RISK MANAGEMENT STRATEGIES IN SUPPLY CHAINS: STRATEGIC APPROACHES AND SOLUTIONS

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Abstract

Many companies' supply chains and processes have traditionally been designed around a stable and predictable economic environment. However, increasing economic volatility requires a comprehensive and dynamic assessment of risk factors in order to reduce the vulnerability of supply chains to disruptions. Previous research shows that the success of companies in crisis situations is greatly influenced by their willingness to take risks and cooperate, a thorough knowledge of corporate values, and their openness to innovation and renewal. It is crucial that the measures and tools used in supply chain management harmonize with current and future risk management strategies. For effective and efficient risk management, it is essential to develop and apply appropriate metrics.

Key words: risk management, strategy, supply chain, solution

JEL Code: L14, L91, M11

Introduction

Today's business environment is increasingly exposed to turbulent and often unpredictable changes that pose many risks to companies. The integration of global markets, the rapid pace of technological development, and political and economic uncertainties all contribute to the fact that it is increasingly difficult for companies to manage risks effectively. In order to remain competitive and survive, companies must adapt to these new challenges, which also require a review of traditional operating models. The constantly changing dynamics of the business environment imposes new requirements on companies, especially with regard to operations in supply chains, where flexibility, adaptability and the importance of risk management strategies play an ever-increasing role. In recent decades, the role of supply chains has grown significantly, as companies have realized that in order to increase their competitive advantage, they need to develop ever closer cooperation with their suppliers, customers and service providers. The supply chain is a special form of economic cooperation, which can be interpreted as a network of companies operating in different stages of the value creation chain. This

network involves not only the flow of goods and services, but also the sharing of information, resources and risks. McManus's research points out that even the slightest disturbance in intercompany value chains can trigger chain reactions, which may have a negligible effect on one company, while they may have devastating consequences on others. Due to the danger of such disruptions, there is a risk of a domino effect in supply chains, which can be particularly acute in crisis situations. The investigation and management of internal risks of companies has long received special attention in both theoretical and practical research. On the other hand, the risks arising from the complex structure of the supply chain, based on interactions, were underestimated for a long time. However, in recent years, global market disruptions such as geopolitical conflicts, natural disasters, pandemics and shipping difficulties have increasingly focused attention on supply chain risks. Examining and managing these risks has become imperative, especially in light of increased extreme events. Supply chains are not only exposed to disruptions arising from external economic and market conditions, but internal risks arising from cooperative relationships can also cause significant problems. Due to the interdependence of organizations in complex networks, a single problem can quickly spread to the entire supply chain, which can pose serious threats to both the companies involved and the wider economic environment. The management of supply chain risks is therefore not only a company-level issue, but also crucial from a global economic and social point of view. Due to the complexity and global nature of modern supply chains, risk management requires a multidisciplinary approach that takes into account all levels and actors of the network. The primary goal of the study is to systematize the risks arising in supply chains, examining their sources, nature and effects. The authors place a particular emphasis on the examination of cooperation risks, since closer cooperation also increases the vulnerability of the network. After that, the study proposes the development of indicators and methods that can be used to control and manage threats in the supply chain more effectively. Finally, the paper summarizes the main findings and suggests directions for further research, particularly the need to develop dynamic risk management strategies to increase the efficiency and resilience of supply chains.

1 Literature review

The purpose of this chapter is to provide a comprehensive picture of the different types of risks inherent in the supply chain and the importance of their management. First, we deal with the grouping of the risks of the supply chain, examining in detail the origin and effect mechanism of each risk factor. After that, we focus on the causes of risks arising from cooperation and their

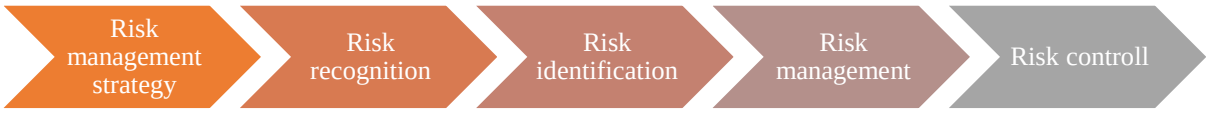
effects on corporate success, since close partnerships not only bring benefits, but also increased vulnerability. Finally, we also discuss communication risks, which play a critical role in the flow of information and the effectiveness of coordination between actors in the supply chain. The chapter discusses the importance of these risks, showing how the vulnerability of supply chains can be reduced and the stability of operations can be increased with appropriate management strategies.

1.1 Grouping of supply chain risks

In economic sciences, the problem of risk has received a lot of attention since the beginning of the last century, and since then many different theoretical approaches have developed around the concept. However, since no unified definition of the nature of the risk has been established so far, two main approaches have spread in the literature: one emphasizes the effect of the risk, while the other emphasizes its causes (Jüttner et al., 2003). According to the former point of view, risk is interpreted based on its economic impact on company activities, while the latter considers lack of information as the primary source of risks (Thiemt, 2003). In addition, there are many additional types of risk that can be organized according to different aspects. The distinction between pure (or damage) risks and speculative risks has become more and more established in both theoretical and practical fields (Schwandt, 2016). While pure risk refers only to negative deviations – i.e. events that cause damage to the company – speculative risk includes both positive and negative outcomes, so it can also be considered as an opportunity (Geißner et al., 2020). Due to such a diversity of risk types and different systematization methods, a clear and non-overlapping classification of risks is often difficult (Pfohl, 200). Until now, studies have mainly focused on risks within individual companies, however, the strengthening of inter-company relationships and the growing complexity of supply chains increasingly prioritize the risk management needs of the supply chain as a whole. Supply chains connect companies at different levels of the value chain within a network that aims to satisfy customer needs by producing appropriate products and services (Demeter, 2017). Through the optimized flow of materials and information, these companies try to take advantage of the benefits of cooperation, which increases their competitiveness (Gelei, 2003). Although better coordination within the supply chain can lead to cost reductions and improved quality, it also increases the dependence of individual companies on the cooperation and performance of their partners. A disruption in the production of a single company can thus affect the entire chain, especially if stocks decrease or lead times increase (Reiß, 2011). The stability of business networks depends to a large extent on the willingness to cooperate and can be significantly compromised by compromising

behavior or lack of trust (Morvai, 2016). Therefore, supply chain management must focus not only on increasing efficiency, but also on managing risks. Supply chain risks can appear in many different forms, so their systematization is essential in order to take appropriate measures. In this process, it can be useful to classify risks based on the level, object and phase to be considered. Due to the network nature of the supply chain, risks can appear at different levels of the value chain and have an impact not only on the participating companies, but also on the entire chain (Favaro-Karlsson, 2010). There are risks that are limited to the cooperation between two companies, while in other cases the effects can affect the entire chain. The effects of company-specific risks on the supply chain are often underestimated, which can later cause significant problems in the operation of the entire chain (Christopher-Lee, 2001). Supply chain risks can be divided into two main categories: external risks arising from factors outside the chain (such as natural disasters, political changes) and internal risks arising within the supply chain itself (Farkas-Szabó, 2010). External risks can be events that affect the entire supply chain, while internal risks often arise from the operations of individual companies, but they can also have an impact on the chain as a whole. Internal risks can appear in the form of functional and cooperation disorders, which make it difficult to coordinate the flow of material, information and money (Kádi, 2016). The purpose of risk management is therefore to manage risks arising during the operation of individual companies and the entire supply chain, minimize damages, and ensure the stable operation of the chain. During this process, the risks must not only be identified and evaluated, but also appropriate measures must be taken to reduce them and exploit favorable outcomes (McManus, 2007). The risk management process includes the development of strategies, the identification, analysis, management and monitoring of risks so that the operations of companies and the supply chain as a whole remain sustainable and flexible (Bauweiter, 2015). The first figure clearly illustrates the process of risk management.

Fig. 1: The process of risk management



Source: Bauweiter, 2015

The identification of risks is one of the central elements of the risk management process, the purpose of which is the timely, comprehensive and thorough mapping of risks, as well as the

early recognition of potential risks (Chickán-Demeter, 1999). The identification is followed by the risk assessment, during which the previously identified risks are analyzed from a qualitative and quantitative point of view. After that, during risk management, measures must be defined, selected and implemented that reduce or manage the effects and causes of the risks. At the end of the process, the risk control ensures that the effectiveness and efficiency of the previously taken measures are properly checked (Svensson, 2002). In order for the company to survive in the long term, the risk management cycle must be repeated continuously, as part of which the analysis of the risks that may have occurred provides the opportunity to further improve the risk management procedures during the next process (Chickán-Demeter, 1999). Due to the peculiarities of inter-company risk management applied in supply chains, it differs somewhat from intra-company risk management. Although there has been a significant increase in interest in supply chain risk management in recent years, Svensson's (2002) research has shown that this topic has still not received sufficient attention from either a theoretical or a practical point of view (Favaro et al., 2010). Supply chain risk management can generally be understood as a structured, collaborative approach to risk management that is integrated into the supply chain's planning and control processes and aims to manage potential risks that may hinder the achievement of the chain's goals. In the rest of the study, the authors discuss the causes of the risks arising from the cooperation and their significance (Dhlamini, 2022).

1.2 The causes and significance of risks arising from cooperation

Cooperation risks arise from the need for cooperation between companies participating in the supply chain, which arises from the characteristics of the network model. Due to the diversity of supply chain partners, relationship-related problems can often occur during cooperation, which can generate various risks. These risks arising from the collaboration can be as significant as the internal and external risks of the supply chain, as they can threaten the success of the collaboration in the long term. In his research, Gibson (2010) pointed out that the unique characteristics associated with relationships significantly influence the success of cooperation, and this is also supported by empirical data (Gibson, 2010). Since there are many types of relationships in the supply chain, and as a result many different cooperation risks can arise, it is necessary to accurately separate each risk area. Cooperation risks between companies arise to a significant extent from the fact that the goals, strategies and corporate cultures of the actors in the supply chain do not always match. This can be the source of many conflicts and can often be interpreted as the root cause of the risks of cooperation (Ványi-Varjasi, 2014). The basis for the successful operation of the supply chain is the definition of common goals, which the

participating companies must develop together based on their own individual goals. In the initial stage of the cooperation, special attention must be paid to ensure that the companies' own goals are in line with the goals set by the supply chain as much as possible, otherwise the success of the joint work may be jeopardized in the long term. The greater the discrepancy between the companies' goals, the greater the chance that conflicts of interest will arise in the future. While static conflicts of interest often appear at the beginning of the cooperation, dynamic conflicts of interest can develop later, during the cooperation (Trödle, 1987). In addition to different goals and strategies, cultural differences are also a significant risk factor in cooperation (Weich-Sutcliffe, 2007). Cultural differences play a particularly important role in supply chains, as the resulting differences affect the nature of relationships between companies. The consequences of cultural differences can often manifest themselves in the form of communication and cooperation difficulties, which can lead to more complicated negotiations and more difficult joint agreements. Such problems can worsen with the increase in the duration and intensity of cooperation, so attention must be paid not only to strategic but also to cultural harmony in the supply chain. However, it is important to note that cultural differences are not always a disadvantage, as they can also be a source of synergies. Threats affecting the supply chain, which arise from problems in the relationships between network actors, can be examined by measuring the satisfaction index and network affiliation. The satisfaction index shows how satisfied supply chain companies are with network collaboration and is an important indicator of relationship quality (EOQ, 2015). The greater the satisfaction of the companies within the network, the more stable the supply chain becomes, therefore the level of satisfaction must be regularly assessed by interviewing all the companies involved. The quality of the cooperation is also shown by how long each company has been a member of the supply chain. Long-term partnerships not only indicate satisfaction with cooperation, but can also help reduce the risk of supply chain disruption. In the next chapter, we examine the role of trust within the supply chain, emphasizing how it affects the cooperation between companies and the management of risks (Shrivastava et al., 2024).

1.3 The role of trust within the supply chain

Trust and its impact are crucial in the operation of supply chains, since the risks of cooperation often arise from a lack of trust between companies (Huth-Romeike, 2016). Trust plays a crucial role in shaping the structure and quality of relationships, especially in networked systems. It is important because it facilitates the exchange of information between participants, is a prerequisite for the safe sharing of sensitive data, and reduces conflicts while enabling joint

management of problems. In addition, trust contributes to the reduction of transaction costs and the simplification of processes. Kuhn's research highlights that the exclusion of compromise, the values of good reputation and belonging are fundamental drivers of trust (Kuhn-Hellingrath, 2002). According to this approach, the danger of companies' adaptive behavior only arises if they can benefit from it. However, if such behavior carries penalties that outweigh the lost profits, companies are likely to refrain from doing so. Another key factor in reliability is values. Values essential to cooperation, such as loyalty, openness and discretion, all contribute to strengthening trust. Consistency of core values in a business network is also important, as the same or similar values can help build trust between participants. The existence of strategic and cultural fit within the chain further strengthens the cohesion of the companies. When examining the degree of trust, the trust ratio and breach rate can be key indicators. While the trust ratio reflects the quality of cooperation, the breach ratio indicates the risks caused by self-interested behavior in the supply chain. Violation of contracts can not only indicate a lack of interest in cooperation, but can also permanently damage trust and satisfaction between companies, thereby jeopardizing the atmosphere of cooperation. In order to preserve the stability of the cooperation, it is recommended to punish the breaches of the contract and strive to bring the ratio of the breaches of the contract close to zero. For example, System Allianz imposes heavy fines on shipping companies for breaches of contract during monthly quality and performance inspections. In the next chapter, we will examine the importance of communication-related risks, paying special attention to how they affect the efficiency of the supply chain and the cooperation between companies.

1.4 Significance of communication-related risks

In addition to coordinating the flow of goods in supply chains, it is also essential to optimize the flow of information between companies in order to achieve the goals of the chain. Due to the intensive exchange of information, communication problems can become a source of serious cooperation risks (Chikán-Demeter, 1999). Communication difficulties in a network often arise from a lack of willingness to exchange information between companies, as well as non-cooperative communication behavior and partnership conflicts. Willingness to communicate is highly dependent on the reliability of supply chain partners and the security of information exchange. The sharing of confidential information can only take place if companies trust that their partners will not engage in restrictive behavior and will not abuse the shared data. In order for a continuous and smooth exchange of information to take place in the supply chain, companies use integrated information systems. These enable the cost-effective and

flexible integration of different information and communication systems (Michelberger, 2009). The use of public Internet networks is not ideal from the point of view of information security. Since the information shared within the chain, such as inventory levels, order status, production plans and capacities, is highly sensitive data, companies consider it essential to implement measures that guarantee information security. The use of encryption procedures, for example when establishing direct Internet connections and transferring files via e-mail, is becoming increasingly important to maintain the confidentiality of information exchanges. In addition, secure information exchange is particularly important in the case of time-critical relationships for information and material flow, such as when using the just-in-time (JIT) delivery method, as disruptions in the information flow directly affect the material flow. The table below summarizes the probable effects of the development steps of each supply chain.

In general, the higher the trust between supply chain partners and the greater the information security, the greater the willingness of companies to share their confidential data within the network. In addition to the company's basic decision whether to share its information, it is also important to monitor its communication behavior. The company's communication style can be negatively affected if the willingness to maintain contact during cooperation decreases. There are basically two reasons for this decrease. On the one hand, if the company is increasingly dissatisfied with the development of cooperation, this can be associated with a decrease in network identity. On the other hand, dissatisfaction with the achievement of goals can also lead to a decrease in willingness to communicate. Participating in multiple supply chains can be driven by individual companies' dissatisfaction, which may reduce their performance and communication behavior to contractual minimums, while they focus their efforts on other, more profitable collaborations. If a company turns away from the given supply chain, this can in extreme cases endanger the existence of the chain and the individual companies, so the initiatives supporting the network identity, as well as the degree of achievement of the goals, must be constantly monitored. The above-mentioned risks can also occur if the company shows willingness to exchange information during the cooperation, but is unable to fulfill this obligation due to limited technical or inadequate number or quality of human resources. This can not only cause interruptions in the coordination of material and information flow, but can also impair the performance of the supply chain, thus endangering its existence. The presented cooperation risks are closely related to each other, and their effects mutually reinforce each other. Strategic and cultural fit can have a positive effect on trust between companies and the willingness to communicate, while increasing conflicts with supply chain partners can negatively affect trust.

Tab. 1: Probable effects of some supply chain development steps

The type of change	Description (example)	Expected effect on the channel shape	Impact on supplier relationships
Faster and more accurate data collection	With a barcode on the order papers and/or the packaging.	Faster adaptation to conditions (faster data collection) A more certain knowledge of the inventory can allow it to be reduced.	It may be necessary for the carrier to manually address the goods or change the packaging.
Processing technology	Connecting two separate processes.	Reduces internal lead time and intermediate inventory by eliminating intermediate handling.	It may be necessary to change the quality characteristics of the materials at the supplier.
Processing technology	Changing the sequence of processes to delay assortment training, for example garment dyeing instead of textile dyeing.	It reduces the reaction time to changes in market demand. Allows for better service and/or reduced inventory.	As above, it may be necessary to change the quality characteristics of the materials at the supplier. A process may be transferred from the supplier to the customer
Product design	Component rationalization "design for production".	It enables the reduction of parts storage and faster production.	The supplier of the affected parts can be involved in the redesign
Electronic Data Interchange (EDI)	Electronic transmission of orders and other data (plans, schedules, stocks, availability).	Reduces lead time by reducing the time required to process an order, provides greater accuracy and control (saves time by avoiding handling errors) and creates opportunities for more frequent order cycles.	It assumes technical and commercial cooperation with the supplier to establish communication. The necessary investment of time and other resources presupposes a close relationship.
JIT deliveries	Faster deliveries in smaller quantities.	It reduces both lead time and inventory.	A significant change is required in the supplier's practice and possibly location.

Source: Chikán-Demeter, 1999

Conclusion

The turbulent competitive environment of recent years encourages companies to focus on their core tasks and deepen their relationships with their suppliers, customers and service providers. The goal of long-term cooperation between companies in supply chains is to optimize the flow of materials and information in order to satisfy customer needs at the highest possible level and with the greatest profit. Although there are debates about supply chains both at the theoretical and practical levels, the consideration of the inter-company correlation of risks has not yet received sufficient attention. In light of this, I first identified the internal and external risks of

the supply chain, and then examined the cooperation risks typical of corporate networks. Collaboration risks often arise from relationship problems between partners in a heterogeneous supply chain, which can jeopardize the success of collaboration in the long term. The background of these risks is a lack of identity and trust between the companies involved, as well as communication problems. Supply chain risk management, which includes the identification, analysis, management and control of disruptions, can be implemented at the level of bilateral relations or at the level of the supply chain. It is important that the tools and measures used in risk management of supply chains are consistent with current and future risk management processes. In order to ensure this, the tools and measures used must match the characteristics of the supply chain and the requirements arising from the management of inter-company risks.

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