

Enterprise Digitalization Enabling Supply Chain Development: Driving Mechanisms and Path Choices

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Abstract. With the emergence and popularization of emerging digital technologies such as big data and artificial intelligence, it provides a new direction of thinking for enterprises to optimize supply chain layout and empower supply chain development. Promoting the synergistic and efficient development of the supply chain is a key issue that enterprises need to explore urgently. This paper takes the enterprise supply chain development as the research object, takes the enterprise digital transformation as the starting point, and deeply analyzes the mechanism and path of enterprise digital empowerment supply chain development. This paper explores the influence path of enterprise digitalization on supply chain development from the aspects of enterprise innovation ability and financing constraints, and puts forward suggestions and countermeasures for the dilemmas faced by enterprises in digital transformation, and the results of the research have certain practical significance for supply chain management.

Keywords: Enterprise Digitization; Supply Chain; Unified National Market.

1. Introduction

In recent years, under the multiple impacts of geopolitical conflicts, trade frictions and epidemics, the global industrial chain supply chain has seen a reconfiguration of its dynamics, and the security of the industrial chain supply chain has faced more severe challenges. In the Opinions on Accelerating the Construction of a Nationally Unified Market, the Chinese government points out that it is necessary to accelerate the construction of a nationally unified market, connect markets to break local protectionism, and solve the key problems hindering the economic cycle, so as to make the flow of resource factors faster and wider. At the enterprise level, to enhance the competitiveness of products and services, it is indispensable to optimize the collaboration and management of the supply chain. However, enterprises often face higher transaction costs, logistics deployment, warehouse management construction and many other problems when laying out a new supply chain, and it is not easy to make supply chain layout adjustments.

In 2021, the Chinese government clearly pointed out in the "14th Five-Year Plan" for the development of digital economy that it should accelerate the digital office, realize digital marketing, create intelligent production lines, and develop the digital economy from the point to the surface, the whole business, and the whole process. The emergence and popularization of digital technology has provided a new direction for enterprises to think about supply chain development. In terms of supply and demand matching, the digital platform leading enterprises can change the traditional business model and improve the efficiency of supply and demand matching[1]. In terms of cooperation information assessment, the emergence of digital platforms reduces the cost of searching before the signing of the contract, for example, public platforms such as Tian YanCha provide a convenient channel for enterprises to understand the supplier's credit, registration information and other information. In terms of process management, the application of artificial intelligence and big data management has revolutionized the equipment maintenance model in the manufacturing process to achieve cost reduction and efficiency in supply chain management[2]. Similarly, digital technology can be used to monitor and analyze the entire production process and automate responses to abnormal problems.

Compared with the established research, the academic contributions of this paper include: first, exploring the impact effect of enterprise digitization from the dimension of supply chain development. Currently, academics mainly conduct in-depth research on the impact effects of enterprise digitization from the perspective of the enterprise's own high-quality development. For example, in the aspect of business management, Lu Xuebo (2023)[3] argues that enterprise digitization can effectively reduce business risks. In terms of enterprise resilience, Jiang Luan et al. (2022)[4] pointed out that enterprise digital transformation significantly improves enterprise resilience from the perspective of dual innovation. In terms of green innovation, Liu Yanxia et al. (2023)[5] found that enterprise digitalization promotes the improvement of enterprise green innovation performance. However, few scholars have studied the impact of enterprise digital transformation on supply chain development, this paper explores the impact of enterprise digitalization from the innovative perspective of supply chain development, which is not only a useful supplement to the past literature on the assessment of the effect of enterprise digitalization, but also a theoretical reference to further promote enterprise digital transformation. Second, previous literature focuses on the influence factors of supply chain development from the perspectives of market environment[6] and urban agglomeration development[7], while this paper investigates the impact of enterprise digitization on supply chain development, and explores the influence mechanism from the perspectives of enterprise innovation ability and financing constraints, which expands the research on the influence factors of supply chain development.

2. The Development Status and Transformation Dilemma of Enterprise Digitization

In 2022, the volume of China's digital economy exceeded 50.2 trillion yuan, ranking 2nd in the world with a growth rate of 10.3% and accounting for 41.5% of GDP overall. With new technologies such as big data and artificial intelligence entering the application level and large-scale popularization, the digital economy has driven another round of industry-wide revolution and transformation and upgrading in the post-Internet era, and technologies such as the industrial Internet, cloud computing, big data, and artificial intelligence have been deeply integrated into various industries. The digital transformation of an enterprise is a long and complex process, which includes a step-by-step drive from internal management to external business models, to industry platforms, and from the introduction of basic technologies to the development of synergistic strategies.

Digitalization of internal operations and management to build a more agile and resilient operating model, and to achieve quality and cost reduction through digital innovation in internal business processes and management. Enterprises invest in digital technologies such as artificial intelligence, machine learning and automation to build a basic information technology system. On the production side, ICT technology is used to build a data flow that transforms the traditional production process into a more efficient, accurate, reliable, sustainable, scalable, and traceable data handling process, improving the efficiency and competitiveness of the enterprise. In terms of management, a decision-making and control system based on data analysis is established, and the structure of functional departments is flexibly adjusted according to business needs, resulting in effective connectivity between data flow and business flow. Digitization of external business models, converting customer needs into available data information, creating an efficient business cycle of data, opportunities, services, and revenues, and structurally reducing operating costs and improving efficiency. Digitization of industry platform ecology, in which factories, administration, R&D, marketing, supply chain and the entire ecosystem partners will be effectively digitally interconnected to establish a resilient and adaptive supply chain network, taking into account the internal operational efficiency and user experience, and opening up the entire value chain.

According to Accenture, IDC's 2022 research report, most enterprises are in the early stages of digital transformation, and only 17% of leading enterprises have significant transformation results. Although most enterprises have now realized the importance of digital transformation to the survival and development of enterprises, however, in practice, many enterprises still have the problem of difficult to implement transformation. First, it is difficult to build capacity, transformation is not deep. China's

large and medium-sized enterprises led by the policy, began to fully embrace the new situation of the industry brought about by digital technology, while most of the small and micro-enterprises due to the limitations of their own size and management capacity, the use of digital technology is not familiar with the information technology infrastructure is relatively backward, more accustomed to the original mode of operation, the application of new technologies with a negative attitude to the transformation of the lack of motivation to stop at the surface of the digitalization, and at the same time confined to the website construction, social media promotion and online sales, and are less involved in deep transformation such as production mode innovation and business model reshaping. Secondly, the lack of strategy and transformation. For the future vision is not clear, strategic planning is not clear, the direction of the transformation of the enterprise is unknown, often blindly deployed information technology systems, transformation is not focused, and the lack of relevance of their own business, this digital construction is difficult to empower the development of enterprises. In addition, there are large differences in the degree of recognition of transformation and digital cognitive ability of the business leaders, making the digital development of cross-corporate hierarchies and business areas limited, thus leading to poor transformation results. Third, it is difficult to realize the value, and the transformation is powerless. The systematic nature of digital transformation, making the digital investment in slow results, long cycle, and part of the enterprise's own financial strength is limited, the ability to finance general. In addition, enterprises are often eager to see the results, many companies still tend to take the traditional performance appraisal model, the lack of customized assessment mechanism based on the actual state of the company and planning, can not accurately reflect the company's digital transformation process and the value it brings. Under these circumstances, the value of digitization in the short term is often questioned by management, and the sustainability of digital investments is weak and the transformation ineffective.

3. Policy Background and Literature Review

3.1. Policy Background

In May 2015, the Chinese government formulated the strategic plan of "Made in China 2025", aiming at key aspects such as innovation-driven, intelligent transformation, strengthening of foundation, and green development, to promote the manufacturing industry to realize the transformation from big to strong, to promote the digitization, networking and intelligence of the manufacturing industry, and to take the innovation-driven development path. The policy focuses on overcoming common technologies such as informatization design, process integration design, complex process and system design, development of key design tools and software, providing support for the construction and improvement of innovation and design ecosystems, encouraging the establishment of a manufacturing innovation network with innovation centers as the core carriers and public service platforms and engineering data centers as the key support, and setting up a market-based mechanism for selecting the direction of innovation and encouraging the sharing of innovation risks, benefit-sharing mechanism. The plan proposes that by 2020, basic industrialization will have been achieved, the status of the manufacturing industry as a major country will be further consolidated, the level of manufacturing informatization will have been significantly improved, and significant progress will have been made in digitization, networking, and intelligence. By 2025, the broadband penetration rate, the penetration rate of digital R&D and design tools, and the CNC rate of key processes will increase to 82%, 84%, and 64%, respectively.

In March 2022, the Chinese government issued the Opinions on Accelerating the Construction of a Nationally Unified Large Market, a policy aimed at promoting high-standard and high-level connectivity of market facilities and market resources, developing supply chain finance, strengthening commodity quality system management across the entire supply chain, industry chain, and product lifecycle, fostering globally influential supply chain enterprises, realizing cost reductions and efficiency gains, increasing China's presence in the global industry chain supply chain. It will also

enhance China's influence in the global industrial chain supply chain and innovation chain, and enhance its right to speak in international economic governance.

3.2. Literature Review

In the context of China's response to the world's great changes that have not been seen in a century and ensuring China's economic security, it is significant to enhance the modernization level of the industrial chain supply chain, Huang Qunhui (2020)[8] believes that enhancing the industrial basic capacity and the modernization level of the industrial chain under the new development pattern is the key to improving the quality of supply and opening up the blockage points of the national economic cycle. Chen Zhiyuan (2021)[9] points out that digitalization can promote the supply chain from a single chain structure to a network structure, which makes the data of each link of the supply chain to be intelligent and cloud-based, and improves the supply chain operational efficiency and risk-resistant ability. Supply chain digitization can make the supply chain system continuously optimized, matching resources in each link of the supply chain production, circulation and consumption, driving the supply chain efficiency, and realizing the high-quality development of the economy.

Regarding the management optimization of the supply chain, many scholars have carried out research from different perspectives. Xiao Jinghua et al. (2015)[10] applied the theory of strategic renewal to the supply chain perspective, and proposed a theoretical framework of supply chain strategic transformation from partner-oriented to consumer-oriented, expanding the theoretical connotation of supply chain transformation. Zhang Jianjun and Zhao Qilan (2018)[11] revealed the transformation and upgrading mechanism of the circulation supply chain business model driven by new retailing, that is, new retailing completes the adjustment of the elements of the circulation supply chain business model by reshaping the people, goods, and fields, and then realizes the transformation and upgrading of the circulation supply chain business model.

With the booming development of the Internet, human society is moving towards a new era of digitization, and digital development has become a necessary path for the survival of enterprises in the whole industry at present. Zhang Qizai et al. (2021)[12] proposed that the improvement of the modernization level of the industrial chain supply chain should include the dimensions of more sustainable, more digitalized, more safe and reliable, more fair, more coordinated and smooth. Wang Junhong (2021)[13] analyzed in depth the main problems exposed by the traditional supply chain in the context of the rapid development of e-commerce in China, and put forward that the supply chain in China's cross-border e-commerce industry urgently needs to be transformed to digitalization under the impetus of the diversification of the consumption structure and the new requirements of the consumer market for products.

In the process of enterprise digital transformation, the relevant technology improves the operational efficiency of enterprises and also provides opportunities for reshaping the supply chain relationship. Specifically, in the field of new retail, Lai Hongbo (2020)[14] analyzed the mechanism of digital technology empowerment and "new retail" innovation, digital technology can transform marketing decisions, smooth the upstream and downstream of the "new retail" industry chain, and make the industrial development model of consumer to enterprise (C2B) possible, and make the supply chain more efficient. In the field of manufacturing industry, Wang Yonglong et al. (2020)[15] argued that the current digital economic empowerment is still mainly focused on the quantitative effect (expansion margin), and is not obvious for the intensive effect (intensive margin) such as the global value chain location effect, the total factor productivity effect, and the supply chain co-innovation effect, etc. In the field of agricultural products, Bai Shizhen and Huang Shaojuan (2021)[16] conducted an analysis of the operation of agricultural supply chain management in the digital economy environment, the current supply chain system has a lack of unity and standardization, the integrated resource integration platform is not perfect, resulting in the dispersion of resources and the lack of core enterprises with the ability to lead, etc., and digitally empowered supply chain will help to optimize the production structure of agricultural products and regional layout, and greatly reduce the circulation loss of agricultural products; in the field of fresh food supply, Li Meiyu et al. (2021)[17]

pointed out that in the traditional fresh food supply chain, there is a delay in supply and demand information, the development and application of digital technology, not only establishes a digital infrastructure entity, but also facilitates the connectivity of supply and demand information and the upgrading of the experience, drives cross-functional cooperation and synergy among various sub-systems, and improves the efficiency of the supply chain.

4. Enterprise Digitalization Enabling Supply Chain Development

With the continuous extension of the breadth and depth of the supply chain, the supply chain system has been transformed from the traditional single-chain relationship to a multi-entity, multi-functional complex network structure model[18]. Digital transformation can realize the effective allocation of enterprise resources, reduce supply chain management costs and improve production behavior and management mode, empowering the development of the supply chain. At the level of corporate governance, digital transformation improves the enterprise's ability to comprehensively analyze data information and process various types of data, which is conducive to the realization of internal decision-making intelligence and improve supply chain efficiency. Specifically, the digital transformation of enterprises can improve the innovation ability and ease the financing constraints of the two paths, empowering the supply chain development.

First, digital transformation can accelerate the integration of enterprise innovation elements, improve the independent innovation capacity of enterprises and enhance the resilience of supply chains. On the one hand, in the process of digital transformation, the digital infrastructure of enterprises is constantly improved, and the data governance capacity of enterprises is improved, which can improve the independent innovation capacity of enterprises. Enterprises use artificial intelligence, cloud computing and other digital technologies to improve the efficiency of collaborative management and promote the continuous improvement and upgrading of the infrastructure of the supply chain. Based on the continuous improvement of the industrial Internet platform, enterprises improve their data processing ability, data fusion ability and data governance ability[19]. From the point of view of internal information exchange, the use of network information systems improves the efficiency of internal information transfer and communication, helps enterprises to provide effective information, improves the efficiency of information transfer, effectively promotes the enhancement of enterprise innovation ability, and enhances the competitiveness of enterprises in value creation[20]. Based on advanced digital technology to build a collaborative network model of supply chain enterprises, manufacturing enterprises and suppliers, customers to achieve data integration, to promote the sharing and interoperability of data in all segments of the supply chain, and to promote technological innovation and management innovation of enterprises. On the other hand, the improvement of enterprise innovation ability promotes the production process oriented to user demand, thus enhancing the supply chain efficiency[21]. In response to the dynamic changes in the different needs of upstream and downstream customers, enterprises adjust the optimal decision-making of supply chain configuration, which can be more efficiently docked with upstream suppliers and downstream customers[22], and can deeply excavate the potential needs of consumers to improve production behavior and management mode[2]. The enhancement of enterprise innovation ability will also prompt it to continuously improve and rationalize the effective business objectives, and continuously strengthen the cooperation and synergy with other enterprises in the field of knowledge, technology, etc., so as to reduce the production cost, achieve long-term development, mutual benefit and win-win situation, and promote the diversification and resilience of the supply chain to improve.

Second, enterprise digital transformation can promote information integration and reduce transaction costs, thus easing financing constraints and expanding supplier networks. On the one hand, digital transformation can improve the information integration ability of enterprises, improve information efficiency, and better manage and deploy resources in each supply chain link through data analysis and forecasting, thus reducing external transaction costs of information asymmetry in upstream and downstream cooperation[23]. Advances in digital technology and applications can support the launch of collaborative, linked application platforms that facilitate information sharing and allow private

information such as price and demand to become shared information[24]. For supply chain banks, lower transaction costs can simplify the internal audit process, and banks can use third-party data to obtain more authentic and reliable information about enterprises, allowing supply chain banks to make better decisions and alleviate the financing constraints of enterprises[25]. In addition, digital governance can improve the commercial credit of enterprises, thus reducing the financing constraints. Core enterprises in the supply chain build a credibility chain by establishing cooperative relationships with other SMEs in the chain, which improves the credibility of other SMEs and enhances the availability of their supply chain financing[26]. On the other hand, the broadening of enterprise financing channels can establish cooperative relationships with more potential partners, promote the diversification of the supply network, and at the same time can weaken the transmission of the crisis in the industrial chain, so that enterprises can quickly respond to external shocks to some links in the industrial chain chain caused by the chain stops, and to enhance the resilience of the supply chain.

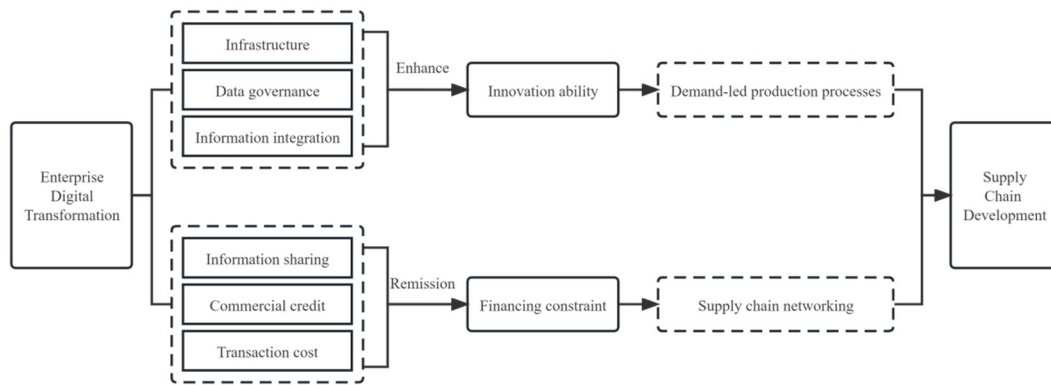


Figure 1. Dynamic mechanism of enterprise digitalization enabling supply chain development

5. Summary and Outlook

The digital revolution has had a profound impact on all links of the upstream and downstream industrial chain of supply chain enterprises, bringing new opportunities and challenges to supply chain enterprises. Specifically, enterprise digital transformation can promote the demand orientation of the production process by enhancing the independent innovation capability of enterprises, help smooth all links in the supply chain, and promote the diversified development of the supply chain; by easing the financing constraints, relaxing the financing channels, strengthening the cooperation and synergies among the supply chain enterprises, promoting the networked development of the supply chain, and enhancing the resilience of the supply chain. Enterprise digital transformation empowers the development of supply chain through the above two paths. At present, there are still many problems in the digital transformation of many supply chain enterprises. At the level of strategic planning, there is a lack of systematic and systematic strategic objectives; at the level of data processing, there is a lack of scientific and unified data and standard specifications; at the level of business model innovation, the breadth and depth of enterprise application of advanced digital technology is insufficient, resulting in insufficient energy for sustainable development of enterprises. Therefore, in order to solve the many problems in the digital transformation of enterprises, and to better play the role of digital technology application on the empowerment of supply chain development, this paper puts forward the following suggestions:

First, based on all kinds of information, build systematic strategic objectives, deeply cultivate their own core competence, and give play to the advantages of core competitiveness. The application of digital technology can improve the ability of enterprises to integrate information, enterprises should be based on various types of adequate information, combined with their own situation to formulate appropriate strategic objectives, and put the enhancement of innovation ability in an important position. Enhance the digitalization of customer service and management, strengthen the value

mining of data, respond to changes in customer demand, improve production mode and management mode, and enhance the resilience of the supply chain.

Secondly, it should strengthen the construction of the data standards and norms system, rely on key data governance technologies to improve data quality and enhance innovation capabilities. Data governance capability is a key capability in the process of enterprise digital transformation. Enterprises should strengthen their information collection capability, improve the efficiency of collaborative management by using artificial intelligence, cloud computing and other digital technologies, reduce the daily operating costs and management costs of the supply chain chain, strengthen the digitalization of customer service and management, and improve market competitiveness. Reduce production costs and human capital investment, increase innovation investment as well as enhance the total factor productivity of enterprises, and thus promote the development of the supply chain.

Third, enhance the ability of business model innovation, and actively explore sustainable digital product and service business growth points. Innovative operation mode, improve financing ability, accumulate economic strength and strengthen inter-enterprise collaboration, which can broaden financing channels and improve the development of supply chain networking.

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