is both profitable and sustainable in response to the determining factors of industrial competition. Compared to other enterprises, a company often reflects its competitive advantage through various business activities, such as production activities, marketing activities, logistics activities, and other internal activities. These activities clarify the differences between

companies, even if they are in the same industry and produce the same products, these activities must be different.

Porter used the concept of value chain to analyze the sources of competitive advantage. As a tool, the value chain can effectively analyze a company's strategic activities, and ultimately, after decomposition, gradually understand the cost characteristics of the company's strategic activities, compare existing and future cost situations, and identify differences (Porter, 1985). Many companies use this approach to proficiently apply value chain tools, uncover much lower enterprise costs than their competitors, and develop corresponding supply chain competition strategies to obtain higher profits. Generally speaking, there are two ways to transform various activity links of enterprises and create competitive advantages through value chain tools, namely "optimization" and "coordination". This value chain structure can effectively reflect the overall effectiveness of the enterprise and individual activities, and can also reflect the balance between the two. (Conkey et al., 2016). When enterprises use higher cost product designs, stricter raw material specifications, or more rigorous production process inspections, it is possible to reduce service costs.

Therefore, only when the value chain of enterprise strategy produces the best results can there be a competitive advantage. The existing research mainly develops in depth from Porter's theory. Porter believes that from the perspective of the strength of the competitors, competitive advantages include products, marketing channels, operating costs, marketing capabilities, research and development, comprehensive costs, finance, organization, general management, company portfolio, core capabilities, growth ability, rapid response ability, adaptability to change, persistence, technical ability, etc.

The competitive strategy is to enable enterprises to find favorable competitive positions in the most basic industries. Therefore, the purpose of competitive strategy is to establish a competitive position that is both profitable and sustainable in response to the determining factors of industrial competition. Competitive advantage often comes from various functional tasks in the internal operation process of a company, which are independent of each other, such as product design, production, marketing, transportation, support, and operation. These functional tasks are closely related to the benefits and costs of the enterprise. The total cost of a company's functional work is lower than that of another company, which must be caused by the differentiation of functional work, which constitutes a cost advantage, and this company has a cost advantage.

For potential competitors, analogies can also be used to evaluate the cost of potential competitors. Cost advantage is a unique characteristic of an enterprise. Once an enterprise forms a cost advantage, it also indicates that the enterprise has its unique characteristics in its key business links. This key link is a barrier that other competitive enterprises cannot break through, giving the enterprise a great advantage. Moreover, this advantage is sustainable and has strategic value. Among the cost advantages of enterprises, cost driven factors are more sustainable, and therefore cost driven factors are the factors that sustain cost advantages.

So, based on the literature review, this paper think the competitive advantage can be reflected in three aspects: firstly, in terms of economic benefits (including market share, net profit, etc.), secondly, in terms of social benefits (product safety, corporate image, social welfare, etc.), and thirdly, in terms of environmental benefits (including material utilization rate, energy consumption, resource recovery, etc.).

Digital supply chain

In terms of the relevant theories of digital supply chain, many scholars have made certain contributions, elaborating from different perspectives. Some scholars have focused on the

application of digital supply chain in various industries, while others have discussed the impact of digital supply chain on enterprise management reform from multiple perspectives.

Agrawal and Narain's study in 2018, "Digital Supply Chain Management: An Overview," is foundational, emphasizing the significance of digitization in supply chain management. It underscores the need to understand how digitization affects organizations and employees and the necessity for adept management during digital transformations (Agrawal & Narain, 2018). This underscores the vital role of digitalization in enhancing competitiveness, particularly in the context of supply chains. The relevant research conducted by Afraz et al. focus shifts to the construction industry (Afraz et al., 2021). The study explores how supply chain innovation (SCI) contributes to this sector's competitive advantage (CA). It reveals that SCI enhances CA by mediating risk management capabilities, robustness, and resilience within the supply chain. This research emphasizes the importance of innovation in the construction industry, reflecting digitization's impact on industry-specific competitiveness.

Additionally, Deepu and Ravi's work in 2021, their paper introduced a model for selecting the optimal Inter-Organizational Information Systems (IOIS) in supply chain integration (Deepu & Ravi, 2021). The study emphasizes the importance of digital technology enablers, security measures, and project completion time in the decision-making process within supply chain management. This study sheds light on how digital tools and technologies affect decision-making processes, a pivotal aspect in enhancing competitiveness.

Discussion of the papers collectively highlights the transformative impact of digitization on supply chain management and competitiveness. Moreover, Agrawal and Narain's foundational study emphasizes the need for adept management during digital transformations. Afraz et al.'s research underscores how supply chain innovation enhances competitive advantage, particularly in the construction industry. Deepu and Ravi's work emphasizes the importance of digital technology enablers and effective decision-making processes in achieving competitiveness. Together, these studies provide valuable insights into the crucial role of digitization in shaping modern supply chains and driving organizational success.

Besides, in the review by Büyüközkan and Göçer, their study emerged as a transformative force. DSC creates value and revenue by leveraging advanced technologies like UAVs, cloud computing, and IoT (Büyüközkan & Göçer, 2018). The review acknowledges DSC's potential while highlighting its limitations. The study suggests further research on real-case applications and scalability, indicating the importance of adopting digital strategies to bolster competitiveness. While acknowledging the promise of DSC, the study also recognizes its limitations and calls for further research in real-world applications and scalability, emphasizing the importance of adopting digital strategies to enhance competitiveness.

In addition, Kalaitzi and Tsolakis' research in 2022 delved into the determinants shaping the adoption of Supply Chain Analytics (SCA). It examines how technological, organizational, and environmental factors influence SCA adoption, underlining the significance of organizational readiness and environmental elements. This study emphasizes the need for a collaborative approach involving stakeholders to foster sustainable human resources, a crucial factor in competitiveness (Kalaitzi & Tsolakis, 2022). Also, Kalaitzi delve into the determinants influencing the adoption of Supply Chain Analytics (SCA) (Kalaitzi & Tsolakis, 2022). It carefully examines how various factors, including technological, organizational, and environmental considerations, impact the adoption of SCA. This research underscores the critical significance of organizational readiness and environmental elements in this process. Moreover, it stresses the necessity for a collaborative approach among stakeholders to nurture sustainable human resources, a key driver of competitiveness.

Therefore, the above scholars have affirmed the digital supply chain from different aspects and clarified its contribution to enterprises, the digital supply chain is a positive reform for enterprises.

Digital supply chain application on enterprise competitive

In the research on the impact of digital supply chain on enterprise competitiveness, many scholars have also elaborated on the impact of digital supply chain on these factors from the definition of competitiveness and the influencing factors of competitiveness. The impact of digital supply chain on the competitive advantage of various types of enterprises is more positive, and many researchers have put forward their own views on this.

The related study by Al Mashalah et al. primarily focused on the alignment of supply chain stages with digital transformation strategies (Al Mashalah et al., 2022). Although it doesn't provide specific findings, it offers a conceptual framework that highlights the increasing importance of e-commerce in supply chain management, an element crucial to competitiveness. Laitso et al. in their paper assessed Greece's digital competitiveness within the European Union context. Using DESI index, they predict Greece will likely catch up in digital competitiveness with the EU-28 by 2026 (Laitso et al., 2020). This illustrates the potential for digital advancements to enhance competitiveness on a national level. Dabbous et al. in a study, quantitatively assessed the impact of digitalization on entrepreneurial activity and sustainable competitiveness (Dabbous et al., 2023). It highlights the role of fast, reliable connectivity and increased internet use in enhancing sustainable competitiveness, underlining the significance of digital technologies in economic advancement.

Laitso et al. emphasized the assessment of Greece's digital competitiveness within the European Union showcasing the potential for nations to catch up and thrive in the digital era, emphasizing the broader implications of digital advancements on national competitiveness, (Laitso et al., 2020). Furthermore, Dabbous et al. stressed that through data analysis, quantitative description, digitalization has brought benefits to entrepreneurship, competitiveness enhancement, and sustainable development, and can be more effective in carrying out such activities than in the past. (Dabbous et al., 2023). It underscores the pivotal role of robust digital infrastructure in driving economic progress and enhancing competitiveness in a sustainable manner. Overall, these studies collectively emphasize that embracing digital technologies and strategies is essential for staying competitive in today's rapidly evolving landscape and holds the potential to drive economic growth and sustainability on both organizational and national levels.

Wang et al. in their study demonstrated the varying impact of the digital economy on export competitiveness in different industries and regions. This research provides empirical evidence of digitalization's positive influence on manufacturing export competitiveness (Wang et al., 2023). Stankovic et al. in their study introduced a methodology for measuring digital competitiveness. It highlights the correlation between digital competitiveness and economic performance, showing how digital advancement can enhance a country's competitiveness (Stankovic et al., 2021).

Kolpak et al. has examined digital competitiveness using a three-dimensional representation and highlight regional variations in competitiveness trends. This emphasizes the adaptability and sustainability potential of digital technologies in different regions (Kolpak et al., 2021). Sepashvili's paper in 2020 has underscores the role of physical infrastructure development in driving digital technology's growth in the global economy (Sepashvili, 2020). The focus on digital signatures and electronic banking demonstrates how technology integrates with financial transactions, improving economic competitiveness. Cichosz explored the impact of digitalization on competitiveness in the logistics service industry, emphasizing the potential

benefits of digitalization in streamlining and enhancing logistics services (Cichosz, 2018). Hu evaluates the impact of smart sensor networks on China's digital economy industry, highlighting the industry's quality, adaptability, and sustainability, which contribute to global competitiveness (Hu, 2022). Finally, Munandar and Firmansyah examine the role of digital marketing and leadership capability in improving SMEs' product competitiveness in the ASEAN Economic Community (AEC) (Munandar & Firmansyah, 2018). This research identifies key variables, such as digital culture, digital attitude, and leadership skill, which can influence competitiveness through digital marketing and leadership capability.

Bradić-Martinović and Miletić focus on the role of Information and Communication Technology (ICT) readiness in the competitiveness of Serbian tourism. They examine each sub-pillar of ICT readiness and its influence on tourism competitiveness (Bradić-Martinović & Miletić, 2017). While the paper does not provide specific findings, it highlights the importance of technological development in the tourism industry, suggesting that ICT plays a crucial role in enhancing tourism competitiveness. Sanusi and Yakabu has investigated the impact of digital banking innovations on the competitiveness of universal banks in Ghana (Sanusi & Yakabu, 2023). The study examines customer perspectives on digital banking innovation. The findings suggest a positive correlation between digital innovation and customer attraction and satisfaction, although customer retention appears less influenced. The study employs correlation and regression analyses to explore these relationships further, emphasizing the significance of digital innovations in the banking sector's competitiveness.

Kurniawan's research in 2022 on digital marketing-based tourism planning policies for regional tourism competitiveness, particularly in East Java (Kurniawan, 2022). The study identifies challenges in local government digital marketing activities, such as customer data processing for retention and determining key performance indicators for digital marketing strategies. These findings emphasize the importance of efficient digital marketing in boosting regional tourism competitiveness. Setyawan work also addresses digital marketing-based tourism planning policies in the context of regional tourism development in East Java (Setyawan, 2022). It underscores the need for collaboration between stakeholders, particularly local governments, to build sustainable human resources. This collaborative approach is crucial for achieving collective goals and enhancing regional tourism competitiveness.

Guo conducted a detailed study on the impact of digital transformation in his paper, using petroleum enterprises as an example, with a focus on the moderating role of knowledge transfer capabilities (Guo, 2023). The findings reveal a positive correlation between digital transformation and the competitiveness of petroleum enterprises, highlighting the role of digital initiatives in enhancing competitiveness. Mazurchenko and Švermová explore the expected how small and medium-sized enterprises face digital transformation and how their competitiveness is affected and the competencies of their employees. This study selected Czech companies, and the research results fully demonstrate the application effect of digital technology. The relationship between employee training and digital technology in these companies is close, showing statistical significance. (Mazurchenko & Švermová, 2021). This underscores the potential of digital transformation in enhancing SME competitiveness and employee competencies.

The above scholars have elaborated on the positive correlation between digital supply chain and enterprise competitiveness, especially in small and medium-sized enterprises, starting from industries such as oil, tourism, and logistics services. At the same time, they have also found some statistical evidence to prove the reliability of their relationship.

Mcleod et al. study on "Accessing Humanities Research in a Digital Environment" holds a pivotal place in the evolving landscape of academic publication. By scrutinizing the role of open access in scholarly publication, this research raises fundamental questions about

knowledge accessibility and authors' rights in the digital age (McLeod et al., 2014). While it may not offer empirical findings, this work emphasizes the increasing significance of open access, its impact on publishing contracts and author copyrights, and the challenges and opportunities it presents in the context of the digital environment. Thus, it contributes substantially to the discourse on academic dissemination, calling for reevaluating traditional publishing practices.

The comprehensive analysis conducted by Al Mashala et al. in their research titled "The Impact of Digital Transformation on Supply Chains through E-commerce" addresses a critical gap in the literature (Al Mashala et al., 2022). The systematic review of 153 publications from 1999 to 2019 offers a comprehensive understanding of how digital transformations, particularly e-commerce, reshape supply chain dynamics. Notably, the findings indicate a substantial surge in e-commerce, further accelerated by the COVID-19 pandemic. Beyond this, the research establishes a solid foundation for future studies in this domain, underlining the urgency of understanding and adapting to the digital revolution within supply chain management.

Dabbous scrutinized the study and examined the factors influencing nations' sustainable competitiveness in the digital era. Including a quantitative panel data analysis is a notable strength of this research, as it allows for a deeper exploration of the impact of digitalization on entrepreneurial activity and sustainable competitiveness (Dabbous, 2023). The study's findings underscore the pivotal role of fast, reliable connectivity and increased internet use for transactions, communications, and content sharing in enhancing sustainable competitiveness. This insight positions the research as a critical contribution to the ongoing discourse on how digital technologies can be harnessed for sustainable economic advancement.

The comparative study led by Wang et al., alongside a group of collaborators, delves into the digital technologies' impact on business competitiveness across Latin American and European countries (Wang et al., 2023). The research reveals strong associations between ICT adoption and various aspects of business dynamism, skills, and product markets in both regions. This comparative analysis paints a vivid picture of how digital technologies act as catalysts for economic dynamism and competitiveness in different global contexts. By doing so, it establishes the significance of digitalization as a common denominator in enhancing business competitiveness, regardless of regional disparities.

Wahyuningtyas et al. undertake a significant study focusing on the competitive resilience of cooperatives in the digital era. Their findings emphasize the industry longevity of most surveyed cooperatives, showcasing their adaptability (Wahyuningtyas et al., 2021). However, the research sounds a cautionary note, highlighting the importance of embracing Industry 4.0 and harnessing digital technology for competitiveness. It underscores the potential management challenges that cooperatives may face if they fail to adapt to the digital transformation. This study's insights underscore the urgency for cooperatives to evolve and adopt digital innovations to maintain their competitiveness.

The research conducted by Da Costa, M Benitez, G Nara, and a team of scholars significantly contributes to understanding the competitiveness dynamics in the food industry within the context of digital transformation. It highlights the importance of concurrent investments in various digital technologies to enhance competitiveness in the food industry. This research advocates for public policies that promote the expansion of digital technology in the sector, recognizing that relying on a single digital tool is insufficient in the competitive landscape. This insight positions the study as a significant piece in the ongoing dialogue about how the food industry can harness the full potential of digital technologies to stay competitive.

Kolpak et al. have introduced a unique three-dimensional representation for assessing digital competitiveness, employing knowledge, technology, and future-readiness as key indicators. While the findings reveal an insignificant link between competitiveness and knowledge, they

affirm the importance of technology and future readiness (Kolpak et al., 2021). Additionally, the study highlights regional variations in digital competitiveness trends. East Asia's long digital competitiveness vector and Western Europe's upward trend emphasize digital technologies' adaptability and sustainability potential in various regions. These insights are crucial for understanding how digital readiness and adaptability vary across regions, ultimately affecting their competitiveness.

In summary, the research framework model of the impact on the competitive advantage of enterprises is shown in the figure 1.

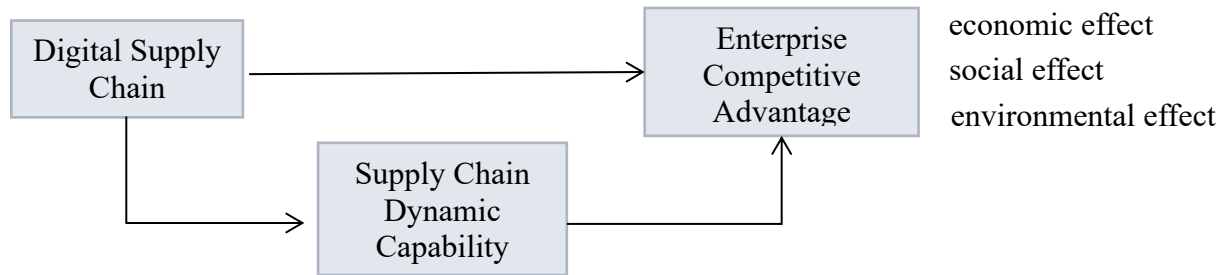


Figure 1: Research Framework

Figure 1 shows that: the application of digital supply chain has an impact on the competitive advantage of enterprises, and of course, digital supply chain can also affect the dynamic capabilities of the supply chain. Then, the dynamic capabilities of the supply chain can affect the competitive advantage of enterprises. This paper will not elaborate on how the dynamic capabilities of the supply chain are affected by digital supply chain.

Findings

These studies collectively provide a comprehensive overview of how digital technology and digital transformation impact competitiveness at various levels, from supply chains and national economies to specific industries and SMEs. They highlight this relationship's multifaceted and dynamic nature, emphasizing the critical role of digital advancements in driving competitiveness in the modern business landscape.

At present, digital transformation is ubiquitous, and academia and industry have invested a lot of resources in research (Persson et al., 2018). Digital technology has been applied to various scenarios in enterprise production and our daily lives (Lu et al., 2011). For example, we only need a mobile phone to complete payment activities, autonomous driving technology is applied to cars, and robots are used to transport materials in factories. However, they are only simple applications of digital technology, and the application scenarios are too single, independent, and do not have universal significance.

In addition, existing research has conducted extensive exploration on the influencing factors of enhancing corporate competitive advantage, but there is a lack of research on the role of supply chain digital transformation in the path of corporate competitive advantage. There is insufficient analysis of the mechanism of the dynamic capabilities of supply chain in the digital economy environment on the role of corporate competitive advantage.

Looking at the current research status at home and abroad, many scholars have obtained rich research results through qualitative or quantitative methods on the key influencing factors of enhancing the competitive advantage of manufacturing enterprises, including the transformation of service-oriented strategies, cooperation with innovation partners through relationship capabilities, entrepreneurial spirit, adjusting the selection of service innovation

strategies for manufacturing enterprises through the improvement of technological capabilities, and implementing social responsibility behaviors for manufacturing enterprises under competitive pressure. However, with the deepening of research on manufacturing enterprises and the broadening of research horizons, manufacturing enterprises, especially consumer goods manufacturing enterprises, have launched e-commerce activities and become a part of e-commerce enterprises. The topic of how these enterprises can obtain sustainable competitive advantages has been proposed, and existing research needs to be further deepened.

Discussion and Conclusion

This article clarifies the concept of digital supply chain through the sorting and analysis of research literature on digital supply chain, and summarizes the relevant research of some scholars on digital supply chain, as well as the most commonly used digital technologies in digital supply chain. Finally, it reviews the application literature of digital supply chain in various industries, laying a foundation for subsequent research by other scholars. From the above, it can be concluded that in this era of information explosion, digital supply chain is a necessary path for enterprise transformation, a driving force for reducing enterprise costs and improving enterprise efficiency. Digitization will create enormous opportunities for various types of enterprises, and it has a great promoting effect on enterprise business. Enterprise managers are no longer just recognizing it, but constantly increasing their chips to improve the digital level of the enterprise and continuously improving its digital technology.

So, further research is needed on the pathway of action. What is the role path of supply chain digital transformation in the competitive advantage of various types of enterprises? It is worth further consideration.

How does digital supply chain affect enterprise performance. After reviewing the literature, it was found that there are conflicting opinions. Capgemini Consulting believes that digital technology transforms supply chain models into flexible. Digital supply chain can achieve business process automation, organizational flexibility, and digital management of enterprise assets. Kinnett believes that digital supply chain is an intelligent, value driven network that utilizes new methods of technology and analysis to create new forms of revenue and business value (Kinnett, 2015).

Companies with digital supply chains can better transfer resources, assets, personnel, and inventory to where they need them at any given time, thereby reducing costs by proactively addressing transportation and manufacturing risks. Ehie et al. defined supply chain digitization as the degree to which key factories implement innovative digital technologies within their supply chain processes (Ehie et al., 2019). Buyukozkan et al. believe that digital supply chain is an intelligent and optimal technology system based on massive data processing capabilities, thereby continuously and flexibly providing more valuable and affordable products for enterprises (Buyukozkan et al., 2018).

From the previous discussions, it has been found that the processing and application of digital information are all mentioned. Therefore, can the impact of digital supply chain on the competitive advantage of e-commerce enterprises be considered from the perspective of information processing, and the systems used in various stages of information processing be divided and considered, such as digitization of data collection, digitization of data transmission and processing, digitization of data storage, etc. It has an impact on the dynamic capabilities of the supply chain and the competitive advantage of enterprises.

The use of digital technology (DT) for enterprises, is a revolution, so, the application of DT path, the application scenario of DT, the application of DT barriers, the application of DT environment, and DT itself, are need enterprise constantly thinking, change their ability, embrace digital technology is the necessary choice and the best choice.

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