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Influencing Factors of Cascading Failures of Supply Chain Quality Risks

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Abstract: Supply chain quality risk has gone through three stages, namely quality inspection risk, statistical quality risk and overall quality risk, and quality risk covers the entire supply chain. The formation of supply chain quality risk is to organize a complete supply chain by organizing individual links such as the quality risk of raw materials provided by suppliers in each link of the supply chain, the product quality risk of production plants and the quality risk of raw materials and product logistics, and when one of these links is overloaded, it will lead to cascading failure. Therefore, this paper classifies and analyzes the influencing factors of supply chain quality cascade failure, starting from the factors that can lead to quality, starting from the quality of suppliers, the quality of raw materials provided by suppliers, human causes, quality inspection system and environment, etc., analyzing the impact of these factors on the cascade failure of the entire supply chain quality risk, and putting forward some countermeasures and suggestions that can improve the quality risk level of the supply chain and reduce the cascade failure phenomenon according to the influencing factors. As a result, supply chain quality risks cascade failures in the market are becoming less and less.

1. Introduction

Quality risk refers to the unpredictability of events that negatively affect every node of the entire supply chain. Huang Dong and Zhou Jinran (2022) Quality risk has a great impact on the supply chain, the so-called negative quality event is can cause damage to the supply chain, as the name is that the occurrence of this event may cause losses to the company on the quality of the company's products, logistics quality and other links, or it can produce some other events that adversely affect the entire supply chain network [1]. These adverse events may lead to these things that quality managers and enterprises do not want to see. However, since any enterprise quality activity, regardless of size, there are certain risks, which means that the occurrence of events that have a negative impact on quality is unpredictable. This negative consequence has two characteristics, and its occurrence can affect the occurrence of supply chain quality risks: first, the consequences of negative quality events; the second is the probability of negative quality events occurring. Wang Bangjun (2005) believes that quality risk is different from other risks, and quality risk has its own unique characteristics [2]. Xiang Jiya (2022) believes that in the context of the supply chain system,

all quality risks faced by all links in the supply chain are part of the supply chain quality risk, that is, supply chain quality risk [3].

In the supply chain environment, the production and sales of products are the process network of cooperation between raw material suppliers, parts suppliers, manufacturers (core enterprises), logistics and transportation providers, distributors, retailers and many other enterprises. Zheng Jindao (2022) Supply chain is a collection of logistics, information flow, quality flow and value stream, and quality flow is one of its important competitive factors [4]. Li Shumin and Wang Xu (2022) study cascading failure, and they believe that the serious thing is that the quality risk of the supply chain is not only the risk of a certain node, but can follow the direction of the entire supply chain, from the raw materials supplied by the front-end supplier, to the processing enterprise that processes the product, and then all the way to the customer who buys the product at the end [5]. Yan Zhong'e (2013) studied the transmission of quality risk in the supply chain, and the transmission process of quality risk cannot be summarized by simple linear transmission, but due to the accumulation of quality problems in each link, which will cause quality risk to produce a "bullwhip effect" It is an intertwined problem, which may lead to various forms of quality problems, and it is precisely because of the complexity of supply chain quality risk transmission, each link will have problems, so the links with quality problems are different, and sometimes it is not the source of supply chain quality risks [6]. Chen Haodong et al. (2022) The structure of the supply chain is very complex, the more complex it is, the more node enterprises are involved, the more sources of related supply chain quality risks, and therefore the more complex the form of quality risks will be [7]. Under certain circumstances, the supply chain quality risk will be transformed into various risks of the supply chain enterprise, such as cost risk, supply risk and demand risk.

Therefore, this paper classifies and analyzes the influencing factors of supply chain quality cascade failure, starting from the factors that can lead to quality, starting from the quality of suppliers, the quality of raw materials provided by suppliers, human causes, quality inspection system and environment, etc, to analyze the impact of these factors on the cascade failure of the entire supply chain quality risk, and put forward some countermeasures and suggestions that can improve the quality risk level of the supply chain and reduce the cascade failure phenomenon according to the influencing factors.

2. The Influencing Factors of Supply Chain Quality Risk Cascade Failure

Supply chain quality risk occurs in the selection of product raw materials, product production, product processing, product transportation, product sales, etc., due to various factors, the quality of products does not meet the national standards for product inspection, cannot meet the actual needs of customers for products and produce potential harm. On the basis of relevant literature research and analysis [8-11], through exchanges and discussions with the expert group, the main constraints affecting the quality and safety risks of agricultural product supply chain were identified.

2.1. Supply Chain Structure

The supply chain structure generally affects the degree of occurrence of quality risk cascade failure, and if there are a large number of middleware vendors in the supply chain structure, it will generally increase the probability of quality risk. The lack of corporate social responsibility will lead to a decrease in product quality, which is the most basic embodiment of corporate social responsibility. In the product supply chain, enterprises aim to obtain economic benefits, and the pursuit of profits is the essence of enterprises, but excessive profit drive, lack of social responsibility will cause the quality of agricultural products to be difficult to guarantee, the competition of interests will make enterprises reduce production costs at all costs to increase the

income, no time to take into account the cost of agricultural product quality prevention and control. The lack of corporate social responsibility results in focusing on one's own vested interests in product processing and neglecting product quality.

2.2. Supplier Quality Management

Supplier quality management is an important factor affecting the cascade failure of quality risk, if the quality management of suppliers is not strict, it will increase the probability of quality risk. Lack of quality awareness and awareness will lead to product quality and safety awareness and awareness, which will directly affect the production behavior of the enterprise, and its behavior directly determines the quality and safety level of the product. The lack of quality awareness of all links in the supply chain will cause different degrees of harm to product quality. The supply chain involves many subjects, the level of knowledge and technology has a large gap, and the production, processing, logistics and sales links in the supply chain should have relevant professional technology. Quality Control Benefits and Cost Concerns Product supply chain enterprises abandon the use of quality improvement and control methods based on short-term gains, focus on vested interests, and ignore the long-term development of enterprises. Quality prevention and control requires enterprises to introduce advanced quality management ideas and production technology, transform the existing organization and production structure, hire relevant talents and other measures, whether the current cost can make up for the expected benefits has become an important factor in enterprise decision-making, when the net present value of the expected income is greater than the current investment cost, the enterprise will invest in the quality management of agricultural products.

2.3. Supplier Responsibility

Suppliers have the responsibility to implement effective quality management to ensure the quality of products, if suppliers have insufficient responsibility for quality management, it will increase the probability of quality risks. Source risk is the root of product quality and safety risk, once in the product processing risk agricultural product processing risk refers to the process of processing product raw materials into finished products and packaging, due to imperfect processing technology, unhygienic processing equipment and staff driven by interests to carry out illegal operations, resulting in product pollution, so that residual harmful to human health ingredients hidden danger. Processing risks are not only affected by environmental hygiene, but also by the safety, process level and quality of processing accessories. Safety risks in the sales of products refer to the possibility of contamination or quality deterioration of agricultural products in the sales process, resulting in the possibility of harmful ingredients remaining in the products and the severity of the harm. The safety risk of product use refers to the harm caused by the product to the human body due to improper use or expiration date after the consumer's purchase to use.

2.4. Supply Chain Flexibility

Supply chain flexibility is also an important factor affecting the cascade failure of quality risk, if the supply chain flexibility is insufficient, it will increase the probability of quality risk. The flexibility of the supply chain can make the supply chain have enough time and capacity to solve the cascade failure phenomenon, when the flexibility of the supply chain is not enough, the quality risk of the supply chain cannot be guaranteed, which will affect the cascade failure phenomenon of the supply chain quality risk.

2.5. Supply Chain Process

The efficiency of the supply chain process is also an important factor affecting the cascade failure of quality risk, and the unreasonable design of the supply chain process, or the process management is not strict, will increase the probability of quality risk. Information transmission obstacles Product quality information transmission is not smooth, forming a "lemon market", resulting in adverse selection of consumers, under the role of market mechanism, crowding out high-quality products and retaining inferior products. Downstream product retailers will increase the number of orders in order to ensure the supply quantity of products and avoid out-of-stock costs, and the untrue information transmission in the product supply chain will form a "bullwhip effect", and when the information is transmitted to upstream suppliers, the demand will be infinitely amplified, forming product supply risks.

2.6. Human Factors

Human factors are also an important factor affecting the cascade failure of quality risks, and if the ability of supply chain managers is insufficient, it will increase the probability of quality risks. Laws and regulations are not perfect and supervision is not strict, China's product quality related laws have experienced a long stage of development and made great progress, but there are still major problems, such as the lack of coordination of laws and regulations between various departments of the state, insufficient deterrence, etc. Enterprises form mandatory legal constraints, and enterprises that violate product quality and safety will be held accountable and pursued in accordance with laws and regulations. Laws and regulations need to be strictly implemented by relevant departments to achieve the expected results, the lack of government supervision and guidance on the profit-seeking behavior of product production and processing enterprises will increase quality and safety risks, and the combination of perfect laws and regulations and strict regulatory measures provides guarantee for product quality and safety.

2.7. The Testing and Inspection System is not Perfect

When the production process of the product and the detection of raw materials are not strict, it will lead to the unqualified products processed during the processing link to the quality inspection, and cannot reach the quality of the qualified products sold. The imperfection of the entire inspection and testing system will lead to the highest series of quality risks of the product, and the system will not be able to operate completely. That is, a sound testing and inspection system can reduce the cascade failure of supply chain quality risk. It can also increase the income of the enterprise.

2.8. Environmental Factors

The production environment changeable will make the production of products there is a possibility of pollution, for the environment, quality controllers should always pay attention to changes in the environment, environmental changes can make workers' mood and emotions change, will lead to changes in product quality.

3. Recommendations and Measures

The supply chain has become a hot spot for enterprises and markets, and to achieve market stability, the supply chain needs to be fully implemented. The phenomenon of supply chain quality risk cascade failure from the beginning of the supply chain to the last end, if there is a problem with

the node or edge of one of the links, it will cause serious load on the neighboring nodes, and if the node cannot be supported, the phenomenon of failure will occur, that is, to ensure the stability of each node can reduce the cascade failure. No matter which industry, a complete and stable supply chain is required to achieve the complete operation of the enterprise. In terms of the factors affecting the stability of the supply chain, the occurrence of cascading failures that can improve the quality of the supply chain is proposed.

3.1 Build Integrated Information

In order to eliminate the disadvantages of asymmetric information in product quality control, it is necessary to establish and improve the information platform as soon as possible. The integrity of the information chain can enable cooperative enterprises to quickly propose solutions to the problems that occur, so as to achieve the minimum loss of corporate interests, and can select the entire supply chain structure when selecting product raw materials, so as to prevent middleware vendors from occurring cascading failures, which will delay the progress of the entire supply chain. It can also be that the cascade failure of supply chain quality risk reaches a certain degree of safety, and the probability of failure phenomenon is reduced.

3.2 Strengthen Internal Management

It is necessary to establish a sound enterprise management system, improve the level of enterprise management, and strengthen the rationality of the technical structure. If the process of the supply chain is designed more reasonably, the process management is more strictly, the phenomenon of cascading failure will be reduced. Supply chain quality risks run through the entire supply chain, and different quality risk issues will arise at each link. Strict control of the internal management of the enterprise can not only improve the management level of the enterprise, but also improve the income of the enterprise. A complete and sound testing and inspection system can not only make the entire supply chain quality risk network better implemented, but also reduce the phenomenon of cascade failure.

3.3 Strengthen External Control

Improve supplier management, strictly control the quality of suppliers, and strengthen the ability to respond to market changes. The selection of raw materials is the first step in the supply chain, and qualified raw materials are the key to product qualification, so when selecting raw materials, it is necessary to investigate the supplier and carry out various inspections on the raw materials provided.

3.4 Strengthen Technical Processing

The development of technology can reduce the failure of quality risks at all stages of the supply chain. First, the testing of raw materials can be timely and accurate, and the trust between cooperative enterprises will increase; second, the quality of products in the process of processing will be affected by advanced technology, and advanced technology can improve the work efficiency of staff; third, the safety of logistics quality is improved, the accuracy of delivery is higher, and the products are protected during transportation.

4. Conclusion

The quality risk of the supply chain runs through the entire supply chain, the entire supply chain quality risk network involves many links, from the strict selection of raw material quality, the processing process of product quality, the quality inspection process of product quality, the control process of logistics quality, the management of sales quality are essential links in the quality risk of the entire supply chain, the whole process constitutes a cascading effect, if the node of a certain link changes or is damaged, it will cause cascade failure. The factor that causes cascading failure is the quality control of each link in the entire supply chain. Supply chain networks play an important role in the overall market, and it has become a hot topic. In the supply chain quality risk, the phenomenon of cascade failure has also attracted the attention of various enterprises, and if the problems that occur at each link node can be reduced, the probability of cascade failure can be reduced. The prevention of supply chain quality risks can not only make the market stable, but also improve the economic efficiency of enterprises. Therefore, in general, the phenomenon of cascade failure should start from each link that can produce quality risk, and reduce the probability of cascade failure by preventing each node and edge.

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