

Research on the resilience system of the agricultural supply chain under the blockchain

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Abstract: With the emergence of various emergencies, the importance of supply chain resilience is gradually increasing. At the same time, it is also urgent to build a resilient supply chain system. By reviewing the existing literature at home and abroad, this paper can understand the practical application cases of supply chain resilience, the implementation methods of supply chain resilience and the evaluation scheme of the resilience system. In the context of the increasingly mature blockchain technology, the supply chain and the blockchain technology will be integrated to achieve a more stable and resilient supply chain system.

Keywords: Supply chain resilience; Blockchain; Resilience system.

1. Overview of the domestic theory development

For the research on the resilience of agricultural supply chain, most of the current literature focuses on the recovery strategies after interruption, and there is little literature research on the prevention of agricultural supply chain interruption. Therefore, this paper sorts out the domestic research literature on the resilience of agricultural supply chain, agricultural supply chain and risk issues, and agricultural supply chain integration of block chain, and then comments on the existing research status.

2. Review of the domestic literature

2.1. Research on supply chain resilience

The concept of supply chain resilience was first proposed by Professor Rice and Professor Caniato in 2003. Many scholars have explored the implementation and application of supply chain resilience from different perspectives. Wang Minghua (2020) has explored the resilience of the supply chain of steel enterprises based on the root theory Chen Rong (2021) analyzed the influencing factors of the resilience of the medical product supply chain, and then obtained the final method to achieve resilience[2]; Guo Yuxuan (2021) extended the concept of Chinese water samples from the perspective of organizational resilience, discussing how to build a resilient automotive industry supply chain[3]; Qifang Zhong (2022) constructed an early warning model of supply chain resilience for manufacturing enterprises from the perspective of supply chain[4]; Song Hua (2022) analyzes the relationship between digital technology and supply chain based on modern communication technology[5]; Xu Wenping (2022) Based on the characteristics of cold chain logistics of fresh agricultural products, he constructed the resilience evaluation index system of cold chain supply chain of fresh agricultural products[6]; Wang Yixin (2022) takes a green and low-carbon economy as the starting point and builds a structural model of resilience interpretation of green building supply chain[7]; Zhang Li (2022) proposed to improve the supply chain elasticity level of the automobile manufacturing industry to help them effectively respond to risks[8]; Yuan Yin (2022) made a comprehensive exploration on the resilience of supply

chain from the context of supply chain interruption[1]; Shen Xi (2022) From the perspective of the global trade network of key mineral resources and the input and output of the industrial chain, the risk resilience of the supply chain network nodes is evaluated by using the simulation results of multi-risk scenarios.

Liu Xiangli (2021) raised the importance of supply chain resilience to the level of national strategy. Starting from the supply chain policy adopted by Japan, it analyzed its impact on China and explored the measures that China should take to enhance supply chain resilience; Liao Han (2021) investigated supply chain security from the perspective of supply chain resilience, and proposed to identify the resilience of supply chain by the degree of supply damage, recovery degree and recovery time under adverse external shocks. Wang Jing (2022) made a comparative analysis of the policies of the United States, the European Union and Japan to build a flexible supply chain, so as to inspire the design of China's resilient supply chain.

There are also differences in the impact of supply chain resilience on different industries. Cheng Lei (2022) used the data of 386 circulation enterprises from 2015 to 2019 to conduct empirical analysis from the perspectives of operating efficiency and operator performance, and found that the resilience of supply chain has the greatest positive impact on logistics operators.

Scholars have also done a lot of research on the improvement of supply chain resilience. Yang Xiaoye (2021) uses blockchain technology to manage supply chain risks to improve supply chain resilience; Zhou Ying (2021) combined with the theory of elastic supply chain, deeply analyzed how Alibaba supply chain responded to the uncertainty caused by the epidemic, summarized the useful experience and enlightenment of effectively improving the elasticity of supply chain, and put forward targeted suggestions Pan Helin (2022) proposed that technological innovation is the fundamental place to improve the resilience of the supply chain; Lv (2022) analyzed the influencing factors of supply chain resilience and made suggestions on developing strategies to enhance supply chain resilience.

Improving the resilience of the supply chain has many substantial effects and significance. Fan Shenggen (2021) proposed that enhancing the resilience of the food supply

chain can deal with the interference of a variety of uncertain factors; Wensheng Ko (2021) points out that the resilience of supply chains across all sectors is more important than short-term cost optimization; Ye Hua (2021) proposed that the stability and flexibility of the medical device supply chain can improve the hospital's emergency prevention and control capacity, and ultimately ensure the safety of patients and medical staff.

2.2. Introduction of the principles and characteristics of blockchain technology

Due to its advantages of decentralization, tamper-proof, transparency and security, blockchain technology provides an opportunity to eliminate the problem of information asymmetry in the supply chain, and then stimulate the generation of trust among various subjects in the supply chain. Blockchain is a distributed ledger that is maintained by distrusted multiple participants [21-22]. To achieve a trusted multi-party data sharing and decentralization. Blockchain technology, because of its huge potential, provides new solutions to supply chain risk problems.

Blockchain combines cryptography, distributed system technology, and P2P technology, using algorithms to reach a consensus, so as to realize the coordination and cooperation among various nodes. Consensus is a key feature of blockchain, which refers to the consensus view and consensus among blockchain participants. Blockchain records each transaction in chronological order according to the consensus mechanism, thus, blockchain has the following advantages:

1)decentration. A P2P (Peer to peer) network means that the nodes in a distributed system are logically equal. Therefore, the blockchain system can automatically trigger the behavior between nodes without the central node.

2)tamper-proof. After the consensus process in the blockchain system is completed, the transaction is automatically added into the block. All transactions are built with a time stamp that cannot be changed once recorded in a block to build trust.

3)transparent. Information is recorded and checked by all participants, and then recorded in the blockchain according to the consensus mechanism. Each node in the blockchain system has complete data.

4) safe. Distributed and encryption mechanisms ensure the integrity, confidentiality and non-deniability of information, and can exclude the malicious behavior of nodes.

3. Overview of foreign theory development

Foreign scholars' research on "supply chain resilience" started early and was more comprehensive. In the early stage of the development of supply chain resilience, most scholars regard supply chain resilience as a single dimensional concept [23]. With in-depth research, scholars began to study supply chain resilience from a dual-dimensional perspective. On the one hand, some scholars divide the supply chain resilience into internal resilience and external resilience according to the spatial distribution [24]. On the other hand, some scholars divide the supply chain resilience into proactive resilience and passive resilience according to the time node [25]. With the deepening of research, scholars have made a more specific multidimensional division of supply chain resilience according to the types of capabilities required in the development stage.

At present, most scholars believe that the supply chain resilience is divided into three dimensions: preparation ability, responsiveness ability and recovery ability [26]. Preparedness is the proactive ability to actively predict possible interrupt events and plan for them[27]; Responsiveness refers to the ability to ensure the continuity of the organization's business and maintain the functional integrity of the organization structure in case of a supply chain interruption[27]; Recovery ability refers to the resilience of the supply chain to take effective response measures according to existing resources to reduce the negative impact on the supply chain[27]. On this basis, Bag (2019) [28]. Adding to the dimension of competitiveness, they believe that companies may learn and develop new capabilities from the disruption event to enhance their competitive advantage. In addition, some scholars have divided supply chain according to the interruption time of supply chain. Zhuo (2020) believes that supply chain elasticity before interruption refers to the preparatory resilience such as resistance, avoidance and alarm; supply chain elasticity during interruption refers to the response ability such as response and response; supply chain elasticity refers to survival and innovation after interruption [29].

4. Review of foreign literature

On the research of supply chain resilience, scholars have expounded from different aspects. Aslam (2020) study analyzed the role of supply chain adaptability and consistency in the development of supply chain resilience, and found that supply chain adaptability and consistency have a positive impact on supply chain resilience [30] Um (2021) theoretically assumes and empirically explores the relationship between global supply chain risk, supply chain resilience, and mitigation strategies. The study found that achieving better supply chain resilience plays an important intermediary role between supply chain risk and resilience[31]; Hussain (2022) Research has found that supply chain complexity has positively mitigated the drivers of supply chain resilience and supply chain resilience[32]; Zhu (2022) Based on the questionnaire survey method and structural model analysis, it is found that to improve the performance of supply chain, it is necessary to establish risk prevention awareness, root risk culture in the supply chain network organization, and improve the resilience of supply chain in multi-dimensions, such as dynamic selection of supply chain partners while paying attention to their green performance[33].

Many scholars have also succeeded in finding ways to assess supply chain resilience. One of them is Jacksens (2010) [34], Proa mathematical model of climate change scenario, logistics chain of fresh agricultural products and optimized packaging technology to improve the elasticity of fresh product supply chain; Pavlov (2018) [35] To extend the existing supply chain elasticity model, a method based on mixed fuzzy probability and supply chain design elasticity index. In addition, Michel-Villarreal (2021) [36] Note that low-cost digital technologies (including free software and social media) can support flexibility, collaboration, visibility, and agility, while being important for organizations to improve supply chain resilience. At the same time, many scholars have done research on how to improve the elasticity of the supply chain. For example, Umar (2021)[37]It points out that effective communication, interdependence, information sharing, informal financial support and trust can enhance supply chain resilience and resilience against natural

disasters. Li (2021) [38] A specific example of improving supply chain flexibility is presented. By implementing batch flexibility contracts, manufacturers can be encouraged to build reserve capacity for retailers and maintain channel coordination, so as to reduce the mismatch between supply and demand of retailers. As a risk-sharing mechanism to reduce booking costs and improve flexibility, enterprises are encouraged to expand and improve performance to achieve more overall profits for the entire supply chain.

5. Summary

Through the summary of the above literature, we find that many scholars have evaluated and analyzed the supply chain resilience of different industries, and proposed to build a resilient supply chain system based on the three perspectives of preparation, responsiveness and resilience of supply chain resilience. The implementation of the supply chain resilience system is inevitably related to emerging technologies. Combined with the characteristics of blockchain technology, the organic integration of the two will provide technical support for the improvement and improvement of the supply chain resilience system.

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