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Article

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Effect of lean supply chain on competitive advantage: a systematic literature review

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ABSTRACT

Undoubtedly, Lean Supply Chain Management (LSCM) has been widely identified as a powerful approach to improving supply chain performance and gaining competitive advantage (CA). Despite the challenges faced by numerous organizations in effectively implementing and sustaining lean practices. This research endeavor seizes the opportunity to conduct a comprehensive and methodical review of the existing literature to offer an in-depth examination of the relationship between LSCM and CA, focusing on the critical success factors (CSFs) for the lean supply chain that affect competitive advantage. The current study employed a systematic literature review (SLR) approach to identify studies on the relationship between LSCM and CA. A total of 529 published papers were selected from Web of Science (WoS), ScienceDirect, and Scopus databases. A comprehensive literature review was conducted, in which 55 relevant articles were analyzed from 2003 to 2023. The results revealed that the critical success factors (CSFs) for implementing LSCM can be broadly categorized into internal factors, external factors, and factors related to the implementation of LSCM. The most significant internal factors include customer focus, flexibility, cost reduction, time-to-market, and quality. External factors, such as collaboration with suppliers, customers, and other stakeholders, innovation, and technology, were also deemed critical. Effective LSCM practices such as lean principles, supply chain integration, information management, and logistics management are identified as significant contributors to success. The key results of this paper reveal that LSCM can be a practical approach for improving CA, as it addresses many of these critical success factors (CSFs). By adopting lean principles and integrating all aspects of the supply chain, firms can reduce waste, enhance efficiency, and improve responsiveness to customer demands. The study further discusses the current trends in LSCM and CA and provides implications for future research. However, the research has limitations, which include the restricted scope of the literature review and the lack of empirical research. In conclusion, this study provides valuable insights into the critical success factors (CSFs) for implementing LSCM and their effect on CA, which can benefit practitioners and researchers.

IMPACT STATEMENT

In the current landscape of fierce business competition, staying ahead of competitors is imperative. Therefore, selecting the appropriate supply chain strategy has the potential to enhance the company's competitive advantage (CA). The adoption of lean supply chain management (LSCM) in recent years has generated conditions for substantial change in the way organizations manage their supply chains. However, research is still ongoing on how LSCM can be integrated into current supply chain models to improve CA and performance. LSCM is a powerful technique for improving supply chain performance and establishing a competitive edge, and the current study dives into this topic in depth. In recent times, there has been a notable surge in interest regarding the utilization of LSCM and its effect on CA. Yet, the existing knowledge about the advantages and obstacles of LSCM, which serve as driving forces and their

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connection to CA, is dispersed throughout various sources. This situation has spurred the creation of this paper, aiming to fill this gap through a systematic review of existing literature. Through a thorough examination of literature spanning from 2003 to 2023, this study aims to construct a holistic comprehension of how a lean supply chain influences CA by focusing on the crucial success factors (CSFs) for lean supply chain management that affect competitive advantage. Thus, this paper sheds light on achieving long-term success in a highly competitive market through lean supply chain implementation. Additionally, the connection between the efficient supply chain and CA offers greater motivation for professionals to utilize the implementation of LSCM in order to improve their organizations' CA. The present paper shows that internal aspects, including customer-centricity, adaptability, cost-cutting, speed-to-market, product quality, hand-by-hand with efficient LSCM procedures, and external elements such as teamwork and creativity, are crucial to enhancing CA.

1. Introduction

Over the past few decades, Lean Supply Chain Management (LSCM) practices and principles have been increasingly adopted across various industries. The growing interest in LSCM is primarily due to its significant benefits, including cost minimization, reduced lead times, enhanced product quality, and various other aspects (Rossini et al., 2023). In the contemporary worldwide business landscape, businesses aim to attain competitive advantage (CA) over their competitors through the implementation of diverse strategies (Al-Shami et al., 2022; Garcia-Buendia et al., 2023a; Iyer et al., 2019; Sulistyo & Ayuni, 2020). One such strategy that has gained immense popularity in recent times is Lean Supply Chain Management (Garcia-Buendia et al., 2023a). LSCM amalgamates lean philosophies to construct production systems of superior quality, ensuring their congruence with the demands of customers (Rossini et al., 2024). Since Lamming (1996) first introduced the LSCM concept, scholars and industry professionals have paid heightened attention to it (Moyano-Fuentes et al., 2019), cited by Garcia-Buendia et al. (2021b).

LSCM is a business philosophy that aims to reduce waste in all forms and improve effectiveness as well as efficiency in the supply chain (Chitakatira & Al Bazi, 2011; Garcia-Buendia et al., 2023b). The concept of Supply Chain Management (SCM) has emerged as a critical component of business success in recent decades (Gilal et al., 2017; Monjur & Akon, 2023; Vickery et al., 2003). SCM encompasses overseeing all operations related to producing and distributing goods and services to consumers (Susanto et al., 2024).

The primary aim of SCM is to guarantee the accurate delivery of the appropriate product to the correct customer, precisely when needed, and at an optimal cost (Sahoo & Chaurasiya, 2024; Vickery et al., 2003). The SCM framework relies on the notion that a company's supply chain must be seen as a single entity that must be managed in an integrated manner. Effective SCM can help companies achieve significant cost savings, improved customer satisfaction, and increased profits (Roy & Roy, 2024; Vanichchinchai & Igel, 2009). Lean principles have been widely used in the manufacturing sector to improve efficiency and reduce waste (Chitakatira & Al Bazi, 2011; Rasanjali et al., 2024). Adopting lean principles in SCM has led to the development of LSCM (Chen et al., 2010).

LSCM is a lean-based approach that focuses on eliminating all forms of waste throughout the supply chain (Al Saadi & Amuthakkannan, 2024; Panwar et al., 2015). It comprises the utilization of lean tools as well as techniques, for instance, value stream mapping, pull production, and continuous improvement, to streamline processes and reduce waste (Ali, 2024; Duarte & Cruz-Machado, 2014; Lyons & Ma'aram, 2014). By reducing waste, LSCM can help companies minimize costs, enhance their efficiency, as well as improve customer satisfaction (Al Saadi & Amuthakkannan, 2024). For instance, a study by Cvetić et al. (2021) found that LSCM enables the elimination of waste, quality improvement, and cost reduction, leading to increased supply chain flexibility. This, in turn, can efficiently improve the performance of the supply chain and all its participants.

Furthermore, the adoption of LSCM practices has been found to have a positive impact on the CA of organizations (Garcia-Buendia et al., 2023a; Moyano-Fuentes et al., 2019). CA denotes the distinct edge an entity possesses compared to its competitors, enabling it to yield higher profits or expand its market share (Aristiawan et al., 2024; Crute et al., 2008). LSCM can help organizations achieve CA by improving

their ability to meet customer demand, reducing costs, and increasing efficiency (Ping et al., 2014; Rossini et al., 2023; Vaezinejad & Schniederjans, 2024). For example, implementing LSCM can help healthcare organizations improve internal interaction between employees, supply chain cost management, and supply chain responsiveness (Khorasani et al., 2020). Additionally, LSCM can also be integrated with Industry 4.0 (I4.0) to improve operational performance and achieve sustainable results (Rossini et al., 2023).

Recently, increasing attention has been paid to the relationship between LSCM and CA (Al-Shami et al., 2022; Ping et al., 2014; Sulistyo & Ayuni, 2020). Many researchers have argued that LSCM can provide companies with a significant CA (Bhamu & Sangwan, 2014, 2016; Duarte & Cruz-Machado, 2014; Vaezinejad & Schniederjans, 2024). For example, several empirical studies (Anvari, 2021; Ariadi et al., 2021; Garcia-Buendia et al., 2023a; Klein et al., 2022; Papageorgiou et al., 2020) have demonstrated a significant and positive relationship between lean supply chain management and competitive advantage. However, the nature and extent of this relationship are not well understood, according to Garcia-Buendia et al. (2023a, 2023b).

Furthermore, there has been a significant increase in the significance of SCM in the success and competitiveness of organizations (Garcia-Buendia et al., 2023a). As businesses have become more globalized, the complexity of supply chains has increased, resulting in challenges such as longer lead times, higher inventory costs, and greater supply chain risks (Kavota et al., 2024; Milovanovic et al., 2017; Smith & Synowka, 2014). To address these challenges, businesses have been adopting LSCM practices (Núñez-Merino et al., 2020; Rossini et al., 2023). Therefore, this literature review intends to discover the connection between lean supply chain management (LSCM) and competitive advantage (CA). Additionally, this study aims to identify the main critical success factors (CSFs) of a lean supply chain that affect competitive advantage.

The research area of CSFs is vast and opaque; hence, holistic research provides an overview and organizes prior research since the genesis of the lean concept is required to create a shared foundation for practice and academia. Moreover, firms encounter substantial obstacles in pinpointing and selecting pertinent main factors due to the absence of consensus on specific criteria or a comprehensive framework (Kapaj, 2022). Therefore, the purpose of this article is to provide an in-depth analysis of the secondary data from the literature published between 2003 and 2023, reviewing research in academic journals to understand the critical success factors that are essential in implementing lean practices in the manufacturing and service sectors.

Several studies have explored the nexus between lean supply chain management and competitive advantage, including the works of Rossini et al. (2023), Garcia-Buendia et al. (2023a), Kapaj (2022), Papageorgiou et al. (2020), and Ab Talib and Hamid (2014). However, the search results do not indicate if a comprehensive and systematic literature review was conducted to ensure all relevant critical success factors for implementing LSCM and their impact on competitive advantage were captured (Bambrick et al., 2023; Elkhairi et al., 2019). Therefore, this study attempts to fill this gap by identifying the essential success factors (CSFs) for implementing LSCM, which affect competitive advantage.

The review is organized into several sections. The first section provides a brief overview of the concept of LSCM and its evolution. The second section addresses the connection between LSCM as well as CA, while the third section examines the empirical evidence of this relationship. The fourth section explores the theoretical underpinnings of the relationship between LSCM and CA, while the fifth section examines the critical success factors (CSFs) for implementing LSCM. Finally, the review concludes by discussing the challenges associated with LSCM implementation and providing suggestions for future research.

2. Research methodology

A systematic literature review (SLR) is an objective examination of an existing body of literature that employs a clear as well as reproducible approach for searching, analyzing and synthesizing it (Salawu et al., 2022). The authors performed a systematic literature review (SLR) to aggregate the research findings from papers published on the relationship between LSCM and CA in different parts of the world. The literature review aims to summarise the previous studies, and it helps to illuminate the research problem and pathway for future research and gather limitations of previous studies (Boell &

Cecez-Kecmanovic, 2015; Lame, 2019). A systematic literature review (SLR) summarises the previous study based on rigorously, fair, and auditable research objectives (Mahajan et al., 2024). SLR is an important step in designing new interventions and evaluations, promoting the development of new methodologies, and guiding future research efforts.

The purpose of a systematic review is to identify all relevant empirical evidence that meets predetermined criteria to address a specific research question or hypothesis (Snyder, 2019). In their study, Chaudhary et al. (2021) identify the advantages of the use of the systematic literature review methodology: (1) understanding, rigorous and transparent identification of studies in the literature consistent with the research question; (2) the possibility of supplementing the present literature with theoretical frameworks and future research insights; and (3) the possibility of identifying new study perspectives similar to or contradictory to those already present, as cited by Risitano et al. (2023). In order to ensure a rigorous as well as comprehensive review of the current literature on the effect of lean supply chains on competitive advantage, this study adopted a systematic approach to the literature review process. The approach employed in this research relies on the four-step method proposed by Wolfswinkel et al. (2013), which involves defining the scope of the review, searching for relevant literature, selecting appropriate studies, and analyzing the findings.

The first step in this approach was to define the scope of the review. Therefore, the research team developed a set of inclusion and exclusion criteria to guide the search for relevant literature. The studies were selected based on five inclusion criteria: (1) the documents were selected based on the keywords criteria in the area of supply chain management, lean principles, lean supply chain management, critical success factors, and competitive advantage; (2) the documents were selected based on the research problem and research questions; (3) the publications should be in English language; (4) the document should address the topic of lean supply chain management and competitive advantage in various industries and contexts; (5) the publication year should be from 2003 to 2023. Figure 1 shows the inclusion criteria for the current study. Appendix A shows the list of documents analyzed in this study. The starting year of 2003 was chosen because, although a lean approach in supply chain management emerged in the 1990s, the concept of lean supply chain management as a way to achieve the required competitive advantage began to gain significant attention within both academic and industrial research in the early 2000s (Manzouri & Rahman, 2013; Tasdemir & Gazo, 2018; Ugochukwu et al., 2012). Here, the exclusion criteria were also developed to exclude studies that were not directly relevant to the research problem or did not meet certain quality standards. Thereby, the description on the criterion of the final selection is presented in Table 1.

The second step in the approach was to search for relevant literature. To achieve this, the researchers conducted an extensive search of multiple academic databases, which includes Web of Science,

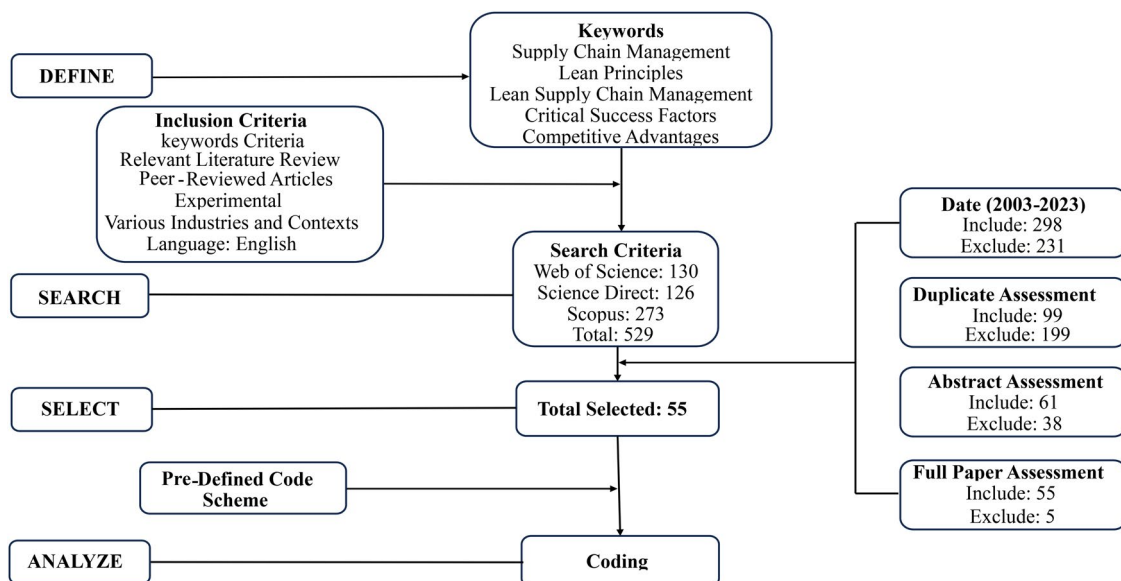


Figure 1. Literature review inclusion criteria.

Table 1. Criteria for inclusion of the paper selection.

Criteria for inclusion	Narrative
Keywords	Supply Chain Management, Lean Principles, Lean Supply Chain Management, Critical Success Factors, and Competitive Advantage.
Language	English.
Types of documents	Articles
Types of sources	Peer-reviewed journals and proceedings
Period (Time interval)	2003-2023

ScienceDirect, Scopus, as well as Google Scholar. In addition, the team also searched for relevant literature in various industry publications, such as trade journals and industry reports.

The third step in the approach was to select appropriate studies. In order to do this, the research team conducted a screening process to identify research that satisfied the exclusion as well as inclusion criteria. Moreover, the screening process involved reviewing the abstracts as well as titles of the recognized studies and then selecting those that were deemed relevant for further analysis. In addition, the team also conducted a full-text review of the selected studies to ensure they met the inclusion criteria and were of high quality.

The fourth and final step in the approach was to analyze the findings of the selected studies. In order to do this, the research team conducted a qualitative analysis of the literature, using a thematic approach to identify common themes and patterns in the findings. The analysis focused on the key factors that contribute to the lean supply chain management effect on competitive advantage, as well as the challenges and limitations associated with implementing lean supply chain practices.

The first phase was defining the search strategy. The inclusion criteria and search parameters were determined, and keywords related to LSCM and CA were identified. The criteria for article selection were based on period of study, language, source, and study design. English-language peer-reviewed journals with both qualitative and quantitative research designs were included. The next phase was searching for relevant articles. Three databases, known as Web of Science, SCOPUS, and ScienceDirect, were selected for the search. The Web of Science (WoS) Core Collection and Scopus databases were considered due to their broader coverage of scientific publications, as well as the high level of curation of their publication data performed by the respective editorial teams (Cortes-Rodriguez et al., 2023; Mauludina et al., 2023). The Scopus database has been instrumental in sourcing relevant material for this review (Ishaya et al., 2024). Thelwall and Sud (2022) described Scopus as an abstract and indexing database with full-text links produced by Elsevier Co. Accordingly, Scopus is considered one of the most suitable databases for literature searches for global research (Ishaya et al., 2024). Data from Emerald was also included, which was similar to the data from Scopus and hence considered in the Scopus stratum. The Web of Science (WoS) database was used because it allows access to 9,000 journals and 12 million articles, allowing substantial international access to high-quality peer-reviewed papers (Júnior et al., 2023). Also, WoS belongs to the provider Clarivate Analytics, which has a portfolio of platforms that can retrieve and analyze high-impact scientific literature (Cortes-Rodriguez et al., 2023). Another database used was Science Direct, one of the most popular online platforms operated by the Anglo-Dutch publisher Elsevier. Science Direct has an electronic collection of full texts provides subscription-based access to large databases (Rodrigues et al., 2024). Google Scholar was also used as the scholarly work coverage in Google Scholar is impressively broad and includes the most important scholarly publishers' archives (Ab Talib & Hamid, 2014).

The keywords were used to search for articles, and the results were filtered using available filtering options. A total of 529 articles were extracted, with 273 from Scopus, 130 from Web of Science, and 126 from ScienceDirect. The third phase was selecting the relevant articles based on specific criteria. The inclusion date range was set from 2003 to 2023, resulting in the inclusion of 298 articles and the exclusion of 231. Duplicate articles were also removed, leaving a total of 99 articles. The abstracts and author keywords were then used to select 61 articles, which were then screened based on their full text. The final selection was 55 articles that met the inclusion criteria. In the final phase, the chosen articles were assessed relying on the provisional coding method. This method involved creating an initial set of codes based on the research conducted and adding specified codes generated from the literature review. This facilitated the validation of previous studies and research, as recommended by Van Lange Paul et al. (2015).

3. Analysis & findings

The selected 55 articles were statistically analyzed based on the context of the study and the publication year, as shown in Table 2, where findings reveal that the majority of the articles selected in this literature review were published in 2014, which was 18.2% of the total selected articles followed by the articles published in the year 2011 2016 in 2021 which was 9.1% of the total selected articles. Accumulatively, these three years include a total of 27.3% of the total selected articles. Considering the selected articles, the least number of articles were published in 2003, 2007, 2009, 2017, 2022 and 2023. It was noted that the subject was understudied in the past two years. One of the main reasons was COVID-19, as most of the researchers were on the pandemic. Figure 2 demonstrates the distribution of articles by publication year.

Considering the research context, all 55 articles were published worldwide roughly, including across most continents. However, the subject of the current study was more popular in Europe and America. The majority of the articles were published in Colombia, the United Kingdom, the United States, India and Indonesia. Whereas in Germany, Iran, Lithuania, Portugal, Spain, Taiwan and Turkey, very few articles were published. However, considering the context of the study, the publications were generalizable from the perspective of LSCM. Figure 3 shows the context of the study.

Table 2. Year of publication.

Year	Frequency	Percent
2003	1	1.8
2007	1	1.8
2008	3	5.5
2009	1	1.8
2010	3	5.5
2011	5	9.1
2012	2	3.6
2013	4	7.3
2014	10	18.2
2015	4	7.3
2016	5	9.1
2017	1	1.8
2018	3	5.5
2019	3	5.5
2020	2	3.6
2021	5	9.1
2022	1	1.8
2023	1	1.8
Total	55	100

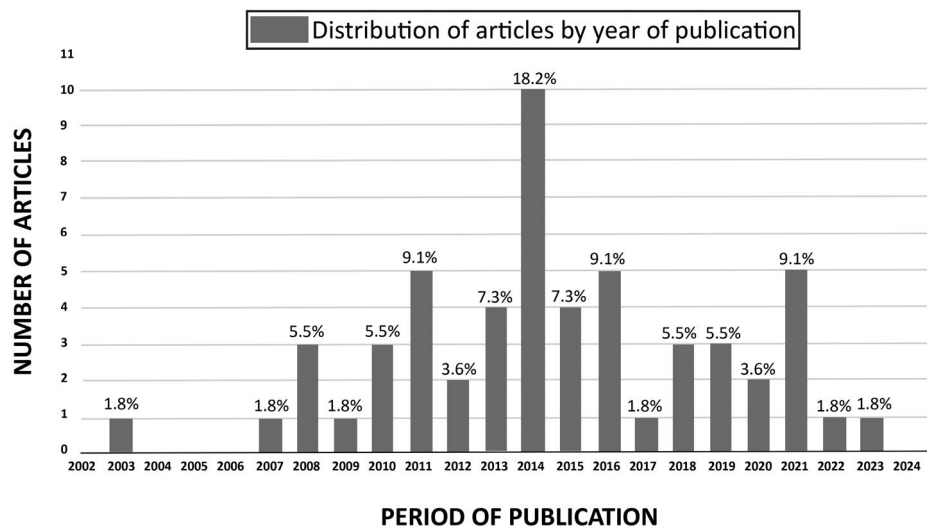


Figure 2. Distribution of articles by publication year.

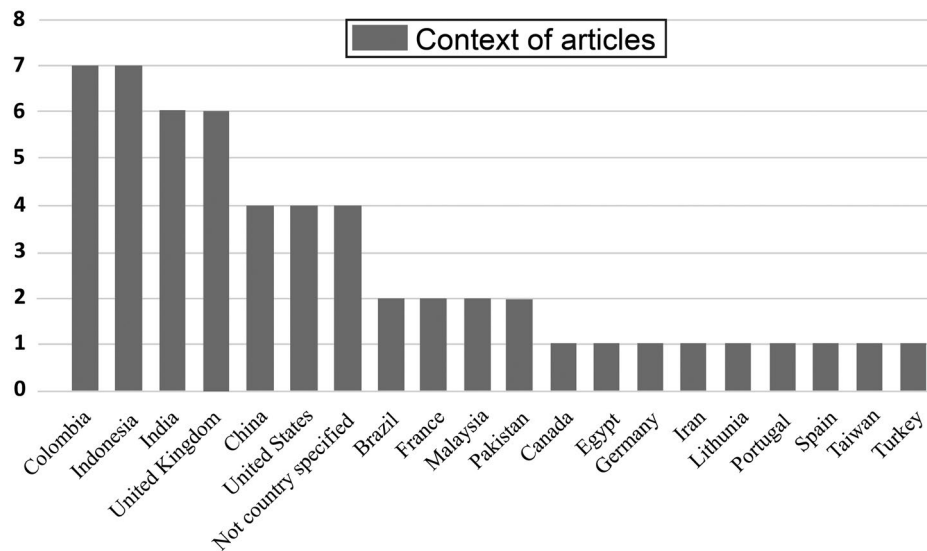


Figure 3. Contextual background of the article.

4. Concept of lean supply chain management (LSCM)

SCM has emerged as a crucial focal point for companies aiming to boost their operational effectiveness, minimize costs, as well as elevate customer satisfaction (Modi & Mabert, 2007; Moori et al., 2013; Narasimhan & Talluri, 2009). LSCM, which has garnered considerable focus in recent times, traces its origins to the emergence of the Toyota Production System (TPS) in Japan during the 1940s and 1950s (Ohno, 1982). TPS, also known as Just-In-Time (JIT) production, which means that their inventory management method is to receive goods from suppliers only as they are needed at short notice. JIT has been widely applied in the automotive industry, and then extended to other industries (Vanichchinchai, 2019). JIT was designed to eliminate waste, increase efficiency, and improve quality in manufacturing processes (Adeyeri et al., 2019; Mankazana & Mukwakungu, 2018). Ohno (1982), the father of TPS, emphasized the importance of reducing waste in all aspects of manufacturing, including the supply chain. He believed that by eliminating waste, companies could boost product quality, minimize costs, as well as respond quickly to customer demand.

Over time, the principles of TPS were adapted and applied to other industries and business functions, including SCM. In the 1980s, the concept of Lean Manufacturing emerged in the West, based on the principles of TPS (Moori et al., 2013). Lean Manufacturing was quickly embraced by many companies, as it provided a framework for reducing waste and improving efficiency in production processes (Anham & Nurcahyo, 2019). However, it soon became apparent that the benefits of Lean Manufacturing could be extended beyond the factory floor to the whole supply chain. This resulted in the creation of LSCM, which applies Lean principles across the entire supply chain, starting from obtaining raw materials to the distribution of finalized goods to customers (Ramachandran & Neelakrishnan, 2017). The goal of LSCM is to eliminate waste, increase efficiency, and improve the overall performance of the supply chain (Fercoq et al., 2016). The LSCM principles continue to evolve as new technologies and business models emerge, and companies seek to adapt to changing market conditions (Indrawati et al., 2018). However, there is no universally agreed-upon definition of LSCM, and different authors have defined it in various ways (Distelhorst et al., 2017). For instance, Christopher and Towill (2001) defined 'Lean SCM as the extension of lean manufacturing as well as lean services principles to the supply chain in order to create a seamlessly coordinated system of materials and information flows'. Narasimhan and Talluri (2009) refer to it as a system of management practices and activities that extend the principles of lean production to the management of the entire supply chain, from supplier to customer. Meanwhile, Bicheno (2004) defined LSCM as a 'philosophy and a set of management techniques that emphasize the elimination of non-value-added activities in the supply chain while enhancing efficiency, reducing costs, and increasing speed and flexibility'.

On the other hand, Modi and Mabert (2007) stated LSCM as the implementation of lean principles to supply chain activities in order to eliminate waste, improve flow, and create value for the customer. Moreover, Moori et al. (2013) defined LSCM as a systematic approach to conducting the whole supply chain to achieve both cost and service objectives by eliminating waste and continuously improving performance. 'Apart from that, Gunasekaran and Ngai (2012) defined LSCM as involving merging lean thinking principles with SCM methods to enhance the smooth movement of products, services, as well as information throughout the entire supply chain network, with the goal of delivering value to customers while minimizing waste and enhancing efficiency'. In this regard, the waste elimination process requires a clear understanding of waste and value across the organization (Ramachandran & Neelakrishnan, 2020). Waste is anything that interferes with the smooth production flow and does not add value (Wen et al., 2014). Value, on the other hand, is something that a customer is ready to pay for and all others are to be considered waste (Ramachandran & Neelakrishnan, 2020). The eight wastes identified are overproduction, waiting, conveyance, overprocessing, excess inventory, movement, defects, and low employee creativity (Gilal et al., 2016; Ikpe & Shamsuddoha, 2024; Ramachandran & Neelakrishnan, 2020; Wen et al., 2014; Wiengarten et al., 2013). Among all these, overproduction is the most significant waste that can mask other inefficiencies (Wen et al., 2014).

Despite these various definitions, it is evident that the core focus of LSCM is on enhancing supply chain efficacy, minimizing costs, as well as improving customer satisfaction through the elimination of waste and continuous improvement. This approach is grounded in lean production principles, highlighting the removal of inefficiencies, streamlining of procedures, as well as the creation of value for the customer. For example, Amazon is known for its highly efficient supply chain and fulfillment operations, built on Lean principles like Just-In-Time (JIT) inventory management. By implementing Lean tools, Amazon optimizes its operations, reduces waste, and enhances customer experience (Onetto, 2014). Similarly, Seven-Eleven Japan successfully applied Lean principles and concepts. As a result, the outcome of some projects contributed to an increase in the integration of processes from ordering to delivery, enhanced service levels, boosted sales, and reduced inventory levels (Naruo & Toma, 2007). Starbucks adopted the Lean approach to enhance customer experience. This strategy involves implementing Lean practices, such as visual management solutions and actions to improve and standardize operational processes (Myerson, 2017). Similarly, Zara utilized Lean principles to gain a competitive advantage over other fashion retailers, including the implementation of a Kanban system to facilitate pulled workflows in their operations (Marques et al., 2022; Robinson, 2021). This system is a subsystem of the Toyota Production System (TPS) and was created to manage inventory levels and regulate the production and supply of components and, in some instances, raw materials (Junior & Godinho Filho, 2010; Rahman et al., 2013), as cited by Marques et al. (2022).

5. Relationship of LSCM and competitive advantage (CA)

CA denotes the distinctive edge a company holds in comparison to its competitors, allowing it to generate increased profits or achieve a superior market position (Sulistyo & Ayuni, 2020). This advantage can be based on various factors, for instance, reduced costs, greater quality services or products, quicker delivery times, better customer service, or a unique business model (Crute et al., 2008). Various forms of CA exist, such as cost advantage, differentiation advantage, as well as focus advantage. Cost advantage denotes a company's capacity to manufacture as well as market its products or services at a reduced cost compared to its competitors (Crute et al., 2008). A differentiation advantage pertains to a company's capacity to provide distinctive and superior products or services that are challenging for competitors to imitate (Crute et al., 2008). The focus advantage denotes a company's capacity to concentrate on a particular market segment and deliver products or services tailored to meet the precise requirements of that market.

In order to maintain a CA, companies must continually adapt and evolve to meet changing market conditions. This may involve investing in new technologies, improving their operations, or expanding into new markets. Companies that are able to sustain their CA are more likely to achieve long-term success and profitability (Garcia-Buendia et al., 2023a). CA is a crucial concept in business strategy, as it allows companies to differentiate themselves from their competitors and capture a greater market share

(Garcia-Buendia et al., 2023a). Companies can achieve a competitive advantage through various means, including cost advantage, differentiation advantage, and focus advantage (Asikin et al., 2024). One prominent example of cost advantage is Walmart, the world's largest retailer. Through supply chain optimization and operational efficiency improvements, Walmart delivers products at competitive costs compared with rivals, catering to cost-conscious consumers (Valentinov & Iliopoulos, 2024). Several companies have effectively implemented the differentiation strategy to achieve competitive advantages. For example, Apple is renowned for its differentiation strategy through its focus on innovative design, user-friendly interfaces, and strong brand identity (Addison & Adelaide, 2022). As a result, it has distinguished itself in the technology market by gaining a loyal customer base willing to pay a premium for its offerings (Pan, 2024). Novo Nordisk is an example of a company that has sustained a competitive advantage through its focus strategy. Novo Nordisk has focused on diabetes medication manufacturing. This focus has allowed it to establish itself as a global leader in diabetes care, attract a loyal customer base, and maintain a competitive edge in the pharmaceutical industry (Eric, 2019).

To maintain their competitive advantage, companies must continually adapt and evolve to meet changing market conditions (Wong et al., 2009). Another benefit of LSCM is improved quality. The focus on continuous improvement and waste elimination in LSCM can help companies determine as well as discuss issues in the supply chain, minimizing the risk of defects while enhancing the entire product quality. In addition, the adoption of LSCM can also lead to a reduction in the time and resources required to resolve quality issues, allowing companies to focus on improving the customer experience (El-Tawy & Gallea, 2011). LSCM can also increase customer satisfaction by providing faster delivery times and better-quality products. In a lean supply chain, goods are manufactured and delivered only when they are needed by the customer, reducing the risk of stockouts as well as overstocking. This can result in enhanced customer loyalty as well as increased sales. LSCM can provide companies with a significant CA by reducing costs, improving quality, and increasing customer satisfaction (Baysan et al., 2013). Companies that adopt LSCM can benefit from improved supply chain efficiency, reduced lead times, and a focus on continuous improvement, which can all help to position them as leaders in their respective fields.

6. Themes of coded literature

Articles were reviewed thoroughly based on their objectives and findings. Considering the current topic of the study, several themes originated from the article. These themes include lean principles and practices, supply chain management, competitiveness, environmental sustainability, and technology and innovation, as depicted in Figure 4. The research themes are shown in Table 3 below.

6.1. Lean principles and practices

Lean principles and practices have gained a lot of attention in recent years as they offer organizations a systematic approach to improving their operations and reducing waste. Moreover, Anvari (2021), Dzikron and Djamaludin (2021), Belekoukias et al. (2014), Yuan and Wang (2013), Konecka (2010), and Jayaram et al. (2008) indicated that the lean principles and practices in SCM had an important role in successful performance and competitive advantage. According to Anham and Nurcahyo (2019), Gilal et al. (2016), Jasti and Kodali (2016), Smith and Rupp (2015), and Chen et al. (2010), lean principles focus on identifying and eliminating activities that do not add value to the organization's processes, thereby improving efficiency and productivity. It is exemplified in the case of Toyota as a prime example, where the implementation of Just-In-Time (JIT), which is a production strategy to minimize waste and inefficiencies, revolutionized the automotive industry by streamlining production processes and eliminating waste (Al-Rifai, 2024). Baysan et al. (2013) and Zahraee (2016) suggest that lean practices involve continuous improvement, waste reduction, and employee involvement. For instance, companies like Amazon have successfully implemented lean practices in their fulfillment centers by utilizing Value stream mapping (VSM), a tool created by the lean production movement to identify and reduce errors, losses, and lead time and to improve value-added activities (Qin & Liu, 2022). Amazon also implemented warehouse robots and automated sorting systems, which enhanced operational efficiency and accuracy within its vast logistics operations and reduced labor costs (Olaoye & Samon, 2024). Anvari et al. (2011, 2013) argued that lean principles and practices can

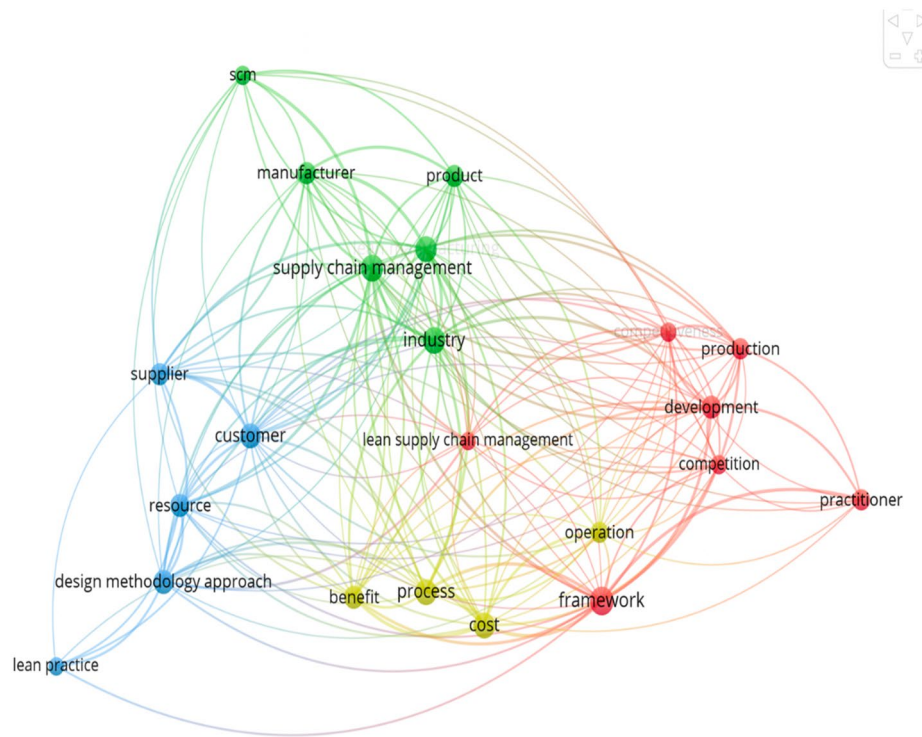


Figure 4. Network themes of the literature.

Table 3. Themes of the articles.

Themes	Authors
Lean principles and practices	Garcia-Buendia et al. (2023a); Manzoor et al. (2022); Dzikron and Djamaludin (2021); Anvari (2021); Ramachandran and Neelakrishnan (2020); Anham and Nurcahyo (2019); Zahraee (2016); Gilal et al. (2016); Jasti and Kodali (2016); Belekoukias et al. (2014); Anvari et al. (2013); Baysan et al. (2013); Wiengarten et al. (2013); Bevilacqua et al. (2015); Smith and Rupp (2015); Bhamu and Sangwan (2014, 2016); Wen et al. (2014); Lau & Wang, 2013; Yuan and Wang (2013); Mantilla Celis and Sánchez García, (2012); Anvari et al. (2011); Li et al. (2010); Chen et al. (2010); Konecka (2010); Sauer (2008); Jayaram et al. (2008); Koch and Horbal (2003).
Supply chain management	Boschi et al. (2018); Chitakatira and Al Bazi (2011); Crute et al. (2008); Özdemir et al. (2014); Gilal et al. (2016); Distelhorst et al. (2017); El-Tawy and Gallear (2011); Anvari et al. (2011).
Competitiveness	Dzikron and Djamaludin (2021); Brown et al. (2015); Belekoukias et al. (2014); Baysan et al. (2013); Zahraee (2016); Fercoq et al. (2016); Garcia-Buendia et al. (2023a); Anham and Nurcahyo (2019); Bhamu and Sangwan (2014); Lau and Wang (2013); Chitakatira and Al Bazi (2011); Jasinavičius and Jasinavičius (2011); Crute et al. (2008); Anvari et al. (2013); Gilal et al. (2017); Konecka (2010).
Environmental sustainability	Bhamu and Sangwan (2016); Fercoq et al. (2016); Shashi et al. (2019); Gaikwad and Sunnapwar (2021).
Technology and innovation	Anvari et al. (2013); Powell and Skjelstad (2012); Boschi et al. (2018); Garcia-Buendia et al. (2023a); Jasti and Kodali (2016); Indrawati et al. (2018); Moyano-Fuentes et al. (2021); Tortorella et al. (2018b); Koch and Horbal (2003).

potentially improve an organization's overall performance by reducing costs, improving quality, and increasing customer satisfaction. In the 1990s, General Electric (GE) implemented Lean Six Sigma (LSS) successfully across its business units (Deniz & Tükenmez, 2024; Gupta et al., 2020), which is a methodology that can help companies improve their focus on quality, cost, delivery, and customer satisfaction to gain long-term competitive advantage (Vashishth et al., 2024). On the other hand, Bhamu and Sangwan (2014) and Lau and Wang (2013) suggest that lean practices also facilitate organizations to enhance their SCM by minimizing lead times as well as inventory levels. For instance, companies (e.g. Dell and Gateway) have designed a build-to-order supply chain (BTO-SC) network system to confront the uncertainty of customers' demand, which is a system that builds products according to customers' particular requests at a competitive cost and time through outsourcing, information technology, and standardization of parts to maintain low inventory levels, minimize lead times and inventory costs, allowing for efficient customization of products and quick response to customer orders (Taheri-Bavil-Oliaei et al., 2021).

6.2. Supply chain management (SCM)

SCM holds paramount importance for businesses as it encompasses the oversight of the movement of products and services from suppliers to customers. According to El-Tawy and Gallear (2011), SCM involves activities such as planning, sourcing, production, and logistics. Gilal et al. (2016), Özdemir et al. (2014), and Anvari et al. (2011) stated that SCM enhances competitiveness and performance by integrating the internal functions of the company and effectively associating them with the operations of suppliers and customers. Meanwhile, Boschi et al. (2018) suggest that effective SCM can facilitate organizations to boost their competitiveness by minimizing costs, enhancing quality, as well as improving customer satisfaction. Furthermore, Chitakatira and Al Bazi (2011) argue that SCM is also essential for organizations to adapt to changing customer demands and market conditions.

6.3. Competitiveness

Competitiveness is a critical factor for organizations as it determines their ability to compete in the marketplace and achieve sustainable growth. According to Brown et al. (2015), competitiveness involves creating and delivering value to customers, improving efficiency, and leveraging technology and innovation. Meanwhile, Anham and Nurcahyo (2019), Dzikron and Djameludin (2021), Zahraee (2016), Belekoukias et al. (2014), Lau and Wang (2013), and Konecka, 2010; argue that lean principles and practices can help organizations improve their competitiveness by reducing costs and improving quality. Moreover, Baysan et al. (2013) and Jasinašius and Jasinašius (2011) suggest that efficient SCM is also crucial for organizations to improve their competitiveness by reducing lead times and inventory levels. Apart from that, Fercoq et al. (2016) highlight the importance of environmental sustainability in improving an organization's competitiveness by reducing costs and enhancing reputation.

6.4. Environmental sustainability

In recent years, organizations have placed growing emphasis on environmental sustainability, aiming to diminish their environmental footprint and enhance their public image (Bhamu & Sangwan, 2016). According to Fercoq et al. (2016), environmental sustainability involves reducing waste, conserving resources, and minimizing pollution. Additionally, Gaikwad and Sunnapwar (2021) proposed that organizations can enhance their environmental sustainability by embracing green supply chain management strategies like eco-friendly design, environmentally conscious procurement, and reverse logistics. Fercoq et al. (2016) argue that environmental sustainability can also improve an organization's competitiveness by reducing costs and enhancing its reputation.

6.5. Technology and innovation

Technology and innovation are critical factors for organizations as they seek to improve their efficiency, productivity, and competitiveness. Thus, IT development is constantly increasing manufacturing companies' ability to react quickly and reliably to demand through enhanced transparency, visualization, and processing capabilities (Powell & Skjelstad, 2012). According to Boschi et al. (2018), technology and innovation involve the development and implementation of new ideas, products, and processes. Moreover, Garcia-Buendia et al. (2023a) and Jasti and Kodali (2016) suggest that technology and innovation can help organizations improve their SCM by enhancing visibility, collaboration, as well as responsiveness. Meanwhile, Tortorella et al. (2018a) and Jasti and Kodali (2016) argue that technology and innovation can also help organizations improve their environmental sustainability by reducing waste and increasing efficiency. Furthermore, Moyano-Fuentes et al. (2021) emphasize the significance of organizational culture as well as leadership in fostering innovation and creativity.

7. LSCM factors affecting competitive advantage (CA)

In the analysis of 55 studies on the connection between LSCM as well as CA, a number of factors emerged as having a significant impact on CA. The factors can be broadly categorized into two main areas: External as well as Internal factors.

Internal factors: These comprise customer focus, flexibility, cost reduction, time-to-market, quality, information management, collaboration, innovation, strategic planning, supply chain integration, lean principles, and organizational culture (Ab Talib & Hamid, 2014; Distelhorst et al., 2017; Manzoor et al., 2022; Ramachandran & Neelakrishnan, 2017; Vickery et al., 2003) as follows:

Customer focus refers to the ability to understand the needs and preferences of customers and provide them with customized products and services that are more appealing than competitive products in the market, which can enhance customer satisfaction and loyalty and strive to exceed customer expectations (Bhamu & Sangwan, 2016; de Oliveira Cunha et al., 2011; Hibadullah et al., 2014; Manzoor et al., 2022).

Flexibility expresses the capability to quickly adapt to transformations in customer demand as well as market conditions, which can improve responsiveness and reduce lead times (Manzoor et al., 2022).

Cost reduction is the ability to reduce costs through efficient and effective use of resources. This can help companies maintain competitive pricing, increase profitability, and reinvest resources into other areas of the business (Manzoor et al., 2022).

Time-to-market is the capability to bring new services and products to market faster than competitors, which can help companies gain a first-mover advantage and capture a larger share of the market (Manzoor et al., 2022; Moori et al., 2013).

Quality is the capability to deliver high-quality services and products that satisfy or surpass customer expectations, which may enhance brand reputation and customer loyalty (Anham & Nurcahyo, 2019; Moori et al., 2013).

Information management is the ability to effectively manage and utilize data and information for decision-making, which can improve operational efficiency and effectiveness (Ping et al., 2014).

Collaboration refers to the ability to work closely with suppliers, customers, and other stakeholders to achieve common goals, which can enhance supply chain visibility, improve communication, and foster innovation (Tortorella et al., 2018a).

Innovation refers to the ability to develop new and innovative products, services, and processes, which can create a CA and enhance customer satisfaction (Tortorella et al., 2018a).

Strategic planning is the ability to develop and implement a comprehensive and well-defined strategic plan, which can help companies align their supply chain operations with overall business objectives and improve decision-making (Chitakatira & Al Bazi, 2011).

Supply chain integration is the ability to integrate all aspects of the supply chain to enhance effectiveness and efficiency, which can enhance supply chain visibility, reduce lead times, and improve customer satisfaction (Sulistyo & Ayuni, 2020).

Lean principles refer to the application of lean principles aimed at eradicating inefficiencies and streamlining operations to boost effectiveness, minimize costs, as well as elevate customer satisfaction (Chitakatira & Al Bazi, 2011).

Organizational culture is also a factor that impacts CA in the LSCM context. The development of a culture that promotes continuous improvement, collaboration, and innovation may increase operational efficiency, minimize costs, as well as elevate customer satisfaction (Manzoor et al., 2022).

External factors: These include technology, human capital, sustainability, risk management, logistics management, and supplier management (Narasimhan & Talluri, 2009; Rahman & Subramanian, 2012; Reeves, 2007; Reeves et al., 2010; Tortorella et al., 2018a; Wong et al., 2009) as follow:

Technology refers to the use of technology to enhance efficiency and effectiveness, which can improve operational efficiency and reduce costs (Lee et al., 2024).

Human capital refers to the ability to attract, retain, and develop a skilled and motivated workforce, which can enhance innovation and operational efficiency (Birhane et al., 2023; Wong et al., 2009).

Sustainability refers to the ability to balance economic, environmental, and social factors in business operations, which can enhance brand reputation and customer loyalty (Gamachu & Kurse, 2024; Wong et al., 2009).

Risk management refers to the ability to identify and mitigate risks in supply chain operations, which can reduce the likelihood of disruptions and improve business continuity (Ambarwati et al., 2024; Konecka, 2010; Narasimhan & Talluri, 2009).

Logistics management refers to the ability to effectively manage the flow of services and goods through the supply chain, which can reduce lead times, improve inventory management, and enhance customer satisfaction (Ganbold, 2024; Reeves, 2007; Reeves et al., 2010).

Supplier management refers to the ability to effectively manage suppliers to ensure quality, reliability, and responsiveness, which can improve supply chain performance and reduce costs (Bhamu & Sangwan, 2016; Modi & Mabert, 2007; Orijji & Joel, 2024; Wang et al., 2023).

8. Challenges in LSCM

LSCM is a prominent strategy for increasing the effectiveness and efficiency of SCM (Bhamu & Sangwan, 2014; Bicheno, 2004; Boschi et al., 2018). The goal of LSCM is to reduce waste, increase speed and flexibility, and enhance customer value. LSCM has been widely adopted by organizations in different industries as it is seen as a way to gain a CA. However, there are several challenges associated with LSCM, as well as its effect on CA. In this essay, we will discuss the challenges associated with LSCM as well as its impact on CA, relying on the analysis of 55 studies. One of the main challenges associated with LSCM is the complexity of SCM (Chitakatira & Al Bazi, 2011). SCM engages various stakeholders, encompassing suppliers, distributors, manufacturers, as well as retailers (Yang et al., 2021). Each of these stakeholders has different goals, objectives, and processes (Sindakis et al., 2023). The complexity of SCM makes it challenging to implement LSCM successfully. The adoption of LSCM requires a significant change in the way organizations manage their supply chains. This change involves redefining processes, roles, and responsibilities. This change can be difficult to manage, especially when dealing with multiple stakeholders who may not have a shared vision or understanding of LSCM (Berger et al., 2018).

The second challenge associated with LSCM is the lack of understanding of lean principles among supply chain stakeholders (Crute et al., 2008). Lean principles are the foundation of LSCM. They are designed to reduce waste, increase efficiency, and enhance customer value. However, the lack of understanding of lean principles among supply chain stakeholders can hinder the successful implementation of LSCM (Lau & Wang, 2013; Tortorella et al., 2018b). For example, suppliers may not have a clear understanding of what is required of them to meet the lean requirements of LSCM; this can lead to delays, inefficiencies, and higher costs. Toyota's suppliers encountered challenges in fully comprehending lean manufacturing principles, potentially leading to quality concerns (Maware & Parsley, 2022). One notable practical case example is the sudden acceleration and brake loss problem in Toyota's vehicles, which occurred in 2009 (Bowen & Zheng, 2015) and was predominantly attributed to a defect in the accelerator assembly supplied by one of a tier-two supplier who supplies individual parts or assembled components to Toyota Co., highlighting the importance of addressing quality control in the manufacturing process to prevent such safety concerns (Andrews et al., 2011).

The third challenge associated with LSCM is the lack of collaboration among supply chain stakeholders (Horbal et al., 2008). Collaboration is critical to the success of LSCM. LSCM requires all supply chain stakeholders to work together to identify and eliminate waste. However, the lack of collaboration among stakeholders can hinder the successful implementation of LSCM (Fan et al., 2023). For example, if suppliers are unwilling to share information with manufacturers, this can lead to delays and inefficiencies in the production process. Similarly, if manufacturers are unwilling to collaborate with distributors, this can lead to stockouts and higher costs (Bag et al., 2023).

The lack of technological infrastructure is also a challenge associated with LSCM. LSCM requires the use of technology to monitor and optimize the supply chain (Garcia-Buendia et al., 2023a). However, many organizations do not have the necessary technological infrastructure to support LSCM. For example, organizations may not have the necessary software or hardware to monitor supply chain performance in real-time, especially in developing countries (Khalifa et al., 2021).

This can lead to delays and inefficiencies in the supply chain. Similarly, organizations may not have the necessary data analytics tools to assess supply chain data as well as determine areas for

improvement (Kandasamy et al., 2023). A possible solution to this problem can be offered through the use of RFID (radio frequency identification) tags. These tags could be attached to products, which aid in tracking the movement of goods in real-time, reducing the risk of stockouts and overstocking, and helping to optimize inventory levels and minimize waste. RFID also enables better visibility and traceability throughout the supply chain, making it easier to identify and address issues such as delays, bottlenecks, or quality concerns. Thus, it can lead to a sustainable competitive advantage (Ikpe & Shamsuddoha, 2024; Powell & Skjelstad, 2012). Moreover, IoT technology enables the connection and communication of various devices and sensors throughout the supply chain, allowing for real-time data collection and analysis. This can be used to monitor environmental conditions during transportation, such as ensuring that products are stored at optimal temperatures, thereby reducing the risk of spoilage or damage (Ikpe & Shamsuddoha, 2024).

The fifth challenge associated with LSCM is the lack of resources (Ping et al., 2014). Implementing LSCM requires significant investment in time and resources. Organizations may not have the necessary resources to implement LSCM successfully (Garcia-Buendia et al., 2021b). For example, organizations may not have the necessary budget to invest in new technology or hire additional staff to support the implementation of LSCM. Consequently, due to a lack of proper investment, many industries are unable to adopt new technologies such as Machine Learning, Big Data, and Artificial Intelligence. This limitation can result in delays, inefficiencies, and increased costs (Kandasamy et al., 2023).

Finally, the lack of alignment between supply chain strategy and business strategy is a challenge associated with LSCM (Modi & Mabert, 2007). LSCM is a SCM strategy designed to reduce waste, increase efficiency, and enhance customer value (Al Saadi & Amuthakkannan, 2024; Garcia-Buendia et al., 2023a). However, the success of LSCM depends on the alignment between supply chain strategy and an organization's business strategy (Garcia-Buendia et al., 2021a; 2023a; Tortorella et al., 2017). For example, if an organization's business strategy is focused on cost reduction, this may conflict with the principles of LSCM, which emphasize value creation. The lack of alignment between supply chain strategy and business strategy can hinder the successful implementation of LSCM (Santos et al., 2021).

9. The literature concerns

The 55 studies reviewed in the previous sections provide a broad overview of the relationship between LSCM as well as CA. Nevertheless, there are still some gaps in the literature that have to be discussed in future studies. In this section, we will discuss the main literature gap for LSCM and CA. One of the main gaps in the literature is the lack of empirical studies that investigate the impact of LSCM on CA in different industries (Rahman & Subramanian, 2012; Sołoducho-Pelc & Sulich, 2020; Sulistyo & Ayuni, 2020). While many studies have explored the relationship between LSCM as well as CA in the manufacturing industry (Bhamu & Sangwan, 2014), there is limited research in other industries, such as health-care, hospitality, and retail. As a result, it is difficult to determine whether the findings from manufacturing can be generalized to other industries. Therefore, there is a need for empirical studies that examine the relationship between LSCM as well as CA in different industries.

The second literature gap is the lack of attention given to the role of information technology (IT) in aiding the adoption of LSCM and enhancing CA (Boschi et al., 2018). Although some studies have acknowledged the importance of IT in LSCM, few have explored its impact on CA. As digital technologies like the Internet of Things (IoT), big data analytics, and blockchain become more widely used, there is a growing necessity for studies that explore how these technologies facilitate enabling LSCM and creating CA.

Additionally, the literature has focused on the benefits of LSCM for firms in terms of reducing costs and improving efficiency (Mendes dos Reis et al., 2014). However, there is limited research on the impact of LSCM on customer satisfaction and loyalty. Given that LSCM can enhance the responsiveness and flexibility of supply chains, it is likely to have a positive impact on customer satisfaction and loyalty. Therefore, research is required to conduct empirical studies that investigate how LSCM affects customer satisfaction and loyalty.

Furthermore, most of the literature has examined LSCM as a set of practices that firms can adopt to achieve CA (Panwar et al., 2015). However, there is limited research that examines the process of implementing LSCM and the challenges that firms face during the implementation process. As LSCM requires

significant changes in the organizational culture, processes, and structures, it is likely to face resistance from employees and other stakeholders (Lobato et al., 2021). Therefore, there is a need for research that examines the challenges of implementing LSCM and the strategies that firms can use to overcome these challenges.

Finally, most of the literature has examined the relationship between LSCM and CA at the firm level (Moori et al., 2013). However, there is limited research that examines the LSCM impact on supply chain performance as well as competitiveness at the industry level. Given that supply chains are interconnected and the performance of one firm can impact the performance of others, it is important to examine the LSCM impact on supply chain performance as well as competitiveness at the industry level. Thus, there is a need for a study that evaluates the LSCM impact on supply chain performance and competitiveness at the industry level.

10. Discussion

In the existing research, we discovered the relationship between LSCM and CA. Based on a systematic review of 55 articles, we identified 18 factors that have an impact on CA, including customer focus, flexibility, cost reduction, time-to-market, quality, information management, collaboration, innovation, strategic planning, supply chain integration, lean principles, technology, human capital, sustainability, risk management, supplier management, logistics management, and organizational culture. The findings of the current study suggest that LSCM can be an effective approach for improving CA, as it addresses many of these CFSs. By adopting lean principles and integrating all aspects of the supply chain, firms can reduce waste, enhance efficiency, and improve responsiveness to customer demands. Additionally, LSCM can promote a culture of constant collaboration and improvement, which may yield innovation as well as strategic planning.

Furthermore, this study revealed some gaps in the literature, particularly in terms of the lack of empirical studies that examine the relationship between LSCM and CA. Most of the studies we reviewed were conceptual or theoretical, which suggests a need for further empirical research to validate the findings and test the proposed relationships. Another gap in the literature is the scarcity of attention to the role of technology in LSCM and its impact on CA. With the rapid advances in digital technology and the increasing adoption of Industry 4.0 principles, it is important to understand how technology can be leveraged to enhance LSCM and improve CA. Moreover, this study highlights the importance of considering external factors, such as market conditions and customer demands, when implementing LSCM. Firms must be agile and flexible in responding to changes in the market and adapting their supply chain strategies accordingly.

11. Conclusion

In conclusion, this research aimed to examine the relationship between LSCM as well as CA. Based on a comprehensive review of 55 articles, it was found that LSCM has a significant impact on CA through various factors, including customer focus, flexibility, cost reduction, time-to-market, quality, information management, collaboration, innovation, strategic planning, supply chain integration, lean principles, technology, human capital, sustainability, risk management, supplier management, logistics management, and organizational culture. The literature review identified that there is still a gap in the literature concerning the precise nature of the relationship between LSCM and CA.

Future research should address this gap by conducting empirical studies to explore the relationship between LSCM and CA further and to identify other factors that may impact this relationship. Additionally, there is a need for more research on the practical implementation of LSCM in various industries and contexts. In terms of practical implications, this study provides useful insights for managers and practitioners on how to improve their SCM practices to achieve CA. By focusing on the CFSs identified in this study, firms can enhance their efficiency, responsiveness, and innovation capabilities. Finally, this research contributes to the current literature by offering an extensive review of the factors that impact CA in the context of LSCM. The findings suggest that LSCM can be a valuable tool for achieving CA and highlight the importance of considering internal and external factors when implementing LSCM strategies. Nevertheless, additional study is required to validate these findings as well as explore new avenues for improving LSCM practices in the future.

11.1. Research limitations

There are a few limitations to the existing research that must be acknowledged. Firstly, the study only analyzed a limited number of articles (55) from a specific time frame (2003-2023) and within a particular scope (LSCM and CA). While efforts were made to ensure the sample was diverse and representative, it may not be entirely extensive, and several pertinent articles may have been missed. Second, the study relied on a systematic literature review methodology that is subject to inherent limitations. For example, the inclusion and exclusion criteria used in the study may have excluded relevant articles or included irrelevant ones. In addition, the quality of the articles included in the study may vary, which could have influenced the findings. Finally, the study did not include primary data collection, and therefore, the findings are limited to the existing literature. While the analysis provides a valuable synthesis of the current state of research on LSCM and CA, primary data collection could provide further insights and validation of the findings. In spite of its constraints, this study's contributions, particularly its framework, significantly address the void in the existing literature and offer a foundation for scholars and professionals to delve deeper into the possibilities of attaining competitive advantage through the adoption of LSCM.

11.2. Future research agenda

Future research on LSCM and CA could focus on a number of areas to further advance the understanding and implementation of these concepts in various industries and contexts. Here are some potential directions for future research:

The impact of technology: With the increasing use of technology in SCM, future research could explore how technology can be leveraged to enhance the effectiveness of LSCM and how it can contribute to gaining CA (Garcia-Buendia et al., 2021a, 2023). Specifically, the research could explore how technologies, for instance, blockchain, IoT, as well as artificial intelligence, can be integrated into LSCM practices to streamline operations, minimize waste, as well as elevate customer satisfaction.

The role of collaboration: LSCM emphasizes collaboration among supply chain partners to optimize the flow of goods and information (Seth & Panigrahi, 2015). Future research could investigate how collaborative relationships impact CA, particularly in the context of global supply chains. Studies could explore how collaboration can help firms improve flexibility, responsiveness, and resilience and how it can contribute to better risk management and reduced costs.

The impact of cultural differences: As supply chains become more globalized, cultural differences can present challenges to the LSCM practices implementation (Lobato et al., 2021).

Future research could examine how cultural differences impact the effectiveness of LSCM and how firms can manage these differences to achieve CA. Studies could explore how cultural factors such as communication styles, attitudes towards risk, and expectations around collaboration impact supply chain performance and how firms can design LSCM practices that account for these factors.

The role of sustainability: Sustainability has become a vital consideration in SCM as firms seek to minimize their environmental impact as well as respond to growing consumer demand for sustainable products (Sony, 2019). Future research could explore how LSCM practices can contribute to sustainability goals and how sustainability can be leveraged to gain CA. Studies could examine how firms can implement sustainable practices throughout the supply chain and how these practices can help to enhance cost efficiency, minimize waste, as well as elevate customer loyalty.

The impact of disruption: Supply chain disruption can have significant impacts on firm performance, and the COVID-19 pandemic has emphasized the significance of building resilient supply chains. Additional studies could examine how LSCM practices may contribute to supply chain resilience and how firms can manage disruption to maintain CA. Studies could explore how LSCM practices such as lean inventory management, flexible manufacturing, and agile supply chain design can help firms respond to disruptions and maintain the continuity of operations.

The impact of the regulatory environment: The regulatory environment plays a significant role in shaping SCM practices, and future research could examine how regulatory changes impact LSCM and CA (Mendes dos Reis et al., 2014). Studies could explore how regulations such as trade policies, labor laws,

and environmental regulations impact supply chain operations and how firms can respond to these regulations to maintain competitiveness.

The role of human factors: Human factors such as employee training, motivation, and engagement can impact the success of LSCM practices (Moyano-Fuentes et al., 2021). Future research could explore how human factors contribute to CA in SCM and how firms can design LSCM practices that promote employee engagement and motivation. Studies could also investigate how firms can measure the effect of human factors on supply chain performance, as well as how they can leverage this information to improve LSCM practices continuously.

Regional contribution: Research in the developing regions and even some of the developed regions was not being carried out on lean supply chain management (LSCM). It is recommended that future research should be conducted in Australia, Africa, and other parts of Asia, including certain Gulf countries like Iraq.

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Author contributions

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Data availability

The authors confirm that the data supporting the findings of this study are available within the article.

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Appendix A

Appendix A shows the documents selected using the SLR. Column 1 indicates the author, Column 2 the title of the article, Column 3 the year of publication, and Column 4 the academic journal in which the document was published. Each row represents a single document.

List of selected papers reviewed and analyzed in article.

	Authors	Title	Year	Journal name
1	Garcia-Buendia N., Moyano-Fuentes J., Maqueira J.M., Avella L.	The lean supply chain management response to technology uncertainty: consequences for operational performance and competitiveness	2023	Journal of Manufacturing Technology Management
2	Manzoor U., Baig S.A., Hashim M., Sami A., Rehman H.-U., Sajjad I.	The effect of supply chain agility and lean practices on operational performance: a resource-based view and dynamic capabilities perspective	2022	The TQM Journal
3	Garcia-Buendia, N., Moyano-Fuentes, J., & Maqueira-Marin, J. M.	Lean supply chain management and performance relationships: what has been done and what is left to do	2021	CIRP Journal of Manufacturing Science and Technology
4	Moyano-Fuentes J., Maqueira-Marin J.M., Martínez-Jurado P.J., Sacristán-Díaz M.	Extending lean management along the supply chain: impact on efficiency	2021	Journal of Manufacturing Technology Management
5	Gaikwad L., Sunnapwar V.	Development of an integrated framework of LGSS strategies for Indian manufacturing firms to improve business performance: an empirical study	2021	The TQM Journal
6	Anvari A.R.	The integration of LARG supply chain paradigms and supply chain sustainable performance (A case study of Iran)	2021	Production & Manufacturing Research
7	Dzikron M., Djamaludin	Lean manufacturing model, supply chain management, and the role of government towards industrial competitiveness	2021	Journal of Engineering Science and Technology
8	Vanichchinchai A.	Exploring organizational contexts on lean manufacturing and supply chain relationship	2020	Journal of Manufacturing Technology Management
9	Ramachandran G.M., Neelakrishnan S.	Lean strategies to overcome low volume and high variety for enhanced delivery performance	2020	International Journal of Services and Operations Management
10	Anham S. and Nurcahyo R.	Implementation of Lean Supply Chain Management on Maintenance Repair and Overhaul using SCOR	2019	IEEE 6th International Conference on Engineering Technologies and Applied Sciences
11	Shashi, Centobelli P., Cerchione R., Singh R.	The impact of leanness and innovativeness on environmental and financial performance: Insights from Indian SMEs	2019	International Journal of Production Economics
12	Iyer, K. N., Srivastava, P., & Srinivasan, M.	Performance implications of lean in supply chains	2019	International Journal of Production Economics
13	Indrawati S., Budi Khoirani A., Clara Shinta R.	Model Development of Lean Action Plan Selection to Reduce Production Waste in Batik Industry	2018	IEEE 4th International Conference on Science and Technology (ICST)
14	Tortorella G.L., Giglio R., Limon-Romero J.	Supply chain performance: how lean practices efficiently drive improvements	2018a	Journal of Manufacturing Technology Management
15	Lotfi M., Saghiri S.	Disentangling resilience, agility and leanness Conceptual development and empirical analysis	2018	Journal of Manufacturing Technology Management
16	Distelhorst G., Hainmueller J., Locke R.M.	Does lean improve labor standards? Management and social performance in the Nike supply chain	2017	Management Science
17	Fercoq A., Lamouri S., Carbone V.	Lean/Green integration focused on waste reduction techniques	2016	Journal of Cleaner Production

(Continued)

Appendix A. (Continued)

	Authors	Title	Year	Journal name
18	Bhamu J., Sangwan K.S.	A framework for lean manufacturing implementation	2016	International Journal of Services and Operations Management
19	Gilal F.G., Gilal R.G., Jian Z., Gilal R.G., Gilal N.G.	Supply chain management practices as a contemporary source of securing competitive advantage and organizational performance: Evidence from the FMCs of Pakistan	2016	International Journal of Information Systems and Change Management
20	Zahraee, S. M.	A survey on lean manufacturing implementation in a selected manufacturing industry in Iran	2016	International Journal of Lean Six Sigma
21	Jasti N.V.K., Kodali R.	Development of a framework for lean production system: An integrative approach	2016	Journal of Engineering Manufacture
22	Seth D., Panigrahi A.	Application and evaluation of packaging postponement strategy to boost supply chain responsiveness: A case study	2015	Production planning & control
23	Brown K.A., Schmitt T.G., Schonberger R.J.	ASP, the art and science of practice: Three challenges for a lean enterprise in turbulent times	2015	Interfaces
24	Bevilacqua M., Ciarapica F.E., De Sanctis I., Mazzuto G., Paciarotti C.	A Changeover Time Reduction through an integration of lean practices: A case study from pharmaceutical sector	2015	Assembly Automation
25	Smith A.D., Rupp W.T.	Supply chain integration and innovation in a global environment: Case studies of best business practices	2015	International Journal of Logistics Systems and Management
26	Ab Talib, M. S., & Hamid, A. B. A.	Application of critical success factors in supply chain management.	2014	International Journal of Supply Chain Management
27	Hibadullah, S. N., Habidin, N. F., Zamri, F. I. M., Fuzi, N. M., & Desa, A. F. N. C.	Critical success factors of lean manufacturing practices for the Malaysian automotive manufacturers.	2014	International Journal of Quality and Innovation
28	Wen C.L., Wee H.M., Wu S.	Revisiting lean manufacturing process with vendor managed inventory system	2014	Proceedings of the 5th International Asia Conference on Industrial Engineering and Management Innovation (IEMI2014)
29	Duarte S., Cruz-Machado V.A.	Lean and green supply chain performance: A balanced scorecard perspective	2014	Proceedings of the Eighth International Conference on Management Science and Engineering Management
30	Mendes dos Reis J.G., Machado S.T., de Oliveira Costa Neto P.L., de Alencar Nääs I.	Aligning Supply Chain Strategy with Product Life Cycle Stages	2014	IFIP International Federation for Information Processing 2014
31	Ping C.H., Zakuan N., Omain S.Z., Sulaiman Z., Saman M.Z.M., Ariff M.S.M.	Development of supply chain management practices and competitive advantages in manufacturing industries: A review	2014	Applied Mechanics and Materials
32	Özdemir, A. I., Simonetti, B., & Jannelli, R.	Determining critical success factors related to the effect of supply chain integration and competition capabilities on business performance	2014	Quality & Quantity
33	Lyons A.C., Ma'Aram A.	An examination of multi-tier supply chain strategy alignment in the food industry	2014	International Journal of Production Research
34	Smith A.D., Synowka D.P.	Lean operations and SCM practices in manufacturing firms: Multi-firm case studies in HRM and visual-based metrics	2014	International Journal of Procurement Management
35	Belekoukias, I., Garza-Reyes, J. A., & Kumar, V.	The impact of lean methods and tools on the operational performance of manufacturing organisations	2014	International Journal of Production Research
36	Wiengarten F., Fynes B., Onofrei G.	Exploring synergetic effects between investments in environmental and quality/lean practices in supply chains	2013	Supply Chain Management
37	Lau K.H., Wang J.	Application of lean thinking in supply chain management by the small and medium sized manufacturers in China: A status survey	2013	International Journal of Information Systems and Supply Chain Management
38	Baysan S., Cevikan E., Satoglu Ş.I.	Assessment of energy efficiency in lean transformation: A simulation-based improvement methodology	2013	Theory and Applications
39	Yuan H.-X., Wang X.-Q.	Design of lean supply chain for real estate operations	2013	International Asia Conference on Industrial Engineering and Management Innovation (IEMI2012) Proceedings

(Continued)

Appendix A. (Continued)

	Authors	Title	Year	Journal name
40	Powell D., Skjelstad L.	RFID for the extended lean enterprise	2012	International Journal of Lean Six Sigma
41	Celis O.L.M., García J.M.S.	A technological approach to the development of logistic projects using 'Lean Six Sigma'	2012	Estudios gerenciales
42	Anvari, A., Hossein, H. S. M., Yusof, I., Mohd, Y. R., Norzima, Z., & Majid, M.	Performance Measurement System Through Supply Chain	2011	World Applied Sciences Journal
43	El-Tawy N., Gallear D.	Management to Lean Manufacturing	2011	Proceedings of the European, Mediterranean and Middle Eastern Conference on Information Systems - Informing Responsible Management: Sustainability in Emerging Economies, EMCIS 2011
44	De Oliveira Cunha L., Alves J.M., De Souza J.P.E.	The proposal for a method of lean manufacturing implementation to support the quality management system: Application to an organization in the aeronautical industry	2011	Proceedings of the 21st International Conference on Production Research: Innovation in Product and Production, ICPR 2011
45	Chitakatira H., Al-Bazi A.	A frame-work to applying lean principles to air cargo logistics	2011	The OR Society OR53 Annual Conference 2011 - Nottingham, United Kingdom. Proceedings
46	Jasinavičius R., Jasinavičius N.	Strengthening enterprise competitiveness by synchronizing supply chain	2011	Business: Theory and Practice
47	Konecka, S.	Lean and agile supply chain management concept in the aspect of risk management.	2010	LogForum
48	Li S., Arokiam I., Jarvis P., Garner W., Moradi G., Wakefield S.	Development of a Robust Supply Chain for Dynamic Operating Environment	2010	International Journal of Economics and Management Engineering
49	Chen H., Lindeke R.R., Wyrick D.A.	Lean automated manufacturing: Avoiding the pitfalls to embrace the opportunities	2010	Assembly Automation
50	Wong Y.C., Wong K.Y., Ali A.	A study on lean manufacturing implementation in the Malaysian electrical and electronics industry	2009	European Journal of Scientific Research
51	Sauer G.	Supply Chain Optimization using Lean Manufacturing - Strategies, Methodologies and Requirements	2008	FISITA 2008 World Automotive Congress, Munich, Germany
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