

Research on Risk Management under Supply Chain Cooperation

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Abstract: With the increase in economic globalization and complexity, supply chain cooperation plays a crucial role in modern business and enterprise development, being a key aspect of contemporary enterprise operation. However, the complexity of the supply chain system poses numerous uncertainties and risk challenges to its management. Therefore, this paper aims to analyze and discuss supply chain cooperation networks and their risk management, providing practical methods and guidance for enterprises to safeguard the robustness and resilience of supply chain cooperation in today's competitive society.

Keywords: Supply chain cooperation, Information asymmetry, Risk management.

1. Introduction

Martin Christopher, a top European supply chain logistics expert and Chairman of the Center for Logistics and Transportation Studies at Cranfield University, once profoundly pointed out that the competition in the 21st century is no longer between enterprises but between supply chains. Supply chain cooperation and risk management, as a key part of contemporary enterprise development and operation, its effectiveness and robustness are directly related to the competitiveness and market performance of enterprises. However, the complexity of the supply chain system and the volatility of the global market environment have led to more uncertainties and risk challenges in supply chain cooperation and management. The current research on supply chain at home and abroad mainly focuses on supply chain strategy and planning, operation and execution, optimal allocation of resources under the supply chain, and supply chain information technology and digital transformation, with relatively little research on risk management under supply chain cooperation. Risk management under supply chain cooperation is the intersection of supply chain cooperation management and risk management, which is an emerging research direction that is becoming independent.

2. Overview of Supply Chain Cooperation

2.1. Connotation of Supply Chain Cooperation

Supply chain is one of the core nodes of modern business operation activities, which refers to the transmission of resources, products and services to end users by a holistic network of multiple participants such as raw material suppliers, producers, distributors and retailers. Supply chain cooperation is conceptually different from supply chain, and the focus and scope of attention of the two are also different. Vokurka (1998) suggests that supply chain partnership is a cooperative agreement between supply chain firms on a period of long-term partnership, in which information sharing and revenue and risk allocation are agreed upon [1]. Supply chain cooperation refers to a long-term, strategy-based partnership between two or more companies in a supply chain network, emphasizing mutual trust, information sharing, risk sharing, resource integration, and mutual profitability among

partners to achieve win-win situations and optimize common goals.

2.2. Characteristics of Supply Chain Cooperation

Unlike the cross-organizational and process characteristics of the supply chain, supply chain cooperation is based on mutual trust and cooperation among the participants based on long-term partnership. In terms of production planning and inventory, participants can better share information and collaborate in planning to optimize the production and sales activities of each link; in terms of human, financial and material resources, participants can better integrate resources to improve the overall coordination and competitiveness; when the market and the natural environment undergoes major fluctuations, partners can also share the risk, and be more holistic and responsive; in terms of new product development and technology application, participants can carry out joint innovation, which improves the overall coordination and competitiveness; in terms of new product development and technology application, participants can carry out joint innovation, which improves the overall coordination and competitiveness. In terms of new product development and technology application, the participants can carry out joint innovation, which improves the relevance and innovation ability, and can better serve the customers, improve efficiency, reduce costs, and realize continuous improvement and value addition.

3. Overview of Cooperative Risk Management in the Supply Chain

3.1. Concept of Risk Management

Due to economic globalization and increased complexity, supply chain cooperation plays a very crucial role in modern business and enterprise development. "The characteristics of supply chain cooperation, such as multiple parties directly involved, uneven spatial distribution, multiple links and processes, and risk sharing, make it susceptible to more influences from both the external and internal environments, thus forming supply chain cooperation risks. The risk management of supply chain cooperation aims to identify potential risks among the participants and take timely measures to prevent or better respond to the risks to ensure

the robustness and resilience of supply chain cooperation. According to Thun and Hoening, unlike the traditional supply chain risk management, the risk management of supply chain cooperation is characterized by cross-company orientation, which focuses on the entire supply chain partners, not only the operating profit of individual enterprises, and the objective is to identify the risks of supply chain cooperation. firms' operating profits, with the goal of identifying and mitigating risks [3]. According to Khojasteh-Ghamari and Irohara, collaborative supply chain risk management is an overlap between supply chain management and risk management [2]. Fan Y. Stevenson M describes collaborative supply chain risk management as a strategy based on the coordination of the interests of each member of the participant, identifying, evaluating, and managing collaborative supply chain risks to ensure continuity, profitability, and sustainability of the supply chain to gain competitive advantage [4].

This paper argues that supply chain cooperation risk management is to manage the risks in the supply chain associated with the participants, and the objects of these risks include the risk management of the information flow, logistics and supply chain node organization of the supply chain cooperation as a whole, which refers to a series of measures such as identifying, evaluating, controlling and monitoring, with the aim of ensuring that the supply chain participants in the process of cooperation to identify the potential risks affecting the supply chain in all aspects of the supply chain,. Thus, the process of coping with various uncertainties and guaranteeing the smooth operation, reliability and sustainability of the supply chain. This process involves identifying, analyzing, evaluating and monitoring risks in supply chain cooperation, and taking appropriate countermeasures to reduce the probability of risk occurrence. Since supply chain cooperation is ongoing, the risks are also in a constant state of evolution, and new risks may appear at any time [5]. Therefore, effective management of supply

chain collaboration risks requires long-term and continuous efforts, being a key factor for companies to maintain their competitive advantage and achieve sustainable development [6]

3.2. Risk Identification

3.2.1. Connotations of Risk Identification

Supply chain risk identification is a key part of risk management in supply chain cooperation, which refers to the process of identifying potential risks and uncertainties related to each link of supply chain cooperation operation with the help of scientific methods, tools and data support in the process of supply chain management, which is conducive to the improvement of reliability, robustness and sustainability of the whole supply chain cooperation.

3.2.2. Process of Risk Identification

Risks are present throughout the supply chain. Risk identification is the process of identifying the risk factors, risk scope, potential causes and possible consequences associated with cooperative supply chain operations, and categorizing these risks to form a comprehensive list of risks to describe the risk factors. The process of identifying and categorizing these risks to form a comprehensive list of risk factors [7]. In general, supply chain parties should clarify their own environment in the supply chain on the basis of comprehensive consideration of the internal and external environments, determine the scope, boundaries and objectives of supply chain cooperation risk identification, and conduct risk classification and assessment based on the identification of potential risks that may affect the supply chain operation, analyze which risk events may affect the supply chain, list each of the identified risks, and analyze the risk factors in a comprehensive risk list. The process of analyzing which risk events may affect the supply chain operation, listing the identified risks one by one, and describing and recording them. The process of risk identification is shown in Figure 1.



Figure 1. The process of risk identification

3.2.3. Importance of Supply Chain Risk Management

The importance and necessity of risk management in supply chain collaboration cannot be overstated.

(1) Theoretical reference and practical significance.

The risk management practice of supply chain of other enterprises in the market has strong practical significance, supply chain risk cannot be avoided, but a series of measures can be taken to avoid and cope with the risk. This paper discusses the possible risk problems in supply chain cooperation management, draws on the risk management experience of different enterprises in supply chain cooperation, and puts forward preventive and coping measures, which is of theoretical reference significance for different enterprises to carry out self-management and risk control in supply chain cooperation.

(2) Improve the efficiency and competitiveness of supply chain management.

Supply chain cooperation is based on the common interests and long-term partnership of all parties involved, and good risk management capability is an important part of maintaining common interests and safeguarding the sustainability of the supply chain. Effective risk management can reduce the losses caused by uncertainty, which is conducive to improving the efficiency and competitiveness of the whole supply chain management and safeguarding the interests of all parties and long-term partnership.

(3) Ensure the stability and resilience of the supply chain.

The stability and resilience of the supply chain is one of the key aspects of the sustainable operation of enterprises. Implanting risk management in the process of supply chain partnership is conducive to the construction of a stable and resilient supply network, and such a strategy not only effectively reduces the risk of supply chain disruption and loss, but also ensures the stability and resilience of supply chain cooperation, responds to the complexity of the modern supply

chain through comprehensive identification and assessment as well as risk management, and minimizes the knock-on effects of the close dependency relationships in the supply chain. The new tools and techniques it provides can also bring other benefits to the enterprise [8].

(4) Maintaining corporate reputation and brand image.

Supply chain risk management can help enterprises to minimize negative impacts and maintain corporate reputation and brand image. Through effective supply chain risk management, enterprises can reduce the risk of supply chain disruption or delay, ensure that the quality of products or services produced meets the expectations of consumers and ensure the stability of supply, but also through the establishment of contingency plans and crisis response mechanisms, timely response to problems in the supply chain, better control and prevention of various types of risk events in the supply chain, reduce negative impacts and protect brand image and corporate reputation. And corporate reputation.

4. Risk Management Practices in Supply Chain Cooperation

4.1. Common Risks in Supply Chain Cooperation

Supply chain partners as a whole may be exposed to a number of risks associated with operational cooperation between the parties:

4.1.1. Information Asymmetry

Information sharing plays a vital role in supply chain cooperation, but if the amount of information shared by supply chain co-operative enterprises is not balanced, or if some enterprises intentionally conceal information or artificially cause information to be transmitted poorly due to moral corruption and the desire to gain personal benefits, it will lead to information asymmetry [9]. The uncertainty of the supply chain participants' compliance with each other's contracts, opportunistic behavior, failure to fulfill due diligence or violation of contractual terms will definitely affect the robustness of the supply chain cooperation system, leading to a breakdown of trust, and in some cases, the collapse of the entire supply chain cooperation chain, which will affect the communication and cooperation among the partners.

4.1.2. Conflict of Interest

Supply chain partners are an inseparable community of interests, but may also be due to the different goals, priorities and interests of the parties or supply chain management mechanism is not sound, the distribution mechanism is unreasonable and other issues that lead to unbalanced profits, thus generating conflicts of interest, for example, in terms of price, quality standards, cost control, profit distribution, as well as the market share and competition, etc., if supply chain participants cannot deal with conflict of interest properly, it will lead to negative cooperation or even termination of the cooperation relationship, resulting in low productivity or collapse of the supply chain.

4.1.3. Information Security Risks

In supply chain cooperation, a large amount of information sharing and data transmission will be involved, so information security risk is a serious consideration. Since partners need to share sensitive information, such as business secrets, customer data, supply chain information, etc., the

flow of information is a crucial link in supply chain cooperation relationship, if the information is leaked or utilized or tampered with by partners with ulterior motives, the competitive advantage of supply chain cooperation will be lost, common information security risks such as: data leakage and data security, abuse of privileges by internal staffs Common information security risks include: data leakage and data security, abuse of privileges by internal employees leading to leakage of trade secrets, malware and virus damage, etc.

4.1.4. Risk Transfer between Supply Chain Firms

Risk transfer among supply chain enterprises refers to the situation that in supply chain cooperation, as a closely linked community of interests of multiple enterprises, the risks faced by one partner may affect other partners, triggering certain production-side, supply-side or sales-side risks and leading to threats or damages to the whole supply chain system. This type of risk transfer includes: financial risk transfer, market risk transfer, technology and information security risk transfer and brand image and corporate reputation transfer risk. The main reason for risk transfer is due to inappropriate selection of supply chain partners or information asymmetry, so solving these two problems can effectively mitigate the risk transfer problem among supply chain enterprises.

4.1.5. Supply Chain Partner Selection Risk

In supply chain cooperation, it is crucial to choose suitable supply chain partners, and once the partners are chosen, they will generate the risk of cooperation rigidity and cannot be replaced at will, so there are certain selection risks, such as the choice of too many or too few partners, the strength of the partners, the credibility of the partners, the level of credit, creditworthiness, the risk of target conflict, and supply chain enterprise matching, etc., all of which may generate certain risks and even lead to the normal operation of the supply chain. Therefore, proper selection of partners in the supply chain is an effective measure to avoid the risk of destruction of the whole supply chain.

4.1.6. Trust Risk

In supply chain cooperation, trust is the basis for maintaining the stability and effective operation of the partnership, and is a necessary precondition for the survival and development of the supply chain, so in supply chain cooperation relationships, the participants need to clarify each other's responsibilities and obligations, and establish a relationship of trust and identification with each other, if there are ambiguities or disputes between the partners in the assumption of responsibility, the lack of trust, or affected by the unstable market environment as well as linguistic and cultural differences may lead to information opacity between the partners and affect the level of trust and the robustness and resilience of the cooperative relationship. If there are ambiguities or disputes between partners over responsibilities, lack of trust or the impact of unstable market environments and language and cultural differences, this may lead to information opacity between partners, affecting the level of trust and the robustness and resilience of the relationship.

4.1.7. Management Coordination Risk

In supply chain cooperation, management coordination risk refers to the potential problems and challenges caused by insufficient management and coordination among partners. Each node enterprise and supplier in the supply chain has its own interest orientation as an independent subject, and there are big differences in enterprise culture, staff level, technical

ability, etc., which may lead to difficulties in coordinating the objectives and optimizing the interests in supply chain cooperation, thus affecting the robustness, resilience, and competitiveness of the supply chain, and leading to instability of the supply chain.

4.2. Responses to Common Risks in Supply Chain Cooperation

4.2.1. Establishment of an Efficient Information Communication Mechanism

Supply chain cooperation network is a complex structure of the organism, each participant should establish smooth communication channels, timely information disclosure, reasonable contract design, clear rights and responsibilities, mutual learning, more in-depth understanding of the industry situation, and the establishment of an effective credibility mechanism between the members of the nodes [10]. In order to strengthen the supervision and review, avoid the opportunism in the process of members' transaction and cooperation, effectively reduce the obstacles of supply chain cooperation caused by information asymmetry and moral risk, realize the optimized management of the whole supply chain, and lay a solid foundation for the improvement of the competitiveness of supply chain cooperative enterprises.

4.2.2. Establishment of Effective Conflict Management Mechanisms

Although the participants in supply chain cooperation are in cooperative relationship, they all have their own different interests to pursue, and the fairness of the distribution system of the whole supply chain cooperation requires the core enterprise to have strong decision-making power of profit distribution. In order to effectively solve the conflict of interest arising from supply chain cooperation, it is necessary to establish an effective conflict management mechanism: each participant should cooperate and negotiate to formulate a win-win profit distribution plan based on the contribution to the supply chain as a whole of the participant enterprises, and balance their respective interests; to establish a stable and long-term cooperative partnership, and to enhance the level of trust between all parties; and to consider the implementation of the benefit-sharing mechanism or cooperative projects.

4.2.3. Strengthening Information Security Prevention and Control Measures

Each participant in the supply chain indicates the information security terms in the cooperation agreement, including confidentiality, the degree of information sharing and data protection, and establishes a clear cooperation agreement and division of responsibilities; strengthens the security of data transmission during the data transmission process, implements strict data access and control measures, and strengthens the data backup and recovery operations to prevent data loss or tampering; establishes an open and transparent communication mechanism among all participants. All participants establish an open and transparent communication mechanism to handle urgent issues in a timely manner; continuously monitor the security situation of each participant, conduct regular security assessments and reviews, and respond to emergencies in a timely manner; and cultivate and continuously improve the information security awareness of employees.

4.2.4. Building an Agile Risk Monitoring and Assessment Network

Building an agile risk monitoring and assessment network is an important part of ensuring the stability of supply chain cooperation and business continuity. Since the supply chain network is distributed in different time and space, it is impossible to absolutely judge the time nodes of risk occurrence, but a series of monitoring and tracking systems can be established to monitor the status of supply chain cooperation enterprises in real time, and to control the risk within a reasonable range [11]. At the same time, when facing risks, all participants should work together to actively respond to them, share the risks and challenges, and continuously improve the risk-resistant ability of the cooperative network, reduce unforeseen risks, and promote the sound development of the supply chain cooperative network.

4.2.5. Establishment of a Mechanism for Trust in Partners

In order to maximize the benefits of supply chain cooperation, each participant depends on the robustness and long-term resilience of the supply chain cooperation network, which is closely related to the high degree of mutual trust, so it is crucial to establish a mechanism of partner trust. Enterprises can establish the cooperation principle of repeated games, strengthen long-term cooperation and information transfer; strengthen the construction of contract regulations and contract management; establish a wide range of effective communication mechanisms, timely grasp of the actual situation of partners; and establish a trust assessment mechanism.

4.2.6. Proposed Core Enterprise-Led Coordination and Management of Supply Chain Cooperation

When it is difficult to coordinate risks among supply chain cooperating enterprises, a risk management department led by the core enterprise can be jointly established, based on the community of interest above, by the core leading enterprises in the supply chain cooperation to maintain a strong pressure for improvement [12]. However, this department has no coercive power, but through monitoring the risk of supply chain partners, establishing information sharing platform and performance evaluation mechanism, building harmonious team, establishing win-win cooperation concept, and ensuring the collaborative operation of the supply chain and long-term stable cooperation.

Before establishing or joining a supply chain cooperation network, enterprises first need to measure whether their own conditions match with those of the enterprises in the cooperation network, and select supply chain partners scientifically. Enterprises can establish scientific entry assessment standards, use scientific qualitative and quantitative ways to measure the matching of partners; establish the terms of cooperation relationship, formulate reasonable cooperation agreements and contracts; enhance the risk-resistant ability of supply chain enterprises, effectively inhibit and mitigate the risk transfer between supply chains; design flexible multi-head supply chains, and establish cooperation with enterprises with high technical level and good reputation; through the above measures, the risk of supply chain partner selection can be effectively reduced, and the success and benefits of supply chain cooperation can be improved. Through the above measures, the risk of supply chain partner selection can be effectively reduced, and the success rate and benefit of supply chain

cooperation can be improved.

5. Empirical Studies and Case Studies

5.1. Risk Management under Supply Chain Collaboration Successful Company-Apple Inc

Apple Mobile is a high-tech company headquartered in California and has been the world's largest company by market capitalization for three consecutive years. Apple's supply chain covers hundreds of suppliers worldwide, involving raw material sourcing, parts manufacturing, assembly, logistics and other aspects. The huge supply chain network enables Apple to flexibly respond to changes in market demand while maximizing the use of global resources and capabilities.

Meanwhile, Apple has established strategic partnerships with Foxconn, Sony, Samsung, Qualcomm, and Intel to work together to respond in a timely manner even when unexpected situations arise. While working together to promote product innovation and performance enhancement, Apple leads the research, development, and production of key components and core technologies, which reduces dependence on external suppliers and improves the differentiated competitive advantages of its products. Apple attaches great importance to supply chain management, requiring suppliers to comply with the Supply Chain Responsibility Guidelines to ensure that production processes in the supply chain meet standards of sustainability and social responsibility. At the same time, Apple continuously carries out product innovation and technological upgrades, and works with its partners to promote product innovation and technological advancement, ensuring that the quality and performance of its products reach the industry's leading level through the continuous introduction of new products and features.

To sum up, the success of Apple Mobile's supply chain cooperation risk management is attributed to its effective practices in the establishment of globalized supply chain network, rational distribution of supply chain management and rights and responsibilities, as well as continuous innovation and technological leadership, which provide solid support for the company's long-term development and market competition.

5.2. Failed Firms in Risk Management under Supply Chain Collaboration-OFO

OFO Little Yellow Bike, one of China's leading bike-sharing companies, founded in Beijing in 2014 and rapidly expanding nationwide from 2016-2018, is now unavailable.

Risk management problems in OFO's supply chain cooperation led to the company's failure. In the process of supply chain cooperation, it cooperates with a large number of suppliers and expands rapidly to meet the market demand; however, with the continuous expansion of the company's scale, OFO's supplier management has become chaotic, and the lack of an effective supplier evaluation and management mechanism fails to ensure the stability and reliability of the supply chain cooperation; coupled with the fact that the rapid expansion of the supply chain requires a large amount of financial support, but due to the instability of the business model, the profitability of the profit model is not clear, and other However, due to unstable business model, unclear profit model and other reasons, OFO's funds broke, thus affecting

the supply chain cooperation.

To summarize, the risk management problems under OFO supply chain cooperation mainly originated from the two aspects of capital chain breakage and supplier mismanagement, and this cause of failure has a reference and warning significance for global enterprises' supply chain cooperation.

6. Conclusion

Supply chain cooperation can certainly provide better information sharing and collaborative planning and resource integration, share risks, increase efficiency and reduce costs, and realize continuous improvement and value addition. However, while supply chain cooperation may also lead to deviations or losses due to unpredictable uncertainties and information asymmetry, therefore, risk management under supply chain cooperation has become an indispensable and important task for enterprises.

Therefore, the identification of risks in supply chain cooperation and how to manage them more effectively has become an urgent challenge. This paper aims to identify the types of risks in supply chain cooperation and systematically discuss their prevention and response measures, so that enterprises can better guarantee the robustness and resilience of the supply chain in today's increasingly competitive supply chain to provide practical methods and guidance, and to guarantee the smooth development of the production and management activities of enterprises. It is of great practical significance to ensure the smooth development of production and operation activities of enterprises.

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