

Research on Supply Chain Management Strategy under the Background of Digital Transformation

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Abstract: The advantages of businesses undergoing digital transformation are now more apparent due to the presence of the digital economy, and many businesses are already on this journey. Enterprises need to find solutions to a number of supply chain management issues in the context of digital transformation, including data management complexity, a lack of supply chain transparency and visibility, a shortage of supply chain management personnel, and supply chain data security risks. This report offers the five countermeasures in light of the aforementioned issues. Through these countermeasures, enterprises can solve the problems of supply chain management under the background of digital transformation and help enterprises develop in the long run.

Keywords: Digital Economy; Digital Transformation; Supply Chain Management

1. Introduction

After the agricultural economy and the industrial economy, the digital economy is the most significant type of economy. Data is the primary component and the current information network is the carrier in the digital economy. The main impetus behind the growth of the digital economy is the advancement of information technology. China's digital economy is at a stage of rapid expansion between 2016 and 2020. According to Table 1, the size of China's digital economy expanded from 22.6 trillion yuan in 2016 to 39.2 trillion yuan in 2020, accounting for an increase in percentage points from 30.3% to 38.6% of the country's total GDP.

Table 1 Development of China's Digital Economy in 2016-2020 (Unit: trillion)

Year	2016	2017	2018	2019	2020
Total scale of digital economy	22.6	27.2	31.3	35.8	39.2
Scale of digital industrialization	5.2	6.2	6.4	7.1	7.5
Scale of industrial digitalization	17.4	21	24.9	28.7	31.7

Data source: White Paper on China's Digital Economy Development (2021) and White Paper on China's Digital Economy Development and Employment (2019).

Chinese businesses are rapidly undergoing a digital transition, although the process is still in its early stages. Data from Red Shirt Capital's 2021 Annual Guide to Enterprise Digitalization shows that 95% of the polled businesses have begun the process of digital transformation. However, overall, Chinese businesses are still in the early stages of their digital transformation. Only 16% of businesses, according to a Heidrick and Cree International poll, are pushing and strengthening digital transformation. The early stages of the digital transformation are being experienced by 40% of businesses.

According to the data, the digitalisation level of China's supply chain will be improved in 2022. More than 30% of the 615 measures of the first batch of national supply chain innovation and application demonstration enterprises are related to the supply chain management platform. According to statistics from the Ministry of Industry and Information Technology, in 2022, the number of industrial equipment connections on key platforms will exceed 80 million units (sets), the number of industrial apps will reach nearly 300,000, the penetration rate of digital R&D and design tools in manufacturing enterprises will reach 76%, and the numerical control rate of key processes will reach 57.2%. The improvement of these technologies will further help China improve its position in global supply chain management.

2. Literature Review and Development

2.1 Literature analysis of digital economy

The digital economy, with data serving as the main component and digital technology serving as the driving force, has ushered in the

spring of development with the advent of a new round of scientific and technical revolution and industrial transformation. The notion of the digital economy is contested both domestically and internationally. The digital economy was fully defined by Shi Yong in 2022: The three components of big data, intelligent algorithms, and computing power platforms are the foundation of the new economic structure known as the “digital economy.” It combines clever algorithms and a computational power platform to store, process, and analyze massive data. They assist in the efficient use of resources as well as the modernization and upgrading of many industries.

2.2 Theoretical research on digital transformation

According to Chen Jian (2020) and others, the digital transformation of a company is the implementation of large-scale digital technology in its mode of production, operation, and management. Enterprise digital transformation is a cross-system change for conventional businesses. Digital transformation is a crucial decision for businesses looking to achieve a competitive edge and a key component of boosting competitiveness. In order to create a new innovation model, Wen Huwei and colleagues advocated that businesses employ digital technology to allocate resources with data serving as the primary production element. To increase the adaptability of digital transformation, enterprise digital transformation demands the use of cutting-edge digital technology as well as deep integration with the organization’s system, mode, and strategy.

2.3 Theoretical research on supply chain management

According to Tang Longji (2020), the Internet of Things, cloud computing, big data, artificial intelligence, and other contemporary digital technologies represent the foundation of this change. The majority of studies indicate that the supply chain’s digital transformation is a key indicator of the success of the digital transformation of all organizations. The supply chain management digital technology is deeply integrated with the industrial Internet, which has a significant impact on the supply chain’s digital transformation. According to Liu Weihua (2021), the supply chain’s structure has undergone significant modifications in recent decades as a result of the development process. Incorporating digital technology into a company’s everyday management, procurement, production, operation, and sales has enabled complete integration of logistics, information flow, and capital flow while also creating new challenges for corporate supply chain management. How can businesses continue to exploit the supply chain to its fullest capacity to acquire resources in the digital environment? How can I use my resources to gain a distinct competitive edge? These are significant problems that must be resolved as part of the enterprise’s digital transformation in order to implement supply chain management. According to Li Dan (2022), supply chain management is the two-way coordination and management of the business flow, logistics, information flow, and capital flow of the entire supply chain through effective enterprise cooperation, from the best effect of obtaining information to the best cost, time, and efficiency for end users of products. Supply chain management understands consumer needs at the strategic level.

2.4 Comprehensive review

Under the environment of rapid development of digital economy, enterprises are gradually embarking on the path of digital transformation. In the process of digital transformation of enterprises, with the increasing application of digital technology in enterprise management, some problems existing in the original supply chain management of enterprises are gradually exposed, and corresponding solutions to the related problems are needed. Analysing the current problems in supply chain management and proposing solutions is conducive to the long-term development of enterprises.

3. The problems of enterprise supply chain management under the background of digital transformation

With the steady development of digital economy in China, enterprises improve supply chain management under the background of digital transformation. There are many problems in the traditional supply chain management, which can not adapt to the current digital transformation environment. Under the background of digital transformation, there are six major problems in enterprise supply chain management:

3.1 Lack of awareness of the importance of supply chain management and digital technology

Liu Qingqing (2020) has pointed out that companies have established a complete supply chain system, but only in logistics and distribution. One of the important reasons why the function of supply chain cannot be brought into full play is that managers do not know enough about the idea of supply chain management. According to Dong Xinyu, Sun Hongzhi, Zhao Hongwei and others (2022), in the process of digital transformation of supply chain management, many enterprises have insufficient strategic awareness of digital transformation. They only stay on the surface and lack strategic awareness, which leads to the unsatisfactory effect of digital transformation of supply chain.

According to the survey, about 40% of the enterprise management can not agree with the importance of supply chain management. They believe that the current supply chain is enough to cope with the current development of enterprises, and does not need to change. They believe that the digital transformation of supply chain is more complex, and the integration of supply chain and digital technology still needs a lot of investment, but the effect is not good, and the digital transformation of supply chain is of little significance.

The trend of digital development is surging, most enterprises in the face of emerging digital technology, do not properly understand the importance of digital technology, and can not realize that the traditional supply chain management can not adapt to the current trend of digital development, the traditional supply chain management needs to be changed. Under the background of digital transformation, digital technology has become the key to enterprise development, but some enterprises have not yet realised the importance of digital technology. At the same time, supply chain management is directly related to the cost of enterprises. If supply chain management is not in place, it may lead to the breakdown of the supply chain, resulting in significant losses such as stagnation of product production.

3.2 Complicated data management and ineffective supply chain operation

Yang Zengmao (2023) said that in the process of supply chain digitisation, new technologies such as industrial internet, artificial intelligence and big data need to be integrated, which is difficult and complex, and it is also difficult for many enterprises to master the technology in a short time. Gao Jingqian (2021) pointed out that due to the lack of effective resource integration framework and governance mechanism between supply chain, customers, logistics and other links, there are many problems in material operation, information communication and capital flow between enterprises.

At the same time, each link in the supply chain lacks common goals and development strategy synergy, and the maximization of enterprises' own interests in the supply chain as the basis of cooperation is easy to lead to the realization of their own interests by harming the interests of other supply chain partners, which leads to the deterioration of supply chain cooperation and ultimately the collapse of supply chain cooperation. This is because the same data may be recorded multiple times by different entities in the supply chain, resulting in data duplication and inconsistency. In the process of enterprise digital transformation, enterprises can obtain a large amount of data related to the supply chain, and these data often come from different departments or systems within the enterprise, forming a relatively scattered situation of data, as a result, enterprises can not timely obtain the real-time status of the enterprise supply chain, and it is difficult to make reasonable decisions through data analysis.

3.3 Low transparency and visibility of the supply chain

Supply chain transparency, as demonstrated by Montecchi (2021), Zhou Maosen, and Zhang Qingyu (2020), primarily relates to the sharing and availability of supply chain data visualization. Accurate identification and data gathering from all supply chain connections are necessary for data visualization. Data should be exchanged within or outside the supply chain, and the level of sharing must be categorised and authorized in accordance with business decisions. Data sharing barriers, challenges with data interconnection, and limited openness of supply chain data were caused by Dai Jianping and Luo Wenping's (20–23) proposed various data authorisation criteria for various supply chain decision-making subjects. The desire to share within the supply chain is also poor due to disparities in management cognition across decision makers. Shared decision-making based on sharing a small amount of data cannot fully play the role of the supply chain.

Data and information are frequently exchanged from one location to another in traditional supply chain management, which lacks

integrity and openness. The majority of businesses struggle with data integration and sharing, and supply chain visibility is generally low. Because of the traditional reliance on manual accounting and interpersonal contact, it is challenging for businesses to fully comprehend the status of the supply chain and the current functioning of each link. This makes data sharing challenging. In addition, there are numerous suppliers or partners in the supply chain, and these partners frequently utilize different data management systems and data formats, which further impedes and complicates the administration of enterprise supply chain information flow.

3.4 Shortage of supply chain management talents

Gao Jingqian (2021) pointed out that in the process of digital transformation of enterprises, there is a shortage of supply chain management professionals. Although the concept of supply chain management has matured for many years, and every year our colleges and universities have trained more and more high-quality supply chain management-related talents, in the process of combining theory and practice, only a handful of talents can apply theory to management practice. Under the background of digital transformation, there are few talents who can combine digital technology with supply chain management. Zhou Huanyue (2023) pointed out that the establishment of a modern supply chain talent training system is the basis for enterprises to train supply chain talents. At present, the construction of modern talent management system in enterprises is still in the initial stage, and the talent training plan, talent training curriculum management and talent evaluation criteria need to be improved.

It is estimated that the demand for jobs in the national supply chain is about 4.33 million. However, such talents are rare, especially high-end talents who understand both supply chain and finance and information, and are the target of competition among enterprises. Ren Haoxiang, vice president of the China Federation of Logistics and Purchasing, pointed out in the interview that the demand for supply chain talent in China will be about 4.3 million in the next three years. At present, the training of supply chain talents is still in the start-up stage, and the shortage of supply chain talents in China needs to be solved as soon as possible.

Digital transformation requires enterprises to have relevant technologies, including cloud computing, Internet of Things or artificial intelligence, and some enterprises lack relevant experience and talent reserve in these areas. Digital transformation places higher technical demands on supply chain management talent, such as the need to master data analysis and processing capabilities, extract valuable information from massive amounts of information, and make accurate decisions based on valuable information. At the same time, digital transformation is not only at the technical level, but also at the strategic level. Supply chain management talents need to have strategic planning and high execution capabilities, combine digital transformation with corporate strategy, formulate a corresponding supply chain strategy and implement it efficiently. This is a new challenge for the training of corporate talent.

3.5 Supply chain data security risks

Yao Hong (2022) said that while the current supply chain security issues are significant, the threats to supply chain network security are not only growing, but also underestimated. According to industry data, supply chain attacks accounted for half of all cyber attacks in 2020, a jump of 78% compared to 2019. Li Dan (2022) suggested that under the pressure of trade barriers, it is a challenge for companies to prevent supply chain risks. Improving the early warning and response mechanism of supply chain risks is a necessary process for the long-term development of enterprises.

According to the 2021 China Software Supply Chain Security Analysis Report issued by Qi'anxin Code Security Laboratory, 2188 enterprises have used open source software, with an average of 52.5 software vulnerabilities in each software project. There are 1695, 1559 and 1319 projects with open source software vulnerabilities, high risk open source software vulnerabilities and super dangerous open source software vulnerabilities respectively. They account for 77.5%, 71.3% and 60.3% respectively. Once exploited by hackers, these vulnerabilities affect more than half of all software and have a significant impact on supply chain security.

In the process of digital transformation, the hidden threat of data security has become a major obstacle to companies' development. First, the problem of data leakage, due to the use and processing of large amounts of data in the process of digital transformation, many enterprises have shortcomings in data management and storage, leading to data leakage. The second is the problem of network attacks. In the pro-

cess of digital transformation, data is stored or transmitted in electronic form, which also requires the protection of network systems. Some companies are attacked by computer viruses, extortion software, hackers and so on, resulting in data loss or damage. At the same time, in the process of digital transformation, enterprises will collect a large amount of user data and personal information. If companies violate relevant laws and regulations when using data, they may face data security risks and legal disputes.

4. Countermeasures for Supply Chain Management under the Background of Digital Transformation

4.1 Attach importance to supply chain management and digital technology

From the strategic level, enterprises should formulate a clear digital supply chain strategy and determine the application goals of digital technology in supply chain management. From the perspective of managers, we should cultivate managers' digital awareness and improve managers' attention to supply chain management and digital technology. Strengthen the training of employees in digital skills and improve the importance of employees in digital technology. Improve awareness of continuous innovation and optimisation of supply chain management. Digital transformation is an ongoing process. Companies should continue to innovate and optimise supply chain management, take advantage of the emergence of digital technology, explore supply chain management technologies and tools, and improve the transparency, flexibility and operational efficiency of the supply chain. From a strategic point of view, the digital strategy of supply chain management will be designed, and the role of supply chain management in the development of the enterprise will be emphasised. Establish a professional supply chain management team to make reasonable planning for each part of the supply chain. From the perspective of staff training, from management to ordinary employees, digital concept training is carried out, and the development of supply chain management and digital technology is emphasised.

4.2 Establish a unified data platform or use integration tools to select appropriate technical standards, integration platforms and systems

First, the key data in the supply chain are identified and defined, ensuring a clear understanding of the data needs of each link in the supply chain, and the types and sources of data to be collected. Second, standardise the data format. Ensuring that the data formats of different data sources and systems are consistent and formulating unified data standards and normative requirements will help ensure data compatibility and integration, and facilitate data integration and sharing. Unified data standards and formats are adopted to realise the commonality between different systems. Third, select the appropriate data integration and sharing platform, such as enterprise resource planning (ERP) system, supply chain management (SCM) system, data warehouse, and so on. At the same time, ensure that the platform can support the integration, storage, processing and sharing of data. Finally, data integration technology and tools are used to extract, transform and load (ETL) data from different data sources. Application programming interfaces, data integration software, data replication and other tools help organisations process data efficiently.

4.3 Introduce a tracking technology, Establish supply chain data analysis and monitoring system

To ensure that the chosen tracking technology can satisfy the needs of real-time data tracking, choose the right tracking technology, such as Internet of Things devices, sensors, GPS positioning systems, etc. Set up methods and gadgets for tracking. Select and deploy the appropriate equipment and systems according to the selected tracking technology, such as installing sensors or scanning devices at each link in the supply chain. Establish a real-time monitoring and alerting mechanism to detect potential supply chain problems in a timely manner by setting up warning lines and anomaly detection algorithms. At the same time, it visualises the data, displaying the results of analysis and monitoring in the form of graphs and using icons, reports and other tools to provide decision-makers with a more intuitive view of the status of the supply chain. At the same time, the supply chain management system is established through digital technology to integrate the data information of each link, monitor the supply chain in real time, monitor the operation of the supply chain, and ensure the normal operation of

the supply chain.

4.4 Employ supply chain management talents and establish a professional management team

Increase recruitment efforts and hire supply chain management professionals through a variety of channels, including but not limited to university recruitment, social media, recruitment websites, etc. Establish a long-term partnership with a reputable supply chain management company or a staffing agency at the same time to give businesses more hiring options. Establish a professional management team and a supply chain management department after hiring qualified supply chain management candidates to make sure that all team members have the necessary educational and professional credentials. Provide training and development opportunities to team members after forming the professional management team. This can be done by combining internal and external training with attendance at industry seminars. At the same time, we should use pay and benefits, career prospects, and other strategies to draw in and keep top supply chain management personnel. In order to acquire more professional support that facilitates communication between team members and peer specialists and researchers, establish long-term collaboration with professional supply chain management organizations and associations. Work together with reputable supply chain management businesses or research institutions to give staff members greater opportunity for theoretical discussion and to raise their own supply chain management proficiency.

4.5 The government should establish and improve the emergency information release mechanism. The enterprise shall establish risk identification, assessment, treatment and monitoring mechanism

A consistent platform for the release of economic information should be established at the government level. Economic information will be released at various levels depending on the severity and impact of supply chain emergencies, and it will be broken down into warning, concern, and general levels so that businesses can respond appropriately depending on the level of information they have. In terms of businesses, the government should set up a comprehensive system for identifying supply chain risks and routinely evaluate supply chain risks using a variety of channels. Understanding the supply chain risk of partners and gathering pertinent information will need dialogue with suppliers and partners. The risk matrix or risk index model is used to quantitatively or subjectively analyze the risk for the identified supply chain risk enterprises, and the probability, impact, and urgency of the risk are assessed. The relevant risk management methods, risk prevention steps, standby suppliers, and contingency plans are developed in accordance with the findings of the risk assessment. A qualified risk management team should be developed at the same time to monitor risks, supervise the use of risk management methods, and promptly modify the strategies.

5. Conclusions and recommendations

The main research topic of this article is the issues and solutions related to enterprise supply chain management in the context of digital transformation. It then analyzes the current state of enterprise supply chain management in the context of digital transformation under the current digital economy in China and provides the pertinent solutions to the issues. The following are the paper's conclusions:

First off, most Chinese businesses are still in the early stages of their digital transformation and development, and they lack a thorough understanding of supply chain digitalization. From a strategic perspective, businesses can create a digital supply chain management plan and emphasize the relevance of the function in the growth of the company.

Second, many businesses lack transparency and visibility in the established supply chain during the early stages of the digital transition, and data management is challenging. To increase supply chain openness and visibility, businesses should expedite the development of a supply chain data analysis and monitoring system. Managers can more effectively manage in response to the current circumstances by concentrating on the real-time dynamics of the supply chain.

Third, businesses lack talent in supply chain management. There is a talent gap in supply chain management due to the difficulty of combining theory and practice for those trained by colleges and universities, which is a problem when businesses undergo digital transformation. Businesses have a range of methods for attracting people, working with expert supply chain management companies, and providing

training.

Fourth, supply chain management security faces dangers and difficulties as a result of digital transformation. Create a reliable information security system and bolster the supply chain's data and information protection. Utilize access control, encryption technologies, and other safeguards to stop network attacks and data loss. Establish a risk management system to systematically evaluate the risks associated with enterprise supply chain management. Control risks that are already there effectively and keep an eye out for new threats.

Last but not least, it is crucial that we comprehend that supply chain management is not a long-term idea that has a set mode of operation. Supply chain management should promptly offer solutions to issues discovered in the enterprise's supply chain under the relevant circumstances, modify the current supply chain management strategy in light of the solutions, and support the enterprise's supply chain's steady long-term development.

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