Research on Risk Identification of Dual-channel Green Supply Chain under Dual-carbon Background

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Abstract. Based on the double-carbon background, this article analyzes the development requirements of green supply chain. According to the characteristics of dual-channel green supply chain, the risks are divided into external risks and internal risks, and the causes of the risks are analyzed. The internal risk mainly consists of operational risk and collaborative risk. The classification emphasizes channel synergy, dual-channel supply chain integration and green synergy.

Keywords: Dual-channel, green supply chain, risk identification.

1. Introduction

With the rapid development of the global economy, the global energy consumption continues to rise, and the impact of industry on the environment is increasingly prominent. It is more important to maintain the balance between economy and environment. In order to break the constraints of resources and environment, all kinds of government green incentive policies came into being. In addition, increasingly fierce market competition, increasingly strict environmental protection and quality standards, as well as consumers' increasing awareness of environmental protection have brought great social pressure on enterprises to save energy and reduce emissions. In addition, the huge potential market of green products attracts more and more enterprises to incorporate green practices into traditional supply chain management and practice green supply chain management. In addition, existing studies have shown that the implementation of green supply chain management has a significant impact on the improvement of enterprise performance.

2. Development Requuirement and Research Status of Green Supply Chain under Dual-carbon Background

2.1 The Dual-carbon Goal Promotes the Development of Green Supply Chain

In China, modern supply chain has become a national strategy. "Upgrading the modernization level of industrial chain and supply chain" and "accelerating the digital development" point out the direction of supply chain transformation and development. To build a modern green intelligent supply chain management system with green, digital, networked, intelligent and standardized features and three business chains of intelligent procurement, digital logistics and panoramic quality control to support efficient collaboration inside and outside, and actively serve the national carbon peak and carbon neutral goals. As an innovative environmental management method, green supply chain management integrates the concept of the whole life cycle and extension of producer responsibility with traditional supply chain management. This approach relies on the supply relationship between upstream and downstream enterprises, takes core enterprises as the fulcrum, and drives the continuous improvement of green performance of the whole supply chain mainly through green supplier management and green procurement. The green supply chain created by the core enterprises can always be connected with the whole body, playing the role of "taking the line with the point" and "taking the line with the surface", driving the relevant enterprises in the supply chain to continuously improve the level of green development. Under the background of double carbon, the innovation practice pioneered by European and American multinational enterprises has brought new changes to the green supply chain management mode. How to protect our ecological home, adhere to the green development direction, implement the new pattern and new development concept, promote the reform and development of our green supply chain management model, and handle the relationship between ecological environmental protection and economic development with the idea of " coordination of all the activities of the nation like pieces in a chess game" is particularly important.

2.2 Literature review

The Existing research conclusions on supply chain risk classification are similar, mainly dividing supply chain risk into internal risk and external risk [1]. Zhao et al. divided supply chain risks into three categories: internal risk, supply-driven risk and demand-driven risk [2]. Internal risks of enterprises practicing green development include green design risk, green technology risk and long delivery cycle caused by green products and materials [3-4]. Another major category of green supply chain risk is external risk, which can be divided into supply risk and demand risk [5].

In addition, most researches on green supply chain risk focus on the influence of risk attitude of supply chain members on decision-making. The study of Ha [6] shows that retailers tend to lie about their marginal costs, which leads to the decrease of the optimal order quantity and the increase of the selling price, and ultimately the weakening of the supplier's earnings. Yan et al. [7] studied the influence of suppliers' misrepresentation of cost information on the supply chain when retailers were in a dominant position in the mixed-channel supply chain. Cao et al. [8] studied the wholesale price contract of the dual-channel supply chain when the supplier has the advantage of production cost information. The research of Liu et al. [9] shows that information sharing among green supply chain members can greatly improve consumers' demand for green products, which is conducive to improving the stability and overall efficiency of the supply chain system. Shi et al. [10] studied the information sharing of green supply chain under asymmetric demand prediction, and the results showed that when the green cost coefficient was high, the information sharing of retailers could be promoted by making bargaining contracts. The study of Yang et al. [11] shows that when different members of the supply chain have carbon information advantage, there are significant differences in the behavior of misreporting and its impact on the supply chain. Members of green supply chain are not completely rational and often have the characteristics of risk avoidance. Information asymmetry leads to the misreporting behavior of supply chain members, which affects the decision-making of green supply chain and members' profits. The above literature considering information asymmetry mostly focuses on general supply chain. Existing literature mainly studies the risks of single-channel green supply chain, while there is little literature on the risk identification of dual-channel green supply. This article attempts to explore the risk types of dual-channel green supply chain on the basis of existing research.

3. Risk Identification of Dual-channel Green Supply Chain

Dual-channel green supply chain emphasizes the synergy among participating enterprises and realizes the synergy effect through information sharing, contract cooperation and risk sharing. Therefore, based on the existing research, this article draws on the classification of most supply chain risks and divides the risks of dual-channel green supply chain into two parts, one is internal risk and the other is external risk. Then, combined with the characteristics of dual-channel green supply chain, internal risks are further divided. The specific risk index system is shown in Figure 1. External risks mainly come from the impact of the uncertainty of external environment on the dual-channel green supply chain, including natural environmental risks, economic risks and social risks. Internal risk is mainly the risk between enterprises in dual-channel green supply chain, which mainly consists of operational risk and collaborative risk. Operational risks include green procurement risk, green manufacturing risk and green sales risk, while collaborative risks include information sharing risk, relationship risk and green technology risk.

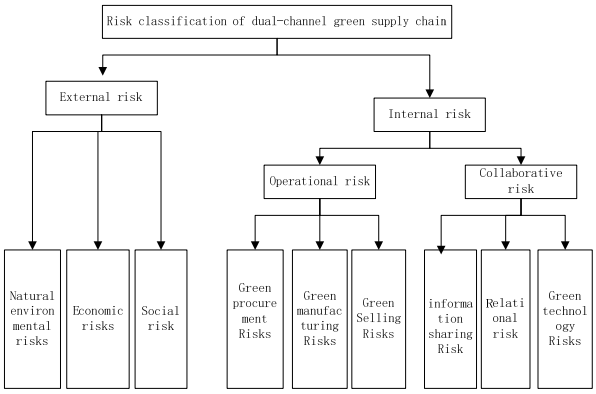

Fig. 1 Risk classification of dual-channel green supply chain

3.1 External Risks

Natural environment risk is one of the risks caused by some irresistible external factors of dual channel green supply chain. It mainly includes some natural disasters, such as flood, fire, earthquake, typhoon and so on, which have an impact on the whole dual-channel green supply chain, such as supply interruption, delay and facility damage. In 2021, the biggest ship jam of the century in the Suez Canal was caused by strong winds that caused the hull to veer off the bottom and run aground. The world's busiest maritime trade artery was completely blocked. With about 30 heavy cargo ships passing through the Suez Canal every day, a single day of blockages means 55,000 containers are delayed, affecting global supplies of a wide range of goods. Economic risk is the impact of global economic environment, such as inflation, green trade barriers, economic cycle, import and export quotas on the green supply chain. The economic growth rate has a direct impact on the supply of raw materials and the inventory of products, which in turn affects the normal supply of the green supply chain. Social risks mainly refer to the risks brought by changes in laws and policies, social customs, social unrest and legal environment. For example, war, strike, terrorism and so on have a negative impact on the dual-channel green supply chain.

3.2 Internal Risks

3.2.1 Operational risk

Existing literature defines the circular economy model of enterprises as the "3R" principle, namely reduction, reuse and recycling [12-14]. The implementation of circular economy requires efforts at different levels [15], including ecological design of products, clean production, green procurement, green consumption and product recycling or reuse. The dual-channel green supply chain emphasizes on improving the ecological efficiency of the entire supply chain, reducing the input of specified primary energy, raw materials and waste in the consumption process, and reducing the impact on the environment while pursuing the maximization of commodities. In the manufacturing link of the supply chain, product recycling is emphasized. For example, today's slow fashion focuses on environmental protection and classics, which emphasize the use of raw materials for clothing and accessories and increase the life cycle of products. The recycling of products or components not only requires the production enterprises to take the main role, but also requires retailers to participate in the product recovery and marketing of remanufactured products. The dual-channel green supply chain involves many enterprises, and the operation process is complicated. Therefore, based on the "3R" principle of circular economy, this article divides operational risks of dual-channel green supply chain into green procurement risk, green manufacturing risk and green sales risk according to risk sources and operational processes from a macro perspective. Green procurement risks mainly include environmental protection of green materials, procurement cost risks, and carbon emissions of logistics distribution. Green manufacturing risks involve environmental management system certification, green design, green product qualification rate, green supplier certification, material recycling, waste disposal, etc. Green sales risks include green marketing strategy, price fluctuation of green products, product recycling and so on.

3.2.2 Synergy risk

The integration ability of green supply chain is a new direction in the field of supply chain management. Dual-channel green supply chain pays more attention to the synergistic relationship between online and offline channels. Synergy is generated by independent components on the basis of resource sharing, which symbiosis and mutual growth with each other, and forms the business performance of enterprise groups through simple aggregation of enterprise activities [16]. In the collaborative process, resource sharing includes tangible resources and intangible resources, and the combination of the two increases the value of the enterprise. Information and technology are intangible resources and important content of channel integration. Supply chain coordination contract is the main research direction of dual-channel supply chain coordination. Wholesale price contract is the simplest and easy to execute. In the process of contract performance, there may be misrepresentation of information, so the phenomenon of non-performance of contract relationship and moral hazard. Therefore, combining the characteristics of dual-channel and green supply chain, this paper divides collaborative risk into information risk, relationship risk and green technology risk.

3.2.3 Information risk

Information asymmetry, information distortion and incomplete information in the process of transmission are typical problems in the supply chain operation, which lead to the phenomenon of "bullwhip effect" and "information island". The management of information resources lies in transforming information resources into economic profits and social benefits of enterprises and realizing the value creation of information resources through the processing and utilization of information. When the information in the supply chain is asymmetrical, it will lead to the deviation between the forecast market demand and the actual demand, which will lead to risks. Dual-channel green supply chain is market demand-oriented, and the changes of market demand and environment have a great impact on the decision-making of the supply chain. Information sharing can effectively reduce information asymmetry and reduce the harm caused by bullwhip effect. In addition, in dual-channel green supply chain, product price is a sensitive factor for consumers to choose channels, and information service is a public product, which provides free riding opportunities for consumers in dual-channel green supply chain. Offline channels can provide consumers with a full range of product information and services. Consumers can experience and understand the characteristics and performance of products through offline channels, and then collect and compare the price information of products through the availability of network information through online channels, and choose to purchase products through online channels. Information service can improve consumer viscosity, if not to provide quality information service to avoid free riding behavior, it may lead to the loss of consumers.

3.2.4 Risks of green technology

As the market demand for green products increases, green technology is also improving. Green technology risk refers to the risk caused by the increase of production cost and decrease of production capacity in the supply chain due to the significant change in the applicability, advancement, availability, reliability and expectation of the technology or the failure to introduce advanced technology, resulting in substandard green products. Market demand drives the progress of technology, and the inconsistency of technical standards used by enterprises will affect the synergy of supply chain. The maturity and complexity of green technology are the main factors of technology risk.

Green technology belongs to one kind of knowledge application. In the process of knowledge transfer, the

primary condition is the trust among the participants. In the strategic alliance based on knowledge chain, if the trust between the parties participating in the collaborative operation of dual-channel green supply chain reaches a certain level, the transfer and learning of tacit knowledge can be effectively promoted and opportunistic behaviors can be overcome. The flow of knowledge in dual-channel green supply chain occurs in the process of value creation. Among them, all the subjects and employees involved in the integration are the participants of knowledge flow. For example, manufacturers and suppliers jointly participate in the design activities of green products. The manufacturer proposes the material characteristics required for green products, and the manufacturer completes the production activities after the supplier provides the green materials that meet the requirements. Knowledge chain is not static, invariable, and is infinite cycle, can quickly respond to changes in the external environment. Knowledge is constantly changing from old to new, and in the integration process of dual-channel green supply chain, it is necessary to constantly take updated measures to rebuild the new knowledge chain, so as to make it adapt to the changing external environment and the adjustment of industrial structure, and reduce the risk of supply chain.

3.2.5 Relationship risk

Relationship risks are mainly caused by the unethical behaviors of some enterprises driven by short-term interests due to the differences in management systems among enterprises in the supply chain, the lack of communication in the cooperation process, the information asymmetry and the incompleteness of the contract itself. There is a contractual relationship between enterprises in dual-channel green supply chain. In dual-channel green supply chain, manufacturers simultaneously open online and offline channels to sell products. When the sales behavior of online channels affects the interests of offline retailers, retailers may adopt certain behaviors, such as cutting prices, thus affecting the interests of manufacturers. It is difficult for manufacturers to observe the activities of offline retailers, so retailers are prone to moral hazard.

4. Summary

Dual-channel green supply chain is full of risks. By classifying the sources of risks inside and outside the green supply chain, enterprises can identify the risks and propose effective management strategies to reduce the vulnerability of the entire supply chain. The dual-channel green supply chain has more participants, showing the characteristics of cross-region, cross-organization and multi-links, so there are more risk factors. The division from internal and external dimensions is conducive to further analysis of the causes and complexity of risks. This article attempts to combine the characteristics of dual-channel green supply chain, and further expounds the causes of internal risks from information risk, collaborative risk and green technology risk, in order to provide a theoretical basis for the risk control of enterprises participating in dual-channel green supply chain.

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