Supply Chain Resilience and Risk Management:

An industry analysis and strategic examination of how logistic companies are making their supply chains more resilient to crisis and disruptions

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Abstract

McKinsey & Company (2023) has characterized the research objective by saying, that "Resilience is the ability to not only recover quickly from a crisis but to bounce back better – and even thrive". Although it has become an inflationary term that is used in many different areas, it should still be given the utmost consideration, especially in the context of logistics and supply chains. This dissertation addresses aspects of resilience and supply chain risk management in the face of internal and external disruptors to the corporate and operational performance of logistics companies, a subject that has become a frequently debated concern, particularly following the outbreak of the COVID-19 pandemic. However, how can a crisis-proof management be established to ensure resilience against disruptions within the supply chain?

To approach the overall subject, a broad examination of the literature served as an initial analysis, which was supplemented by the incorporation of expert assessments in a qualitative research design. A wide spectrum of strategic and operational approaches emerged, which are often driven by innovation, collaboration, and technology, but also include human and environmental aspects such as ethical sourcing and sustainability.

Altogether, it has become apparent that only a holistic perspective can provide a promising approach and has potential for a closer examination beyond this dissertation.

Keywords: Supply chain management, supply chain risk management, supply chain resilience, disruptions, logistics, strategic measures, competitive advantage, crisis management

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Sumário

A McKinsey & Company (2023) caracterizou o objetivo da investigação dizendo que "a resiliência é a capacidade não só de recuperar rapidamente de uma crise, mas também de recuperar melhor - e até de prosperar". Embora se tenha tornado um termo inflacionário que é utilizado em muitas áreas diferentes, deve ainda ser dada a maior consideração, especialmente no contexto da logística e das cadeias de abastecimento. Esta dissertação aborda aspectos da resiliência e da gestão de risco da cadeia de abastecimento face a disruptores internos e externos ao desempenho corporativo e operacional das empresas de logística, um tema que se tornou uma preocupação frequentemente debatida, particularmente após o surto da pandemia COVID-19. No entanto, como pode ser estabelecida uma gestão à prova de crise para garantir a resiliência contra perturbações na cadeia de abastecimento?

Para abordar o assunto em geral, um amplo exame da literatura serviu de análise inicial, que foi complementada pela incorporação de avaliações de peritos numa conceção de investigação qualitativa. Surgiu um vasto espetro de abordagens estratégicas e operacionais, que são frequentemente impulsionadas pela inovação, colaboração e tecnologia, mas que também incluem aspectos humanos e ambientais, como o aprovisionamento ético e a sustentabilidade.

Em conjunto, tornou-se evidente que apenas uma perspetiva holística pode fornecer uma abordagem promissora e tem potencial para uma análise mais aprofundada para além desta dissertação.

Palavras-chave: Gestão da cadeia de abastecimento, gestão do risco da cadeia de abastecimento, resiliência da cadeia de abastecimento, perturbações, logística, medidas estratégicas, vantagem competitiva, gestão de crises

Título: Resiliência e gestão de riscos na cadeia de abastecimento: Uma análise da indústria e um exame estratégico da forma como as empresas de logística estão a tornar as suas cadeias de abastecimento mais resistentes a crises e perturbações

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SCM	Supply Chain Management
SCR	Supply Chain Resilience
SCRM	Supply Chain Risk Management
RBV	Resource Based View

1. Introduction

Continuous digital transformation, enabled by information and communication technologies logistics technologies, etc., increases the effectiveness and visibility of global supply chain processes. Despite the favorable consequences of globalization, which have been facilitated by advancements in technology and the unrestricted exchange of commodities, data, and capital, supply chain management has faced numerous challenges (Bailey, Barriball, Dey, & Sankur, 2019) However, in a rapidly evolving business landscape, maintaining supply chains is both crucial and critical. Throughout recent decades, the importance of this issue has notably increased particularly for logistics companies with global operations (Skjoett-Larsen, 1999). Considering this specific scenario, there is a growing discourse about the terminology of supply chain resilience (Pires Ribeiro & Barbosa-Povoa, 2018).

Supply chain resilience and the ability of logistics companies to successfully manage crises and disruptions are of major importance in today's globalized and turbulent business environment. The dynamics of global trade, the impact of natural disasters, political uncertainties, pandemics and other unpredictable events or disruptions have clearly demonstrated the vulnerability of supply chains (Burkhardt, 2020). In this context, the terminology of supply chain resilience as well as a corresponding crisis management is becoming increasingly important (Durugbo & Al-Balushi, 2022).

1.1 Background and Rationale

The COVID-19 pandemic demonstrated how quickly unforeseen events can disrupt supply chains worldwide, especially companies in the logistic industry (Vilko & Hallikas, 2023). Production failures, transportation disruptions, and shortages of key components were just some of the challenges companies faced. The important role of logistics companies being critical infrastructure and supply chains as bottlenecks in the global economy became notably evident during this period (Scholz, Schauer, & Latzenhofer, 2022).

In addition, growing pressure on companies to operate more efficiently and sustainably has increased the complexity of supply chains (Gurzawska, 2019). This leads to additional risks and uncertainties. Global competition, volatile commodity prices and trade conflicts further escalate the situation. Hence, it appears essential for companies to develop strategies intended for enhancing the resilience of their supply chains to effectively tackle these challenges. Moreover, they should leverage insights gained from previous crises and derive appropriate

conclusions to safeguard their value creation and establish a competitive advantage (Brundin, Reeves, & Schreiber, 2022).

1.2 Research Objective

Considering the problem described in the previous section, which will be amplified with additional examples of disruptive events from a corporate perspective, it is essential to better protect an organization from external influences in the future. To safeguard the integrity of operational and strategic company objectives, it is imperative for logistic companies engaged in international operations to adopt a resilient approach. The primary aim of this dissertation is to examine the strategic measures that logistics organizations may implement to enhance their supply chain capabilities, enabling them to effectively address the complexities posed by a disruptive economy and attain a sustained competitive advantage (Schuster, et al., 2021). In order to accomplish this objective, the dissertation first outlines the initial conditions, examines typical methodologies, notices crucial factors that determine success, and evaluates the significance of crisis management and the insights derived from previous experiences of disruptions. Furthermore, by synthesizing and developing strategic frameworks, this paper can provide valuable insights and recommendations that can help logistics companies in their quest for greater resilience and competitive advantage in an ever-changing and disruptive business environment. A holistic literature review serves as the foundation for the research, which is subsequently assessed through a methodical evaluation of expert interviews.

Considering the challenges confronting logistics companies with regard to their supply chains and after presenting the research objective and design, the following **Research Question** is posed, which will be tested in the further course of this dissertation:

"How can logistics companies strategically enhance their supply chain resilience to effectively manage and mitigate disruptions, thereby gaining a sustained competitive advantage?"

The Research Question aims to investigate the causal relationship between logistics companies' strategies to improve supply chain resilience (independent variables) and the subsequent impact on their ability to manage and mitigate disruption and gain a competitive advantage (dependent variable).

2. Literature Review

This Literature Review provides a framework of the field and serves as a basis for the qualitative research in the later part of this dissertation. To approach core aspects of supply chain resilience, this chapter defines the various concepts and relates them to current challenges and management theories.

2.1 Introduction Supply Chain Management

Prior to investigating supply chain management (SCM), it is useful to examine terminology associated with a supply chain. A supply chain is defined as a process of general value creation pertaining to all phases of an organization's operations, including procurement, production, storage, sales, distribution, and customer transportation (Otto, 2002). Overall, the literature contains numerous attempts to define the nature and function of a supply chain. At the same time, some critics ism also emerges from the literature which, for example, only refers to the inclusion of products within a supply chain and does not address services. However, what all definitions have in common is that a supply chain represents an ecosystem of autonomous companies linked at multiple tiers through physical, informational, and/or financial transactions (Schröder, 2019).

SCM entails coordination and management of processes involved in the production and delivery of goods and services from suppliers to customers, along with all other associated aspects. By approaching the central aspect of supply chain resilience and already considering the research question, the following definition by Arndt (2021) may be used to illustrate the challenges that companies face in order to set up their supply chain competently and robustly in order to withstand disruptors and crises:

"Supply Chain Management involves the cross -company coordination and improvement of material, information and value flows across the entire value chain, from raw material extraction through various stages of refinement to the end customer. The aim is to optimise the entire process, taking into account customer requirements and focusing on both time and cost efficiency" (p. 45).

Moreover, the notion of SCM is frequently linked with the concept of logistics, which constitutes a fundamental aspect of this dissertation as the research and subsequent measures implemented to foster supply chain resilience are directly connected to logistics companies. In this context, four different perspectives emerge from the literature that relate SCM to logistics. The "traditionalist perspective" indicates SCM to be related to logistics outside the company and integrates both customers and suppliers. Accordingly, SCM is defined as a function of

logistics (Stock & Lambert, 2001). On the other hand, the "re-labling perspective" considers both aspects to be synonyms (Biedermann, 2018), whereas the "unionist perspective" states that logistics forms a part of SCM and that SCM simultaneously fulfills many other functions, which have already been mentioned (Schröder, 2019). Finally, the "intersectionist perspective" recognizes overlaps between the two aspects, with SCM having a greater focus on strategic objectives (Schröder, 2019).

To conclude, the tasks and objectives of SCM are influenced by social and macroeconomic requirements. In addition, the objectives are shaped by the policies and guidelines of the company and the market in which it operates (Werner, Supply Chain Management: Grundlagen, Strategien, Instrumente und Conrtolling, 6th Ed., 2017). This and other factors derived from the literature indicate that SCM is subject to enormous complexity, which is particularly intensified in times of crisis and disruptions. Companies must take decisive measures to address this reality, which Durugbo & Al-Balushi (2022) outline as follows:

"However, the dominant theoretical and practical challenge remains to understand SCM complexities in times of crisis for improving supply chain resilience" (p. 1180).

2.2 Point of View: Logistic Industry

Among the expanded context SCM, the logistic industry fulfills a pivotal role in orchestrating the frictionless flow of goods, information, and value within the supply chain (Richey, Roath, Adams, & Wieland, 2021). However, the unique challenges and perspectives faced by logistics companies, as well es the complex nature of logistic operations, justify a particular examination to understand their role in improving supply chain resilience. As being critical nodes in the supply chain network, the logistic industry operates at the intersection of various elements, including procurement, production, warehousing, transportation, and distribution (Chen, et al., 2022). The effectiveness in managing these elements determines the overall efficiency and responsiveness of the supply chain. Initially, a categorization is needed to determine the characteristics of the logistics industry, its definition and the specific challenges that need to be managed within SCM.

The logistic industry and companies such as shipping lines, freight forwarders, rail service providers, warehouses, etc. are the key players in the supply chain ecosystem and are responsible for the efficient transportation of goods and services from suppliers to end customers (Fleischmann, 2018). They act as important intermediaries and facilitate the physical, informational, and financial transactions that connect the diverse network of

autonomous companies within the supply chain (Schröder, 2019). The challenges faced by logistics companies are diverse and include the need for precise coordination, on-time delivery, and cost-efficient processes. Furthermore, their role goes beyond simply facilitating transactions, as logistics companies are an integral part of strategic objectives - and not only of those considering the SCM (Heskett, 1977).

In an increasingly dynamic and complex economy, global competition, fluctuating commodity prices and trade conflicts are making the logistics industry more vulnerable to disruption than ever before. Pressure on efficient and sustainable processes further intensifies the complexity of SCM (Vilko & Hallikas, 2023). Moreover, the logistics industry and its associated companies are characterized by constantly high asset values, which provide an additional risk dimension in terms of costs. As a result, the logistics industry is increasingly being scrutinized as a critical infrastructure and ever higher standards are being set for resilience, especially after unforeseen disruption (Arora, Böhm, Dolan, Gould, & McConnell, 2020).

2.3 Supply Chain Resilience

The following chapter examines various aspects of supply chain resilience, hereafter referred to as SCR, starting with a concise definition that serves as a framework in understanding subsequent sections. The definition of SCR focuses on the ability of a supply chain to adapt quickly to unforeseen changes and maintain its functionality (Alfarsi, Lemke, & Yang, 2020). It not only addresses the traditional challenges, but also the growing importance in disruptive economic environments These are precisely the challenges that are crucial in the context of SCR. This section highlights the changing nature of economies and the impact these changes or events are likely to have on supply chains. This is followed by a discussion of the driving forces behind supply chain disruption. Various factors are identified that can have a potentially negative impact on supply chains. Finally, this chapter focuses on supply chain risk management. Effective risk management is essential to ensure SCR while maintaining agility and flexibility to deal with future disruptions (Ghadge, Danir, & Khalawsky, Supply chain risk management: present and future scope, 2012).

2.3.1 Definition

To come to an understanding of SCR, it is necessary initially to categorize the broader concept of resilience. The term "resilience" in Latin originates from the discipline of natural sciences, wherein materials are deemed resilient if they exhibit the ability to revert to their original shape or form following exposure to stress (Röhe, 2022). Following that, the term was extended to

individuals considering the field of psychology and thereafter to organizations within the context of business and management. According to Duchek, Geithner & Scheuch (2021), resilience can be defined as the capability of an organization or individual to anticipate and respond to potential threats, effectively manage critical events, and ultimately emerge stronger through a process of learning.

However, resilience exceeds just the capacity for quick recovery. Resilience in business includes the ability to withstand and adapt to disruptions and setbacks to foster growth as stated by McKinsey & Company (2023) while also contributing to this discourse through applying a definition approach and establishing a connection to the primary subject of this dissertation:

"Resilience is the ability to not only recover quickly from a crisis but to bounce back better—and even thrive"

Upon further examination of the existing literature, it becomes apparent that adoption of this terminology is widespread and holds significant importance across different disciplines. Through human resources, (geo)-political aspects to supply chain risk management, resilience is currently omnipresent and subject of debate (Heß & Kleinlein, 2021).

The definition of SCR adheres to the generally recognized understanding of resilience but will be framed within a more specific perspective that aligns with the focus of the present research. The ability of a supply chain to anticipate, respond to, and recover from disruptions, while also adapting to its environment and thriving despite the presence of adversity, is referred to SCR. It demands being able to withstand a variety of challenges and adapting to those challenges in order to ultimately foster growth and development within the supply chain ecosystem (Alfarsi, Lemke, & Yang, 2020). Moreover, the concept of SCR aims for a requirement of an ongoing implementation of operational procedures to restore performance to the desired level, with the objective of improving the capability and competitiveness of a supply chain (Biedermann, 2018). The importance of SCR cannot be overstated, especially in today's dynamic and interconnected business environment. Meanwhile, four essential pillars are identified in the literature that emphasize the necessity of strategical SCR and thereby supports the definition approach.

1. *Risk Mitigation:* SCR is critical in mitigating risks associated with disruptions such as natural disasters, geopolitical instability, and pandemics (Pires Ribeiro & Barbosa-Povoa, 2018) which will be further elaborated in chapter 2.4.

2. *Adaptability and Flexibility:* Resilient supply chains are characterized by their ability to accommodate changing environments and unforeseen disruptions. This adaptability empowers companies to adjust their operations, identify alternative sources of supply and recover quickly from disruptions to ensure continuous supply chain performance (Adobor & McMullen, 2018).
3. *Competitive Advantage:* A resilient supply chain may provide organizations with a competitive advantage in the market. Through the ability to navigate challenges and maintain reliable performance, companies can strengthen their reputation, build customer satisfaction, and gain a competitive advantage over less resilient rivals (Tukamuhabwa, Stevenson, Busby, & Zorzini, 2015).
4. *Sustainability and Viability:* Establishing resilience in the supply chain is key to its long-term sustainability and viability. By proactively managing potential threats and disruptions, companies can ensure the business continuity of their operations, minimize financial damage, and fulfil their obligations to stakeholders such as customers, suppliers, and investors (Ruel, El Baz, Ivanov, & Das, 2021).

2.3.2 Disruptive Economies

Through the past few years, there has been a significant transformation in the global business environment due to the emergence of disruptive forces that are challenging established economic frameworks (El Namaki, 2018). Once an uncommon occurrence, disruption has become a constant and common component of modern economies. In order to gain an understanding of disruptive economies, this subchapter will examine the fundamentals of disruption, the difficulties it presents for businesses, and the growing recognition of the requirement of strategic resilience in the face of these challenges (Grzybowska & Stachowiak, 2022). To begin with, the following quote from Gilbert & Bower (2002) serves as a classification that disruption is not solely a negative phenomenon. In fact, it creates opportunities:

"If we see a change as a threat, we tend to react defensively, taking immediate, aggressive action to protect ourselves. If, however, we see the change as an opportunity, we tend to be more deliberate and reasoned in our response. We may postpone action, continuing in our established routines as we wait to see how the situation plays out. Business organizations are no different"

Disruption is defined as a dramatic shift or change that profoundly modifies accepted norms in a market or business. It surpasses the traditional ups and downs of economic cycles, frequently driven by innovations in technology, changes in global politics, or unforeseen events (Kilkki,

Mäntylä, Karhu, Hämmäinen, & Ailisto, 2018). However, the transformative nature of disruption is also equally shaped by and conducive to the "VUCA" concept, which refers to volatility, uncertainty, complexity and ambiguity and thus confronts companies and economies overall with major, unprecedented challenges (Kaivo-oja & Lauraeus, 2018).

This continuous state of change requires businesses to adopt a proactive approach in order to maintain their competitiveness and flexibility (Ghadge, Danir, & Khalawsky, Supply chain risk management: present and future scope, 2012). Secondly, the ripple effects of disruptive events have been worsened by the interdependence of the global economy. The rapid transmission of a crisis from one region to another can have far-reaching consequences for supply chains, markets, and consumer behavior (Katsaliaki, Galetsi, & Kumar, 2022). As awareness of disruptive forces grows, so does the realization that strategic resilience is essential. In a time of uncertainty, companies are obliged to re-evaluate their traditional practices and adopt a dynamic, adaptive mindset. The ability to navigate disruptive economies depends on strategic foresight, agility and especially a commitment to innovation (Natale, Poppensieker, & Thun, 2022). Companies that proactively cultivate resilience are not only more capable of resisting shocks, but also of seizing opportunities that may arise in a disruptive context. Incorporating resilient strategies is not just a reactive response to crises, but a forward-looking posture that adapts to the shifting nature of today's challenging business environment (Marquard, Johnson, Worsfold, & Walch, 2023).

Within the framework of disruptive economies, supply chains take a preeminent position of vulnerability, representing a crucial link of interdependent sectors (Grzybowska & Stachowiak, 2022). Examining how logistics companies are strategically managing their supply chains in the face of disruption is central to understand the practical implications of resilience to disruptive forces. A more comprehensive analysis of the drivers of supply chain disruptions to which logistics companies are particularly exposed will be provided in the subsequent chapter.

2.4 Supply Chain Disruption

Numerous factors, ranging from natural disasters to geopolitical tensions, can trigger disruptions with far-reaching consequences for supply chains. For logistics companies striving towards supply chain resilience, understanding the various potential disruptors is crucial. In this context, any foreseeable or unforeseeable event that has a direct impact on the performance or stability of the supply chain can be described as a disruptive event (Biedermann, 2018). Until the corresponding event occurs, it is considered a foreseeable or unforeseeable risk, whose

management and subsequent strategies for countering disruptors will be discussed more specifically in the remainder of this dissertation. However, to identify various supply chain disruptive events, potential disruptors are first categorized, and disruptive events are explained in the context of supply chain resilience.

2.4.1 Drivers of Supply Chain Disruption

Natural disasters: Unpredictable elements of nature can have a devastating impact on supply chains. Earthquakes, hurricanes, floods, and other natural disasters have the potential to disrupt transportation chains, damage infrastructure and prevent the smooth flow of goods (OECD, 2023).

Geopolitical uncertainty: Geopolitical landscape characterized by shifting alliances, trade tensions and regional conflicts adds another dimension of uncertainty that directly impacts supply chains. Tariff disputes, sanctions and political instability can disrupt established trade routes and change the dynamics of global supply chain networks (Roscoe, Skipworth, Aktas, & Habib, 2020).

Pandemics and public health crises: The global emergence of infectious diseases represents a significant threat to supply chains. Recent pandemics can lead to labor shortages, shutdowns, and transportation disruptions, significantly impacting the production and distribution of goods (Vilko & Hallikas, 2023).

Cybersecurity threats: The vulnerability of supply chains to cyber threats seriously needs to be recognized in an era dominated by increased digital connectivity. Cyberattacks on information systems, ransomware incidents and data breaches can disrupt operations, jeopardize sensitive data, and interrupt the smooth operation of supply chains (RiskOptics, 2023).

Supplier and contractor issues: Dependency on a network of suppliers and contractors puts supply chains at risk from their financial instability, production delays or abrupt terminations. The failure of a key supplier can have a cascading effect, leading to disruptions throughout the supply chain (RiskOptics, 2023).

Regulatory changes: Changes in regulatory frameworks, such as changes to customs procedures, trade agreements or environmental regulations, have the potential to impose complexity and uncertainty on supply chain performance (Martin, 2023).

Climate change: Evolving climate patterns are creating long-term risks for supply chains. Rising temperatures, extreme weather events and changing environmental conditions can affect agricultural production, disrupt shipping routes, and require adjustments to supply chain strategies (Boyson, et al., 2022).

Market volatility: SCM can be problematic due to rapid shifts in consumer preferences, market demand, and economic conditions. Companies must be able to react to changes in customer demand to avoid shortages or overstock, which may slow the flow of goods (Nitsche & Straube, 2020).

2.4.2 Phases of Supply Chain Disruption

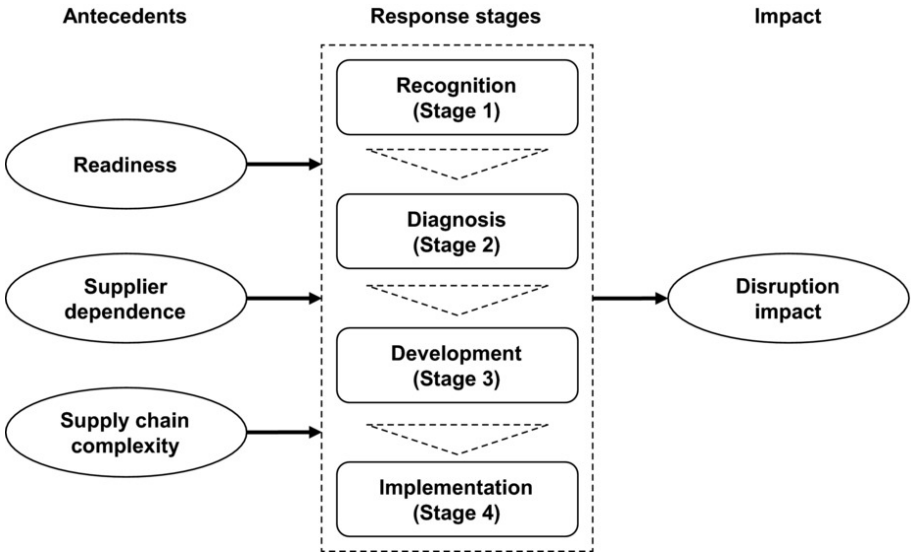
Within the above-mentioned categories, there is a fundamental distinction between external (e.g. regulatory and pandemics) and internal (e.g. strikes and cybersecurity) events (Khan, Huth, Zsidisin, & Henke, 2023). To evaluate the disruptive event and prepare for its subsequent management, it is critical to determine the extent and scope of the risk and to divide the event into distinct phases over time (Kiebler, Eben, Klink, & Sardesai, 2020). In addition, it is equally important to determine whether the disruption is driven by regulation or innovation, which has a long-term impact on the supply chain and the company, or rather a possible short-term crisis that needs to be managed with necessary measures. However, this dissertation is primarily concerned with the extent to which supply chains are affected by external or internal disruptive factors and less with the fact that innovative trends necessitate a general recalibration, restructuring and modernization of the supply chain (Brundin, Reeves, & Schreiber, 2022).

Besides the probability of occurrence and the causes of disruptions, the intensity of the event is of crucial importance and is categorized into three levels: “deviation”, “disruption” and “catastrophe” (Viswanadham & Gaonkar, 2008). A deviation arises when one or more key performance indicators diverge from their typical levels, yet the supply chain remains unaffected. A disruption, on the other hand, results in a substantial impact on the supply chain, striking it off guard and unprepared. A catastrophe emerges when the entire network of supply chain fails as a result of an unexpected and widespread interruption, leading to irreparable harm (Biedermann, 2018).

To provide a basis for strategies within risk and disruption management, reference is made to a phase model that illustrates the phases a supply chain goes through after the occurrence of a disruptive event using two different representations. Figure 1 has used information processing as a construct to understand decision-making processes that occur in response to a disruptive

event. The model conceptualizes organizational reactions or decisions as the result of three consecutive phases - also referred to in the literature as scanning, interpretation, and action - that together act as a decision mechanism between a disruptive event and the triggered reaction. Three contributing factors (readiness, supplier dependency and supply chain complexity) influencing the subsequent response stages as well as the final disruption impact on the supply chain and company (Bode & Macdonald, 2016).

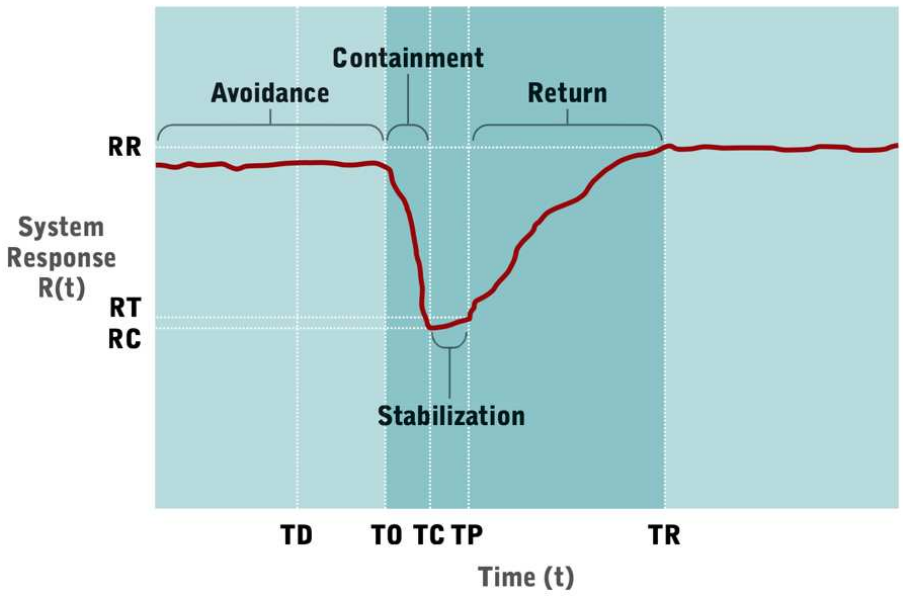
Figure 1: Conceptual Framework and Phase Model 1



Source: Bode & Macdonald (2016)

Considering the second representation and in addition to determining the probabilities of occurrence and the causes of "deviation", "disruption" and "catastrophe", SCR often refers to two system components that address the capacity to respond to the disruption. The "resistance capacity" refers to the system's ability to mitigate the impact of the disruption, to avoid it entirely or to minimize the period between the onset and recovery of the disruption which is described as containment. Secondly, "recovery capacity" describes the ability of a system to restore full functionality after a disruption or subsequent to the avoidance and containment phase. In this regard, the concepts of stabilization and return are particularly important (Melnyk, Closs, Griffis, Zobel, & Macdonald, 2014).

Figure 2: Time Series Display of Supply Chain Resilience Factors and Phase Model 2



Source: Melnyk, Closs, Griffis, Zobel & Macdonald (2014)

As this process is basically more of a cycle with repeating phases, the return phase is followed by a review, which allows the system or company time to document its experiences and take optimization measures for future crisis management. Finally, this review phase leads back to the avoidance phase to prevent disruptive events (Melnyk, Closs, Griffis, Zobel, & Macdonald, 2014).

Addressing the multitude of supply chain disruptions requires unpacking of various risks and associated challenges that may arise. As companies face the unpredictability of the global economy, the following chapters will examine how the industry is dealing with corresponding risks and disruptions to strengthen the resilience of supply chains. Discussing supply chain risk and disruption management, as well as examining industry practices and strategic initiatives, will provide insights into the evolving landscape of SCM in the face of disruptive forces.

2.4.3 Supply Chain Risk & Disruption Management

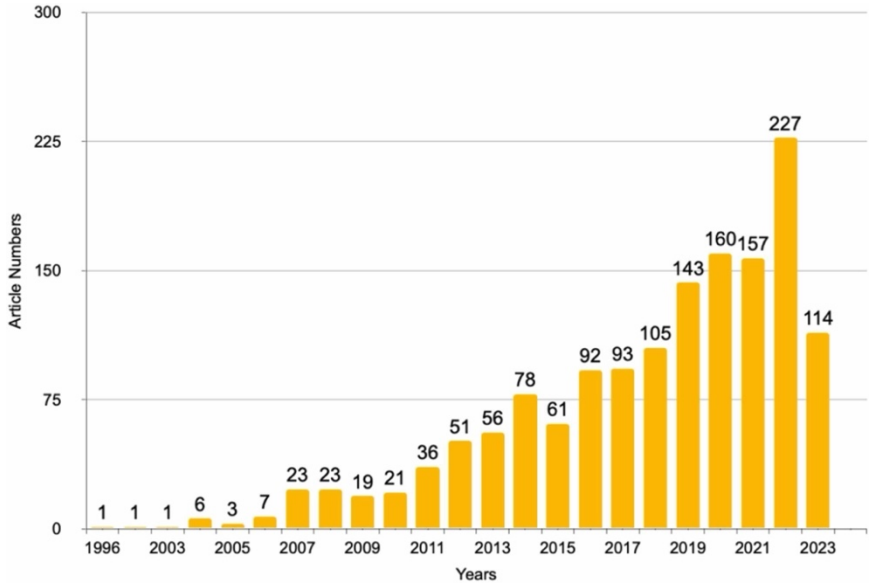
To contextualize supply chain risk management (SCRM), a preliminary breakdown of the individual components is needed. In the literature, SCRM is considered to be a connecting link between the holistic risk management of a company, which initially has internal tasks such as securing corporate goals (microeconomics), and SCM, that exceeds the boundaries of the company and is categorized around macroeconomics. SCRM, which is increasingly being used with the addition of disruption management, therefore utilizes aspects of both disciplines, and

has a corresponding impact as well as obligations (Ghadge, Dani, & Kalawsky, 2012). However, SCRM has its own set of distinct responsibilities and obstacles that impact different categories. For instance, it is necessary to differentiate management of identified risks from unknown ones (Bailey, Barriball, Dey, & Sankur, 2019). The probability of disruptions occurring can also be generalized as a supply chain risk (Werner, 2017). According to Biedermann (2018), supply chain risks are those events that interrupt or completely prevent the flow of information, materials, and products.

Drivers are often clustered in the literature as, "operational risks", "financial risks", " hazardous risks" and "strategic risks", all of which could be grouped into different sub-clusters (Schlegel & Trent, 2012). The terminology of the SCRM in general is used to both predict and manage disruptive events (Fan & Stevenson, 2018). Generally, SCRM is based on a risk management process that represents the various phases of corporate risk management and can therefore also be applied to SCRM (Schröder, 2019). This process is broadly similar to the phase models from 2.4.2, whereby the risk is first identified, followed by an analysis and an assessment. Subsequently to the risk response, adequate monitoring serves as documentation to be able to address future challenges more effectively. Such SCRM is particularly applicable where risks are known and therefore potential disruptions can occur frequently or recurrently. Experts from McKinsey & Company have published a guide respectively a practical approach to SCRM where four steps in the corresponding risk management are mentioned in addition to the previous examples. First, risks are identified and documented, which is followed by building a SCRM framework. Usually, a scoring is carried out by reflecting the likelihood of the risk materializing and the preparedness of the company. Subsequently, the risk is monitored and concluded by the institution of governance and a regular review (Bailey, Barriball, Dey, & Sankur, 2019).

The significantly increasing involvement with aspects of SCRM in both theory and practice is also illustrated by the following graphic from Emrouznejad, Abbasi, & Sıcakyüzc (2023). It shows that SCRM is increasingly becoming the subject of scientific debate and, of course, of practical application in many companies.

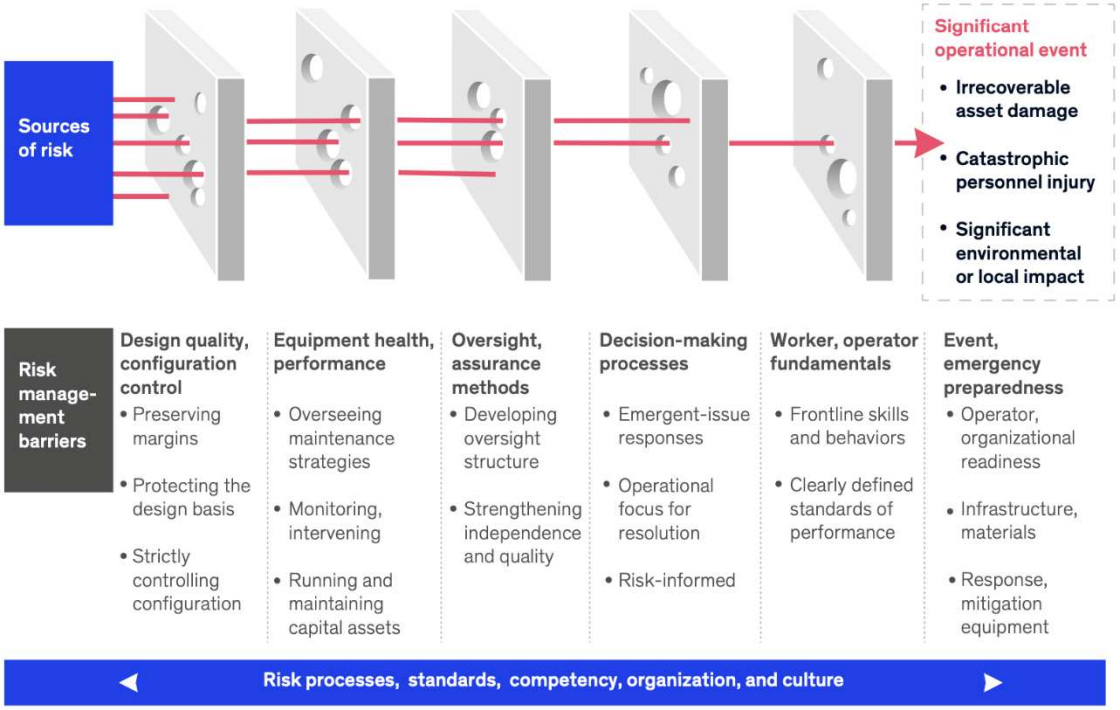
Figure 3: The Number of Papers related to SCRM published over the Years



Source: Emrouznejad, Abbasi, & Sıcakyüzc (2023)

Within the SCRM, the risk management process and associated purpose of preventing damage to a company through disruption entails strategic measures taken to manage risks as well as to mitigate them. This is particularly relevant when it comes to managing predominantly unknown risks. Unknown risks are inherently challenging because they cannot be forecast, quantified, or integrated into risk management frameworks associated with known risks. According to the literature, the most effective method for mitigating unknown risks is to establish robust defenses and foster a risk-aware culture, which mainly involves attributes such as acknowledgement, transparency, responsiveness, and respect for risks potentially occurring (Bailey, Barriball, Dey, & Sankur, 2019). These layers are illustrated in the following figure, which uses various risk management barriers to demonstrate how companies manage unknown risks throughout a sequence of different governance structures.

Figure 4: Layers of Defenses supporting SCRM



Source: Bailey, Barriball, Dey & Sankur (2019)

These structures include risk processes, standards, areas of competence within the organization and its culture. A further breakdown is provided within the various layers. The objective is to ensure, for example, a high-quality controlling configuration, maintenance, and oversight strategies/methods that ultimately help to ensure risk-centered and fast decision-making processes. In combination with clearly defined standards and required skills for the workforce, appropriate event emergency preparedness should be guaranteed to minimize the impact of disruptive events (Bailey, Barriball, Dey, & Sankur, 2019).

Which internal optimization measures and strategic modifications are initiated along the supply chain in consideration of risk management depends entirely on the individual requirements as well as the agility of the company to first identify the need and then execute the implementation (Marotta, 2023). Looking at the process in more detail, it is generally accepted that the first step is risk identification and the assessment of internal and external factors that could pose a disruptive threat to the supply chain (Khan, Huth, Zsidisin, & Henke, 2023). By using a variety of tools and techniques, including risk mapping, scenario analysis and predictive modeling, organizations can assess the likelihood and impact of identified risks. These digital platforms and supply chain visibility tools provide real-time data, allowing companies to respond quickly to emerging threats and optimize their operations. This strategic use of technologies such as

advanced analytics, artificial intelligence and real-time monitoring enables a more proactive approach to risk response to improve the resilience of the entire supply chain network (Dunkelberger, 2023).

Risk mitigation strategies in the context of cybersecurity are also supported by blockchain technology which enhances transparency and traceability in the supply chain and reduces risk of fraud, counterfeiting and unauthorized access (Chin, 2023). To ensure continuous monitoring of the supply chain environment as well as the SCRM process, companies must be vigilant and agile, adapt to changing conditions and adjust strategies accordingly. An internal or external supervisory body, e.g. through regular auditing, can ensure that risk management practices remain effective and are adapted to evolving industry dynamics (Norrman & Wieland, 2020). The literature often refers to a broad range of factors that must be fulfilled or implemented to establish a resilient supply chain or high-quality SCRM. After clustering all these factors, Biedermann (2018) and Werner (2022) identify an overarching framework consisting six features that should ensure successful application.

In particular, the previously mentioned agility of an SCRM and ultimately the entire supply chain is an overarching concept that enables a rapid response to unforeseen disruptions. Information transparency, a high degree of operational efficiency and good responsiveness enable companies to limit damage and restructure processes efficiently. The aspect of flexibility should also be mentioned here, as it enables companies to take appropriate measures in the event of disruptions while using resources as cost-effectively as possible. This flexibility is enhanced by a proactive redundancy strategy that provides additional resources when disruptive events occur; for instance, this is applied through increased inventory in warehouses or back-up suppliers in the event of delivery or transport failures. Another key success factor is collaboration within the supply chain. Close collaboration between all stakeholders along the supply chain strengthens the flexibility and resilience of the entire network. Transparency also becomes crucial as it ensures clear monitoring of the inventory, for example, and thus helps to prevent ambiguities. This naturally also applies to communication with each other. Finally, decentralization through process decoupling of the entire supply chain helps to increase systematic security and mitigate external influences (Werner, 2022) and (Biedermann, 2018).

Taken together, agility, flexibility, redundancy, collaboration, transparency, and decentralization form an integrated network of principals ensuring a resilient and efficient

supply chain and thus guarantee a transition from a mere risk management approach towards strategic resilience (Natale, Poppensieker, & Thun, 2022).

2.5 Managerial Relevance

Agency theory provides a central perspective for understanding the dynamics between principals and contractors in logistics organizations, offering valuable insights into risk management and resilience strategies. In the complexity of supply chains, agency problems are often caused by information asymmetries and conflicts of interest between the involved stakeholders. Logistics companies address these challenges by utilizing mechanisms such as aligning incentives and contractual agreements (Fayezi, O'Loughlin, & Zutshi, 2012). These measures are designed to ensure that the key players act in the best interests of the overall strategy and mitigate potential disruptions.

Porter's Five Forces Framework extends agency theory by highlighting the external competitive forces that shape the logistics industry. By examining the bargaining power of suppliers and buyers, the threat of new entrants, the risk of substitute products or services and the intensity of competition, logistics companies can adapt their resilience strategies. This approach aims to remove vulnerabilities in the supply chain and strengthen the ability to withstand disruptions and emerge stronger from adverse circumstances (Porter Analysis, 2017).

From a more internal perspective, the Resource-Based View (RBV) focuses on the unique capabilities and resources that provide logistics companies with a competitive advantage. In terms of supply chain resilience, companies use advanced technologies, skilled labor, and efficient processes. The RBV helps to identify and promote these special competences enabling logistics companies to build a resilient supply chain that gives them a sustainable competitive advantage (Yao & Meurier, 2012). Dynamic capabilities theory contributes to the managerial toolkit by explaining how e.g., logistics companies adjust to changing supply chain environments. Barreto's (2010) multidimensional view of dynamic capacities helps solve business problems in dynamic environments. Dynamic capabilities enable proactive supply chain response to uncertainties and disruptions. Logistics companies using dynamic capabilities may understand and capitalize on opportunities, improving their ability to innovate and change quickly. This approach is relevant due to changing client needs, technology, and market conditions (Pu, Li, & Bai, 2022). Thus, this perspective also complements agency theory and RBV. Additionally, resource dependency theory adds another layer by emphasizing the importance of external relationships in managing uncertainties and risks. Organizations should

be interdependent and collaborate to achieve higher long-term performance gains rather than seeking short-term benefits at the expense of others. However, the diversification of supply sources is also an integral part of this approach, enhancing resilience by ensuring access to critical resources even during disruption (Kim, Lee, & Hwang, 2020). This is supported by the strategic alliances and network theory, which addresses the collaborative nature of supply chain management and demonstrates how logistics companies actively engage in partnerships to create networks that facilitate resource sharing, risk allocation and knowledge transfer. By strategically collaborating with partners, companies leverage the collective capabilities of the network, which should ultimately strengthen overall resilience (Hearnshaw & Wilson, 2013).

2.6 Use Cases: Resilient Strategies from Logistic Companies

Following this, three real life use-cases from the logistics industry are provided to illustrate SCRM approaches that can be implemented to enhance strategic resilience within the supply chain.

Starting with UPS, using advanced and predictive analytics to assess and mitigate risks in its supply chain. Through historical data analysis, UPS is also able to optimize transportation routes, allocate resources efficiently and anticipate potential disruptions while enabling proactive decision-making. Resilience strategies always incorporate an actionable Plan B to quickly resolve disruptions, align supply chain management tactics with the company's strategic vision, and manage suppliers to reduce their potential for business disruption alongside their own risk management. In addition, UPS emphasizes the importance of partnerships across the industry to ensure a positive recovery from disruption. These efforts reflect UPS's commitment to building a more resilient supply chain to effectively manage challenges and continue to serve its customers (UPS Capital, 2023), (UPS, 2022) (Szwast, 2014) and (Post & Parcel, 2023).

In addition to the technological optimization measures that are being implemented in a similar setting by the Danish Maersk Group and major efforts to decarbonize the supply chain, the company is particularly pursuing the strategy of increasing its influence and gaining greater control over its logistics services through acquisitions along the entire supply and value chain, thereby focusing on creating resilient transport networks. The company's own business model of container transport by sea is expanded through investments in other logistics companies, freight forwarders, infrastructure such as container terminals, but also through the recent deployment of cargo planes to complement the shipping business. This diversified approach

helps Maersk to mitigate disruptions and to be responsive and influential throughout the supply chain (Maersk, 2023), (Leonard, 2021) (Link, 2021) and (Berger, 2022).

Since Amazon is increasingly entering the logistics industry in addition to its core business as an e-commerce retailer, a similar example is also being used. Increasing risk identification and mitigation, streamlining manual activities, and boosting supply chain visibility are the three components of Amazon's risk management strategy for strengthening supply chain resilience. To accomplish these objectives, the company leverages AWS Supply Chain, an end-to-end business application that provides enterprise-wide visibility and actionable machine learning-enabled insights. Moreover, the company prioritizes the importance of diversifying options in suppliers, sources, contracts, and technology components to make the supply chain more robust. This multi-layered approach is intended to address the dynamics of increasingly complex supply and value chain networks and thus position Amazon ahead of its competitors (Balasubramanian, 2023), (Cooley, 2023) and (Murray, 2022).

3. Methodology

In the following part, the general approach of the research within this dissertation will be explained and discussed. More specifically, it deals with aspects of methodology selection, data collection through expert interviews and the corresponding analysis according to evident criteria. To guarantee a structured approach and a more comprehensive insight, the development of the interview guideline and the selection of experts are also briefly discussed.

3.1 Methodical Approach: Qualitative Research and Data Collection

The research presented in this dissertation used the principles of empirical social research, which is defined as the systematic recording and interpretation of social phenomena. The empirical research thereby strived for information and insights through the targeted evaluation of experiences and knowledge (Bhattacherjee, 2012). Therefore, the selected methods such as interviews and subsequent content analysis were used to test and validate the theoretical concepts and foundations provided in the literature based on concrete realities. This allowed the research question to be answered within this dissertation. While determining the appropriate empirical method, qualitative research was selected in this dissertation as the primary source of reference for the purpose of gaining relevant insights through interviews with industry experts.

The experts were selected based on various standards to incorporate as broad a spectrum of knowledge and expertise as possible into the evaluation and analysis. A good and careful selection was therefore essential to ensure high-quality research with valid and practical findings. Based on the literature, many attempts were made to define what an expert is. In this context, three questions in consideration of the selection process for experts from the literature were taken into account. Which expert has information, which expert can communicate precise information and which of these experts is available and willing to provide these insights? (Gorden, 1975). In the end, however, a spectrum of people working in the industry (shipping companies, freight forwarders and port logistics specialists) as well as a range of external experts looking at the industry as consultants were selected.

3.1.1 Interview Guideline

Simultaneously, the interview guideline respectively questions were designed, which were only made available to the experts during the semi-structured interviews. Nevertheless, the experts were informed of the research direction before the interview was conducted. Within the interviews, several open questions were posed with reference to the literature and with the intention of providing answers to the research question. In the process, not every (sub)-chapter

was assigned to corresponding questions, since the focus remained on SCM, SCR and SCRM in terms of disruptive events. In addition, the two initial questions were not included in the following tables, as they only served as icebreakers and did not provide any insights into the research question and were primarily intended to obtain demographic data.

Table 1: Interview Guideline

Sub-Chapter	**Interview Question**
2.1 Introduction Supply Chain Management	1. Can you provide insights into the current trends and challenges in supply chain management?
2.2 Point of View: Logistic Industry	2. Can you elaborate on the key challenges specific to the logistics industry in terms of supply chain management and disruption mitigation? 3. How do logistics companies perceive and adapt to changes in the industry landscape?
2.3 Supply Chain Resilience	-
2.3.1 Definition	4. How do you define supply chain resilience? 5. From your perspective, what are the critical elements and objectives that constitute a resilient supply chain in the logistics industry?
2.3.2 Disruptive Economies	-
2.4 Supply Chain Disruption	-
2.4.1 Drivers of Supply Chain Disruption	6. From your experience, what are the primary drivers of supply chain disruption in the logistics sector?
2.4.2 Phases of Supply Chain Disruption	7. How do logistics companies manage and mitigate disruptions across different phases of disruption occurrence?

2.4.3 Supply Chain Risk and Disruption Management	8. How do companies effectively identify and assess both known and unknown risks in their supply chains?
2.5 Managerial Relevance	9. In your opinion, does a more in-depth awareness of theoretical concepts in business administration and economics, such as Porter's Five Forces or the Resource Based View, strengthen the understanding of resilience in companies and enable more efficient measures to be taken in terms of SCRM?
2.6 Use Cases: Resilient Strategies from Logistic Companies	10. While looking at the market, it quickly becomes apparent that SCRM will be particularly characterized using advanced analytics and AI in the future. How do you assess this, as well as the efforts of certain companies to become more resilient to disruptions through acquisitions along the supply chain?

Source: Own representation

3.1.2 Expert Interviews

Meanwhile, all interviews were conducted in person or via video conference in German language and the answers were transcribed and translated as bullet points (each interview can be found in the appendix under A-H). Without any exception, all the experts emphasized not to publish any personal data or references to their companies, which was implemented in accordance with the standards of the German General Data Protection Regulation. After completing the open-ended questions in the semi-structured interview, one additional question was asked to collect ordinal data in the form of a Likert scale. This was designed to quantify a final perception of the experts:

"Using a scale of 1-5, how convinced are you that the measures currently being taken by the industry are sufficient to be able to respond better to disruptions in the future and thus ensure improved supply chain resilience? The 1 represents unconvinced, 2 slightly convinced, 3 undecided/neutral, 4 fairly convinced and 5 very convinced"

While conducting the individual interviews, it quickly became apparent that the feedback and corresponding insights frequently turned out to be comparable, which resulted in no further experts being consulted after the conclusion of the eighth interview.

3.2 Evaluation Method and Data Analysis

Similarly, categories were created, representing the foundation for the concluding content analysis of the expert interviews. Thus, the categories listed in the further course of this dissertation were derived or extracted from the theoretical material in the first sections. Typically, this is referred to as a deductive application of categories. Unlike the inductive categorization from the text material and thus the transcribed expert interviews (Mayring, 2015).

Table 2: Overview of Categories for subsequent Analysis

Category	**Interview Question**	**Purpose**
C1: Supply Chain Management: Dimensions & Challenges	1. Can you provide insights into the current trends and challenges in supply chain management?	The findings shall provide a foundation for the relevance of the dissertation research objective
C2: Logistic Industry Perspective	2. Can you elaborate on the key challenges specific to the logistics industry in terms of supply chain management and disruption mitigation? 3. How do logistics companies perceive and adapt to changes in the industry landscape?	This category is intended to reflect on the perspective of the logistics industry and its specific requirements and challenges towards SCM
C3: Fundamentals of Supply Chain Resilience	4. How do you define supply chain resilience? 5. From your perspective, what are the critical elements and objectives that constitute a resilient supply chain in the logistics industry?	The insights provided by the experts in terms of SCR are intended to verify the findings from the literature and generate further knowledge

C4: Understanding Supply Chain Disruption	6. From your experience, what are the primary drivers of supply chain disruption in the logistics sector? 7. How do logistics companies manage and mitigate disruptions across different phases of disruption occurrence?	The findings on the disruptors affecting supply chains should provide insights concerning potential responses to mitigate the impact on the business model
C5: Risk & Disruption Management Success Factors	8. How do companies effectively identify and assess both known and unknown risks in their supply chains?	The experts shall provide insights into effective risk & disruption management considering success factors examined in the literature
C6: Theoretical Frameworks & Practical Application	9. In your opinion, does a more in-depth awareness of theoretical concepts in business administration and economics, such as Porter's Five Forces or the Resource Based View, strengthen the understanding of resilience in companies and enable more efficient measures to be taken in terms of SCRM? 10. While looking at the market, it quickly becomes apparent that SCRM will be particularly characterized using advanced analytics and AI in the future. How do you assess this, as well as the efforts of	The purpose of this category is to investigate the managerial relevance as well as to connect practical application with promising examples

	certain companies to become more resilient to disruptions through acquisitions along the supply chain?	

Source: Own representation

For addressing the research question, the experts' responses within the individual categories are analyzed and summarized in the following sub-chapters. The citations for the specified statements by experts and related examples (A-H) refer to the transcripts of the individual interviews listed in the appendix. Statements that were used repeatedly and appeared similar in the context were emphasized more specifically and included as anchor examples in the evaluation of the categories.

3.2.1 Supply Chain Management: Dimensions & Challenges

The experts' insights focus on the key dimensions and challenges of modern supply chain management. A repeated theme is the increased focus on sustainability, risk management and ethical sourcing, underlining a global trend. The adoption of technology, sustainability and digitalization trends are highlighted by several experts, with interviewee B particularly highlighting eco-friendly practices and green shipping. The complexity caused by globalization is a consistent challenge mentioned by interviewees B, C and G. Real-time visibility and the integration of AI to optimize operations are highlighted by interviewees D and G. However, there are also unique perspectives, with interviewee F identifying challenges for example in African trade in terms of digitalization and labour-intensive processes impacting efficiency. The struggle to adapt to evolving global standards, particularly around sustainability, is emphasized, highlighting regional differences in supply chain dynamics. The global nature of supply chains is highlighted by interviewees E and G, with geopolitical uncertainties reinforcing the need for adaptable strategies.

In summary, the experts collectively emphasized the complexity of supply chain management in a globalized context and highlight the challenges related to sustainability, technological integration and geopolitical uncertainties that have already been described in the literature. Whilst there is consensus on the key issues, regional nuances and differing perspectives highlight the dynamic nature of the industry, which requires a multi-layered approach to supply chain resilience and risk management.

3.2.2 Logistic Industry Perspective

The experts interviewed across the logistics industry provided insights into the key challenges and adaptation strategies in the research context of this dissertation. While discussing the specific challenges faced by logistics companies, the industry's reliance on global networks and suppliers was generally recognized. Problems such as transport bottlenecks, geopolitical events and natural disasters were consistently emphasized. Weaknesses resulting from weather conditions, port congestion and infrastructure problems were also mentioned. One interesting element of agreement was the trade-off between cost efficiency and resilience, which underlines the fragile balance that companies face, as interviewee D. highlighted. All experts emphasized the importance of monitoring technological developments, industry patterns and market dynamics. Proactive measures included agile supply chain strategies, adapting quickly to emerging trends and forming collaborative networks and partnerships. However, the challenges of continuous engagement and resistance to change were also acknowledged. Looking at specific examples, interviewee B prioritized the importance of partnerships for shared insights and risk mitigation, while interviewee G highlighted regulatory compliance as a key focus. Interviewee E provided insights into the industry's open approach to innovation through proactive technology adoption. However, interviewee H was concerned about the industry's delayed progress in addressing cybersecurity threats.

In summary, the experts highlighted the difficult balance that logistics companies need to strike between global efficiency and vulnerability. While challenges such as geopolitical risks and infrastructure constraints were addressed, the different focuses and approaches highlighted the importance of proactive adaptation using technology, collaborative partnerships, and agile organizational structures within the evolving industry landscape.

3.2.3 Fundamentals of Supply Chain Resilience

A supply chain's resilience, as defined by interviewees, is characterized by its ability to adapt, recover, and maintain operational continuity in the face of disruption. Interviewees universally emphasized that a supply chain must be able to absorb shocks without significant disruption, adapt and recover quickly. This resilience includes strategies aimed to reduce the disruptive impact on stakeholders and consumers and highlights the importance of responsiveness and adaptability in logistics operations. In the expert's view, there are several key elements and objectives that constitute a resilient supply chain. Redundancy measures, such as a diversified supplier base and robust inventory control, were highlighted as essential strategies to minimize risks. The importance of real-time visibility and monitoring systems combined with reliable

risk management processes was mentioned as a fundamental aspect of ensuring a responsive and adaptable supply chain. Collaboration with partners was repeatedly stated, which highlights the importance of collective efforts in maintaining a resilient supply chain. Although there was common ground on many points, there were also variations in the experts' views. Interviewee F, for example, highlighted the inclusion of human adaptability in crisis response and argued in favour of investing in human capital development and promoting strong community engagement. Interviewee G, on the other hand, favoured the use of adaptive technologies for predictive analysis and the development of robust contingency plans through scenario analysis and simulation. Interviewees also addressed the challenges of defining supply chain resilience, with interviewee H referring to the different definitions and the potential discrepancy between theoretical resilience and operational requirements. This underlined the need for practical approaches, such as real-time visibility across the supply chain, collaborative relationships with key stakeholders and careful consideration of the extent of diversification of the supplier base.

3.2.4 Understanding Supply Chain Disruption

When investigating the drivers of supply chain disruption in the logistics sector, the experts provided broad perspectives. Geopolitical factors such as tensions and uncertainties were highlighted by interviewees as impacting trade routes and global trade. In addition, the effects of climate change and natural disasters were cited as significant disruptive factors affecting production, transport, and infrastructure. Meanwhile, the increasing threats to cyber security and IT systems were commonly recognized, indicating the growing digital vulnerabilities within supply chains. There was consensus on the importance of proactive risk management strategies when responding to disruptions. These included the development of contingency plans, alternative sourcing strategies and risk sharing initiatives with suppliers, which was highlighted by interviewee A. Risk assessments, scenario planning and transparent documentation proved to be essential components. In addition, interviewee C emphasized continuous monitoring of supply chain processes, real-time monitoring systems and collaborative partnerships within the supply chain. Interviewee D stressed the diversification of suppliers and modes of transport leading to the development of risk sharing agreements. Interviewee F emphasized the importance of proactive risk assessment and planning, especially in challenging environments. Regarding the management of disruptions in different phases, the experts provided differentiated approaches. Pre-disruption strategies included risk assessments, scenario planning and contingency strategies, which were emphasized by interviewees B and G. During an interruption, communication protocols, alternative routing and resource allocation

were considered critical. After the disruption, a collective focus on improvement, lessons learned, and optimization was highlighted as a common perspective. Rapid response teams were identified by interviewee E as crucial for effective coordination. To summarize, the logistics sector focuses on a variety of supply chain disruptions, all of which have the potential to be analyzed individually. The experts agreed on the importance of proactive risk management, diversified strategies, and collaborative approaches to improve supply chain resilience and mitigate the impact of disruptions, in line with the broader strategic objective of gaining a sustainable competitive advantage in an unpredictable business environment.

3.2.5 Risk & Disruption Management Success Factors

Looking at the success factors of risk and disruption management, the industry experts gave different but interrelated insights into how logistics companies effectively identify and assess both known and unknown risks within their supply chains, which already builds on the previous category. According to interviewee A, supply chain resilience relies on consistent risk assessment and scenario planning. This opinion was shared by interviewee D, who emphasized the importance of regular risk assessments and scenario planning, incorporating past data analysis for predictive risk modelling. Interviewee G highlighted the aspect of collaboration and supported working with suppliers and partners to jointly identify and mitigate risks. Interviewee B and E both highlighted the importance of a comprehensive understanding and mapping of supply chain networks. For interviewee B, supply chain mapping and capturing the totality of dependencies was critical, while interviewee E focused on the human element, indicating greater collaboration with suppliers for transparency and trust. In addition, both interviewees stressed the use of data analyses to assess the impact and likelihood of risks occurring. Regular internal and external risk assessments were recurring subjects, with interviewee C expressing the need for supplier relationship management. Interviewee H also warned against information overload when analyzing data for risk prediction and was in favour of cross-functional risk management teams. Establishing data analytics for risk prediction and monitoring was a common feature, with several experts, including interviewee H, emphasizing their role alongside other approaches. Interviewee G mentioned the application of advanced analytics and artificial intelligence for predictive risk modelling, while interviewee D included supplier audits and performance monitoring in its risk assessment strategy. In addition, interviewee F highlighted regional and cultural intelligence as a unique asset and recognized the importance of understanding local dynamics for effective risk management and subsequent resilience. In conclusion, strategy fusion includes regular risk assessments, scenario planning,

supplier engagement, a comprehensive understanding of the supply chain and a balance between human insights and data analyses.

3.2.6 Theoretical Frameworks & Practical Application

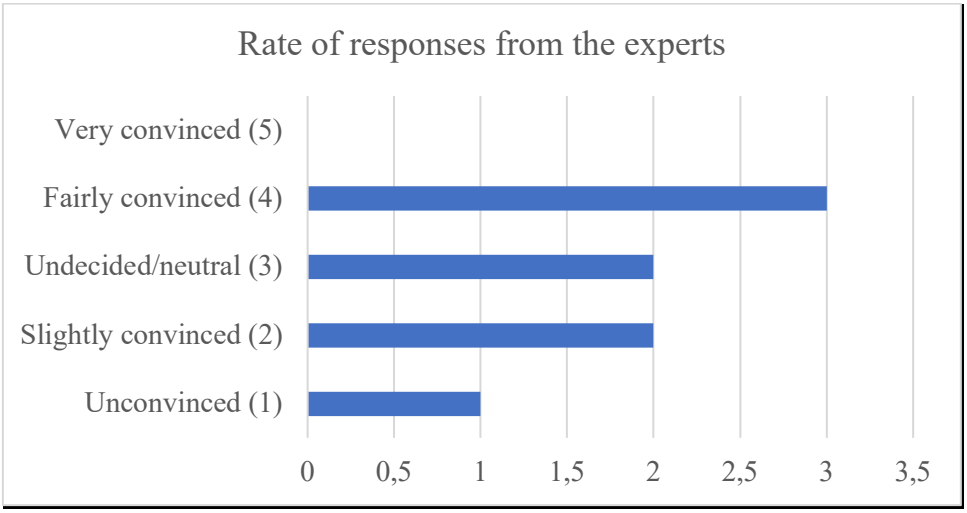
Examining the intersection of theoretical frameworks and practical application in the context of supply chain resilience and risk management, the findings of the experts interviewed showed a diverse and multi-layered environment. Concerning the relevance of theoretical concepts, the experts agreed that such frameworks significantly contribute to strategic decision-making and risk assessment. Interviewee A emphasized the application of these concepts for making informed decisions on resource allocation, while interviewee B highlighted the structured perspective they provide for strategic decision-making. However, interviewee E adds a crucial layer commenting that while theoretical concepts provide valuable insights, their adaptation to real-world scenarios is essential for practical relevance. In terms of advanced analytics and AI in supply chain risk management, the experts emphasized their transformative potential. Predictive capabilities and technology-enabled transparency are identified as critical elements. Despite the enthusiasm for advanced technologies, interviewee H urged caution and highlighted the importance of not overlooking human expertise in crisis response. This view is shared by interviewee F, who stressed that all stakeholders must be involved in strategic planning with cultural sensitivity. The strategic importance of acquisitions featured as a recurring theme throughout the responses. The interviewees underlined the role of acquisitions in supply chain systems, particularly in shipping. Interviewee H referred to their importance in gaining control, generating synergies, and ensuring end-to-end resilience. Interviewee C emphasized the importance of mergers and acquisitions for diversification and redundancy, while interviewee H recognized their strategic and beneficial approach, albeit with potential integration issues.

Overall, the experts summarized the symbiotic relationship between theoretical framework and practical application. Their perspectives underlined the importance of a holistic approach that balances theoretical insights with real-world adaptability and technological advances, while recognizing the value of human expertise.

3.2.7 Ordinal Data Collection

After reviewing and initially categorizing the experts' qualitative insights regarding the interviews, the assessment of the final question will now be addressed. The objective was to classify the extent to which the measures currently being taken by the industry are sufficient to enable a better response to disruptions in the future. The following bar chart illustrates the rates of all eight experts' responses on a Likert scale from 1-5.

Figure 5: Bar Chart representing the Rate of Responses from the Experts



Source: Own representation

Altogether, the responses showed no extremes at the upper end of the Likert scale and only one extreme at the lower end. Three experts selected "fairly convinced" followed by two responses each for "undecided/neutral" and "slightly convinced". To summarize, the average score was 2.875, indicating a rather neutral perspective overall. These findings demonstrate that the strategic measures taken to date have been recognized and rewarded, but their practical implementation could be intensified. Reference is also made to the fact of who gave which answers. This already refers to the limitations of the research discussed later in this dissertation. All three responses in the "fairly convinced" range were given by experts working in consultancies. However, more cautious answers were given by those who work directly in industry. Accordingly, it is important to include the expert’s individual perspective into the evaluation.

4. Reflection and Result Discussion

This part of the dissertation is based on three points of reference. Initially, a reflection of the research is undertaken based on the literature, which is linked to management theories in the second step. Subsequently, the methodology section is addressed, in which the research is also critically considered.

The literature review offered a comprehensive overview of the basic concepts and challenges in the field of SCM, focusing on the central subject of this dissertation, SCRM and SCR. To provide greater insight, attempts were made to define and discuss the nature and function of a supply chain, emphasizing its role as an ecosystem of autonomous companies linked by transactions. To adequately introduce the research, a reference to the vulnerability of the entire ecosystem was constantly highlighted. Subsequently, the logistics industry was examined in the context of SCM, stressing its crucial role in ensuring the frictionless flow of goods, information, and value within the supply chain. Logistics companies, acting as key players, encounter various challenges, all of which contribute to the complexity of SCM. To address the research question more specifically, a detailed definition of supply chain resilience followed, with four key pillars identified: Risk mitigation, adaptability and flexibility, competitive advantage, and sustainability and viability. Disruptive forces that need to be managed and, ultimately, mitigated in the context of the research question were presented and discussed using various examples. Disruption is seen as both a threat and an opportunity that requires companies to take a proactive approach and cultivate strategic resilience. The logistics sector is particularly vulnerable to disruption, which requires greater resilience.

This demonstrated the distinction between external and internal events and that the intensity of the disruption must also be included in the evaluation and strategic decision-making process for implementing countermeasures. The literature review also provided insights into the SCRM of companies, whereby SCRM is seen as a link between the risk management of a company and SCM. Its discussion explored the challenges of managing unknown risks and the need to create robust defence layers and promote a risk-aware culture. It already provided initial insights into the strategic measures being utilized by logistic companies, including the role of technological aspects such as advanced analytics, AI and blockchain. It also became apparent that various success factors need to be considered when selecting measures, including agility, flexibility, redundancy, collaboration, transparency, and decentralization. Referring to the qualitative research findings, these characteristics form an integrated network that transitions from a risk management approach to strategic resilience and is beneficial to answering the

research question. All the above is supported by a more theoretical perspective, which was discussed within the dissertation under the heading of managerial relevance.

Various frameworks were brought into the appropriate research context and their influence on practical decision-making regarding SCM and SCRM was examined. The experts were also asked a related question, with the results showing that they are basically very much in favour of intensively dealing with theoretical principles and thus bridging the gap to practical implementation and decision-making processes. Meanwhile, the methodological part of this dissertation served to harmonize the aspects discussed in the literature and theory with real-life scenarios across the industry. A qualitative research approach was used to investigate the complex subject of supply chain resilience and risk management in the logistics industry. By conducting a categorical content analysis, the theoretical concepts were compared to concrete realities. Several criteria were considered when carefully selecting the experts.

The resulting sample ensured a holistic assessment of the industry, which was essential for gaining valid and practical insights. The interview guide was fueled by a set of open questions relating to supply chain management, supply chain resilience and supply chain risk management in the context of disruptive events. The evaluation method subsequently highlighted six categorized areas of interest. Each of these categories revealed a range of insights that emphasized the intricate interaction of global dynamics, technological advances and adaptive strategies within the logistics sector and provided a useful indication that effective risk management designed to promote supply chain resilience requires a combination of initiatives. The research highlights the industry's fragile position between efficiency and vulnerability, with challenges ranging from geopolitical risks to infrastructure constraints. Collaborative partnerships, agile organizational structures, and proactive adaptation using technology emerged as essential strategies to navigate this dynamic landscape. The experts stressed the importance of a resilient supply chain characterized by adaptability, redundancy measures, real-time visibility, and collaboration. Concerning the success factors of risk and disruption management, the experts emphasized the importance of regular risk assessments, scenario planning and collaboration with suppliers, alongside numerous contributing factors. To summarize, this dissertation used a qualitative research methodology that captured the multiple dimensions of supply chain resilience and risk management in the logistics industry. The findings contribute to the academic discourse by in answering the Research Question, and also provide practical insights into the industry by recognizing the dynamic nature of global supply chains and the need for adaptable strategies in an ever-changing environment.

5. Conclusion

The concluding chapter of this dissertation presents a consolidated overview of the findings in relation to the research question as well as discussing the practical contribution. Additionally, the research limitations will also be addressed along with a discussion of potential approaches for future research.

5.1 Research Conclusion

In addressing the Research Question, this work used a comprehensive qualitative approach. The findings highlight the complexity of supply chain challenges in the logistics industry and emphasized the delicate balance between efficiency and vulnerability, which significantly influences the approach to measure implementation. The dissertation identified the key dimensions and challenges in supply chain management, focusing on risk management, sustainability, collaboration, ethical sourcing, diversification, technological innovation, etc. Logistics companies face complex global dynamics, including geopolitical uncertainties and the adoption of technology trends. A consensus emerged from the research among experts regarding the importance of proactive adaptation through collaborative partnerships, agile organizational structures, and technology integration. In answering the research question, the experts emphasized the industry's need for a holistic approach that balances theoretical concepts, technological advances, and human expertise. The study's ordinal data collection reinforced a neutral view of the industry's current actions, indicating not only recognition but also room for more intensive practical implementation.

In summary, logistics companies can strategically improve supply chain resilience by embracing adaptability, fostering collaborative partnerships, and utilizing technology, while maintaining a delicate balance between theoretical insights and practical adaptability. These strategies enable organizations to effectively manage and mitigate disruption to ultimately gain a sustainable competitive advantage in the dynamic landscape of the logistics industry. However, it must also be recognized that the field of research is exposed to countless risks and influencing factors, which prevents complete immunity to risks and disruptions as described by Melnyk, Closs, Griffis, Zobel & Macdonald (2014):

"The full avoidance of a supply chain disruption is an admirable goal. However, accidents and disruptions will still occur. For that reason, firms need to develop the ability to deal directly with events that are unavoidable" (p.38).

5.2 Practical Contribution

At the outset, the goal was to provide practical contributions with direct relevance for the logistics industry, including insights. These can assist companies in developing effective supply chain resilience and risk management strategies. Since comprehensive perspectives were provided by experts who work directly in or advise this sector, this statement can also be endorsed, with the caveat of the limitations inherent in this work. The key dimensions and challenges of modern supply chain management discussed are important. Logistics companies can utilize this information to re-evaluate priorities and align strategies with global trends to promote resilience in the face of changing requirements. By fully embracing the challenges posed by geopolitical risks, infrastructure constraints and the need for adaptability, companies can formulate agile and collaborative strategies to navigate this complicated landscape. The emphasis on collaborative partnerships, agile organizational structures, and proactive adaptation using technology provides practical guidance for logistics companies aiming to improve their supply chain resilience. However, it can be concluded that most companies have already recognized these challenges and have begun to take appropriate action.

5.3 Limitations

Several limitations should be considered, particularly regarding future research approaches. To begin with, the qualitative approach of the study, which was based on expert interviews, can introduce a certain degree of subjectivity into the results. The selection of the sample may also entail limitations despite careful implementation. Furthermore, the focus solely on a German context through the participation of only German experts can limit the transferability of the results to a broader perspective, as the dynamics and challenges of supply chains can vary from region to region. The restriction of company-specific identifiers in compliance with data protection regulations also limits the ability to validate or cross-reference the information provided, which may affect the reliability of the data. The limited number of interviews, while sufficient for thematic saturation, restricts the depth of insights and prevents a comprehensive examination of all potential perspectives within the logistics industry.

Whilst the study provided valuable qualitative insights that largely confirmed the literature, the limitations mentioned above should be considered. Future research could benefit from addressing these limitations to further improve supply chain resilience in logistics.

5.4 Future Outlook

Data collection and data-driven studies could help to validate the issues identified and provide a more differentiated perspective on the extent and effectiveness of specific strategies and approaches. Extending the geographical scope of the study beyond the German context may provide insights into regional differences in supply chain dynamics and disruptions. A benchmarking analysis of strategies used by logistics companies in different global regions would contribute to a more comprehensive understanding of the universal and context-specific challenges of the industry. Lastly, future research should explore the intersection between supply chain resilience and sustainability, considering the growing influence of environmental concerns and corporate responsibility. The sustainability disruptor will impact various facets and in particular the complexity of risk management and supply chain resilience. Understanding how logistics companies integrate sustainable practices into their resilience strategies and how these practices impact overall supply chain dynamics is critical to aligning business operations with global sustainability goals. Practical examples from the author's experience refer for instance to the fact that in tendering processes not only the cheapest supplier is always commissioned, but also someone who has a certain risk or sustainability score.

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Appendices

Appendix A: Interview A

Occupation: Strategy Consultant (Travel, Transportation & Logistics)

Years of professional experience: 9 years

Origin: Germany

FLK	Can you provide insights into the current trends and challenges in supply chain management?
A	• Growing emphasis on sustainability, risk management and ethical sourcing • A focus on technology adoption and digitalization • Global geopolitical uncertainty affecting supply chains
FLK	Can you elaborate on the key challenges specific to the logistics industry in terms of supply chain management and disruption mitigation?
A	• Dependence on global operating vendors and extensive supply networks, with occurring bottlenecks especially in transportation • Vulnerability to geopolitical events, natural disasters and
FLK	How do logistics companies perceive and adapt to changes in the industry landscape?
A	• Constant monitoring of technology developments and industry patterns • Agile supply chain strategies to enable quick modifications • Collaboration networks and involvement in the ecosystem
FLK	How do you define supply chain resilience?
A	• A supply chain's capacity to adjust and bounce back from disruptions • Sustaining operational continuity in the face of unexpected situations • Reducing the effect of conflicts on stakeholders and consumers
FLK	From your perspective, what are the critical elements and objectives that constitute a resilient supply chain in the logistics industry?
A	• Redundant networks of suppliers for crucial components • Robust inventory control and visibility

	• Quick reaction times and adaptability in e.g. transport operations
FLK	From your experience, what are the primary drivers of supply chain disruption in the logistics sector?
A	• Tensions in geopolitics impacting trade routes • Events linked to climate change and catastrophes caused by nature • Threats to cybersecurity and malfunctions in IT systems
FLK	How do logistics companies manage and mitigate disruptions across different phases of disruption occurrence?
A	• Creating contingency plans and alternatives sourcing strategies • Continuous monitoring of supply chain processes • Initiatives for cooperative risk sharing with suppliers
FLK	How do companies effectively identify and assess both known and unknown risks in their supply chains?
A	• Consistent risk evaluations and scenario planning • Data analytics applied for immediate risk identification • Interaction with industry intelligence and external specialists
FLK	In your opinion, does a more in-depth awareness of theoretical concepts in business administration and economics, such as Porter's Five Forces or the Resource Based View, strengthen the understanding of resilience in companies and enable more efficient measures to be taken in terms of SCRM?
A	• Theoretical concepts improve strategic planning and risk prediction, but their application depends heavily on the company • Frameworks help to understand competitive dynamics, e.g. Porter, RBV as well as many others • Application of concepts informs resource allocation decisions
FLK	While looking at the market, it quickly becomes apparent that SCRM will be particularly characterized using advanced analytics and AI in the future. How do you assess this, as well as the efforts of certain companies to become more resilient to disruptions through acquisitions along the supply chain?
A	• Advanced analytics and AI improve predictive capabilities and thus the impact on efficient SCRM. Technology-supported transparency and

	control of the supply chain is an instrument of both the present and the future • Consolidation pressure in logistics has been an observable driver for many years, both to achieve synergies and to gain control of the supply chain. This strategic measure is applied by companies in different approaches. However, acquisitions for vertical integration are often indispensable

FLK: Using a scale of 1-5, how convinced are you that the measures currently being taken by the industry are sufficient to be able to respond better to disruptions in the future and thus ensure improved supply chain resilience? The 1 represents unconvinced, 2 slightly convinced, 3 undecided/neutral, 4 fairly convinced and 5 very convinced.

A: 4

Appendix B: Interview B

Occupation: Manager Procurement Excellence (Shipping Industry)

Years of professional experience: 10 years

Origin: Germany

FLK	Can you provide insights into the current trends and challenges in supply chain management?
B	• Increasing international trade and complex supply chains • Technology integration (digitalization, AI, and data analysis) • Growing focus on environmentally friendly practices and green shipping as part of the supply chain
FLK	Can you elaborate on the key challenges specific to the logistics industry in terms of supply chain management and disruption mitigation?
B	• Dependence on global suppliers and risks due to geopolitical issues and trade restrictions • Weather, port congestion and infrastructure issues • Fluctuations that affect resource management and capacity planning
FLK	How do logistics companies perceive and adapt to changes in the industry landscape?

B	• Regular market observation to anticipate changes • Rapid adaptation to emerging trends and innovations • Building partnerships for shared insights and risk mitigation
FLK	How do you define supply chain resilience?
B	• Ability to absorb shocks without significant interruption • Capacity to adapt strategies and processes to changing conditions • Rapid recovery and return to full operation after disruptions
FLK	From your perspective, what are the critical elements and objectives that constitute a resilient supply chain in the logistics industry?
B	• Diverse supplier base and reduced reliance on a single source • Robust IT infrastructure and efficient data exchange and real-time tracking • Contingency planning: predefined strategies for various disruption scenarios
FLK	From your experience, what are the primary drivers of supply chain disruption in the logistics sector?
B	• Political instability, geopolitical conflicts affecting trade routes • Natural disasters and other unpredictable events • Pandemics and other health crises impacting workforce and global mobility
FLK	How do logistics companies manage and mitigate disruptions across different phases of disruption occurrence?
B	• Risk assessments, scenario planning and contingency strategies before the disruption • Communication protocols, alternative routing, and resource allocation during the disruption • Improvement, lessons learned and optimization after the disruption
FLK	How do companies effectively identify and assess both known and unknown risks in their supply chains?
B	• Supply chain mapping and understanding of the entire network and dependencies

	• Utilizing data analytics to assess impact and likelihood of risk occurrence • Regularly updating risk assessments and monitoring based on dynamic factors
FLK	In your opinion, does a more in-depth awareness of theoretical concepts in business administration and economics, such as Porter's Five Forces or the Resource Based View, strengthen the understanding of resilience in companies and enable more efficient measures to be taken in terms of SCRM?
B	• Improved understanding of the theoretical framework provides a more structured perspective for strategic decision-making (e.g. based on concepts such as Porter's Five Forces) • Comprehensive approach as theoretical insights are combined with practical industry knowledge
FLK	While looking at the market, it quickly becomes apparent that SCRM will be particularly characterized using advanced analytics and AI in the future. How do you assess this, as well as the efforts of certain companies to become more resilient to disruptions through acquisitions along the supply chain?
B	• Acquisitions are strategic investments to improve end-to-end control of the supply chain and are a major factor in shipping in particular • AI-driven automation, e.g. for process streamlining and reducing response time, is just as important as predictive analytics and the general use of digital tools

FLK: Using a scale of 1-5, how convinced are you that the measures currently being taken by the industry are sufficient to be able to respond better to disruptions in the future and thus ensure improved supply chain resilience? The 1 represents unconvinced, 2 slightly convinced, 3 undecided/neutral, 4 fairly convinced and 5 very convinced.

B: 2

Appendix C: Interview C

Occupation: Strategy Consultant (Generalist with a focus on risk management and process optimization)

Years of professional experience: 2 years

Origin: Germany/Russia

FLK	Can you provide insights into the current trends and challenges in supply chain management?
C	• Sustainability as one of the major challenges as well as potential for improvement • Complexity is rising due to globalization • The use of technologies like blockchain and IoT
FLK	Can you elaborate on the key challenges specific to the logistics industry in terms of supply chain management and disruption mitigation?
C	• Dependence on efficient cross-border operations with last-mile delivery optimization • Inventory management in dynamic markets as just-in-time strategies are no longer the solution to all problems
FLK	How do logistics companies perceive and adapt to changes in the industry landscape?
C	• Permanent observation of industry trends • Adaptation of agile organizational structures (logistics is often still considered to be very conservative and reactive) • Investment in technology and automation
FLK	How do you define supply chain resilience?
C	• Ability to respond to disruptions and to recover • Minimization of the long-term impact on operations
FLK	From your perspective, what are the critical elements and objectives that constitute a resilient supply chain in the logistics industry?
C	• Diversified supplier base

	• Reliable risk management processes • Flexibility of logistics networks
FLK	From your experience, what are the primary drivers of supply chain disruption in the logistics sector?
C	• Natural disasters and the effects of climate change • Geopolitical instability, economic crises and internal factors such as strikes • Technological failure
FLK	How do logistics companies manage and mitigate disruptions across different phases of disruption occurrence?
C	• Real-time monitoring systems, planning and simulation of emergencies to be integrated into the risk management process • Transparent and rigorous documentation to ensure a learning process • Collaborative partnerships in the supply chain
FLK	How do companies effectively identify and assess both known and unknown risks in their supply chains?
C	• Regular internal/external risk assessments • Data analysis for early detection • Supplier relationship management
FLK	In your opinion, does a more in-depth awareness of theoretical concepts in business administration and economics, such as Porter's Five Forces or the Resource Based View, strengthen the understanding of resilience in companies and enable more efficient measures to be taken in terms of SCRM?
C	• Theoretical frameworks provide strategic insights and help anticipate industry changes • Decision-makers can be guided by theories, thus giving them practical relevance • Improve proactive risk management
FLK	While looking at the market, it quickly becomes apparent that SCRM will be particularly characterized using advanced analytics and AI in the future. How do

	you assess this, as well as the efforts of certain companies to become more resilient to disruptions through acquisitions along the supply chain?
C	• Sustainable and streamlined processes can no longer be achieved without predictive analytics for risk assessment and AI for dynamic optimization of the supply chain • M&A activities, particularly for diversification and redundancy, but also as an instance of control and leverage, are becoming increasingly relevant

FLK: Using a scale of 1-5, how convinced are you that the measures currently being taken by the industry are sufficient to be able to respond better to disruptions in the future and thus ensure improved supply chain resilience? The 1 represents unconvinced, 2 slightly convinced, 3 undecided/neutral, 4 fairly convinced and 5 very convinced.

C: 4

Appendix D: Interview D

Occupation: Supply Chain Manager (Fruit Trade Industry)

Years of professional experience: 7 years

Origin: Germany

FLK	Can you provide insights into the current trends and challenges in supply chain management?
D	• Increasing demand for real-time transparency • Implementation of artificial intelligence for operational optimization • Prioritization of sustainability and eco-friendly logistics
FLK	Can you elaborate on the key challenges specific to the logistics industry in terms of supply chain management and disruption mitigation?
D	• Dependence on global supply chains (e.g. shipping networks) • Limited capacities at suppliers and producers • Trade-off between cost efficiency and resilience to disruption
FLK	How do logistics companies perceive and adapt to changes in the industry landscape?

D	• Continuous monitoring of market dynamics, including collaboration with industry representatives to gain insights • Companies in the logistics sector must have an agile structure in order to keep pace with the dynamics
FLK	How do you define supply chain resilience?
D	• The ability to adapt quickly to unexpected disruptions • Strategies to identify and minimize potential threats in the supply chain • Ongoing efforts to increase the efficiency of the supply chain through continuous improvement
FLK	From your perspective, what are the critical elements and objectives that constitute a resilient supply chain in the logistics industry?
D	• Reliable and flexible supply chain networks with stable and robust procedures for risk management • Real-time visibility and monitoring systems
FLK	From your experience, what are the primary drivers of supply chain disruption in the logistics sector?
D	• Natural disasters and weather-related events that have an impact on production in our industry, but also affect transportation etc. • Geopolitical issues with an impact on supply chains • Global health crises and pandemics
FLK	How do logistics companies manage and mitigate disruptions across different phases of disruption occurrence?
D	• Response plans for emergencies and outage situations • Diversification of suppliers and modes of transport • Continuous communication and cooperation with partners
FLK	How do companies effectively identify and assess both known and unknown risks in their supply chains?
D	• Regular risk assessments and scenario planning including past data analysis for predictive risk modelling • Supplier audits and performance monitoring

FLK	In your opinion, does a more in-depth awareness of theoretical concepts in business administration and economics, such as Porter's Five Forces or the Resource Based View, strengthen the understanding of resilience in companies and enable more efficient measures to be taken in terms of SCRM?
D	• I believe that theoretical models are always conducive to strategic decision making and provide an analytical framework • Understanding competitive forces, for example according to Porter, helps with risk assessment, but there are also other theoretical foundations, including collaboration in the supply chain, to create symbioses and benefits for all stakeholders
FLK	While looking at the market, it quickly becomes apparent that SCRM will be particularly characterized using advanced analytics and AI in the future. How do you assess this, as well as the efforts of certain companies to become more resilient to disruptions through acquisitions along the supply chain?
D	• As we are currently undergoing an M&A process, I can fully understand the sense and necessity of it • Digital tools and instruments such as predictive analytics for risk forecasting or AI-driven optimization measures are key to success in the future

FLK: Using a scale of 1-5, how convinced are you that the measures currently being taken by the industry are sufficient to be able to respond better to disruptions in the future and thus ensure improved supply chain resilience? The 1 represents unconvinced, 2 slightly convinced, 3 undecided/neutral, 4 fairly convinced and 5 very convinced.

D: 2

Appendix E: Interview E

Occupation: General Manager (Multinational logistic company involved in port infrastructure operations, cargo logistics and inland transportation)

Years of professional experience: +20 years

Origin: Germany

FLK	Can you provide insights into the current trends and challenges in supply chain management?
E	• A variety of technology solutions offer exciting opportunities • Sustainability efforts gain traction, even though standardized metrics need to be implemented • Geopolitical uncertainties emphasize the need for adaptable strategies
FLK	Can you elaborate on the key challenges specific to the logistics industry in terms of supply chain management and disruption mitigation?
E	• Global supplier relationships provide efficiency but also require diligent risk management • Infrastructure constraints lead to continuous discussions about long-term improvements • Dynamic regulatory changes stress the importance of adaptable logistics strategies
FLK	How do logistics companies perceive and adapt to changes in the industry landscape?
E	• Proactive adoption of new technologies signals the industry's openness to innovation • Collaborative partnerships are being formed, although ongoing engagement remains a challenge
FLK	How do you define supply chain resilience?
E	• Resilience is the ability to adapt and recover from disruptions with continuous improvement • Redundancy measures are seen as an investment in risk mitigation

FLK	From your perspective, what are the critical elements and objectives that constitute a resilient supply chain in the logistics industry?
E	• Emerging risk management strategies reflect a commitment to continuous improvement • Real-time visibility efforts are evolving and recognize the importance of transparency • Collaboration with partners serves to ensure a stable supply chain
FLK	From your experience, what are the primary drivers of supply chain disruption in the logistics sector?
E	• Risk assessments are becoming increasingly complex • Political instability is becoming more integrated into risk management • Technological failures are leading to a shift towards robust backup systems
FLK	How do logistics companies manage and mitigate disruptions across different phases of disruption occurrence?
E	• Contingency planning shall be further strengthened, taking into account lessons learnt from real-life scenarios • Risk sharing arrangements are evolving to create a more balanced and equal framework • Rapid response teams streamlined for more effective and efficient coordination
FLK	How do companies effectively identify and assess both known and unknown risks in their supply chains?
E	• The human component is becoming increasingly important alongside technical innovations. Therefore, co-operation with suppliers becomes stronger, promoting transparency and trust • Regular risk assessments get favoured as a proactive measure against unforeseen challenges • Data analysis is increasingly used for predictive risk analysis
FLK	In your opinion, does a more in-depth awareness of theoretical concepts in business administration and economics, such as Porter's Five Forces or the

	Resource Based View, strengthen the understanding of resilience in companies and enable more efficient measures to be taken in terms of SCRM?
E	• Theoretical concepts provide a basic understanding and offer valuable insights, but practical application is still considered essential, where the focus is on adapting theory to real-life scenarios • Awareness of theoretical concepts complements practical experience, providing a holistic view
FLK	While looking at the market, it quickly becomes apparent that SCRM will be particularly characterized using advanced analytics and AI in the future. How do you assess this, as well as the efforts of certain companies to become more resilient to disruptions through acquisitions along the supply chain?
E	• Without a doubt, predictive capabilities, advanced analytics and the adoption of AI are seen as essential to stay ahead of disruption as data quality and scope are becoming crucial • Acquisitions are also identified as a strategic move in our organisation, offering opportunities for diversification and resilience. However, our focus is obviously on gaining control along the chain

FLK: Using a scale of 1-5, how convinced are you that the measures currently being taken by the industry are sufficient to be able to respond better to disruptions in the future and thus ensure improved supply chain resilience? The 1 represents unconvinced, 2 slightly convinced, 3 undecided/neutral, 4 fairly convinced and 5 very convinced.

E: 3

Appendix F: Interview F

Occupation: Trade Manager Africa / Europe (Shipping Company)

Years of professional experience: 5 years

Origin: Germany

FLK	Can you provide insights into the current trends and challenges in supply chain management?
F	• Limited digitalization in African trade • Human resource-intensive processes that affect efficiency • Challenges in adapting to evolving global standards (sustainability etc.)
FLK	Can you elaborate on the key challenges specific to the logistics industry in terms of supply chain management and disruption mitigation?
F	• Dependence on manual documentation slows down processes • Human-centred communication hurdles • Limited infrastructure in some regions hinders connectivity
FLK	How do logistics companies perceive and adapt to changes in the industry landscape?
F	• Continuous monitoring of market trends, including those in emerging markets • Cultural considerations that influence the pace of adaptation. The aim here is to achieve a balance between tradition and modernization for smoother transitions • Importance of hands-on training for new technologies
FLK	How do you define supply chain resilience?
F	• Flexibility in supply chain design and processes including quick recovery and restoration of operations regarding disruptions • Incorporating human adaptability in crisis response
FLK	From your perspective, what are the critical elements and objectives that constitute a resilient supply chain in the logistics industry?

F	• Investing in human capital development and fostering strong community ties for support (collaborative relationship with partners) • Robust risk and disruption management
FLK	From your experience, what are the primary drivers of supply chain disruption in the logistics sector?
F	• Socio-political instability affecting the labour force as well as human error in manual processes • Natural disasters and climate change • Technological aspect such as limited access to real-time data for decision making
FLK	How do logistics companies manage and mitigate disruptions across different phases of disruption occurrence?
F	• The most important aspect is proactive risk assessment and planning, even in challenging environments such as Africa Trade
FLK	How do companies effectively identify and assess both known and unknown risks in their supply chains?
F	• Regional and cultural intelligence for understanding local dynamics • Proactive risk assessment and planning with corresponding contingency plans for counter-measures • Prioritize human-driven risk insights alongside data analytics
FLK	In your opinion, does a more in-depth awareness of theoretical concepts in business administration and economics, such as Porter's Five Forces or the Resource Based View, strengthen the understanding of resilience in companies and enable more efficient measures to be taken in terms of SCRM?
F	• Provide an understanding of industry forces and competitive dynamics to improve risk management • Need to apply theories with cultural sensitivity and involve all stakeholders in strategic planning
FLK	While looking at the market, it quickly becomes apparent that SCRM will be particularly characterized using advanced analytics and AI in the future. How do

	you assess this, as well as the efforts of certain companies to become more resilient to disruptions through acquisitions along the supply chain?
F	• Strategic acquisitions with a focus on developing expertise, transferring knowledge and influencing the entire supply chain are also occurring in the African market, for example Hapag-Lloyd's acquisition of NileDutch / DAL or Maersk's Safmarine acquisition some years ago • Integration of technical innovation is certainly essential for the future, albeit with regional differences in implementation

FLK: Using a scale of 1-5, how convinced are you that the measures currently being taken by the industry are sufficient to be able to respond better to disruptions in the future and thus ensure improved supply chain resilience? The 1 represents unconvinced, 2 slightly convinced, 3 undecided/neutral, 4 fairly convinced and 5 very convinced.

F: 3

Appendix G: Interview G

Occupation: Strategy Consulting (Partner, Operations Practice)

Years of professional experience: 15 years

Origin: Germany

FLK	Can you provide insights into the current trends and challenges in supply chain management?
G	• The rise of globalization and integrated supply chains has led to increased complexity including aspects like digital transformation, sustainability, and ethical objectives (sustainable sourcing) • Increased emphasis on constructing robust supply systems in response to unexpected disruptions
FLK	Can you elaborate on the key challenges specific to the logistics industry in terms of supply chain management and disruption mitigation?
G	• Vulnerability to disruptions due to dependencies on various international suppliers and partners in global networks • Challenges in transport by overcoming transport restrictions, especially through global crisis situations

	• Regulatory compliance by following evolving international regulations that impact cross-border logistics
FLK	How do logistics companies perceive and adapt to changes in the industry landscape?
G	• Promote collaboration with key stakeholders by sharing insights and jointly managing change in the industry • Adapting quickly through agile decision-making processes and continuous improvement initiatives • Proactive and constant tracking of industry trends, regulations, and technological advancements
FLK	How do you define supply chain resilience?
G	• The ability of a system to anticipate, prepare for, respond to and recover from disruptions promptly and efficiently while protecting core business functions and ensuring customer satisfaction
FLK	From your perspective, what are the critical elements and objectives that constitute a resilient supply chain in the logistics industry?
G	• Real-time visibility of risks and dependencies in the supply chain • Diversification of supplier networks to reduce vulnerability • Implementation of adaptive technologies for predictive analysis • Development of robust contingency plans through scenario analysis and simulation
FLK	From your experience, what are the primary drivers of supply chain disruption in the logistics sector?
G	• Natural disasters and environmental events with an impact on transport and infrastructure • Geopolitical factors, trade tensions, tariffs and political instability impacting international commerce • Digital security threats with increasing risk of cyberattacks on the digital infrastructure of the supply chain
FLK	How do logistics companies manage and mitigate disruptions across different phases of disruption occurrence?

G	• Reliable risk assessments, scenario planning and development of contingency plans; real-time monitoring, rapid decision-making and agile response execution; learning and adapting from disruptions through post-event analysis and continuous improvement
FLK	How do companies effectively identify and assess both known and unknown risks in their supply chains?
G	• Engaging with suppliers and partners to collectively identify and mitigate risks • Regularly assessing supplier risks, geopolitical risks, and market risks e.g. through auditing • Utilizing advanced analytics and AI for predictive risk modeling
FLK	In your opinion, does a more in-depth awareness of theoretical concepts in business administration and economics, such as Porter's Five Forces or the Resource Based View, strengthen the understanding of resilience in companies and enable more efficient measures to be taken in terms of SCRM?
G	• The integration of theoretical concepts complements practical experience and promotes a holistic approach to resilience, which must, however, always be assessed on a situational level. A theory is not a promise to practical implementation
FLK	While looking at the market, it quickly becomes apparent that SCRM will be particularly characterized using advanced analytics and AI in the future. How do you assess this, as well as the efforts of certain companies to become more resilient to disruptions through acquisitions along the supply chain?
G	• Future trends continue to be key consulting challenges, with advanced analytics and AI expected to have a major role in predicting, preventing, and mitigating disruption. Successful companies are already seamlessly integrating advanced analytics, AI and blockchain into their resilience strategy • Needless to mention, strategic acquisitions continue to strengthen resilience by gaining influence and oversight throughout the supply chain

FLK: Using a scale of 1-5, how convinced are you that the measures currently being taken by the industry are sufficient to be able to respond better to disruptions in the future and thus ensure improved supply chain resilience? The 1 represents unconvinced, 2 slightly convinced, 3 undecided/neutral, 4 fairly convinced and 5 very convinced.

G: 4

Appendix H: Interview H

Occupation: Sea Logistic Supervisor (Freight Forwarder)

Years of professional experience: 8 years

Origin: Germany

FLK	Can you provide insights into the current trends and challenges in supply chain management?
H	• Customer expectations (speed, transparency and sustainability) may exceed the industry's ability to implement rapid change due to the complexity of globalized supply chains • Inconsistent application of standardised measures, e.g. around sustainability, which are often more for PR than genuine commitment • Resilience of the supply chain, whereby an overemphasis on this rhetoric may lead to a neglect of other crucial aspects
FLK	Can you elaborate on the key challenges specific to the logistics industry in terms of supply chain management and disruption mitigation?
H	• Insufficient innovation in overcoming transport and capacity bottlenecks • Dependence on just-in-time inventory models • Delayed or limited progress in addressing cybersecurity threats that lead to exposure of critical data
FLK	How do logistics companies perceive and adapt to changes in the industry landscape?
H	• Some companies may struggle to adapt due to entrenched traditional structures, but the industry is undergoing a transformation process into agile organizational structures for process optimization

	• Monitoring trends doesn't always translate into proactive strategic adjustments which are necessary in today's environment
FLK	How do you define supply chain resilience?
H	• Definitions may vary, leading to a lack of standardised approaches, but in general it is about the ability to adapt to unforeseen disruptions • Rapid recovery with minimal impact on operations (flexibility) • Theoretical resilience may not match real operational requirements
FLK	From your perspective, what are the critical elements and objectives that constitute a resilient supply chain in the logistics industry?
H	• Real-time visibility across the supply chain with focus on practical reality • Collaborative relationships with key stakeholders (cautious consideration as some relationships might not withstand actual stress scenarios) • Diversified supplier base and sourcing strategies (but not too superficial)
FLK	From your experience, what are the primary drivers of supply chain disruption in the logistics sector?
H	• Geopolitical uncertainties that are inherently hard to predict and manage • Cybersecurity as countermeasures cannot keep pace with evolving digital threats • Natural disasters due to climate change
FLK	How do logistics companies manage and mitigate disruptions across different phases of disruption occurrence?
H	• Effective SCRM, which tends to be a bureaucratic exercise • Development of emergency plans and emergency teams • Continuous communication and collaboration with partners
FLK	How do companies effectively identify and assess both known and unknown risks in their supply chains?
H	• Data analysis for risk prediction and monitoring (beware of information overload that hinders effective risk prediction) • Regular in-depth supplier risk audits and assessments

	• Cross-functional risk management teams
FLK	In your opinion, does a more in-depth awareness of theoretical concepts in business administration and economics, such as Porter's Five Forces or the Resource Based View, strengthen the understanding of resilience in companies and enable more efficient measures to be taken in terms of SCRM?
H	• Academic theories may not fully capture the dynamic nature of real-world transformations and do not always translate into actionable strategies, but are often essential to understanding industry structure and competitive forces
FLK	While looking at the market, it quickly becomes apparent that SCRM will be particularly characterized using advanced analytics and AI in the future. How do you assess this, as well as the efforts of certain companies to become more resilient to disruptions through acquisitions along the supply chain?
H	• Strategic acquisitions to improve end-to-end control and flexibility in the supply chain are often a strategic and beneficial approach, but can also bring integration issues (seamless resilience is hard to achieve) • It is becoming increasingly important to use advanced analytics and AI for decision support, but an overemphasis on technology can also overshadow the importance of human expertise in crisis response

FLK: Using a scale of 1-5, how convinced are you that the measures currently being taken by the industry are sufficient to be able to respond better to disruptions in the future and thus ensure improved supply chain resilience? The 1 represents unconvinced, 2 slightly convinced, 3 undecided/neutral, 4 fairly convinced and 5 very convinced.

H: 1