

Lean Supply Chain Management: Insights from bibliometric analysis and literature review

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Abstract: The covid-19 pandemic has impacted many countries and with it arose a growing concern of organizations about the vulnerability and low resilience of global supply chains. The incorporation of lean manufacturing in the supply chains enables the systematic reduction of activities that do not add value in an organization and within a chain could improve business performance, which can be widely extended between areas. Thus, this paper aims to investigate the advancement of knowledge about the lean supply chain through bibliometric indicators of scientific production and literature review. Among the research results, the number of publications increased over the years (1996-2021), and the countries that published the most on the topic are Brazil (46 documents), Malaysia (42), and the United States of America (40). The most applied tool was the Value Stream Mapping (VSM). As for future research, there is a need to propose more applied and comprehensive research; study the impact of lean on the supply chain; evaluate the Lean Supply Chain implementation process, and study the relationship between sustainability and Lean Supply Chain Management.

Keywords: Lean Supply Chain Management; Lean Supply Chain; Bibliometrics

1. Introduction

The COVID-19 pandemic has impacted countless countries. There is a broad debate about health issues versus the economic impacts caused by the pandemic. In Brazil, many measures are being put in place to minimize the proliferation of the virus and encourage the advancement of vaccination. However, a constant concern has been companies' performance in this crisis. There was an increase in electronic commerce, and consumers began requesting immediate delivery of goods. In addition, there was a lockdown within and between countries from 2020 onwards, escalating supply chains' challenges already faced (Chang and Huang, 2022).

Within this context, companies seek tools to reduce costs and waste and improve business performance in the face of a crisis. Therefore, the principles of the Lean Manufacturing (LM) methodology can contribute to the economic recovery process of organizations. According to Palange and Dhatrak (2021), LM is not a trick or magic. However, it aims to identify the valueless activities around production and try to reduce or eliminate them to increase productivity or profit, with simplification of the process or to reduce some weaknesses, to reduce waste and variability in the processes (Mathiyazhagan *et al.*, 2021).

This management system can broadly extend between areas and reach the supply chain. Implementing Lean Management in a supply chain can optimize the execution of all tasks. Therefore, from the application of Lean in the chains, there is Lean Supply Chain Management (LSCM or LSC). This system analyzes what is essential to meet the customer's needs (Núñez-Merino, 2020).

Supply chains are vulnerable to demand uncertainty, material supply disruptions, long lead times, or large order backlogs. In this context, it can be understood that the LSCM is characterized as a change of thinking of an organization about the supply chain, which traditionally is usually interpreted as a limitable system, and starts to act with a network of organizations in an interdependent way. Furthermore, the cooperative aims to meet its customers' wishes (Wieland, 2021). The LSCM approach seeks to develop a long-term plan that aims to commit to the supply chain members (Tortorella, 2017).

Because of the challenges presented by the pandemic and the search for solutions to reduce costs and waste, it is necessary to know the research being developed on Lean Supply Chain. Thus, this research aimed to map the scientific production of Lean Supply Chain in

scientific journals indexed in the Web of Science and Scopus databases. The present work is a theoretical-conceptual study based on quantitative and qualitative, exploratory, and descriptive research, presenting as a focus of analysis: (i) scientific production on Lean Supply Chain through bibliometric indicators and (ii) systematic review of the Brazilian literature on the subject, considering the most cited articles. The results allow us to discuss the current state of knowledge about Lean Supply Chain and lead to an understanding of the development of research on this topic.

2. Lean Supply Chain Management

Supply Chain Management (SCM) aims to achieve a competitive advantage and incorporate a set of activities that involve the flow of information and goods, considering the extraction of raw materials to the final destination of the products. The term SCM emerged in 1982, characterized by consultants Oliver and Webber as a network of organizations involved in the various processes and activities necessary to produce value through products and services (Shan and Wang, 2018; Asgari *et al.*, 2016; Harland, 2013).

A supply chain is composed of interdependent organizations that work together to control the flow of materials, services, and information between the agents involved, thus creating a network. In this network, there is coordination, collaboration, and relationship between participants to maximize the aggregation of the total value generated (Ellram and Murfield, 2019). In this way, supply chains have a set of facilities distributed geographically, and it is necessary to maintain the links so that goods, services, and information can flow (Ramirez-Peña *et al.*, 2020b). Each subsequent link is understood as a customer in this chain, and all components aim to serve these different customers according to their needs. Likewise, the success of a chain cannot be measured at each stage but must be computed as the total profitability of the efforts undertaken jointly (Russell *et al.*, 2018).

Over time, supply chains have been transformed, and Lean principles have also been incorporated. This occurred due to the increasing competitive pressure for shorter delivery times, the desire for lower costs, and better quality standards. Thus, Lean Supply Chain Management (LSCM) is a set of organizations interconnected through products, services, and information, which work collaboratively, to eliminate costs and waste along the chain and meet customer needs (Saudi *et al.*, 2019).

Commonly in organizations, Lean Manufacturing is initially implemented in manufacturing, and later on, it expands to other areas, such as the supply chain. In this way,

Lean practices in the supply chain may be less adopted, and top management usually minimizes their importance. However, when it is intended to integrate all the participants in the chain, it can be an efficient system (Garcia-Buendia *et al.*, 2020).

On the other hand, implementing Lean in the supply chain is not a simple task, as several levels and actors are involved. Any implementation to be successful depends mainly on organizational characteristics. That is, not all organizations must implement the same set of tools. Thus, there is no fixed approach to success, as organizations have different contexts and constraints. Each organization must adopt the practices that are most effective in its context. Some variables can also interfere with implementing the different chain levels, considering the plant size, years of experience in LM, internal supply, and degree of adoption of LM practices (Tortorella *et al.*, 2017).

The leading LSCM practices that can be considered are: pull system (kanban); management of the relationship between those involved (customers and suppliers); level programming (heijunka); logistics management; elimination of waste and continuous improvement; establishment of distribution centers; consignment stock; design and functional packaging, among others (Ruiz-Benitez *et al.*, 2018). Table 1 presents the most recurrent practices identified in the LSCM works.

Table 1 - Lean Supply Chain Management Practices

Practices	Concepts
Value stream mapping (VSM)	The VSM aims to analyze the process flow, which helps to derive the potential product by mapping, helping to identify lead time, inventory level, and worthless activities at all stages (Kumar <i>et al.</i> , 2020).
Just-In-Time (JIT)	JIT can be defined as an integrated supply chain strategy that incorporates defined elements of production, providing improved quality, greater responsiveness, reduced cost, minimized inventory levels, improved productivity, reduced lead time, and reduced downtime (Nimeh, 2020)
Single minute exchange dies (SMED)	SMED seeks to shorten the changeover time (set up) from one product to another, simplifying internal activities so that they happen quickly (Palange and Dhattrak, 2021).
5s	The 5s is a tool that aims to improve the work environment, through 5 senses (use, organization, cleanliness, standardization, and discipline) in order to reduce waste and unnecessary activities (Kusrin and Parmasari, 2020).
Kanban	Kanban is a signaling system that operates in production flows, enabling the narrowing of information and material flows between suppliers and customers, reinforcing collaboration between them (Tortorella, 2018).

Note: Compiled by the authors

The benefits of implementing LSCM correspond to improvements in inventory levels, quality, supply lead time, delivery service level, cost, small batch deliveries, synchronization and leveling of schedule and production, and close relationships between suppliers. And customers in order to provide win-win situations. There is also another set of advantages to using Lean techniques in the supply chain, such as mitigation of environmental impacts and reduction of carbon emissions, resulting in lower impacts on climate change (Mathiyazhagan *et al.*, 2021).

3. Materials and methods

The research aims to understand the development of scientific production on Lean Supply Chain Management.

This investigation aimed to analyze scientific production through bibliometric indicators and a review of the most cited papers on the subject. This is a theoretical-conceptual study based on quantitative, qualitative, exploratory, and descriptive research.

In the first stage, bibliometric metrics were applied to investigate the advancement of knowledge about LSCM, using indicators of scientific production. Bibliometrics is a quantitative and statistical tool to measure and monitor what has been developed in several scientific areas (Lopes *et al.*, 2012).

The collection was performed using data from the Web of Science (WoS) and Scopus. These bases were chosen because they are world-renowned platforms used to carry out metric studies of knowledge production (Oliveira, 2018). The search expression was prepared, and the searches were performed on 07/01/2021, 06/26/2022, and 07/12/2022, in which, on this last date, the citations of the articles were accompanied.

The search term was consulted in the - Topic field. This field retrieves title, keywords, and abstract data. Filters related to the period, document type, and language were applied. Only complete articles published in indexed journals and English language were considered. In the first search, 317 papers were retrieved in Scopus and 154 in WoS, as seen in Table 2.

Table 2 - Lean Supply Chain Management Practices

Query	Scopus™ documents	Web of Science™ documents
“Lean Supply Chain Management” OR “Lean Supply Chain”	317	154

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The collection was performed using data from the Web of Science (WoS) and Scopus. These bases were chosen because they are world-renowned platforms used to carry out metric studies of knowledge production. In the second stage, an analysis of the documents was carried out to verify if they were aligned with the theme. Additionally, a verification of the documents found on both bases was carried out, thus obtaining a total of 217 documents in Scopus and 7 in the Web of Science. The search strategy is detailed in Figure 1.

Based on this, analyzes were carried out on the evolution of scientific production, the major countries, the source (journals), the number of citations, and the JCR/SJR. This systematic literature review intends to understand in some detail how research on the subject was being developed.

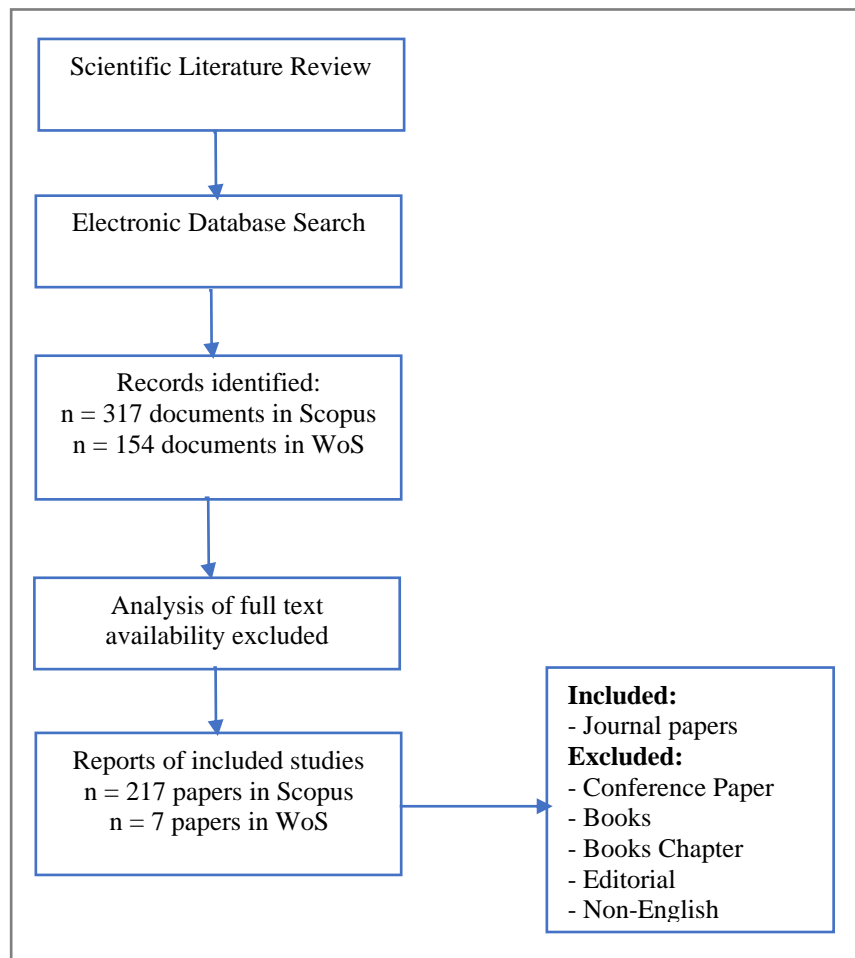


Figure 1 - Search strategy
Note: Compiled by the authors

4. Results

The results can be divided into two types of analysis: a quantitative analysis, using indicators of scientific production, and qualitative analysis, based on a systematic literature review, supported by the most cited documents and those that explore what has been worked on in the lean supply chains.

4.1. Scientific Production on Lean Supply Chain

Supply chains carry out operations involving the production and delivery of the final product. Given this, Lean supply chains ensure the effective functioning of internal and external logistics, products delivered on time and with the expected quality, and acting in the company's strategic areas. Because of the publications over the years, it was possible to observe that the subject had a leap in studies from 2013, as shown in Figure 1. In addition,

one can see a growth perspective, although the year 2021 had a slightly lower scientific production.

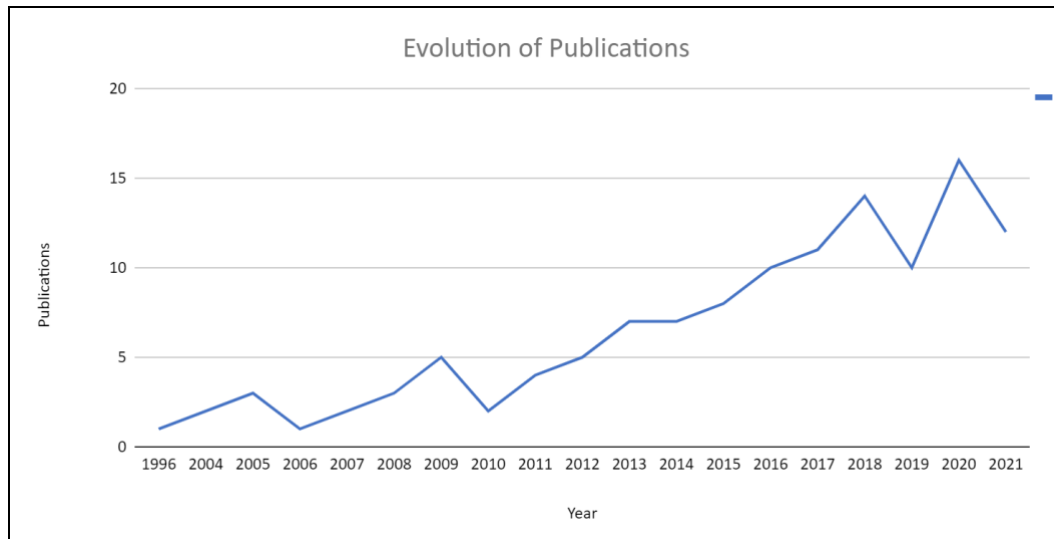


Figure 2 - Annual distribution of scientific production

Note: note research data (2022)

Among the ten countries that published the most on this topic, there is Brazil (46), Malaysia (42), and the USA (40) (Figure 3). Because of the years of publications, it is clear that the theme has been recurrent. However, due to the impact caused by the Covid-19 pandemic, organizations were faced with a high vulnerability and low resilience of global supply chains because of all the limitations imposed, which made it more challenging to respond to the demands in your due time. In this way, companies have been looking for techniques that make it possible to deal with this new scenario. In this context, the implementation of Lean principles acts by optimizing activities along the supply chain from the perspective of the final customer and reducing activities that do not add value, making them a potential tool for companies that are trying to survive this period (Fonseca and Azevedo, 2020).

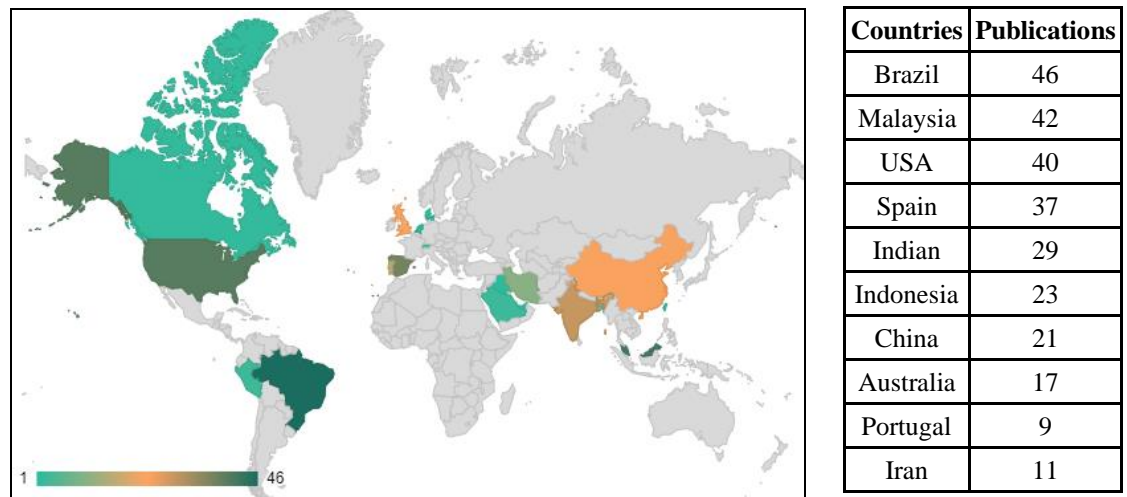


Figure 3 - Countries that published papers on the topic in journals indexed by the Scopus and/or Web of Science
Note: note research data (2022)

Documents on this topic are published in 85 different sources. However, the eight most frequent sources are represented in Figure 3. The International Journal of Lean Six Sigma is the most representative, with 11 documents, and has a JCR of 5.686 and an SJR of 0.79 (2021). The International Journal of Supply Chain Management has the second position with 7 documents, and its SJR was 0.19 in 2019. In third place, we have the International Journal of Production Research, containing 6 documents with a SJR of 2.78 in 2021 and JCR of 9.018 (Figure 4).

The International Journal of Lean Six Sigma was launched in 2010 and publishes literature review articles, case studies, and models related to Lean and Six Sigma methodologies. The research addresses manufacturing, healthcare systems, financial services, education, and local government (Emerald Publishing, 2022). The International Journal of Supply Chain Management publishes scientific research on supply chain management through meta-analyses, case studies, and conceptual and theoretical studies on SCM (International Journal of Supply Chain Management, 2022). Finally, the International Journal of Production Research occupies the third position in this analysis and deals with papers on manufacturing, industrial engineering, operational research, and management science. This journal was created in 1961 and deals with research on decision aid in manufacturing, operations management, and logistics (Tandfonline, 2022).

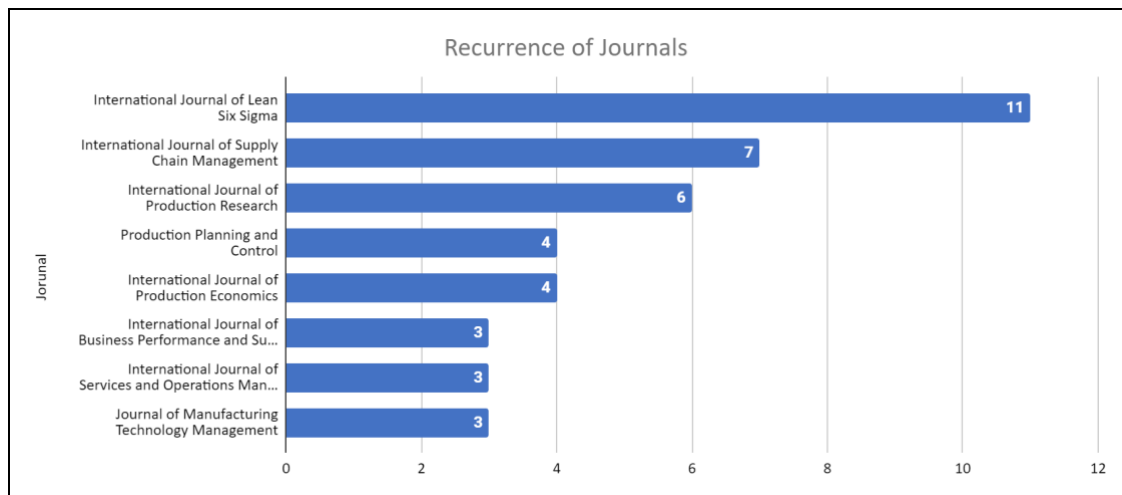


Figure 4 - Main journals used for publication on Lean Supply Chain
 Note: note research data (2022)

Word Cloud aims to make a comparison between words so that the greater the number of words, the greater their incidence in the cloud. Thus, the most relevant words have more evidence, as shown in Figure 5. It is observed that the highlighted words are: Supply Chain, Lean Supply Chain Management, Lean, and Manufacturing. All these words correspond to a correlation to the investigated theme.



Figure 5 - Word Cloud about Lean Supply Chain
 Note: note research data (2022)

4.1. Systematic Review of Literature

Table 3 was constructed considering the first 10 documents with the most citations in the Web of Science and Scopus databases. Therefore, 12 documents were analyzed since the most cited were present in both databases. The analysis comprised the objectives, source, number of citations, JCR, and SJR of the journals.

It is important to mention that the JCR or Journal Citation Report is a report that can help researchers to identify the most appropriate journals for publication contained in the Web of Science (Clarivate, 2022). The SJR or SCImago Journal Rank (SJR) is a Scopus indicator, which measures a journal's impact, influence, and prestige by the number of citations received in the last three years (Scimago, 2022). From the selection of the most cited articles for the analysis, there is the journal Resources Conservation and Recycling with the highest JCR, and the journal International Journal of Production Economics with the highest SJR index.

The most cited paper in WoS and Scopus is the Martínez-Jurado and Moyano-Fuentes (2014), which connects the knowledge of Lean, Supply Chain Management, and Sustainability, exponent subjects for different companies.

Of the selected documents, six developed a model (Qrunfleh and Tarafdar, 2013; Piercy and Rich, 2015; Azevedo *et al.*, 2012; Carvalho *et al.*, 2011; Carvalho *et al.*, 2017; Qi *et al.*, 2017), one carried out survey research (Perez *et al.*, 2010), one research carried out a case study (Wee and Wu, 2009), four studies carried out a literature review (Martínez-Jurado and Moyano-Fuentes, 2014; Jasti and Kodali, 2014; Tseng *et al.*, 2013; Jasti and Kovali, 2015).

Regarding the most cited works on the subject, Martínez-Jurado and Moyano-Fuentes (2014) presented the state of the art of the relationship between Lean Management, Supply Chain Management, and Sustainability, aiming to identify the most studied subjects and discuss research future. To this end, a literature review was carried out, which resulted in two well-studied research topics that correspond to Lean Management and Sustainability, and Lean Supply Chain Management and Sustainability, in addition to identifying gaps for research, discussing some contradictions found, as well as define new research points on the topic. It is possible to notice a significant research gap between sustainability and Lean Supply Chain Management that needs to be better explored.

Table 3 - Systematic Analysis of Literature

Paper	Aim	Citation WoS	Citation Scopus	Source	JCR	SJR
Martinez-Jurado and Moyano-Fuentes (2014)	Assess the state of the art on the links between Lean Management, Supply Chain Management, and Sustainability.	276	348	Journal of Cleaner Production	11.072	1.921
Jasti and Kodali (2014)	Conduct a literature review on Lean Production, analyzing the current Lean Supply Chain Management.	237	279	International Journal of Production Research	9.018	2.780
Tseng, Chiu and Siriban-Manalang (2013)	Present documents on green technologies, sustainable business models and lean supply chain.	233	268	Journal of Cleaner Production	11.072	1.921
Qrunfleh and Tarafdar (2013)	Evaluate strategic partnerships with suppliers and deferral, in the Lean and Agile Supply Chain, through a model.	150	193	Supply Chain Management-An International Journal	11.263	2.385
Piercy and Rich (2015)	Study the sustainability benefits obtained by lean operations or Lean Supply Chain.	179	210	International Journal of Operations and Production Management	9.36	2.291
Azevedo <i>et al.</i> (2012)	Develop a model that addresses the relationship between lean and green practices in the supply chain and sustainable business development.	139	170	Ieee Transactions on Engineering Management	8.702	0.881
Carvalho, Duarte and Cruz-Machado (2011)	Develop a model to explore the divergences and trade-offs between Lean, Agile, Resilient, and Green paradigms, while investigating the effect of paradigm practices on supply chain attributes		208	International Journal of Lean Six Sigma		0.790
Wee and Wu (2009)	Demonstrate how lean manufacturing implementation practices in the supply chain directly affect product cost and quality.	111	144	Supply Chain Management-An International Journal	11.263	2.385
Carvalho, Govidan and Cruz-Machado (2017)	Develop a model for decision-making in Lean and Green Supply Chain Management to improve eco-efficiency	97		Resources Conservation and Recycling	13.716	
Qi <i>et al.</i> (2017)	Develop a model relating operations strategies (OSs), supply chain strategies (SCSs), and supply chain integration (SCI).	84	122	International Journal of Production Economics	11.251	2.808
Jasti and Kovali (2015)	Review existing frameworks on Lean Supply Chain Management (LSCM)	78	114	Production Planning & Control	6.846	1.661
Perez <i>et al.</i> (2010)	Analyze the Catalan pork production chain to identify the parameters of the lean supply chain	70		Supply Chain Management-An International Journal	11.263	2.385

Jasti and Kodali (2014) developed a review article on Lean Production (LP). After the analysis, the works were categorized into Lean Manufacturing (LM), Lean Product Development (LPD), Lean Supply Chain (LSC), and Lean Enterprise (LE) and then studied in depth. LP has grown in recent years; there is much research in manufacturing and little in other areas of the organization; many studies are from developed countries and problems related to this reality. Therefore, through this analysis, it was realized that there is a need for

more practical studies and applied research. There has also been an increase in articles on LSC, especially in the service sector. Thus, there is a stream of studies on Lean in Supply Chain Management.

Tseng *et al.* (2013) presented the special issue of the Journal of Cleaner Production that investigates sustainability through green supply chain management, design, and practice in Asia. The papers analyze supply practices, implications of lean production, green innovation, and green supply chain management limits. Research on green technologies, sustainable business models, and lean supply chains is highlighted.

Qrunfleh and Tarafdar (2013) examined strategic supplier partnerships and deferral in the Lean and Agile Supply Chain and its responsiveness. To this end, a model was developed to demonstrate that appropriate practices in the supply chain can improve responsiveness and performance. In this way, the study was able to identify that there is a relationship between supply chain responsiveness and company performance.

Piercy and Rich (2015) explored the sustainability-related benefits gained from lean supply chain operations. The document presented an integrative stage-based model of lean and sustainable operations management.

Azevedo *et al.* (2012) analyzed how green and lean supply chain management practices help the development of sustainable businesses, using economic, environmental, and social indicators. These practices were applied in a Portuguese automaker for validation. From the case study, a model was developed contemplating the relationship between lean and green practices in the supply chain and the development of sustainable businesses.

Carvalho *et al.* (2011) developed a model to explore the Lean, Agile, Resilient, and Green paradigms in supply chain management. The model was able to identify synergies and divergences in the implementation of practices.

Wee and Wu (2009) presented lean production implementation practices in industries, including several areas of the company, including the supply chain, indicating that Lean Supply Chain directly affects the cost and quality of the product. To do so, they used the VSM and PDCA within the lean supply chain.

Carvalho *et al.* (2017) developed a model for decision-making in Lean and Green Supply Chain Management to improve eco-efficiency. The model was validated in an automotive supply chain. The study identified that not all companies belonging to the chain

were lean or green. The model represented a framework to support the design of eco-efficient supply chains.

The work by Qi *et al.* (2017) developed a model relating operations strategies (OSs), supply chain strategies (SCSs), and supply chain integration (SCI). It is essential to understand the role of operations strategies in supply chains. The model was validated in Chinese industries. The results showed that the lean supply chain is appropriate for companies that prioritize cost, quality, and delivery strategies, while an agile supply chain is appropriate for companies that compete on the flexibility strategy.

Jasti and Kodali (2015) reviewed existing frameworks on Lean Supply Chain Management (LSCM). The study identified that many developed frameworks did not have the participation of professionals in the area, and many incoherent elements were used to propose the frameworks on LSCM.

Perez *et al.* (2010) analyzed the characteristics and performance of the Catalan pork production chain, aiming to identify the parameters of the lean chain. The study showed that the swine sector had adopted lean management techniques in supply chains (Lean Supply Chain Management).

Two articles portray the relationship between Lean and Agile in supply chains. It is important to mention that an Agile chain is focused on quick response to the market, and flexibility, associated with the ability to explore profitable opportunities in a volatile environment. This is possible because the organizations part of the chain have well-integrated and effective relationships. However, this capability has a high operating cost. A Lean chain, on the other hand, focuses on eliminating waste, increasing added value, leveling service, meeting customer needs, and increasing profits. Lean management is best suited for scenarios where demand can be predicted. In volatile environments, the most appropriate thing is to work with a higher level of agility (Nath and Agrawal, 2020).

4.2. Lean Tools Applied in Supply Chain Management

When analyzing the documents published in the WoS and Scopus databases, it was possible to notice some theoretical studies, literature reviews, and applied studies. Among the applied research, some works addressed the application of lean tools in supply chain management, as seen in Table 4.

Table 4 - Analysis of the Application of Lean Tools in the Supply Chain

Paper	Lean Tools
Abideen and Mohamad (2021)	Value Stream Mapping (VSM)
Moyano-Fuentes <i>et al.</i> (2020)	Value Stream Mapping (VSM)
Saudi <i>et al.</i> (2019)	5S
Nimeh <i>et al.</i> (2018)	Just in time (JIT)
Marodin <i>et al.</i> (2017)	Just in time (JIT)
Boonsthonsatit and Jungthawan (2015)	Value Stream Mapping (VSM)
Islam and Rahman (2013)	Kaizen
Taylor and Pettit (2009)	Value Chain Analysis (VCA)
Parveen and Rao (2009)	Just-in-Time (JIT)
We and Wu (2009)	Value Stream Mapping (VSM)
Eisler <i>et al.</i> (2007)	Value Stream Mapping (VSM)

It was possible to notice that most of the studies used Value Stream Mapping (VSM), which identifies all waste in the flow of the value chain and helps to take measures to reduce or eliminate this waste. It is a tool capable of verifying how materials and information flow through the entire production cycle. It presents a broader view of the entire process. The VSM starts with a drawing of a map of the current state, containing information about bottlenecks, delays, and excessive loading and unloading times, among other aspects. The main task is to identify the processes that have added value and the processes that have no added value (Narke and Jayadeva, 2020).

5. Conclusions

The present work aimed to present an overview of the scientific production on Lean Supply Chain Management published in journals indexed in Scopus and the Web of Science. This study indicated significant growth in the number of articles published, mainly between the years 2012 to 2018. In the years from 2019 to 2021, the growth fluctuated slightly. However, it continues to indicate the interest of academics in the subject.

In this bibliometric study, 224 were examined on the subject and published in 85 journals. The journals with the most papers published on this subject were: the International Journal of Lean Six Sigma (11 documents), the International Journal of Supply Chain Management (7), and the International Journal of Production Research (6).

Regarding the countries that published the most on the subject, we have Brazil (46), Malaysia (42), and the USA (40). Furthermore, when analyzing the word cloud, the most

recurrent words are Supply Chain, Lean Supply Chain Management, Lean, and Manufacturing, which are words highly correlated to the research topic.

The literature review indicated much theoretical work and that more applied papers are needed. When the papers involve the application of lean tools, Value Stream Mapping (VSM) has been widely practiced in studies.

Some researchers relate the lean chain and the agile chain, and the agile chain is more focused on responding quickly to the market and having flexibility as its biggest highlight. Agile chains act this way because they have well-integrated and effective relationships based on a high operating cost. On the other hand, lean chains mainly aim to eliminate waste, increase added value, and consequently increase profits. Lean management only occurs in scenarios where demand can be predicted. In volatile environments, it is best to work with a higher level of agility.

Lean Supply Chains can be developed in different ways, there is no predetermined step-by-step incorporation of Lean principles, as well as the use of Lean techniques, can be used in the most diverse segments and sectors of the organization.

The present work aimed to present an overview of the scientific production on Lean Supply Chain Management published in journals indexed in Scopus and the Web of Science. This study indicated significant growth in the number of articles published, mainly between the years 2012 to 2018. In the years from 2019 to 2021, the growth fluctuated slightly. However, it continues to indicate the interest of academics in the subject.

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The literature review indicated much theoretical work and that more applied papers are needed. When the papers involve the application of lean tools, Value Stream Since the Covid-19 pandemic is not only a concern in Brazil but is also a recurring concern in some

countries. This topic is being discussed and propagated more. This is because the pandemic caused organizations to face a series of challenges, demonstrating their supply chains' high vulnerabilities and low resilience, making it difficult to respond to demands at the right time. This factor may have benefited a greater interest in this topic as companies began to look for techniques, practical tools, or methodologies capable of dealing with this scenario of uncertainty. This scenario has been a significant concern for many organizations looking for ways to not succumb to the crisis. In this way, lean principles started to be used for collaborating in a powerful way. To this end, lean techniques were incorporated, aiming to eliminate activities that do not add value, identify the real need of the consumer and establish an adequate flow of value, aiming above all to meet the demands in this turbulent period.

As for future research, there is a need to propose more applied and comprehensive research; study the impact of lean on the supply chain; evaluate the Lean Supply Chain implementation process, and study the relationship between sustainability and Lean Supply Chain Management, that this topic and all environmental concerns currently have been a gap that needs to be better explored.

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