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Supply Chain Risk Management Strategies in the Era of Digital Intelligence Integration: Strategies and Insights

Qiming Liu[1,a,*]

[1]*Shanghai Jianqiao University, Shanghai, 201306, China*
a. 100428@yzpc.edu.cn
**corresponding author*

Abstract: This study explores the impact of digital intelligence-driven developments on business strategies and operations, and through a combination of theoretical analyses and case studies, it provides insights into the risk landscape faced by enterprises in the context of digital and smart transformation, offering practical solutions and insights to help them meet the challenges. In addition, the study highlights the experience of leading manufacturing companies such as Haier in building digital supply chains, which provides valuable experience for SMEs seeking to improve their competitiveness and adaptability. This study also delves into key issues that hinder the implementation of digital supply chain projects, such as financial constraints, technological barriers, talent shortages and cybersecurity issues. Based on these findings, this study proposes that companies adopt a phased digital transformation strategy, focus on talent development and technology adoption, and collaborate with government and stakeholders to create an environment that fosters digital innovation and enhances resilience. Ultimately, successfully addressing supply chain risks in the age of digital intelligence requires proactive strategies, flexible adaptation and cross-sectoral collaboration to drive sustainable growth and competitiveness in the digital economy.

Keywords: Supply Chain Risks, Digital Transformation, Resilience Building, Collaborative Strategies

1. Introduction

Against the backdrop of a new wave of technological revolution, the trend of digitization and intelligence in the global economy is accelerating at an unprecedented rate. This has led to the gradual expansion of supply chain networks. However, as network connectivity increases, so does the risk and uncertainty within enterprise supply chains. As a result, effective risk management has become a significant challenge. Fortunately, emerging technologies like the Internet of Things, artificial intelligence, and blockchain have provided reliable tools for enterprises to identify and respond to various potential risks. Furthermore, these technologies have accelerated the development of digital and intellectual integration.

Under this current trend, the direction of high-quality and high-yield development is towards digital intelligence-enabled development. As significant economic entities, enterprises are encountering new opportunities and challenges under the implementation of new policies and prospects.

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On the one hand, it is necessary to improve the development level of digital intelligence vigorously and, on the other hand, to ensure the enterprise's vitality [1]. Enterprises have shifted from purely pursuing scale, quantity and profit to focusing on supply chain optimization and quality improvement. Under the guidance and support of the policy, the digital supply chain will integrate the logistics terminal, the consumption terminal and the supply chain, which will lead to significant changes in the management and operation of the traditional supply chain and bring opportunities for the development of enterprises and the improvement of international competitiveness. However, the current problem of enterprises is how to efficiently build a digital supply chain and realize the synergy between efficient development and economic growth.

This paper adopts the research method of combining theory with examples to analyze the risk problems that enterprises may encounter in the development of digitization and intelligence and find some reliable solutions, as well as how enterprises should better adapt to the development trend of digital-intelligent integration under the development of the digital economy, to provide inspiration and suggestions for the promotion of the digital-intelligent transformation of enterprises.

2. Current Situation

Since 2022, China has vigorously promoted comprehensive digitization and built a digital China. With data as the key element and the deep integration of digital technology with the real economy as the main line, it aims to promote high-quality economic development and realize the leap from traditional industrialization to the digital era. The main purpose of this is to strengthen digital infrastructure, such as 5G networks, the Internet of Things and data centers, to provide solid technological support for the realization of smart manufacturing, smart cities and the development of new-generation information technology and other areas, and to help enterprises establish digital supply chains. Driven by these trends and policies, organizations increasingly demand a smarter, more integrated approach to managing supply chain risk to reduce losses, improve efficiency, and maintain competitive advantage. The traditional supply chain emphasizes a functional web-chain structure formed by the link between supply and demand. However, the long chain, slow response and high inventory are the drawbacks of the traditional supply chain management model. With the development of intelligent logistics, the logistics connection has deepened further. The logistics, information flow and capital flow have realized the digitization of the whole process, which promotes the integration of the industrial chain and the supply chain and allows the upstream and downstream enterprises in the supply chain system to be interconnected, information fusion, synergistic optimization, and agile response, and realizes the efficient synergy of the supply chain organization system. This process indicates the transformation of the internal form of the supply chain from a rigid organization to a liquid organization. This means that the boundaries between nodes are broken down, the cost of internal transactions and collaboration is reduced, the free combination and free flow of factor resources, and the exchange of knowledge and technology between enterprises is strengthened [2]. Therefore, the supply chain's digital transformation has largely improved enterprises' collaborative capability. With the progress of underlying technologies such as mobile Internet, Internet+, big data, cloud computing, optimization of operations research, etc., the technological foundation has been laid for efficient collaboration among shippers, suppliers, carriers, distributors, terminal sales, logistics and distribution, and the supply chain has generated intelligent optimization, which has promoted the digital development of the supply chain and brought about supply chain digitization and intellectual transformation.

At the same time, the fragility of companies' supply chains has been magnified over the past few years by a new crown epidemic that has had a global impact, and companies are now facing a much more significant test than in the past. The failure rate of digital transformation of Chinese enterprises is relatively high, and there is a big gap between the progress of enterprises and a significant digital

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divide. These divides are due to the need for more understanding of digital transformation; at the same time, many enterprises face transformation difficulties due to the lack of resources and capabilities [3]. For MSMEs, the dilemma they face is also the whole supply chain. After all, leading enterprises are the minority. MSMEs are the main force, and the use of digital technology in supply chain management-related processes has a positive effect on the innovative performance of SMEs [4]. Therefore, reforming the enterprise structure and gradually transforming the digital supply chain is a major trend that all enterprises must comply with.

3. Case Analysis

Several leading manufacturing enterprises, such as Haier, Huawei and DJI, have accelerated their pace in building their digital supply chains, which have great potential for enhancing competitiveness and adapting to market changes. This essay takes Haier as an example to analyze the transformation mode of Haier's appliance and provide ideas for developing small and medium-sized micro-enterprises.

Haier started in the manufacturing industry, and the transformation from a traditional supply chain to a digital supply chain is summarized as "organizational restructuring", which focuses on speed and accuracy. Through organizational restructuring, Haier has achieved an all-round transformation of the entire assembly line, all elements and the digital intelligence system. Enterprise management will choose the user's zero distance, zero distance resources, production, and marketing cooperation. Haier has achieved digital process reengineering through the "instant" perception, response and co-creation [5]. Through digital research and development platforms, manufacturing platforms, business platforms, user experience platforms, on-demand orders, factory mass production, and production process visibility. At the same time, the whole process of product manufacturing and sales is closely linked through big data, which enhances the resilience and robustness of the supply chain and improves the supply chain's adaptability and responsiveness to market changes. Haier has built a big data information management platform based on the functions of each level of the supply chain, which helps enterprises obtain real-time and accurate information and adjust the strategic layout in time to adapt to market changes. In addition, the wisdom of the whole process of the smart factory has improved the production efficiency of the production enterprise [6].

In terms of Haier's products, Haier's goal is to improve product power through product digitization to meet user needs, integrate stand-alone smart products into smart scenarios smart life, improve user experience and create smarter usage scenarios, such as air conditioners. From the previous stand-alone intelligent products to the present, Haier can identify the environment and the crowd through AI intelligence and create smarter use programs for the scene. This is a new experience brought about by product digitization.

Haier is not only for its enterprises; it also did what a "big goose" should do. To help more enterprises achieve digital transformation and upgrading, Haier has developed modular, repeatable tools and lightweight applications to build an industrial digital ecological force. Leading enterprises have driven the development of small and medium-sized enterprises in the whole industry to drive progress and development.

In the digital transformation process, Haier continuously strengthens the management of enterprise digital strategy and strives to form a digital transformation system that adapts to the development trend of modern enterprises to promote the pace of enterprise digital transformation. Haier adjusts its transformation and enterprise development strategies in the digital transformation process by monitoring domestic and international digital information trends. Haier uses digital technology to adjust its development strategy in real time, improve its scientific and technological development and innovation capacity, make full use of digital information technology to build an ecological platform

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and give full play to its important functions, and strive to promote the development of new industries [7].

4. Problem Analysis

While digitizing the supply chain can improve efficiency and reduce costs, its implementation requires significant capital and human resources. Digital transformation works by optimizing the matching of supply and demand and reducing transaction costs [8]. SMEs may be unable to bear the costs of digital transformation due to financial constraints, thus hindering their adoption of advanced supply chain technologies. Secondly, in digital supply chain implementation, enterprises need to integrate multiple systems and platforms, which is a large and complex task for the IT team within the organization. This may lead to implementation difficulties for some SMEs in a weaker position in terms of technology and human resources, affecting the overall effectiveness of the digital supply chain.

4.1. Talent and Technology

Rapid growth and constant change in the technology sector means that new digital tools, platforms and technologies are constantly emerging, which means that organizations must keep up with the times or fall behind the competitive market. The time and cost of finding the right talent is a key issue in the digitization of the supply chain [9]. The market demand for professionals in the digital supply chain sector has grown significantly, leading to a supply shortage.

This requires the government and educational institutions to increase the number and quality of digital skills training programs to meet market demand by reforming the education system. At the same time, the training and education of digital talents can be strengthened to improve their technical level and application ability. Finally, enterprises can conduct internal training programs or cooperate with universities and institutions to introduce professionals and training courses to meet the demand for digital talent.

There is a lack of technological understanding and a mismatch of resources at the technological level, leading to technological “choke points”: that inhibit new technologies and production capacity. At the technical level, problems such as a lack of technological understanding and a mismatch of resources result in technological “choke points” that inhibit new technologies and production capacity. Enterprises should increase their investment in technological innovation and research and development to promote the innovation and application of digital technology. Meanwhile, enterprises can set up special research and development teams or laboratories to carry out cutting-edge technological research and innovation projects to continuously improve their technological level and competitiveness.

4.2. Data Security and Network Security

Due to digital technologies’ breadth and dependence, supply chains often face threats such as internal and external attacks, data leakage, and information tampering. These threats may threaten the supply chain’s data security, business continuity, intellectual property, etc. Starting from the issue of data privacy and security, enterprises have a large amount of supplier-customer and partner information in their autonomous supply chains. These are trade secrets and key factors in the survival of an organization, which can lead to significant losses if attacked or stolen.

Digital supply chains need to ensure that data is traceable and compliant, meets various regulatory and legal requirements, and is within the state’s control. Traceability helps the state better manage the supply chain and helps companies calculate their profits or find out where the problem lies when it occurs. Secondly, digital supply chains face various network security threats, such as malware and

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ransomware strikes. Attackers may attack supply chain systems and data through network infiltration, denial of service and other means, causing serious impacts and losses. During transmission and processing, data may be tampered with or corrupted, thus affecting the normal operation of the supply chain. For example, problems such as false orders and counterfeit products may damage the credibility and reliability of the supply chain. Enterprises can use advanced security technologies and tools, such as firewalls, intrusion detection systems, and vulnerability scanners, to promptly detect and respond to security threats. Simultaneously, disaster preparedness and emergency response plans are established to improve the ability to respond to security incidents. And regularly arrange data security and network security drills to assess the effectiveness and vulnerability of security protection measures. Timely adjustments and improvements of security strategies are made to enhance the ability and capacity to respond to security risks [10, 11].

5. Conclusion

This study finds that supply chain risk management strategies under the digital and intelligent convergence perspective can help companies improve supply chain resilience and competitive advantage in an intelligent and integrated way. Supply chain risks can be identified and assessed more timely and accurately from a digital and intelligent perspective, and effective countermeasures can be taken to maintain supply chain continuity and stability. Enterprises should formulate a comprehensive digital and intelligent convergence supply chain risk management strategy according to their situation to adapt to changes in the external environment and technological advances and enhance their supply chains' flexibility and resilience. This includes the areas of risk identification and assessment, response and control, risk monitoring and early warning, and risk learning and improvement. Based on the problems and examples, it is recommended that enterprises use a "steady progress" approach to gradually transform, focusing on production efficiency and upgrading the effectiveness of their business operations. The goal is to achieve efficient production, accurate services and management upgrades based on integrating all aspects of the business to realize the goal of a modern digital enterprise. Secondly, enterprises should pay continuous attention to the development trend of emerging technologies, introduce and apply new technologies promptly, and continuously improve the level and effectiveness of supply chain risk management.

Governments should help enterprises carry out digital transformation more smoothly at the governmental level by providing funding, technical training and cooperation platforms. Firstly, governments can provide subsidies to enterprises to ease their financial pressure, and secondly, formulate tax policies to encourage enterprises to invest in digitization to reduce the economic costs of digital transformation. Finally, the government should strengthen the construction of digital infrastructure, including high-speed Internet and cloud services, to ensure enterprises can easily access digital tools and platforms. The digital transformation of enterprises is a necessary and inevitable path for China's economic development. Leading enterprises are doing a good job of taking the lead, vigorously developing new technologies and cultivating skilled personnel, while small and medium-sized micro-enterprises are keeping pace and gradually transforming. Continuously strengthening, optimizing and expanding China's digital economy requires the joint efforts of governments at all levels, enterprises and research institutions. Regarding policy support, talent training, technology research, and development, cooperation should be strengthened to promote the sustained and healthy development of the digital economy. It can better build a digital China by optimizing the policy environment, enhancing scientific and technological innovation capabilities, and cultivating high-quality talents.

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