

Critical analysis of the current literature in the area of the Supply Chain Risk Management – an indication of the main areas of analysis and directions of future research

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DOI: 10.24427/az-2024-0007

Abstract

This paper presents a critical review of the existing literature on Supply Chain Risk Management. The study addresses bibliometric analysis, definitions, types of risks and current limitations in Supply Chain Risk Management. Findings suggest a lack of universal definition for Supply Chain Risk Management, focus on demand, environmental and strategic risk. The paper concludes by identifying the need for further research on these limitations to improve risk management strategies in supply chains.

Key words

Supply Chain Risk Management, risk management, supply chain management, critical literature review

Introduction

Transport demand is increasing year by year. This is due to the growth in production and consumption. As a result of globalization, companies are locating their manufacturing operations far from the market, which impacts the elongation of logistics chains [Anholcer, 2019, p. 11]. The longer the supply chain is, the greater the possibilities of disruptions as all operations entail risk.

However, discussions about risk in the context of supply chains and its management are relatively recent. This observation is noted by Baryannis, Validi, Dani and

Antoniou [2018], who state that the concept of Supply Chain Risk Management began to attract attention due to economic uncertainty that started with the financial crisis in 2008.

This paper aims to analyze the existing literature on Supply Chain Risk Management. This study seeks to answer the following research questions:

- 1) How is Supply Chain Risk Management defined and interpreted?
- 2) What are the common types of risks identified?
- 3) What are the dominant limitations in the studies in this area?

The remainder of the article is as follows: Section 2 provides a research methodology. Section 3 presents bibliometric analysis. Section 4 presents the definitions of Supply Chain Risk Management. Section 5 provides information about supply chain risk types. Finally, Section 6 concludes, showing limitations and directions for future research.

1. Research methodology

In this section the research methodology will be presented. The research methodology, as illustrated in fig. 1, is as follows. The first step involved determining the search term and criteria. Our search term was "Supply Chain Risk Management". Author then set the time range from 2017 to 2023 (it is crucial to add that in 2023 only articles from 01.01.2023 to 01.06.2023 were included) and decided to focus on selecting literature from journals and conference papers. Author opted for the Scopus database and obtained 606 records. During the screening phase, it was excluded 44 records. Exclusion criteria consisted of erroneous assignments to the "Supply Chain Risk Management" phrase ($n = 5$). Author also excluded studies not written in English and German ($n = 14$) and case studies ($n = 25$). Ultimately, there were left 522 records for bibliometric analysis. For this kind of analysis, Author utilized the bibliometrix program and VOSViewer. VOSViewer software enables authors of the articles to investigate relations between citations [Van Eck and Waltman, 2013]. The visualization generated clusters grouping it in several fields. Bibliometrix provides a set of tools for quantitative research in bibliometrics and scientometrics. It is written in the R language, which is an open-source environment and ecosystem [Aria and Cuccurullo, 2017; Czerniawska and Szydło, 2020]. This program was used to create annual scientific production, most relevant authors, country scientific production, most relevant sources and word cloud. To conduct a critical literature review, Author utilized papers obtained from the database as well as seminal works, including books and journals from various years.

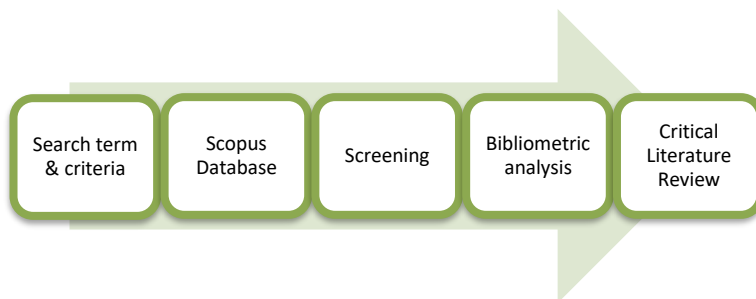


Fig. 1. The research methodology

Source: own work.

2. Bibliometric analysis

Bibliometric analysis is a widely used method for exploring and analyzing large quantities of scientific data. It allows to delve into the evolutionary intricacies of a particular field, while also illuminating emerging areas within that field [Donthu et al., 2021].

Figure 2 illustrates a consistent increase in the quantity of articles dedicated to Supply Chain Risk Management from 2017 to 2023 (from 01.01.2017 to 01.06.2023). The most significant increase in the number of articles can be observed between 2020 and 2023.

It is highly likely that there will be a further increase in the number of articles in 2023. This can be attributed to the increasingly complex global situation, including events such as the war in Ukraine and the still ongoing COVID-19 pandemic.

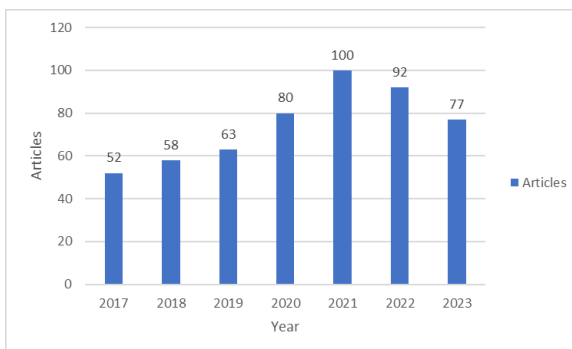


Fig. 2. Scientific research production

Source: own work.

Based on the dataset analysis, certain journals have emerged as the primary publishers of research on Supply Chain Risk Management. The most relevant sources are presented in Figure 3. By examining this figure, it can be noted that the highest number of papers were published in International Journal of Production Research, followed by Computers and Industrial Engineering, International Journal of Production Economics and Sustainability, and also in Supply Chain Management: An International Journal, among others. Based on the analysis, the identified journals are considered prestigious sources of publications on supply chain risk management, indicating their significant role in shaping this research area. The articles covers a variety of topics and approaches, reflecting the interdisciplinary nature of the research. By integrating perspectives from various fields like technology, economics, social sciences, and management, this journals contribute to a deeper understanding and development of Supply Chain Risk Management on various dimensions.

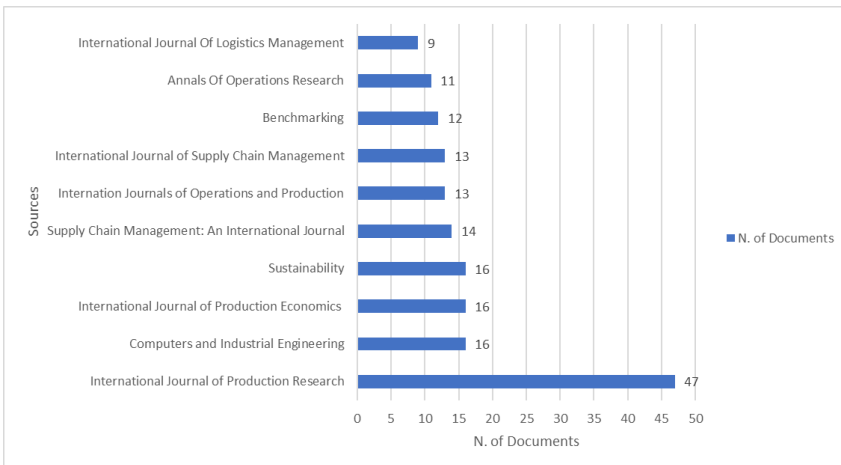


Fig. 3. Most relevant sources

Source: own work.

Figure 4 illustrates the most relevant authors. In terms of their contributions, the highest number of papers were authored by Ivanov, followed by Dolgui, Ghadge and Sawik. This is not surprising considering that these individuals are experts in Supply Chain Risk Management and have produced significant works in this field e.g. [Ivanow, 2017; Ivanov and Dolgui, 2019; Ghadge, 2012; Sawik, 2017].

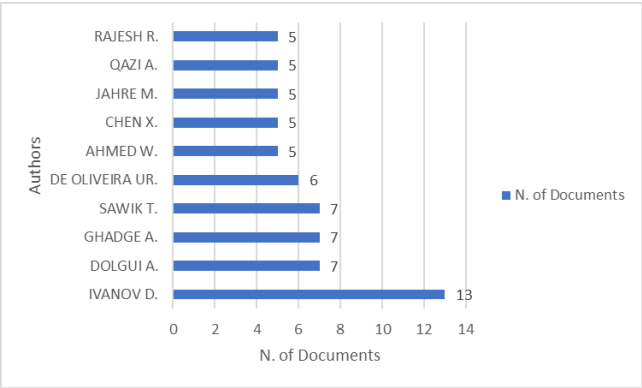


Fig. 4. Most relevant authors

Source: own work.

Figure 5 shows the country scientific production. The top-ranked country in scientific production reveals that the United States holds the leading position in researching and pioneering work practices in Supply Chain Risk Management. The United Kingdom follows as the second-ranked country in terms of paper production, with China also making a significant contribution.

Country Scientific Production

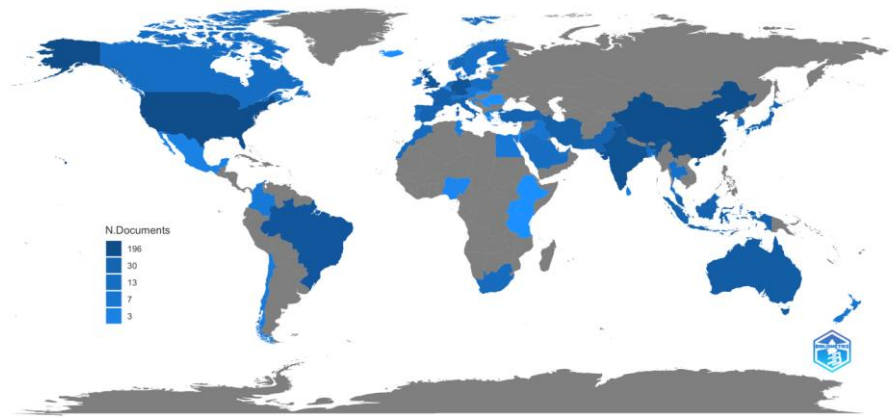


Fig. 5. Country Scientific Production

Source: own work.

The next Figure 6 show a word cloud of keywords used in the papers. Selecting author keywords as graphical parameters offers the advantage of providing insights into the main topics and research trends. They allow to understand the specific areas of focus and the terminology used by researchers in their publications [Patil, 2020]. The most popular keywords used by Authors were: “supply chain risk management”, “risk management”, “supply chain management”, “risk assessment” and “supply chains”.



Fig. 6. Word cloud of keywords used in papers

Source: own work.

The last thing in the bibliometric analysis was to do network analysis by citations analysis. Citation analysis is a method used to assess the impact of a publication. It measures the frequency with which a publication is cited by other works, providing an indication of its popularity or significance [Ding and Cronin, 2011]. Out of the 27997 authors of identified, a total of 536 authors of articles are connected to each other through “undirected” citation, which means that they are either cited by, or have been cited by others [Rüdiger et al., 2021]. Figure 7 present citation network with nodes representing the authors. In the visualization, the size of each node represents the citation strength, indicating the level of influence or importance of an author. The lines connecting the nodes to other represent the citations, illustrating the connections and references made between different authors [Rüdiger et al., 2021]. According to visualization Ivanov is one of the most cited authors.

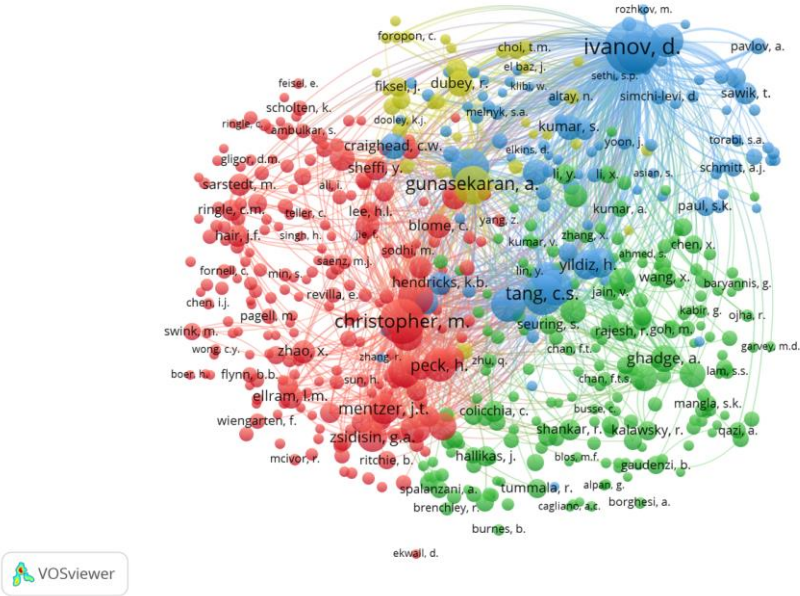


Fig. 7. Citation analysis network

Source: own work.

3. Definitions

The existing and sample definitions of Supply Chain Risk Management are summarized in Table 1.

Tab. 1. The definitions of Supply Chain Risk Management

Author	Year	Definition
Brindley	2004	"Supply chain risk management is to, collaboratively with partners in a supply chain or on your own, apply risk management process tools to deal with risks and uncertainties caused by, or impacting on, logistics related activities or resources in the supply chain"
Waters	2007	"Is an umbrella concept involving identification, analysis and control of risks. It refers to the overall function responsible for all aspect of risk to the supply chain. It ensures that the strategies established by senior managers are applied to logistics risk"

Author	Year	Definition
Ho, Zheng, Yildiz & Talluri	2015	"The likelihood and impact of unexpected macro and/or micro level events or conditions that adversely influence any part of a supply chain leading to operational, tactical, or strategic level failures or irregularities"
Fan & Stevenson	2018	"The identification, assessment, treatment, and monitoring of supply chain risks, with the aid of the internal implementation of tools, techniques and strategies and of external coordination and collaboration with supply chain members so as to reduce vulnerability and ensure continuity coupled with profitability, leading to competitive advantage"
Baryannis et al.	2018	"Supply Chain Risk Management encompasses the collaborative and coordinated efforts of all parties involved in a supply chain to identify and monitor risks with the aim to reduce vulnerability and increase robustness and resilience of the supply chain, ensuring profitability and continuity"
Gurtu & Johny	2021	"Supply chain risk management (SCRM) is a systematic and phased approach for recognizing, evaluating, ranking, mitigating, and monitoring potential disruptions in supply chains"

Source: own work based on [Waters, 2007; Fan and Stevenson, 2017; Brindley, 2004; Baryannis et al., 2018; Gurtu and Johny, 2021].

The definitions of supply chain risk management can be categorized into three main groups:

- Risk identification and assessment – these definitions emphasize the initial and essential stage in Supply Chain Risk Management, which involves identifying, analyzing, and evaluating risks. They view Supply Chain Risk Management as a process of identifying uncertainties and potential threats that could negatively affect supply chain operations. Exemplary definitions in this category: [Shahbaz et al., 2019; Vilko et al., 2019; Fan and Stevenson, 2018];
- Risk mitigation and management – this category considers Supply Chain Risk Management as a proactive approach to effectively manage, address, and mitigate identified risks in order to minimize vulnerability within supply chains. It involves the implementation of strategies and techniques to effectively deal with and reduce the impact of potential risks. Exemplary definitions in this category: [Dohale et al., 2022; Hudin et al., 2021; Elmsalmi et al., 2021];
- Risk resilience and robustness – this category should focus on an organization's ability recover swiftly following a risk event. It involves implementing

strategies and measures to absorb disruptions effectively. Exemplary definitions in this category: [Bygballe et al., 2023; Singh and Singh, 2019; Bar-yannis et al., 2019].

It is crucial to mention that many definitions cover multiple categories, providing a more complete understanding of the Supply Chain Risk Management process, including risk identification, mitigation, and building resilience. Moreover, Authors did not embrace one, universal definition. This statement is also reiterated by [Fan and Stevenson, 2018], but they consider it as a weakness. However, according to the Author the absence of universal definition can be seen as a strength instead of a weakness. It makes the idea more adaptable and adjustable to fit different companies, sectors, and situations. Each definition is useful and gives a different perspective to look at and manage risks in supply chains. This helps to understand this important process in a wider and more detailed way. Therefore, the different definitions show the great variety and changing ideas in this area.

What is more, none of the definitions focus on continuous improvement and adaptability. This should be consider as new category that should emphasize the role of learning from past experiences and making necessary adjustment to strategies in response to the changing environment. To enhance performance and efficiency, it is important for supply chains to learn from the past experiences. By adapting strategies based on these experiences, supply chains can enhance their risk management practices over time. This adaptive approach enables supply chain operations to become more agile and flexible, ultimately contributing to overall resilience and adaptability in the face of changing market dynamics. This is a gap in literature.

Additionally, evolving definitions over time reflect the growing complexity and collaborative nature of modern supply chains. As Fan and Stevenson [2018, p. 210] stated: “Supply Chain Risk Management is a multifaceted concept. As a result, different researchers have defined Supply Chain Risk Management in different ways”.

As can be observed, the definitions address various aspects, but none of them combine elements from all three created categories¹ and there is a lack of emphasis on continuous improvement and adaptability.

Therefore, taking into account the various perspectives presented in the literature, Author develops a definition of Supply Chain Risk Management that includes the identification, assessment, mitigation of risks, the goal of enhancing the

¹ Although it was noted that none of the available definitions fully encompass all elements created categories, the definition by Fan & Stevenson (2018) is considered the most comprehensive as it includes elements of risk identification, assessment, mitigating, monitoring, and external coordination with supply chain members. This suggests that it covers aspects from all three categories. However, the interpretation of which elements are most important may vary.

robustness and resilience of the supply chain and what is more the continuous improvement and adaptability.

Considering the above definitions, common characteristics, principles, and the Author's theoretical and practical knowledge, the definition of Supply Chain Risk Management should be:

Supply Chain Risk Management is a process that encompasses the identification, evaluation, and mitigation of risks that can potentially affect the supply chain. It involves collaborative strategies with all stakeholders in the chain to minimize vulnerability and ensure uninterrupted operations. The goal of Supply Chain Risk Management is to enhance the strength and resilience of the supply chain and safeguarding profitability and promoting continuous improvement and adaptability to changing circumstances.

4. Supply chain risk types

Supply chain risks can be categorized into numerous types, depending on various factors such as the source, nature of the risk, or its impact. Table 2 gives the distribution of articles as per types of risk (only dates from 2017 to 01.06.2023). In the Scopus database, 89 papers were found on supply chain risk types. Out of these, 36 papers focus on supply risk, which is important in supply chain management. As can be observed, the highest number of articles, 36 in total, concentrate on supply risk. This is not surprising since supply risk represent a critical aspect of supply chain management. It involve potential disruptions or vulnerabilities in the supply chain, such as supplier bankruptcies, material shortages, or geopolitical instability, which can significantly impact the flow of goods and services. Additionally, 24 papers discuss operational risk, which involves day-to-day activities like process failures or equipment breakdowns. Operational risk directly affects the efficiency and reliability of supply chain. These findings highlight the importance of managing supply and operational risks for supply chain managers to ensure smooth operations and a continuous flow of goods and services.

Tab. 2. Supply chain risk types

Type of supply chain risk	Definition	No. of articles	Exemplary references
Operational risk	These risks arise from disruptions in daily operations, such as human errors, process failures, or IT systems breakdowns. It can lead to delays or quality issues.	24	Mamun, 2023; Amin et al., 2023; Skorupski et al., 2023; Cavalcante de Souza Feitosa et al., 2021; Panjehfouladgaran and Lim, 2020

Type of supply chain risk	Definition	No. of articles	Exemplary references
Demand risk	These risks are associated with unforeseen fluctuations in demand, including sudden drops in customer demand. Demand risks can also arise from volatility in product lifecycles or changes in market preferences.	13	Foli et al.,2022; Raihan et al., 2022; Silva, de Oliveira et al., 2021; Parast and Subramanian, 2020; Quang and Hara, 2020
Supply risk	These risks arise from disruptions in the flow of products or resources from suppliers. Causes can include financial instability of suppliers, quality issues, political instability in the supplier's region, or transportation disruptions.	36	Sreedevi et al., 2023; De Oliveira et al., 2022; Esenduran et al., 2022; Van Hoek, 2021; Mirfani et al., 2021
Environmental risk	These risks are related to events such as natural disasters, extreme weather conditions, or political instability that can cause disruptions in the supply chain. They also include sustainability issues, where lack of compliance with environmental regulations can lead to fines or reputational damage.	11	Levner and Ptuskin, 2018; Chukwuka et al., 2023; El Baz et al., 2023; Wang and Rani, 2022; Üstündağ et al., 2022
Strategic risk	These risks are linked to strategic decisions at a high level, such as mergers and acquisitions, market entry, or major shifts in business strategy. Poor strategic decisions can result in a loss of competitive advantage or financial losses.	5	Huma et al., 2020; Fan and Xiao, 2023; Amin et al., 2023; Kramer et al., 2022; Silva et al., 2020

Source: own work.

The analysis of articles indicate a clear emphasis on supply risk and operational risk in the literature. Regarding supply risk, this can be interpreted, because of increasing globalization and the complexity of supply chains, which amplify potential failure points. The impact of COVID-19 on supply chains worldwide serves as a prominent example of how supply risk can significantly affect operations. Similarly, operational risk is important because mistakes, system failures, or quality problems can cause major disruptions in the supply chain and harm a company's reputation.

However, it is worth noting that other types of risk, like demand risk, strategic risk, or environmental risk, are not as frequently discussed in the articles Author examined. This suggests that there may be areas in the literature that have not been

received as much attention during the studied years. It is worth noting that these types of risks are not directly related to operational activities in the supply chains or supply networks, but their impact on the stability and efficiency of the chain can be significant. To clarify, it is crucial to understand that demand risk, which is associated with unpredictable changes in customer behavior, can lead to excessive inventory or shortages, which can significantly affect both operations and the financial performance of companies in the supply chain. Moreover, strategic risk, which is related to high-level decisions such as changes in business strategy, can have an impact on the participants and efficiency of the supply chains. Similarly, environmental risk, which is associated with natural disasters, weather conditions, or political instability, can have serious consequences for supply chains, especially those global chains. Additionally, issues related to sustainable development are becoming important in the context of growing societal and regulatory expectations. This makes environmental risk an increasingly significant element in supply chain risk management.

Conclusion

This article presented a critical literature review in Supply Chain Risk Management. The main areas of investigation included bibliometric analysis, overview of definitions of Supply Chain Risk Management and risk types in supply chain.

The analysis revealed several repeating themes and limitations in current research:

- authors did not embrace one, universal definition;
- definitions do not focus on continuous improvement and adaptability;
- authors do not focus on demand, environmental and strategic risk.

These findings suggest that more attention should be given to limitations in future research. Advancing our knowledge in these areas can contribute to the development of more comprehensive and effective strategies or tools for managing risk in the supply chain.

There are still limitation to this study that need to be addressed - only Scopus database was used. Despite this limitation, this study summarizes the current research status of this field and is valuable overview for other researchers.

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Krytyczna analiza aktualnej literatury w obszarze zarządzania ryzykiem łańcucha dostaw – wskazanie głównych obszarów analizy i kierunków przyszłych badań

Streszczenie

Niniejszy artykuł przedstawia krytyczny przegląd istniejącej literatury na temat zarządzania ryzykiem w łańcuchu dostaw. Badanie dotyczy analizy bibliometrycznej, definicji, rodzajów ryzyka i obecnych ograniczeń w zarządzaniu ryzykiem łańcucha dostaw. Wyniki sugerują brak uniwersalnej definicji zarządzania ryzykiem w łańcuchu dostaw, skupienie się na popycie, ryzyku środowiskowym i strategicznym. Artykuł kończy się określeniem potrzeby dalszych badań nad tymi ograniczeniami w celu ulepszenia strategii zarządzania ryzykiem w łańcuchach dostaw.

Słowa kluczowe

zarządzanie ryzykiem w łańcuchu dostaw, zarządzanie ryzykiem, zarządzanie łańcuchem dostaw, krytyczny przegląd literatury