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ARTICLE

SIX SIGMA STRATEGY IN CONTINUOUS IMPROVEMENT OF THE SUPPLY CHAIN: A BIBLIOMETRIC STUDY

ESTRATÉGIA SEIS SIGMA NA MELHORIA CONTÍNUA DA CADEIA DE SUPRIMENTOS: UM ESTUDO BIBLIOMÉTRICO

Raissa Paraquett[1] | Pedro Senna[2] | Ana Carla Souza[3]

[1] Mestranda em Engenharia de Produção e Sistemas, Centro Federal de Educação Tecnológica Celso Suckow da Fonseca - CEFET/RJ. Rio de Janeiro/RJ, Brasil.

[2] Professor do Curso de Graduação em Engenharia de Produção do Programa de Pós-graduação em Engenharia de Produção e Sistemas (PPPRO), Centro Federal de Educação Tecnológica Celso Suckow da Fonseca - CEFET/RJ, Rio de Janeiro/RJ, Brasil. https://orcid.org/0000-0003-2501-2203.

[3] Professora no Instituto Federal de Educação, Ciência e Tecnologia do Rio de Janeiro (IFRJ), Niterói/RJ, Brasil. https://orcid.org/0000-0002-6205-7454.

Corresponding Author:
Raissa Paraquett
E-mail: pedro.senna@cefet-rj.br

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ABSTRACT

Purpose: The objective of this scientific article is to conduct a bibliometric study on the Six Sigma strategy applied to the supply chain seeking to investigate how Six Sigma has been applied in mitigating risks in supply chains. For this, the main characteristics of the implementation of the methodology and its results in terms of reducing waste, errors and improving quality were analyzed.
Methodology/approach: This study identified that the Six Sigma methodology can be used to minimize risks that may affect the entire supply chain, as well as strengthen a company's competitive position, allowing it to offer higher quality products and services, with competitive prices and greater efficiency.
Originality/Relevance: They reside in the fact that the adoption of a strategic approach is fundamental for the successful implementation of the Six Sigma methodology in the supply chain. In addition, information management is essential for a successful implementation of the strategy and innovation management can help identify new opportunities for improvement and cost reduction in the supply chain.
Key findings: This study presents a significant contribution to the literature on the application of the Six Sigma methodology in the supply chain, providing valuable insights for managers and researchers interested in improving the efficiency and quality of their companies' supply chain.
Theoretical/methodological contributions: The theoretical contribution is a bibliometric analysis on the implementation of the Six Sigma strategy in the supply chain, highlighting the main strategies of this application and their impacts on supply chain management.
Keywords: Bibliometrics. Supply chain. Six sigma. Risk management in supply chains. Strategy.

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Open access

RESUMO

Objetivo: O objetivo deste artigo científico é conduzir um estudo bibliométrico sobre a estratégia Seis Sigma aplicada à cadeia de suprimentos, buscando investigar como o Seis Sigma tem sido aplicado na mitigação de riscos em cadeias de suprimentos. Para isso, foram analisadas as principais características da implementação da metodologia e seus resultados em termos de redução de desperdícios, erros e melhoria da qualidade.
Metodologia/abordagem: Este estudo identificou que a metodologia Seis Sigma pode ser utilizada para minimizar riscos que possam afetar toda a cadeia de suprimentos, bem como fortalecer a posição competitiva de uma empresa, permitindo que ela ofereça produtos e serviços de maior qualidade, com preços competitivos e maior eficiência.
Originalidade/Relevância: Residem no fato de que a adoção de uma abordagem estratégica é fundamental para o sucesso da implementação da metodologia Seis Sigma na cadeia de suprimentos. Além disso, a gestão da informação é essencial para uma aplicação bem-sucedida da estratégia e a gestão da inovação pode ajudar a identificar novas oportunidades de melhoria e redução de custos na cadeia de suprimentos.
Principais conclusões: Este estudo apresenta uma contribuição significativa para a literatura sobre a aplicação da metodologia Seis Sigma na cadeia de suprimentos, fornecendo insights valiosos para gestores e pesquisadores interessados em melhorar a eficiência e qualidade da cadeia de suprimentos de suas empresas.
Contribuições teóricas/metodológicas: A contribuição teórica é uma análise bibliométrica sobre a implementação da estratégia Seis Sigma na cadeia de suprimentos, destacando as principais estratégias dessa aplicação e seus impactos na gestão da cadeia de suprimentos.

Palavras-chave: Bibliometria. Cadeia de suprimentos. Seis sigma.

1 INTRODUCTION

Supply chain management (SCM) is a major challenge for today's organizations, especially given the dynamic environment in which they operate. Companies face significant challenges when managing and reducing environmental risks and impacts (KARIMAH, 2016). However, companies that apply management and control of their SCM optimize their resources, maximize their economic return, and foster their competitive advantage process.

As SCM networks increase in complexity and volatility in the trading environment, the risk of disruption also increases (KEI TSE, 2016).Agile operations

and increased threats from competitors have contributed to the importance of SCM risk management (COLICCHIA, 2012). Chain members must undertake a joint effort to identify ways to manage the risk of disruptions, minimize the impact of disruptions (KEI TSE, 2016), and at the same time develop risk mitigation strategies (FILBECK, 2016). In this sense, SCM leaders believe that supply chain risk management (SCRM) has been consolidating as a concept and a set of essential practices (TRKMAN, 2016).

Production systems present dynamic and complex behavior due to the interaction of several resources. In order to minimize errors and waste, one alternative is the application of the six sigma method. The six sigma method applied to supply chains makes it possible to establish a link between the market, distribution network, production process, and purchasing sector, so that customers get the highest possible level of service at the lowest cost, thus acquiring improvement in the quality of the product or service. The implementation of this method in the supply chain can contribute to the improvement of the performance of the entire chain, from the supply of raw materials to the delivery of the final product to the customer (ZHANG et al., 2020). It is an approach to development because it offers solutions to many problems faced by companies today (SNEE, 2010), and this adds value to organizations (TSIRONIS and PSYCHOGIOS, 2016). However, to achieve success in the method, it is necessary to adopt specific strategies that consider the particularities of the chain and the strategic objectives of the organization. The use of it has been adopted by many service and product companies, having multiple proponents of the strategic approach for the continuous improvement of their processes, contributing to the achievement of competitive advantage (GOH et al., 2019; ABDULLAH et al., 2021). The goal of six sigma is to reduce variation in processes and achieve "Six Sigma quality," a statistical benchmark for 3.4 defects per million opportunities (PANDE, 2001).

In this sense, this paper aims to conduct a bibliometric study with the objective of understanding the relationship between six sigma and SCM, seeking to investigate how Six Sigma has been applied in mitigating risks in supply chains. The results point out the main authors, journals, articles and the main networks cowords and cocitation.

2 THEORETICAL REFERENCE

This section presents the theoretical background on the issues that guide the research.

2.1 Supply Chain Risk Management

The Global Supply Chain Forum (2016) defines SCM as the integration of key business processes from the consumer through suppliers that provide products, services, and information that add value to consumers and other stakeholders. SCM can also be considered as the systematic coordination of traditional business functions and tactics employed in the relationship between these functions within a particular company and between different companies in the same chain in order to improve the long-term performance of companies (MENTZER, 2014).

Bowersox (2013) believes that SCM integration does not adopt the conventional

arrangements related to distribution channels, resulting in the elimination of weak connections between independent companies that exchange inventory with each other. Instead, a coordinated management method is employed to maximize market impact, thus resulting in improved efficiency, continuous improvement, and competitiveness.

According to Ballou (2009), all activities are considered fundamental to deliver goods and services to consumers. Furthermore, he highlights the difference between the contemporary supply chain and traditional logistics, considering them as parts of the same process. Thus, logistics plays essential roles such as information, transportation, storage, material handling, and packaging (BOWERSOX; CLOSS, 2001). The Council of Logistics Management (2016) goes further, stating that logistics activities, such as planning, implementation, and efficient control of the flow, storage of goods and/or services, and related information, are part of the supply chain, covering from the point of origin to the final consumer.

Heaney (2015) explains that in the current scenario companies coordinate large amounts of information, so they need to increasingly use techniques such as Business Intelligence (BI) for decision making. These techniques allow the identification of supply chain risks based on data analysis.

However, SCM has risks in its application that can cause vulnerability, such as: impacts and interruptions in the activities of logistics, resources, flow of materials and information in the supply chain (BRINDLEY, 2004). As such, supply chain risk management (SCRM) is described as a set of processes to identify and mitigate potential risks (MANUJ, 2008), and may follow 5 steps (HO, 2015): (i) risk identification - process that identifies types and factors of risk; ii) risk assessment - process that assesses the likelihood and impact of an event occurring; iii) risk mitigation - process to mitigate the likelihood of an event occurring; iv) risk monitoring - process that detects the occurrence of an interruption; v) risk recovery: process to quickly recover the supply chain during an occurrence.

Risks often arise at the interface between supply chain partners, or even, in factors such as lack of cultural alignment and ineffective communication. As far as management is concerned, risk can occur at all layers and is inherent in the occurrence of mismatched information that is present when operating across business units and company boundaries (KEITSE, 2016).

SCRM should be analyzed as an approach to increase value for the company, its customers, and shareholders (TRKMAN, 2016). It should be defined as the identification and management of risks to the supply chain through the coordinated approach between members of the chain in order to reduce the vulnerability of the supply chain, as a whole.

2.2 Six sigma

The six sigma methodology was created with the strategic goal of improving more promising business processes. It has been used by numerous companies of various world classes for over three decades (ANTONY, 2019). Its function is to improve business processes based on minimum waste, variation control, and quality cost reduction (BENDELL, 2006). This strategy has made one of the most significant for

improving processes and products (TLAP, 2016), and suggests that there is a direct correlation between product quality and customer satisfaction (TSIRONIS; PSYCHOGIOS, 2016). Using statistical methods to identify defects and improve processes while responding to customer voices (TSIRONIS, 2016). In addition, for companies that want to adhere to this method, it has standardized training courses. Today, large organizations and small and medium-sized enterprises (SMEs) are using six sigma (KUMAR, 2008).

The goal is to include ideas of continuous improvement, flattened organization of structures, teamwork, elimination of waste, efficient use of resources, and cooperative supply chain management (RAGHU KUMAR, 2016). The methodology provides a set of standard solutions to common problems and optimizes processes throughout the value chain (DE KONING, 2008), based on a set of values and principles that are actualized by methods and tools (MAARTENSSON, 2019). Evidence suggests that six sigma methods and tools enhance organizations in various industries to improve their operations and processes (BELEKOUKIAS, 2014).

However, to achieve success in applying Six Sigma in the supply chain, it is critical to consider information management and innovation management. According to Singh and Banwet (2012), information management is crucial to the successful application of Six Sigma in the supply chain because it enables companies to obtain accurate and up-to-date data about processes and production. This information is important for making accurate and fast decisions, identifying opportunities for improvement and cost reduction, and improving communication and collaboration with suppliers.

Innovation management is also an important aspect to consider when applying Six Sigma in the supply chain. According to Vaidya and Khare (2016), innovation can help identify new opportunities for improvement and cost reduction, making the company more efficient and competitive. In addition, innovation can be applied in various areas of the supply chain, from product design to logistics and delivery.

The integration of Six Sigma with other management practices, such as marketing and innovation, can provide significant competitive advantages for organizations. According to Nahmias (2018), through the application of Six Sigma, companies can identify opportunities to improve marketing processes, improving campaign efficiency and effectiveness and increasing customer satisfaction. Moreover, the integration of Six Sigma with innovation management can lead to innovative products that meet customer needs and outperform the competition.

Six sigma is based on specific approaches, the main ones being DMAIC (Define, Measure, Analyze, Improve, Control) and DMADV (Define, Measure, Analyze, Design, Verify). DMAIC is a systematic process in which the organizational performance problem has a known solution. This approach aims to identify problems, measure the current situation, analyze data, implement improvements, and control the results achieved. This approach is applied when it is necessary to improve an existing process, identify root causes of problems, and optimize operational efficiency along the supply chain. On the other hand, DMADV is used when seeking to develop a new product, service, or process in the supply chain. The process begins by defining goals

and requirements, measuring customer needs, analyzing design alternatives, designing an optimal solution, and verifying its effectiveness before implementation.

The methodology used by DMAIC consists of five distinct stages. In the first stage, Define, the project objectives and requirements are established. Next, in the Measure step, relevant data is collected to understand the current situation and identify areas for improvement. The third step, Analyze, involves in-depth analysis of the data to identify the root causes of the problems and their cause-and-effect relationships. The Improve step focuses on implementing solutions to address the identified problems, using techniques such as process optimization, layout redesign, or technology implementation. Finally, in the Control step, controls and monitoring are established to ensure the sustainability of the implemented improvements over time. DMADV also has five Steps. The first stage, Define, establishes the project goals and requirements. In Measure, data is collected to understand the customer's needs. The Analyze step involves a detailed analysis of the data to identify the best design alternatives. The Design step focuses on developing optimal solutions based on the analysis. Finally, Verify involves testing and evaluation to ensure that the solution developed meets the established requirements. These methods, DMAIC and DMADV, provide robust and comprehensive frameworks for the continuous improvement and development of products, services, and processes along the supply chain, resulting in improved efficiency, quality, and customer satisfaction.

2.3 Six Sigma and Strategic Vision

The Six Sigma methodology is a strategic approach that aims to continuously improve processes, seeking to reduce variability and increase the efficiency and effectiveness of the activities performed (GARG et al., 2020). The Six Sigma strategy is based on a systematic and disciplined approach to problem solving, which includes the use of data and statistical analysis to identify and eliminate root causes of defects and process failures (BUNKER et al., 2019).

The Six Sigma strategy has been widely adopted by companies in various industries to improve their processes, with positive results in terms of cost reduction, increased customer satisfaction, and improved organizational performance as a whole (GHOSH et al., 2021; KUMAR et al., 2021).

However, it is important to emphasize that the application of the Six Sigma strategy in the supply chain requires specific adaptations and strategies to deal with the particularities and challenges of this area (SAVITSKAYA et al., 2021). Thus, the integration of the Six Sigma methodology with other management approaches, such as Lean Manufacturing and Risk Management, can contribute to the achievement of better results in supply chain management (ALVES et al., 2019; MOHAMMADI et al., 2021).

3 METHODS

In order to clarify the objective of this article, the relationship between six sigma and SCM, seeking to investigate how Six Sigma has been applied in mitigating risk in supply chains, a systematic search was structured using the Scopus database. The

Scopus database is the largest searchable source of citations and abstracts (CHADEGANI, 2013).

In the first step, a search was conducted in the Scopus database, using a time frame from 2003 to 2020 and the keywords "Supply Chain Risk Management" and "Six Sigma", in the English language.

The search resulted in 83 documents for this study. Soon after selecting the articles in Scopus, a file with the extension ".bib" was generated, which was used as the database for the bibliometric analyses.

However, it was necessary to remove duplicates and generate a final dataset of articles. Then, all the titles and abstracts of the selected articles were carefully reviewed and analyzed, with the objective of identifying and characterizing the main authors, objectives, results, and applications. The studies revealed some variation in relation to the methodologies used, objectives, and results in the articles found mostly in the Engineering and Business Administration areas. The process adopted began with a review, in which the databases to be searched were selected and the criteria by which the articles related to the methodology would be extracted. Subsequently, Microsoft Excel software was used to classify the 83 articles and investigate the main trends and similarities in relation to the theme. The chronological classification played an important role in understanding the evolution of the Six Sigma methodology over time. Finally, classifications were performed at industry levels to analyze the contributions in different service sectors. The structure of the classifications adopted proved to be fundamental to the understanding of the theme and the presentation of the study carried out.

After analyzing all the articles in question, the package called Bibliometrix (ARIA; CUCCURULLO, 2017) and the R language application called Biblioshiny (ARIA; CUCCURULLO, 2017) were used to generate graphs to provide a comprehensive analysis of these articles. All statistical results and complete datasets are detailed in section 4 of the paper.

4 RESULTS AND DISCUSSION

In this chapter, the results obtained from the bibliometric analysis performed on the implementation of the Six Sigma strategy in the supply chain will be presented. Then, the theoretical and practical implications of these results for supply chain management and for the competitiveness of companies will be discussed.

The results presented in this study provide valuable insights into the main characteristics of the implementation of the Six Sigma methodology in the supply chain and its impacts on waste reduction, error and quality improvement. In addition, the analysis also allowed us to identify the importance of information management and innovation for the successful application of the Six Sigma strategy in the supply chain, applying it in practice to optimize processes, reduce costs, increase quality, and mitigate risks in different sectors and industries.

Thus, the results and discussions presented in this chapter may be useful for managers and researchers interested in implementing the Six Sigma strategy in the supply chain of their companies, contributing to the improvement of the efficiency and quality of the supply chain

and to the strengthening of the competitive position of companies in the market.

By providing a detailed overview of relevant scientific publications, the article facilitates access to important information for researchers, practitioners and managers interested in deepening their understanding of Six Sigma implementation in supply chain management. This enhanced understanding contributes to the advancement of knowledge in this area and promotes the adoption of more efficient and effective practices, resulting in more resilient, competitive, and sustainable supply chains.

4.1 Results

In this section, we present the complete bibliometric analysis. Figure 1 shows the distribution of articles by year of publication. It can be observed that the subject is extremely relevant and has an expressive number of current publications on the theme, we noticed an increasing peak in the year 2019/2020. This is probably due to globalization and the need for companies to adhere to the concept of six sigma applied to the supply chain, with the goal of integrating and coordinating all activities and processes throughout the supply chain through enhanced collaboration and information exchange (LUMMUS, 1999). One also notices a significant number of publications in the year 2009 through 2011.

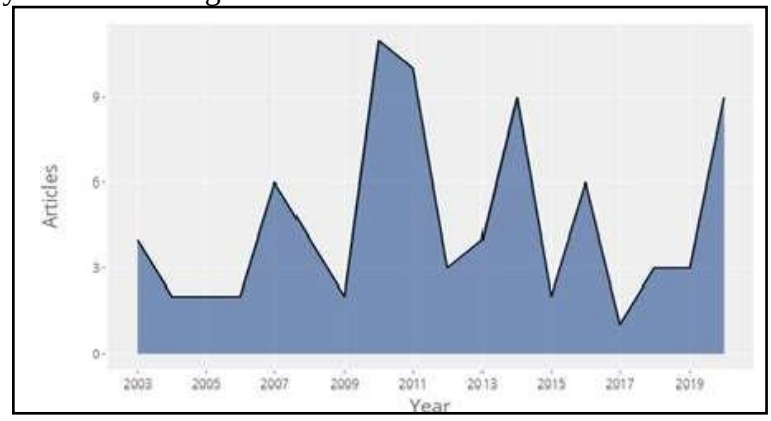

Figure 1 Publications per Year
Source: Prepared by the authors (2022).

Figure 2 shows the number of publications per journal, with the International journal of quality and reliability management standing out with 5 articles.

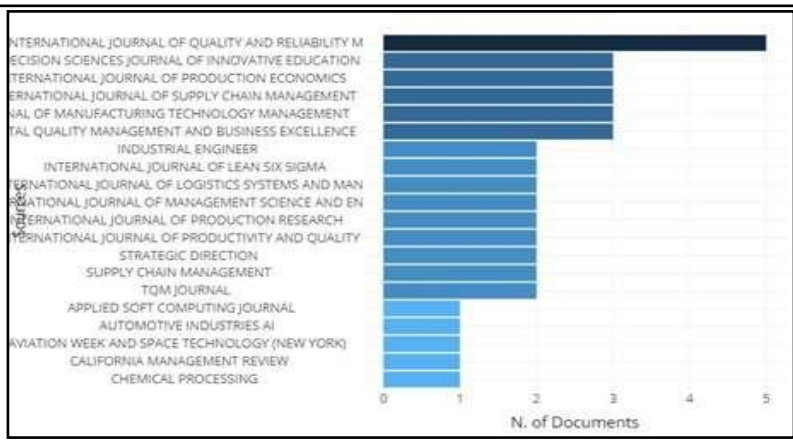

Figure 2 Most Relevant Source)
Source: Prepared by the authors (2022).

The most relevant authors are shown in Figure 3.

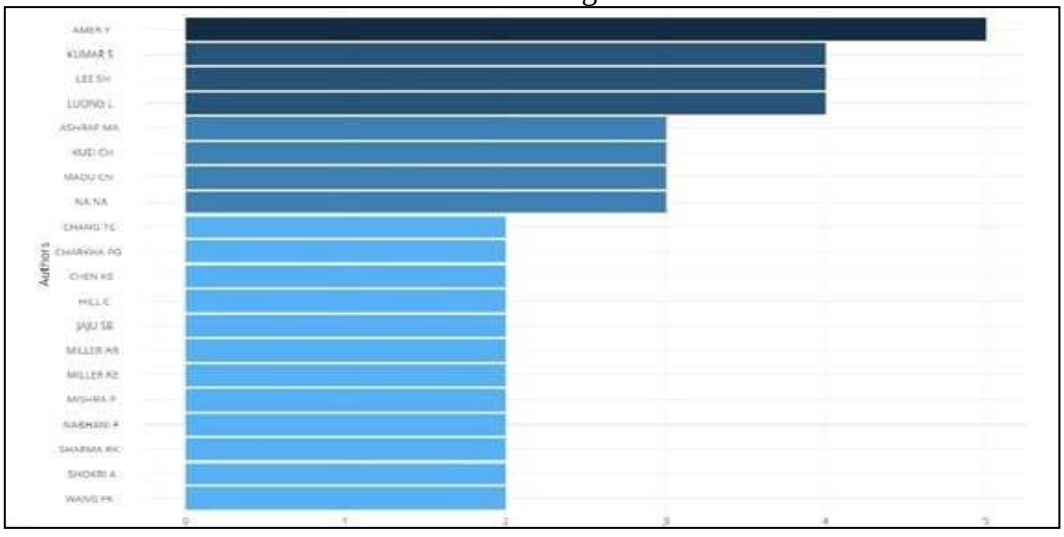

Figure 3 Most Relevant Author(s)
Source: Prepared by the authors (2022).

In Figure 4 we observe the most cited articles on this topic. The 10 articles are: 1- Multi-objective stochastic modeling of supply chains to evaluate tradeoffs between profit and quality. 2- Six Sigma quality: A structured review and implications for future research 3- Designing closed-loop supply chain networks in a fuzzy environment. 4- Using six-sigma metrics to measure and improve the performance of a supply chain. 5- Six sigma supply chain management: A methodology for managing innovation in Samsung Group. 6- Managing recalls in a consumer products supply chain - Root cause analysis and measures to mitigate risks. 7- Application of Six-Sigma in supplier development. 8- Developing quality management systems in the global supply chain. 9- Reducing lead time in a food distribution SME by implementing six sigma methodology. 10 - A modified two-tuple FLC model for SCM performance assessment: By the Six Sigma DMAIC process. Among the entire list of 83 articles, most of them

use different ways to correlate the six sigma method with supply chain management globally or with some specific company. developing a supply chain requires collaboration between the partners in the chain with the goal of helping companies find solutions to improve their performance and thus be more competitive in the market (NURUL KARIMAH, 2016). Collaboration is the confluence of all parties in the chain, acting with a common focus, thus generating added values to each part of it.

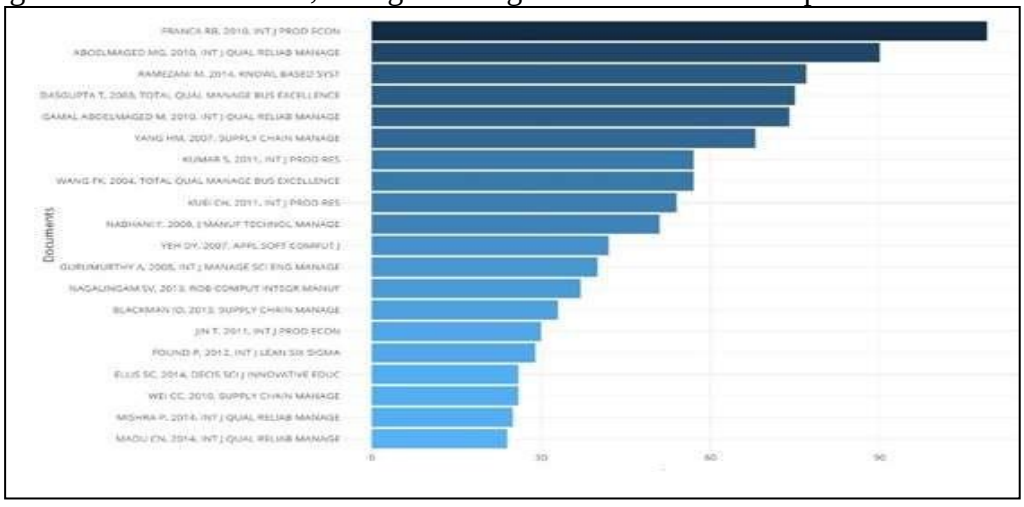

Figure 4 Top quotes
Source: Prepared by the authors (2022).

In this clipping, the main author is Jiju Antony who has the largest number of publications, up to the time of the research. We can see the number of publications by each author in Figure 5.

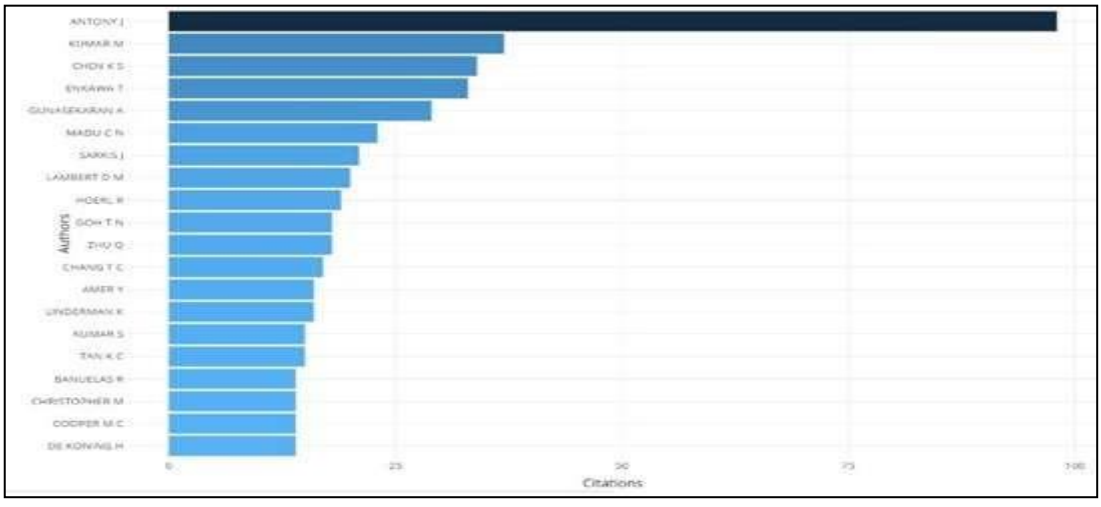

Figure 5 Number of Publications per Author
Source: Prepared by the authors (2022).

Figure 6 shows the word cloud based on the keywords for this research. Word cloud is a form of visualization of linguistic data that shows the frequency with which words appear in a given context from the set of articles searched. We can observe in this cloud

that the most relevant words were "Supply chains" and "Six-sigma". However, there are other relevant words that belong to several articles in this research, such as: "Process engineering", "Process monitoring", "Manufacture" and "Quality Control". From these four words we can observe that six sigma applied to the supply chain is related to the general processes of a company with the objective of having a higher quality control and a clean production, without waste. This mechanism is of great importance for companies, because it allows them to minimize errors during production until the final customer, thus generating greater profit for the company, higher quality in the service or product and customer satisfaction.

Figure 6 Word Cloud
Source: Prepared by the authors (2022).

Figure 7 presents word competition network that allows establishing the possible link strengths between terms and subjects. The generated network has four main clusters. One small cluster associating strategic planning, inventory control, large industries. Two intermediate clusters associating industry, sales, performance measurements, product quality, and the other cluster with the mentions associated with lean manufacturing and logistics. And finally the largest cluster associating supply network, quality management, cost-effectiveness system, manufacturing and others.

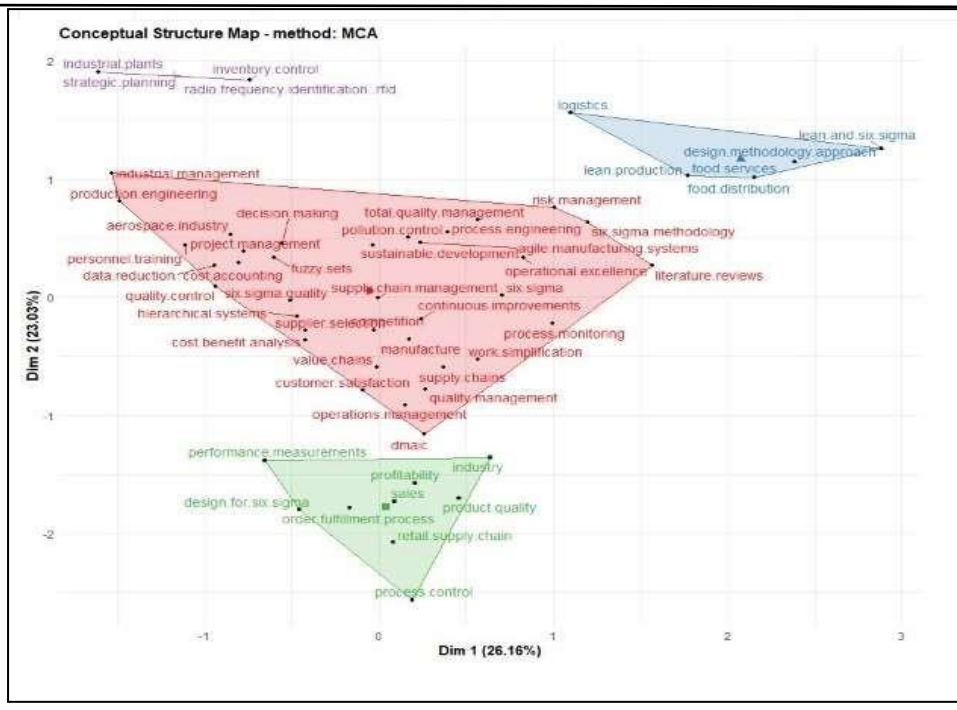

Figure 7 Co Word Network
Source: Prepared by the authors (2022).

In Figure 8 we can observe a co-citation network, that is, the main works published with themes related to six sigma applied to supply chains and the years of publication. This network represents when one or two articles were cited in another more recent article, thus we observe that Dasgupta, Tirthankar's 2003 article was cited several times in more recent publications. The article entitled: "Using six sigma metrics to measure and improve the performance of a supply chain" has great importance, because it brings in a simple way the performance of several processes that could be measured on a common scale and compared with world-class standards, making it more effective. In addition, it shows how six sigma metrics can help organizations. Therefore, this publication has a lot of relevance in this topic and has been mentioned several times in other recent works.

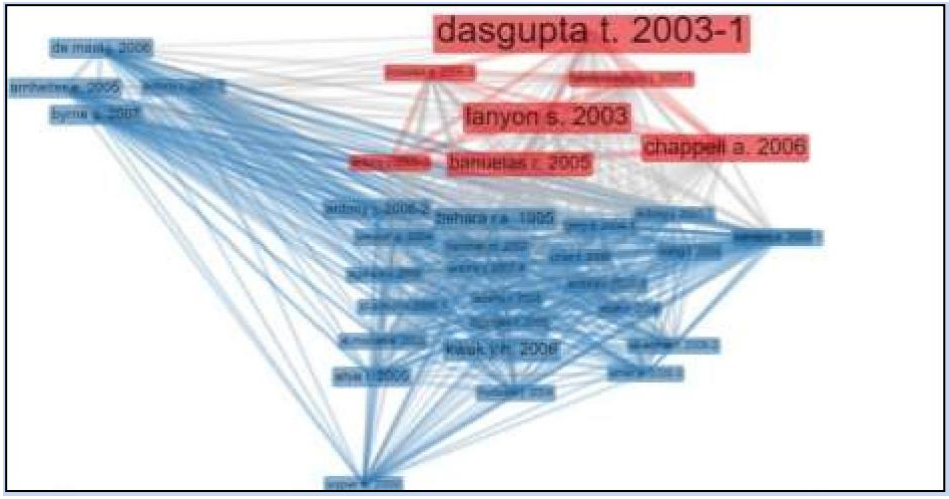

Figure 8 Co Citação Network
Source: Prepared by the authors (2022).

4.2 Discussion

The research conducted aimed to conduct a bibliometric study with the objective of understanding the relationship between six sigma and SCM, seeking to investigate how Six Sigma has been applied in mitigating risks in supply chains. Through this research it was possible to identify the evolution of scientific publications about six sigma applied to the supply chain. For this, we used a qualitative analysis through bibliometric research using the Scopus database. However, there is a limitation in the study, especially in relation to the use of a single database, which, despite being relevant to the scientific environment, it is not possible to guarantee that all relevant literature was covered. In addition, only articles in English were analyzed. The study identified the main authors, the most cited articles, co-citation between articles, as well as other statistics that help create an overview of the literature. The results obtained showed that the beginning of publications on such a theme appeared in the year 2003, however the peak occurred in 2010.Gaudenzi; Christopher (2016) explain that many companies today need to develop supply chains that are "lean" and "agile". Moreover, in this case, it is beneficial to use a project management oriented approach with the six sigma tool, this in turn is key to make improvements and mitigate possible risks in a chain. In order to balance the different needs of "lean" and "agile" in different functions and supply chain, the use of one of this method becomes necessary (ANDERSSON, 2020). As the theme "six sigma" covers several areas of knowledge, in several branches of companies, this research observed that even with a large part of the companies not disclosing the performance of the program due to the high degree of secrecy of the process, the tool will still be one of the great promoters of new technologies regarding the improvement of quality in products and services.

However, it is important to highlight that the achievement of competitive advantage through the application of the Six Sigma methodology in the supply chain requires a continuous process of innovation and improvement, with the adoption of new

technologies and the constant search for excellence in processes and results (BIRUK et al., 2019; SAVITSKAYA et al., 2021). In this sense, innovation management and marketing are fundamental to the success of the Six Sigma strategy in the supply chain, since they contribute to the identification of new opportunities for improvement and to the communication of the results obtained to the various stakeholders involved in the chain (GANGWAR et al., 2019).

In general, integrated strategic planning for the development of logistical activities is of utmost importance to enable a long-term chain, thus encompassing all activities related to the flow and transformation of goods from the raw material stage to the end user, as well as the respective information flows. The first step for companies to minimize risk will be to involve more external suppliers and customers in all production processes of the product or service, to use the six sigma training framework and encourage their participation.

In the current environment, several companies have adopted the six sigma tool with the objective of developing a structured form of new product production processes, to become better, faster, and more flexible. It has been proven that this tool works for innovation and performance at the organizational and operational levels. Furthermore, there are indications that projects that involve more people in a given company, produce the best financial results (Oprime, 2019), thus increasing competitiveness in a turbulent market environment. Thus, the application of this strategy should consider not only the technical and operational aspects, but also the strategic and marketing aspects, aiming to obtain competitive advantage and maximize results for the company.

In order to mitigate supply chain risks it is necessary that the first action to be taken must be within the company itself. Secondly, it needs to be within the supply chain. To perform successfully it is important that there is communication, collaboration and integration among the members that make up the supply chain, allowing for significant results in improving processes and obtaining competitive advantage through efficient management.

5 FINAL CONSIDERATIONS

This scientific paper provides a comprehensive analysis of the application of Six Sigma in continuous improvement in the supply chain, providing valuable information for researchers, practitioners, and managers interested in this topic. Its contributions include insights on process optimization, cost reduction, quality improvement, and risk mitigation in different industries. This contributes to the advancement of knowledge and the development of more efficient and sustainable practices in supply chain management.

The application of the Six Sigma strategy in the continuous improvement of the supply chain can bring significant benefits to organizations, allowing them to improve efficiency, quality and reduce costs, in addition to providing competitive advantages and benefits to their customers. However, it is necessary that companies that are directed to the final consumer should introduce suppliers and other stakeholders into the logistics and supply chain process, because in this way the use of six sigma in the company becomes more effective. The successful implementation of this methodology

also depends on information management and systems integration throughout the supply chain, which can lead to greater visibility and control. Representatives from different companies and from different parts of supply chains can cooperate with each other using the six sigma method and carry out projects together and cross borders.

In addition, the application of the Six Sigma strategy in the supply chain can provide significant competitive advantages for organizations. Integrating this strategy with other management practices, such as marketing and innovation, can further increase the effectiveness of this methodology. This can enable companies to meet customer needs more accurately and quickly, which can lead to higher customer satisfaction and increased customer loyalty.

Logistics needs to be at the same time agile and precise, it has to interact with several areas inside and outside the company and concentrates in its hands a high value in company assets. Therefore, the Six Sigma method is important to solve operational problems in the production area, aiming to eliminate waste and increase process variability. This methodology must be used with seriousness and support from all levels of the organization in order to achieve customer satisfaction and increase profitability, thus being able to stand out in the market and ensure its leadership position.

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