



## Lean Supply Chain Management and Firm Performance: A Review

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### Abstract

This article reviews the existing literature on the relationship between lean supply chain management (LSCM) practices and Firm Performance. (LSCM), with its focus on waste reduction and continuous improvement, has proven to be an outstanding approach to improving operational efficiency and competitiveness. The review examines the various dimensions of (LSCM), including waste elimination, value stream mapping, just-in-time inventory management and continuous improvement initiatives. It analyzes the theoretical frameworks underlying (LSCM) and their impact on key performance indicators such as cost reduction, quality improvement, delivery performance and customer satisfaction. The review also examines the contingent factors that influence the effectiveness of (LSCM) in different organizational and industry contexts. It identifies research gaps and suggests future research directions to further improve the understanding of the relationship between lean supply chains and business performance. The results of this review provide valuable insights for managers looking to implement (LSCM) practices and improve their organization's overall performance.

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### 1. Introduction

An increasing number of modern business firms today are cultivating and embracing a new collaborative business model called lean supply chain management in the face of an extremely challenging and competitive business scenario (Novais *et al.* 2020) <sup>[1]</sup>. A lean system is designed to maximize the use of resources, eliminate waste, and reduce cycle time. The lean principles are: 1) enhancing efficiency with faster response time, 2) improving quality, and 3) waste reduction (Kumar *et al.* 2022) <sup>[2]</sup>. A lean system focuses on improving the quality of the product that the customer receives; it also tries to reduce the prices that the customer has to pay in order to achieve those improvement objectives. Supply chain management systems share the lean system's objective of reducing waste in business operations (Leksic *et al.* 2020) <sup>[3]</sup>. They consist of various autonomous business functions that are linked together by operating within the constraints and imperatives of a larger pipeline (Standahl and Karlsen 2024) <sup>[4]</sup>. Due to its very nature, lean thinking is a continuous learning experience that involves constant comparisons between the desired performance, which represents the objectives, the state of current performance, and continuous redesigning and verification of activities and processes in light of new strategies for performance improvements (Kakouris *et al.*, 2022) <sup>[5]</sup> (Jekiel, 2020) <sup>[6]</sup>. This paper aims to answer the question, "How are the implementation of lean supply chain management principles and its associated practices likely to impact firm performance?" Determinants of firm performance from three integrated perspectives: financial, marketing, and operations are researched. It is expected that this extensive exploration will contribute to conveying how different parts of a firm are likely to be affected as a result of implementing lean supply chain management assumptions and principles (Koskela *et al.* 2020) <sup>[7]</sup>.

### 2. Theoretical Framework

The conceptualization of Lean Supply Chain Management (LSCM) is rooted in both supply chain theory and LSCM practices (El *et al.* 2023) <sup>[8]</sup>.

The development of promotional, informational, and inventory management strategies, such as Quick Response and Efficient Supply, has paved the way for the establishment of LSCM assumptions. Different philosophical, technical, technical-economic, and process-engineering development stages can be identified (Näslund, 2024) <sup>[9]</sup> (Binsfeld & Gerlach, 2022) <sup>[10]</sup>. Since these notions are subject to extensive debates, we must take a closer look at how they have evolved. Lean manufacturing is a set of integrated socio-technical concepts that aim to eliminate manufacturing waste. In accordance with the principles of Lean thinking, several sought to translate this manufacturing concept to the supply chain more than two decades ago (Marsilio and Pisarra 2021) <sup>[11]</sup>.

Lean thinking-based LSCM does not aim at the elimination of stocks only: “The strategies lead to achieving waste elimination by making waste visible, allowing waste to be removed through a consistent and continuous effort emphasizing problem solving.” The coordinated value stream that extends from the customer through the supply chain on the upstream side is to be managed with LSCM: “This has resulted in supply chain management systems known as ‘Lean Supply Chain Management’”. (Kolawole *et al.*, 2021) <sup>[12]</sup> (Gargalo *et al.* 2021) <sup>[13]</sup>. The original development of LSCM and its relation to supply chain strategy is rooted in operations management in various disciplines such as economics and sociology (Mollenkopf *et al.* 2024) <sup>[14]</sup>. Though LSCM practices may be expressed by measures of lead time, response to customer demand, inventory characteristics, price, service, and supplied quality, total cost is often used to express the relation between competitive lead time and supply chain performance (Suri, 2020) <sup>[15]</sup> (Gao *et al.* 2020) <sup>[16]</sup>. The relation between LSCM practices and expectations as outcome measures relates to customer-related inventory found on the merchandise unit level; delivery reliability and delivery lead times, improved information, and communication efficiency can be expected to serve as an outcome (Liang *et al.* 2023) <sup>[17]</sup> (Amporfro *et al.* 2021) <sup>[18]</sup>. The connection between LSCM and firm performance is introduced (Garcia-Buendia *et al.* 2021) <sup>[19]</sup>. A number of literature paths can be parsed or theorized regarding the relation between LSCM practices and firm results. It includes the linkage between strategies and firm performance, the creation of added value also connected with strategic aims, and the generation of financial effects (Garcia-Buendia *et al.* 2023) <sup>[20]</sup> (Stank *et al.* 2024) <sup>[21]</sup>.

Henceforth, this literature posits an influence of LSCM practices and firm performance in order to be able to analyze their relation empirically (Alam, 2022) <sup>[22]</sup>. The behavioral theory of the firm postulates that organizations are coalitions of interest groups. There is an environmental uncertainty determining the condition of the firm's manufacturing processes or the uncertainty on the demand side (Mithani & O'Brien, 2021) <sup>[23]</sup>. To face the problems of cooperation or coordination, the firm's management is necessary to establish institutions that act as a “mediator.” In uncertain environments characterized by a large quantity of fluctuation in the operations of the organizations, the association of lean practices inside this environment couldn't be successful and vice versa (Love & Matthews, 2022) <sup>[24]</sup>. Changes required for a lean transformation would lead to difficulties in a partnership. Building different achievable scenarios for Lean and non-Lean institutional settings, the following can be stated. Several regulatory implications of LSCM are provided

(Fadnavis *et al.*, 2020) <sup>[25]</sup> (Evans *et al.* 2023) <sup>[26]</sup>. The contention in the literature is intuitively known but difficult to quantify. Several theoretical models exist that are applicable to the problem of empirically evaluating performance effects of LSCM practices (Garcia-Buendia *et al.* 2023) <sup>[20]</sup> (Garcia-Buendia *et al.* 2021) <sup>[19]</sup>.

## 2.1 Lean Supply Chain Management (LSCM)

Lean supply chain management (LSCM) is considered a unique management philosophy that is different from the traditional approaches to supply chain management. It is embedded in the practices and principles pioneered within lean manufacturing (Alvim & Oliveira, 2020) <sup>[27]</sup> (Jedliński, 2021) <sup>[28]</sup>. Its prime focus is to have smooth movement of goods across the supply chain with continuous improvement in terms of reducing waste (Wisner *et al.*, 2021) <sup>[29]</sup>. The main principles of lean include using a pull system, takt time, and a smooth production flow, which centers on the principle of balance and continuous improvement in delivering high quality (Gebeyehu *et al.*, 2022) <sup>[30]</sup>. In essence, LSCM is not about being “lean” with minimum inventory or no waste, but LSCM is a lean overall approach to supply chain management where the final goal is agility, efficiency, excellence, and customer satisfaction (Rossini *et al.* 2023) <sup>[31]</sup> (El *et al.* 2023) <sup>[8]</sup>. An efficient supply chain, to a greater extent, has become a strategic weapon and competitive advantage for many moves and countermoves in an attempt to bring efficiency gains to varying degrees (Hofer *et al.* 2022) <sup>[32]</sup>. These practices range from just-in-time, total quality management, and continuous replenishment, to collaboration between trading partners, outsourcing processes, or the entire warehousing and distribution functions, and manufacturing under the roof or build-competes from other original equipment manufacturers known as original design manufacturers (Arjona *et al.* 2020) <sup>[33]</sup> (Brakman *et al.* 2020) <sup>[34]</sup>. Allied industry focus, such as the healthcare sector, adapts these practices to improve supply chain processes and customer service, which in turn reduces cost and time (Ralston and Blackhurst 2020) <sup>[35]</sup> (Schneller *et al.*, 2023) <sup>[36]</sup>. The relationship between the practices of LSCM and better performance of the entire supply chain needs to be supported by some important methodological approaches such as value stream mapping and others. On the whole, LSCM means making more value at less cost to the final utilization of the product, and this is at the heart of what businesses set out to do (Garcia-Buendia *et al.* 2021) <sup>[19]</sup>. The uptake of these principles and active partnership role to polish the supply chain is a positive step that supports the belief that LSCM is connected to SCM better management practice. Hence, supporting LSCM research would indirectly support supply chain research in general (Takeda-Berger *et al.* 2021) <sup>[37]</sup>.

## 3. Methodology

In the systematic review, we followed a structured review that provided stages for the review processes. In the stages, we identified the research aim, eligibility criteria, and the information sources (Garritty *et al.* 2021) <sup>[38]</sup>. We employed a systematic review as a framework during the review process (Kumar *et al.* 2023) <sup>[39]</sup>. The systematic review employs a number of strategies to minimize bias and, in doing so, creates a context to prioritize or select the most appropriate sources of evidence for decision-making. We followed the system approach for developing lean supply chain

management (Acciarini *et al.*, 2021) <sup>[40]</sup> (Kordzadeh and Ghasemaghaei2022) <sup>[41]</sup>. All published articles were important, although the most recent publications were taken into consideration. An extensive search was conducted in various databases in the search domain (Zhu & Liu, 2020) <sup>[42]</sup>. The data search included internet search engines containing relevant articles, such as summarization and supply chain relationships, manufacturing and services, lean management and supply chain, and lean implementation (Higgins *et al.* 2020) <sup>[43]</sup> (Batrimenko *et al.* 2022) <sup>[44]</sup>. Electronic issues of relevant journals were searched, conference proceedings were reviewed, and eprints were used as part of the investigation (Bourne *et al.* 2020) <sup>[45]</sup>. To a great extent, the goal was to include all lean supply chain articles. Indeed, the library had more sources than the final number selected in this review (Khorasani *et al.* 2020) <sup>[46]</sup>. The approach for data analysis is quantitative and qualitative (Renjith *et al.* 2021) <sup>[47]</sup> (Lemon & Hayes, 2020) <sup>[48]</sup>. The review selects the most important articles about lean supply chain management (Rossini *et al.* 2023) <sup>[31]</sup>. The articles include journals, conference proceedings, peer-reviewed proceedings, as well as the latest articles in press, which are automatically published in the domain of supply chain management (Chauhan and Singh. 2020) <sup>[49]</sup>.

### 3.1 Literature search and selection criteria

Different types of databases were searched to complete the final review. At the first step, we searched reputable online databases for academic articles and conference papers (Gusenbauer & Haddaway, 2020) <sup>[50]</sup> (Harari *et al.* 2020) <sup>[51]</sup>. We used a combination of search terms relevant to our research question, including but not limited to 'lean supply chain,' 'supply chain management,' and 'performance.' In addition to this, we also searched for books, case studies, together with research projects to understand the current practices and possible cutting-edge research. All search results were taken into consideration; there are a few inclusion and exclusion criteria that we applied to leverage rigor in our review process (Gusenbauer & Haddaway, 2020) <sup>[50]</sup> (Aliannejadi *et al.* 2021) <sup>[52]</sup>.

Firstly, we only included papers in academic journals or conference proceedings since a literature review is instrumental in obtaining an up-to-date snapshot of the current state of research in an area. Secondly, in relation to the inclusion criteria relevant to the research question, we included papers with a main focus on LSCM and its relationships with firm performance (Garcia-Buendia *et al.* 2021) <sup>[19]</sup> (Garcia-Buendia *et al.* 2023) <sup>[20]</sup>. As a result, papers were included if they examined the elements of LSCM, concepts, enablers, impact on SC, and performance, etc. We did not settle on published date parameters; if we believe the paper is relevant and of methodological rigor. In addition to the focus of the review, the included papers should also report the use of empirical research such as case studies, surveys, and 'action research' because we regard empirical research to be of high quality with regard to the papers' validity (Garcia-Buendia *et al.* 2021) <sup>[19]</sup> (Garcia-Buendia *et al.* 2023) <sup>[20]</sup>. To date, no meta-analysis paper has been conducted specifically focused on LSCM; hence, there is a need for a more diverse selection that allows researchers to explore and reflect on the findings obtained. The validity of the search criteria was assured by conducting pilot searches to examine any potential articles identified in relevant journals (Khorasani *et al.* 2020) <sup>[46]</sup> (Illahi & Mir) <sup>[53]</sup>.

### 4. Lean supply chain management practices

A number of practices contribute to the application of 'lean' in the supply chain. Some of these have been developed from lean within manufacturing, such as the multi-echelon approach described. Others have been developed more specifically for supply chain management itself, such as 'quick response' and 'agile supply' since these include the analysis of supply chain and logistics (Singh *et al.*, 2020) <sup>[49]</sup> (Awan *et al.* 2022) <sup>[55]</sup>. Four approaches that have been identified and categorized fit into this latter category because of their supply chain content. These are 'quick response,' 'agile supply,' 'integrated relationships,' and 'responsive supply chain.' It can be seen that the distinction between lean and the four other approaches presented is not as clear-cut as it might appear from textbooks that separate these approaches as entirely different paradigms (Alzoubi *et al.* 2022) <sup>[56]</sup> (Srinivasan *et al.*, 2020) <sup>[57]</sup>.

**Classification of Lean Supply Chain Management Practices**  
The viewpoint of commodities, raw materials, work-in-process, finished goods, and ultimately customers and waste as commodities is fundamental to the philosophy of lean. Lean focuses on eliminating waste, where waste is any activity or resource use that adds time or resources but does not add value. This has always been possible in manufacturing where, for an individual firm, the commodities or products are stockpiled goods or possibly intermediate goods (Dewi *et al.* 2021) <sup>[58]</sup> (Martínez Sanahuja, 2020) <sup>[59]</sup>. However, for a supply chain network, we cannot view the final goods as commodities that we are trying to maximize their flow, but rather as commodities that already exist and are awaiting to be sold (Hader *et al.* 2022) <sup>[60]</sup> (Sheffi, 2023) <sup>[61]</sup>. To assist managers and practitioners, the principles can be restated from a supply chain perspective. First, this entails the minimization of variation within the supply chain through the use of standardized best practices across the supply chain. Second, in a bid to manage the flow of goods, a number of supporting logistics tools can be used (Bag and Rahman2023) <sup>[62]</sup> (Belhadi *et al.* 2024) <sup>[63]</sup>.

These are either practices that increase the efficiency of the supply chain or design practices that increase the effectiveness of the supply chain. This whole area is vast. Some of these practices are developed for supply chain research and aims, perspectives, and tools from logistics/cross-functional strategies/value-added techniques (Acquah *et al.* 2021) <sup>[64]</sup> (Agyabeng-Mensah *et al.* 2020) <sup>[65]</sup>. The combined use of lean in conjunction with the practices has been referred to as Lean Supply Chain Management. Businesses use a variety of tools and techniques to identify and, if possible, reduce waste. Some close to the focus of our research include: Value Stream Mapping (Abdelilah *et al.* 2023) <sup>[66]</sup> (Moyano-Fuentes *et al.* 2021) <sup>[19]</sup>. Value stream mapping is a lean manufacturing technique used to analyze the flow of materials and information currently required to bring a product to a consumer. The ultimate aim of value stream mapping is to identify waste in time, material that is, the time from receipt of customer order to receipt of cash; the time for information flow from the consumer back to the producer; the setup, lead times, wait times, and transportation times associated with getting goods from the production floor to the consumer (Shabeen & Krishnan, 2022) <sup>[68]</sup> (Yanti *et al.*, 2022) <sup>[69]</sup>.

Continuous Improvement 'Continuously improving key processes through the continuous, incremental, and ongoing series of improvements' has been described as the Japanese

philosophy of continuous improvement. Every company looks for short-term, tactical achievements, for example, minding the immediate, tactical 'quick win' effect rather than working in detail through the process. That is not continuous improvement (Levinson, 2024) <sup>[70]</sup> (Huang *et al.* 2022) <sup>[16]</sup>. Continuous improvement, in the true sense, is the struggle for long-term, strategic improvement, which depends upon continual reworking of the process. In the production process, the objective may be a 'zero defects' environment (Matthews *et al.* 2024) <sup>[72]</sup>.

#### 4.1 Just-in-Time (JIT)

Just-in-time (JIT) is a practice within Lean Supply Chain Management (LSCM) that is very closely related to LSCM. The implementation of lean practices in firms' operations has made JIT one of the most beneficial approaches for manufacturing practitioners (Saini & Singh, 2020) <sup>[49]</sup> (Lara *et al.*, 2022) <sup>[33]</sup>. The concept of JIT can be addressed from the perspective of Lean Thinking, Inventory Strategy, and Lean Supply Chain Management. Lean Thinking focuses on a working approach, resources, learning, and lean tools such as SMED, Kanban, 5S, and TPM. JIT can be seen in its approach to managing operations, which focuses on the integration of suppliers, manufacturers, and consumers to eliminate non-value-added activities. Based on volume, a strategy can be used to reduce costs; an inventory strategy is adjusted based on the volume produced and market demands (Gondi & Kurugonda, 2020) <sup>[75]</sup> (Ahmad *et al.*, 2022) <sup>[76]</sup>. The company receives goods only as needed, and all goods in the inventory are expected to be used up prior to the shift in demand in the market. As a consequence, the goods from suppliers can be considered as having production as the input (Song *et al.*, 2021) <sup>[77]</sup> (Pástor *et al.*, 2022) <sup>[78]</sup>.

JIT has a number of benefits, such as reducing the cost of carrying inventory. Rapid receiving activities can also make the company responsive to customer demands while maintaining low levels of capacity, improving customer service, increasing usable warehouse space, and reducing the required cost of packaging storage containers (Haekal, 2023) <sup>[79]</sup> (Balkhi *et al.*, 2022) <sup>[80]</sup>. In an applied study of 226 companies, it was found that a significant percentage of the companies responding were using JIT approaches. While internal practices may be discussed as representing external customer/supplier links, it suggests a high level of possible JIT implementation (Nugroho *et al.*, 2022) <sup>[81]</sup> (Agyabeng-Mensah *et al.* 2021) <sup>[64]</sup>. Several companies have been very successful in JIT implementation and have received substantial financial gains from this strategy (Hussein & Zayed, 2021) <sup>[83]</sup>. Major retailers are also managing inventory, providing a direct relationship between sales and purchasing through their suppliers. The shotis sent to a manufacturing system where the item is assembled and then sent to the end user. Research regarding the implementation of JIT in plywood roofing manufacturing has been conducted. A number of articles on JIT have been compiled to analyze the different elements of JIT implementation in a firm (Laakkonen, 2023) <sup>[84]</sup> (Kujanpää, 2024) <sup>[85]</sup>.

#### 5. Impact of lean supply chain management on firm performance

Over the years, efficient supply chain management has attracted the attention of researchers and practitioners from around the world. However, with the rapid advancements in information technologies, shortened product life cycles, and

geographic expansion of the supply chain, the focus has shifted from efficient to lean supply chain management. Lean supply chain management is observed to result in substantial improvements to an organization's efficiency, cost, customer satisfaction, and product quality (Moyano-Fuentes *et al.* 2021) <sup>[19]</sup> (Singh *et al.*, 2020) <sup>[49]</sup>. More specifically, a comprehensive review of the literature allowed for the identification of two main ways firms can improve supply chain performance through lean supply chain management (Rossini *et al.* 2023) <sup>[31]</sup>. First, lean supply chain management can be used to improve metrics associated with financial performance. Second, lean supply chain management can facilitate improvements to metrics associated with operational performance that then serve to enhance a firm's competitive advantage (Piotrowicz *et al.* 2023) <sup>[86]</sup>. Lean can be obtained through a systematic study of supply chain design and redesign, and numerous case studies have been published that shed light on the outcomes of lean supply chain management (Vlachos & Malindretos, 2023) <sup>[87]</sup> (Tay & Loh, 2022) <sup>[88]</sup>. Systematic or statistical field studies have reported similar outcomes, enabling researchers to gather data and identify the financial or operational metrics that showed a causal relationship with lean supply chain management. However, the findings are mixed because of the possible involvement of other factors diluted in field conditions (Khorasani *et al.* 2020) <sup>[46]</sup> (Jackson *et al.* 2024) <sup>[89]</sup>. A review of lean supply chain management must take into account the potential trade-offs necessary when deciding which trade-offs are most advantageous for the firm's operations and planning, as well as the firm's long-term strategic goals. Thus, there is a set of operational performance metrics to capture the quantitative aspects of supply chain performance, given that the barriers and limitations are mostly related to supply chain operations (Queiroz *et al.* 2023) <sup>[90]</sup> (Rajesh, 2021) <sup>[91]</sup>.

#### 5.1 Financial Performance

A research agenda emerges seeking to quantify the direct financial benefits (if any) resulting from the "adoption of a Lean supply approach." It is comparatively easy to identify the pitfalls of non-lean supply chains, such as the cost of holding too much inventory and the increased risk associated with waste in the supply chain (Narayanan *et al.* 2022) <sup>[92]</sup> (Novais *et al.* 2020) <sup>[1]</sup>. The aim of the present review is to systematically identify these direct financial benefits and disbenefits that are identified in the literature. It is argued that, as the amount of human effort required is implicitly associated with waste, and the cure to waste is the application of resources and effort, Lean supply chain management can elevate financial performance in several ways (Narayanan *et al.* 2022) <sup>[92]</sup> (Moyano-Fuentes *et al.* 2021) <sup>[19]</sup>. Chief among these are a reduction in inventory levels, which are financially costly in terms of the capital tied up for its acquisition and the systems necessary to handle it. A move towards a just-in-time approach also reduces stock turns, which in turn results in less Money tied up in stock and increased levels of liquidity, which is an important indicator of a firm's liquidity (Capponi *et al.*, 2023) <sup>[93]</sup> (Jean, 2024) <sup>[94]</sup>. There are also reductions in the costs required to handle inventory, as lower inventories require reduced handling in the form of raw materials, work in progress, and spending on de-stocking operations at various levels of the supply chain. This can be seen as a target for intermediation and customer service levels (Pasupuleti *et al.*, 2024) <sup>[95]</sup> (Friday *et al.* 2021) <sup>[96]</sup>.

The literature is rife with examples of such relationships, some of which are illustrated in various sections. The nature of the more qualitative, stakeholder-centered measures means that their application at the firm level is more complex than that of financial ratios (Loughran and McDonald 2024) <sup>[97]</sup> (Apedo-Amah *et al.* 2020) <sup>[98]</sup>. Commercially sensitive information has been identified as a key barrier to development, and despite continued research, both academics and industry are less clear on methods of publicly verifying the mediation of these barriers (Ogbuke *et al.* 2022) <sup>[99]</sup>. These barriers may be because many Lean management tools are costed in terms of staff time and effort. Although the relationship between Lean practices and firm performance is highlighted, not all associations are positive (Saini & Singh, 2020) <sup>[49]</sup>. An analysis of a number of case studies indicated how the adoption of LSCM practices, including quality-based supplier relationships that focus on reduced lead times between ordering and delivery, was beneficial to a number of firms with similar Lean practices (Garcia-Buendia *et al.* 2023) <sup>[20]</sup> (Takeda-Berger *et al.* 2021) <sup>[37]</sup>.

## 5.2 Operational Performance

It is commonly agreed that implementing LSCM practices delivers operational performance benefits to the firm. Redefinition of the production process, which puts emphasis on removing all activities adding no value from this process, should enhance production processes as well (Garcia-Buendia *et al.* 2023) <sup>[20]</sup> (Khawka *et al.* 2024) <sup>[100]</sup>. LSCM has the potential to reduce lead time significantly between batches, lot sizes, and units produced. Small volumes and frequent changes in product design and technology that typically characterize lean practices in manufacturing and the supply chain result in shorter cycle times for the production of goods, services, and products (Hamza *et al.* 2024) <sup>[101]</sup> (Chu *et al.*, 2021) <sup>[102]</sup>. As such, LSCM may be said to lead to improvements in overall operational efficiency and organizational effectiveness. Actual measurements taken by firms using LSCM initiatives use a number of key performance indicators that are correlated with operational performance to measure successful implementation of LSCM initiatives (Garcia-Buendia *et al.* 2023) <sup>[20]</sup> (Moyano-Fuentes *et al.* 2021) <sup>[19]</sup>. Specifically, improvements in the length of lead time, a reduction in defect rates and yields, and improvements in overall process cycle times are often used as measures to assess the effectiveness of lean initiatives. Quality-based performance measures engage the workforce in delivering increasingly lean products to deliver improvements in customer service and satisfaction. Above all, achieving improvements in the quality of the product should not be seen as a one-sided event (Yilmaz *et al.* 2022) <sup>[103]</sup> (Sharma *et al.* 2022) <sup>[43]</sup>. These are processes of continuous collective improvement that can only be successful if all stakeholders are committed to the ethos of the work. LSCM practices are many and varied, encompassing a huge range of possible outcomes, from the mundane to the spectacular. In terms of operational improvements, none can be regarded as magisterial (Garcia-Buendia *et al.* 2021) <sup>[19]</sup> (Khawka *et al.* 2024) <sup>[100]</sup>. The key ingredients in the quest for operational excellence are not systems and structures of working in this case, but the employees themselves. Any company that operates far below the statistical generating time can be said to have eliminated waste and created value both within operations and throughout the supply network (Trakulsunti *et al.* 2023) <sup>[105]</sup>

(Moktadir *et al.* 2020) <sup>[106]</sup>. On average, a portion of total lead time in manufacturing may be defined as value-added, with the remainder being wasted (Martínez Sanahuja, 2020) <sup>[59]</sup>. Examples of the operational efficiency advantages and improvements that can be accomplished through lean practice are numerous and include the near elimination of work in process in combined supplier–purchaser systems, the replacement of a human queue to one of parts at a components facility, and considerable systematic improvements in organization-wide labor productivity (Hopp & Spearman, 2021) <sup>[107]</sup>. In addition, LSCM played a crucial role in the integration of three plants in Europe to win a joint contract. However, it is not enough to plan, oversee through a series of dedicated meetings, and control the implementation of LSCM (Benslimane *et al.* 2024) <sup>[108]</sup> (Abouemara *et al.*, 2024) <sup>[109]</sup>. There are many hurdles to overcome in efforts to foster a lean environment along an entire supply chain. Major obstacles are likely to be experienced in attracting a regular supply of compliant suppliers at the right price and reassuring shareholders by achieving bottom-line benefits all year round (Huq & Stevenson, 2020) <sup>[110]</sup>. By being able to pull products from one plant or even one country very quickly and cheaply, a company can improve its competitive position faster and reduce the effect of changes in demand and the short product life cycles that have become the norm (Alshurideh *et al.* 2023) <sup>[111]</sup>. This is why many companies are adopting a lean approach to supply management to help position themselves competitively in their global market (Rashad & Nedelko, 2020) <sup>[112]</sup>.

## 6. Case Studies

During the past two decades, many companies made significant strides toward adopting Lean Supply Chain Management (LSCM) within their existing supply chain networks (El *et al.* 2023) <sup>[8]</sup>. The results have shown that transitioning to LSCM has become increasingly necessary because it can significantly reduce waste, improve productivity, and minimize time to market (El *et al.* 2023) <sup>[8]</sup>. The introduction of recent manufacturing trends and numerous technologies has paved the way for the growth of LSCM. The objective of this paper is to introduce the concept of LSCM. By conducting case studies, we can investigate the main objectives of our study: to identify the significant success factors that contribute to achieving the perfect LSCM transition, to study and analyze the historical background of case study participants, to recognize the goals of studying Lean and LSCM, to identify the reporting format for each case study, and to consider brief implications for practice and a basis for future research. Case Studies (Rossini *et al.* 2023) <sup>[31]</sup> (Näslund, 2024) <sup>[9]</sup>. This section provides a variety of case studies in different fields and validates the successful implementation of LSCM with several practical applications (Nguyen & Le, 2022) <sup>[113]</sup>. These case studies show how some industries have engaged in lean production chains or impulses to pursue their theoretical and practical strategies and have had a clear impact on their economic and non-economic outcomes. For each image, I describe the main challenges that must be addressed and the actions associated with the change (Henao and Sarache 2024) <sup>[114]</sup> (Chien *et al.*, 2022) <sup>[115]</sup>. Key takeaways and lessons learned are emphasized in the discussion. Comparison of different industries provides a common framework and a proven idea for managers to understand and apply lean chain strategies

(Rossini *et al.* 2023) <sup>[31]</sup> (Piotrowicz *et al.* 2023) <sup>[86]</sup>. An in-depth view of case studies in terms of actual operational conditions and strategies offers a great way to support the development of theoretical frameworks discussed in the investigation (Welch *et al.* 2022) <sup>[116]</sup>.

## 7. Challenges and limitations

Lean Supply Chain Management (LSCM) has many potential advantages, but there are substantial challenges associated with its implementation (Khawka *et al.* 2024) <sup>[100]</sup>. Key among these are internal organizational barriers, such as a culture that opposes or resists change or reliance on ways of working that are embedded in the firm's routines and technological difficulties, including expensive or incompatible information technology solutions (Ali *et al.* 2020) <sup>[117]</sup> (Kaur *et al.* 2021) <sup>[118]</sup>. Cultural issues have been linked to difficulties in changing organizational processes that are based on the well-worn practice of business process optimization (Zarandona *et al.* 2024) <sup>[119]</sup>. The complexity of changing technology-centric organizations and an overreliance on quantitative methods and lean tools can also be barriers (Trollman *et al.*, 2024) <sup>[120]</sup>. A further issue relates to the fact that the various benefits of lean are not explicitly captured in some performance measures. It is argued that contemporary performance measures should combine operational and financial variables and reflect the perspectives of a wider range of stakeholders to gain a greater understanding of the performance impacts of lean (Dieste *et al.* 2021) <sup>[121]</sup> (Hernandez-Matias *et al.* 2020) <sup>[122]</sup>.

Some limitations of this study must be acknowledged. It is difficult to measure all of the impacts of LSCM effectively. Obtaining empirical evidence of the impact of LSCM was hampered by the fact that the data did not adequately represent the variables necessary for a complete theory (Herden *et al.*, 2020) <sup>[123]</sup> (Khawka *et al.* 2024) <sup>[100]</sup>. The restrictions on access to the organizations involved meant that working in depth with either their suppliers or clients was not possible (Flehsig *et al.* 2022) <sup>[124]</sup> (Duan *et al.* 2021) <sup>[125]</sup>. Furthermore, in many cases, organizations were unable to separate LSCM impacts from the other changes they were making, rendering measurement an imprecise task. Most of the contemporary research has been done with a focus on Western countries (Biesta, 2021) <sup>[126]</sup> (Eriksen *et al.* 2021) <sup>[127]</sup>. The management of supply chains, particularly logistics providers, in the Asia Pacific has significant differences compared to those in Western countries (Pató *et al.*, 2022) <sup>[128]</sup> (Lau *et al.*, 2022) <sup>[129]</sup>. The complexities associated with some developing countries are barriers to applying globally regarded best practices in the supply chain management of organizations. The importance of being conscious of issues that are peculiar or indigenous to some developing countries is vital, as there are differences between cultures in Eastern countries and Western countries (Rahman *et al.* 2020) <sup>[62]</sup> (Asif *et al.* 2020) <sup>[131]</sup>.

## 8. Future research directions

Given the key findings with significant gaps in our knowledge, an important direction for future research is to investigate the effect of lean supply chain management in different industries and regions (Moyano-Fuentes *et al.* 2021) <sup>[19]</sup>. In addition, few studies have considered the development of digital technologies' impact on LSCM processes and systems on organizations' performance; we see this as an important direction for future research to clarify the

relationship (Núñez-Merino *et al.* 2020) <sup>[132]</sup>. To increase practically relevant contributions and impacts in this field of research, further research should be undertaken in this area as a longitudinal case to more in-depth assess the impact of LSCM on performance in the long term (García-Buendía *et al.* 2021) <sup>[19]</sup> (Moyano-Fuentes *et al.* 2021) <sup>[19]</sup>. One of the main challenging factors that trigger future research on LSCM is the growing concern regarding the sustainability of the supply chain within the LSCM paradigm through reduction, reuse, and recycling (Näslund, 2024) <sup>[9]</sup>. The detailed discussion of LSCM-based sustainability performance could provide effective insights into the competitive advantage of a sustainable organization in the market (El *et al.* 2023) <sup>[8]</sup>.

Existing research in this field lacks insight, and there are no available cases because, so far, adequate frameworks of corporate supply chain performance lack many theoretical foundations (Hazen *et al.* 2021) <sup>[133]</sup>. We are conducting a theoretical investigation based on practitioners and academicians in the field and providing opportunities to communicate with the industry for investigation. In the future, researchers from various fields, such as SEM, industry, and ecology, should be consulted in the field of sustainability (Xu *et al.*) <sup>[134]</sup>. Possible future research in this area has the potential to allow researchers to shed light on the nature of LSCM strategies. Given the overview presented, we suggest five research directions to build and receive research (Rutz *et al.* 2020) <sup>[135]</sup>.

## 9. Conclusion

In conclusion, this paper reviewed the extant literature on the impact of Lean Supply Chain Management (LSCM) on firm performance. Operations and financial performance, as well as sustainable dimensions, were mostly reviewed in the selected articles. In terms of the impact on operations, one of the most important aspects for the manufacturing sector seems to be the improvement of operational performance by facilitating shorter production lead times and decreasing work-in-process inventories at manufacturing facilities. The firms are also expected to improve their financial performance, including reducing costs, enhancing quality, and increasing flexibility. Consistent with these findings, the positive effect of LSCM on performance is reported for various countries. In sum, the existing literature extensively agrees on the positive impact of LSCM on firm performance. The firm's philosophy and targets, performance measurement, suitable values, and progressive culture suggest a considerable challenge to achieve the ultimate advantages of putting lean into practice. On the supply chain level, one of the biggest issues is the establishment of a strategic partnership to allow close interaction between plants, distribution centers, suppliers, and other participants in a lean supply chain to fully realize the potential for a truly reactive, low-inventory chain. In addition, lean supply chain implementers will have to appreciate the best approach to counter the problems linked to defects raised through the just-in-time philosophy. Given these future implications, further research in LSCM is certainly an important subject since our understanding still needs to be developed further in this area. Specifically, the increasing market globalization, the implementation of global LSCM, and LSCM sensitive to environmental issues, as well as the strategic management dimension of LSCM, remain largely unexplored. Given the same orientation of previously published reviews on the same

topic, we provide clear guidance for further research that can be carried out in this field.

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