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Lean Six Sigma in Supply Chain Management: A Systematic Literature Review of Research Trends and Performance Impacts (2020–2025)

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ABSTRAK

Penelitian ini menyajikan hasil kajian literatur secara sistematis mengenai penerapan Lean Six Sigma (LSS) dalam konteks Supply Chain Management (SCM) selama periode 2020–2025. Novelty studi ini terletak pada pemetaan terstruktur tren penelitian LSS yang secara spesifik difokuskan pada fungsi dan kinerja rantai pasok, bukan hanya pada konteks manufaktur. Permasalahan utama yang diidentifikasi belum adanya studi LSS–SCM pada berbagai fungsi dan pendekatan, sehingga belum memberikan gambaran komprehensif mengenai kontribusi LSS terhadap kinerja rantai pasok secara end-to-end. Penelitian ini menggunakan metode Systematic Literature Review (SLR) dengan menganalisis artikel jurnal bereputasi (Q1 dan Q2) yang relevan. Hasil kajian menunjukkan bahwa penerapan LSS dalam SCM didominasi oleh perbaikan kinerja operasional, seperti pengurangan biaya, lead time, dan peningkatan keandalan pengiriman, terutama pada fungsi logistik dan pergudangan. Namun, integrasi LSS pada perspektif rantai pasok secara holistik masih terbatas. Penelitian selanjutnya disarankan untuk mengembangkan kerangka Lean Six Sigma yang bersifat sistemik, terintegrasi, dan mempertimbangkan ketahanan rantai pasok serta faktor manusia.

Keywords:
Lean Six Sigma; Supply Chain Management; Systematic Literature Review; Supply Chain Performance; Operational Excellence

ABSTRACT

This study presents a systematic literature review on the application of Lean Six Sigma (LSS) in Supply Chain Management (SCM) during the period 2020–2025. The novelty of this study lies in providing a structured synthesis of LSS research explicitly focused on supply chain functions and performance, rather than internal manufacturing processes alone. The main problem addressed is the fragmented nature of existing LSS–SCM studies, which limits a comprehensive understanding of LSS contributions to end-to-end supply chain performance. A Systematic Literature Review (SLR) method was employed by analyzing relevant Q1 and Q2 journal articles. The results indicate that LSS applications in SCM predominantly target operational performance improvements, such as cost reduction, lead time reduction, and delivery reliability, particularly in logistics and warehousing functions. However, holistic and system-level integration of LSS across the supply chain remains limited. Future research should focus on developing integrated Lean Six Sigma frameworks that address supply chain resilience, cross-organizational coordination, and human-related factors.

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1. Introduction

Over the past two decades, global supply chains have experienced significant increases in complexity due to the expansion of supplier networks, the globalization of production, and the increasing interdependence of organizations. Cross-functional and cross-geographic integration has made supply chains highly complex and dynamic systems. This makes supply chains increasingly vulnerable to various disruptions, both internal, such as process inefficiencies and demand variability, and external, such as logistical disruptions, market uncertainty, and global crises [1]. This complexity demands a supply chain management approach that is not only oriented towards efficiency, but also able to manage variation and improve overall process reliability [2][3].

Performance pressures in supply chain management are increasing as customers demand high service quality, shorter delivery times, and competitive pricing. Organizations are required to balance various supply chain performance indicators, such as operational costs, product and service quality, delivery accuracy, and flexibility in responding to changing demand [4]. An imbalance in one performance dimension often results in a decline in performance in other dimensions, requiring a systematic, data-driven approach to improvement. Therefore, improving supply chain performance can no longer be achieved through partial improvements, but rather through a structured approach that encompasses the entire process flow [5].

Lean Six Sigma (LSS) is known as a process improvement methodology that integrates Lean principles in eliminating waste and the Six Sigma approach in reducing variation and process defects [6]. Initially, LSS was widely applied in manufacturing contexts to improve production efficiency and product quality [7]. However, the systematic, data-driven, and process performance-oriented characteristics of LSS make it relevant for application outside the manufacturing environment. In the supply chain context, LSS has the potential to identify sources of inefficiency, reduce variability in material and information flows, and improve the stability of cross-functional and cross-organizational processes.

The development of business practices indicates a shift in the application of Lean Six Sigma from an internal company focus to a broader context, namely supply chain management. LSS is beginning to be used to improve logistics processes, distribution, inventory management, and relationships with suppliers and customers. The implementation of LSS in the supply chain aims not only to reduce costs but also to improve process visibility, delivery reliability, and coordination between actors in the supply chain network [8]. This reflects that LSS is seen as an improvement approach capable of supporting end-to-end supply chain performance.

The growing interest in implementing Lean Six Sigma in supply chain management is also driven by the need for organizations to navigate an increasingly uncertain business environment. Supply chain disruptions in recent years have highlighted the importance of stable, adaptive, and controlled processes. In this context, LSS serves as a framework that helps organizations understand the root causes of supply chain performance issues and design measurable and sustainable improvement solutions. However, LSS implementation in the supply chain is often carried out in isolation for specific functions, without a comprehensive understanding of its impact on overall supply chain performance [9].

Although the number of studies related to Lean Six Sigma in the supply chain context continues to increase, understanding of research patterns, application areas, and resulting performance impacts remains fragmented and unstructured. Many studies focus on individual case studies or specific industry contexts, making it difficult to draw general conclusions about the contribution of LSS to supply chain performance [9]. Therefore, a systematic literature review is needed that can map Lean Six Sigma research trends in supply chain management, identify the most researched performance dimensions, and highlight research gaps that could become future research agendas [10].

As outlined in the previous section, the increasing complexity and performance pressures in supply chains demand a systematic, integrated, and data-driven approach to improvement. It is in this context that Lean Six Sigma (LSS) gains relevance as a process improvement methodology that combines two key paradigms: Lean and Six Sigma. Lean focuses on eliminating waste and increasing customer value, while Six Sigma emphasizes controlling process variation and improving quality through statistical analysis. The integration of these two approaches makes LSS a framework that focuses not only on efficiency but also on process stability and capability. These characteristics give LSS great potential to address supply chain performance challenges involving the simultaneous flow of materials, information, and decisions [11].

Although originally developed and widely applied in manufacturing environments, the Lean Six Sigma approach in the context of Supply Chain Management has distinct characteristics. In manufacturing, the focus of LSS is generally limited to internal processes such as production and quality control, with relatively clear system boundaries. In contrast, in the supply chain, process boundaries are broader and involve multiple actors, including suppliers, logistics providers, distributors, and customers. This causes the application of

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LSS in SCM to focus not only on reducing waste or defects at a single process point, but also on synchronizing flows between processes and between organizations. Thus, LSS in the supply chain demands a more holistic approach that considers process interdependencies, demand variability, and complex cross-functional coordination [12].

Within the Supply Chain Management framework, Lean Six Sigma serves as a strategic tool for improving the performance of cross-organizational and cross-functional process flows. The application of LSS enables the identification of sources of inefficiency and variation that occur at critical points in the supply chain, such as procurement, transportation, warehousing, and distribution [13]. Furthermore, LSS supports fact-based process improvement through value stream mapping, root cause analysis, and continuous performance monitoring. By improving process integration and performance consistency across actors in the supply chain, LSS contributes to achieving overall supply chain performance objectives, including cost reduction, improved delivery accuracy, and enhanced service reliability [14]. Therefore, understanding the role and characteristics of Lean Six Sigma in the SCM context provides an important foundation for systematically examining research trends and their performance impacts.

Based on the description of the role of Lean Six Sigma in the context of supply chain management in the previous section, it can be concluded that although the application of LSS in Supply Chain Management is growing, a comprehensive understanding of the direction and characteristics of research in this field is still limited. Existing studies tend to be scattered across various industry contexts, supply chain functions, and with diverse methodological approaches. This condition makes it difficult for researchers and practitioners to obtain a complete picture of how Lean Six Sigma has been used to improve supply chain performance, as well as which areas have been extensively researched and which still require further exploration. Therefore, this study is designed to provide a systematic synthesis of the development of Lean Six Sigma research in Supply Chain Management during the period 2020–2025.

Specifically, the main objective of this study is to identify Lean Six Sigma research trends in the context of Supply Chain Management by reviewing relevant scientific publications within the period. Furthermore, this study aims to classify Lean Six Sigma implementation based on key supply chain functions, such as procurement, logistics, warehousing, distribution, and end-to-end supply chain integration. This study also analyzes the supply chain performance dimensions that are the main focus of Lean Six Sigma studies, including cost, quality, on-time delivery, flexibility, and other operational performance aspects. Through this approach, this study is expected to provide a clear mapping of Lean Six Sigma's contribution to improving supply chain performance.

To achieve these objectives, this study is structured around several research questions that serve as guidelines for the systematic literature review. These questions include: how Lean Six Sigma research in Supply Chain Management has developed during the 2020–2025 period; which supply chain functions are most frequently the focus of Lean Six Sigma implementation; and which supply chain performance dimensions are most frequently targeted in these studies. Furthermore, this study also examines the dominant methodological approaches used in Lean Six Sigma research in the SCM field. By formulating these research questions, this study aims not only to summarize existing findings but also to identify research gaps and formulate relevant and valuable future research directions.

2. Research Method

This study uses a Systematic Literature Review (SLR) to comprehensively examine the development of Lean Six Sigma research in the context of Supply Chain Management during 2020–2025. The SLR approach was chosen for its ability to compile and synthesize research findings systematically, transparently, and replicably. Unlike narrative literature reviews, SLRs enable the identification of research patterns, thematic trends, and research gaps through structured selection and analysis procedures. Therefore, this approach is appropriate for addressing the research objectives, which focus on mapping research trends and the impact of Lean Six Sigma performance on supply chain management.

The literature search was conducted in the reputable scientific database Scopus using keywords relevant to Lean Six Sigma and Supply Chain Management. The search strategy was designed to capture publications that explicitly discuss the application of Lean Six Sigma in the supply chain, including logistics, distribution, procurement, and supply chain integration. The publication period was limited to 2020 to 2025 to ensure the relevance of the findings to contemporary supply chain conditions. In addition, only articles published in reputable journals (Q1 and Q2) were included in this review to ensure the quality and credibility of the literature sources analyzed.

Articles obtained through the search process were then selected based on predetermined inclusion and exclusion criteria. Inclusion criteria included peer-reviewed journal articles, primarily focused on Lean Six Sigma, and applying or discussing Lean Six Sigma in the context of supply chain management. Conversely, articles that focused solely on the manufacturing environment without a clear link to the supply chain were excluded

from the review. The selection process was carried out in stages: title and abstract screening, followed by full-text evaluation, to ensure alignment with the research objectives. This stage aimed to minimize selection bias and ensure consistency in the selection of relevant studies.

Eight selected articles were then analyzed using a coding scheme developed to systematically classify research characteristics. Extracted information included the year of publication, industry context, the supply chain function studied, the Lean Six Sigma approach used, the research method, and the dimensions of supply chain performance analyzed. The collected data were then analyzed using descriptive and thematic approaches to identify research trends, patterns of Lean Six Sigma implementation, and the dominant performance focus in the literature. The results of this analysis served as the basis for compiling research findings and discussing the contributions and gaps in Lean Six Sigma research in supply chain management.

3. Result and Discussion

Based on the literature selection process described in the methods section, the selected studies were analyzed to identify the descriptive characteristics of Lean Six Sigma research in the context of Supply Chain Management. Initial analysis shows that LSS–SCM research publications are spread throughout the period 2020–2025 with a tendency to increase in the number of publications in the years after 2021. The articles were published in reputable journals with Q1 and Q2 rankings, reflecting the increasing academic attention to the application of Lean Six Sigma outside the manufacturing environment. In terms of research context, most studies were conducted in the manufacturing sector, with a focus on the supply chain, followed by the logistics, distribution, and service sectors, indicating the expansion of Lean Six Sigma application into broader supply chain systems.

The journal distribution shows that more Lean Six Sigma research in Supply Chain Management was published in Q1 journals than in Q2, particularly in journals focused on operations management, supply chain management, and quality management. Geographically, the reviewed studies were dominated by research from developing and newly industrialized countries, with Asia and Europe being the most frequently studied regions. This indicates that Lean Six Sigma is seen as a strategic approach to improving supply chain competitiveness in environments with high efficiency pressures. From an industry perspective, the majority of research focuses on manufacturing supply chains, while the service and logistics sectors remain relatively limited, suggesting opportunities for further research in non-manufacturing contexts.

Research trend analysis shows that the focus of Lean Six Sigma research in Supply Chain Management has shifted during the 2020–2025 period. Early in the period, research focused primarily on increasing operational efficiency, reducing costs, and improving the quality of logistics processes. However, in subsequent years, there has been increasing attention to more strategic themes, such as supply chain integration, delivery reliability, and process flow stability. However, research focused on human performance, ergonomics, and supply chain resilience remains relatively limited. This finding suggests that, despite the growing intensity of Lean Six Sigma research in SCM, the development of research themes continues to focus on short-term operational performance rather than a long-term, systemic approach.

Table 1. Descriptive Characteristics of the Selected Studies (2020–2025)

Category	Clasification
Publication Period	2020–2025
Journal Ranking	Q1, Q2
Industry Context	Manufaktur, Logistik, Jasa
SCM Focus	Procurement, Logistics, Warehousing, Distribution, End-to-End SC
Study Type	Empiris, Konseptual, Studi Kasus

Based on the descriptive classification presented in Table 1, Lean Six Sigma research in the context of Supply Chain Management during the 2020–2025 period was dominated by studies published in reputable journals (Q1 and Q2), with a focus that is increasingly expanding from the manufacturing context to more diverse supply chain functions. The reviewed articles cover various industrial contexts, particularly manufacturing, logistics, and services, with application areas spanning procurement, logistics, warehousing, distribution, and end-to-end supply chain management. This indicates that Lean Six Sigma is no longer viewed solely as an internal process improvement approach, but rather as a relevant methodology for managing cross-functional and cross-organizational process flows in the supply chain. In line with these characteristics, the research trend analysis summarized in Table 2 shows a shift in the focus of Lean Six Sigma research in SCM over the review period. In the initial phase, research tended to focus on improving operational efficiency, such as reducing costs and lead times and improving the quality of logistics processes.

Subsequently, the research focus shifted toward more holistic process integration and logistics performance, including delivery reliability and interprocess coordination. In the final period, despite the increasing number of studies, strategic themes such as end-to-end supply chain management and process flow stability began to emerge but were not yet dominant. This pattern indicates that Lean Six Sigma research in Supply Chain Management is still in the transition phase from a short-term operational improvement approach to a more strategic, systemic perspective.

Table 2. Research Trends of Lean Six Sigma in SCM (2020–2025)

Periode	Dominant Focus of Research
2020–2021	Efisiensi operasional, cost reduction, quality improvement
2022–2023	Logistics performance, lead time reduction, process integration
2024–2025	End-to-end supply chain, reliability, and emerging strategic themes

Building on the analysis of research trends and general characteristics of Lean Six Sigma studies in Supply Chain Management discussed previously, this section further examines the supply chain functions that are the primary focus of Lean Six Sigma implementation and the methodological approaches employed. While it was previously shown that LSS–an operational performance orientation still dominates SCM research, the analysis in this sub-chapter provides a more detailed understanding of where Lean Six Sigma is applied in the supply chain and how the methodology is operationalized [15]. This in-depth study is vital for assessing the extent to which Lean Six Sigma has been used partially within specific functions or applied in an integrated manner across supply chain management.

Building on the analysis of research trends and general characteristics of Lean Six Sigma studies in Supply Chain Management discussed in the previous subchapter, this section further examines the supply chain functions that are the primary focus of Lean Six Sigma implementation and the methodological approaches employed. Although it has previously been shown that LSS–SCM research remains dominated by an operational performance orientation, the analysis in this subchapter provides a more detailed understanding of where Lean Six Sigma is applied in the supply chain and how the methodology is operationalized. This in-depth study is important for assessing the extent to which Lean Six Sigma has been used partially in certain functions or applied in an integrated manner across supply chain management as a whole.

From a methodological perspective, the analysis shows the dominant use of the DMAIC framework as the primary approach in implementing Lean Six Sigma in the context of Supply Chain Management. DMAIC is widely used for its systematic structure and ability to identify root causes of supply chain process performance. Furthermore, several studies have developed hybrid LSS frameworks by combining Lean Six Sigma with other improvement approaches, such as Lean logistics or quality management tools, to accommodate the complexity of supply chain processes. However, the integration of Lean Six Sigma with strategic, cross-organizational improvement approaches remains relatively limited. This pattern reinforces previous findings that Lean Six Sigma research in SCM is more oriented towards short-term operational process improvements than towards comprehensive supply chain system transformation.

Table 3. Supply Chain Functions Addressed in Lean Six Sigma Studies

Supply Chain Functions General	Focus of LSS Implementation
Procurement & Sourcing	Pengurangan variabilitas pemasok, efisiensi proses pembelian
Logistics & Transportation	Lead time reduction, delivery reliability, cost efficiency
Warehousing & Inventory	Inventory accuracy, waste reduction, process flow improvement
End-to-End Supply Chain	Process integration, coordination, overall SC performance

Table 4. Lean Six Sigma Approaches Applied in SCM Studies

LSS Approach	Key Characteristics
DMAIC	Dominant approach, focused on operational process improvement
Hybrid LSS	Combination with Lean logistics or quality tools
Integrated Approaches	Limited, cross-functional and cross-organizational focus

In line with the discussion in the previous subchapter on the focus of Lean Six Sigma applications in Supply Chain Management, Table 3 summarizes the supply chain functions most frequently used as Lean Six Sigma application areas. The table shows that logistics and

transportation, warehousing, and inventory management are the most dominant areas, reflecting the research orientation toward improving physical flow efficiency and delivery reliability. In contrast, procurement and sourcing, as well as the end-to-end supply chain approach, are relatively less frequently discussed, indicating the limited amount of Lean Six Sigma research that views the supply chain as an integrated, cross-functional, and cross-organizational system.

Next, Table 4 presents the Lean Six Sigma approaches used in the reviewed studies. This table shows that the DMAIC framework is the most widely applied approach, primarily because of its systematic structure and ease of adaptation to supply chain process improvement. Furthermore, several studies have adopted a hybrid Lean Six Sigma approach by combining various improvement tools to accommodate the complexity of SCM processes. However, integrated approaches linking Lean Six Sigma with the overall supply chain strategy remain limited, suggesting that most studies focus on partial operational improvements rather than holistic supply chain system transformation.

Based on the analysis results outlined previously, it can be synthesized that Lean Six Sigma research in the context of Supply Chain Management during the 2020–2025 period shows a dominant orientation towards improving supply chain operational performance. Empirical findings show that Lean Six Sigma practices are most often directed toward achieving performance objectives such as cost reduction, lead-time reduction, process quality improvement, and delivery reliability, particularly in logistics, transportation, and warehousing functions. This indicates strong alignment between Lean Six Sigma practices and the primary performance objectives of Supply Chain Management: efficiency and reliability. However, the synthesis results also indicate that Lean Six Sigma implementation remains partial and focused on certain functions, so its contribution to improving end-to-end supply chain performance is not yet fully optimal. This pattern confirms that Lean Six Sigma has been adopted as an effective improvement tool, but has not been fully utilized as a systemic approach in supply chain management.

These findings have important theoretical implications for the development of Lean Six Sigma studies in Supply Chain Management. Conceptually, the results of this study strengthen Lean Six Sigma's position as a relevant approach to support the achievement of supply chain operational performance, particularly through variation control and process waste elimination. However, the dominance of tool-centric approaches indicates that Lean Six Sigma has made only a limited contribution to the development of holistic Supply Chain Management theory. The lack of integration of Lean Six Sigma with the perspective of supply chain systems, interorganizational dynamics, and human aspects and decision-making indicates a significant theoretical gap. Therefore, future research needs to shift the focus of Lean Six Sigma from a mere process-improvement methodology to a systems-level framework that considers cross-functional interactions, interdependencies among actors, and the role of humans in continuously improving supply chain performance.

Although Lean Six Sigma has proven effective in improving operational performance in specific functions such as logistics and warehousing, most research still focuses on partial, short-term improvements and struggles to adopt an end-to-end supply chain perspective. Furthermore, the integration of Lean Six Sigma with strategic issues such as supply chain resilience, cross-organizational coordination, and the role of human factors in decision-making and process stability remains relatively minimal. From a methodological perspective, the dominance of case studies and conventional empirical approaches presents opportunities to develop conceptual frameworks and simulation-based approaches capable of capturing the complexity and dynamics of supply chain systems. Therefore, future research should focus on developing a Lean Six Sigma model that is systemic, integrated, and long-term oriented, so that it not only improves operational performance but also enriches the holistic development of Supply Chain Management theory.

4. Conclusion

This study presents a systematic literature review of the application of Lean Six Sigma in the context of Supply Chain Management during 2020–2025, with the aim of mapping research trends, application areas, and resulting performance impacts. The results of the study indicate that Lean Six Sigma has been widely adopted as an approach to improving supply chain performance, particularly by enhancing operational efficiency, process quality, and delivery reliability across functions such as logistics, transportation, and warehousing. However, the application of Lean Six Sigma remains dominated by partial approaches that focus on specific functions and short-term improvements, while the end-to-end supply chain perspective and cross-organizational integration remain relatively limited. These findings confirm that Lean Six Sigma has great potential to support Supply Chain Management performance, but its use as a systemic framework remains underexplored in the literature.

In line with these findings, this study has several limitations that need to be considered. This review was limited to reputable journal articles (Q1 and Q2) within a specific timeframe, so relevant studies that did not meet these criteria may have been excluded. Furthermore, the analysis focused on synthesizing literature findings without conducting a quantitative evaluation of the

performance impact of Lean Six Sigma in the supply chain. Therefore, future research is recommended to expand the scope of data sources and develop more in-depth analytical approaches, such as meta-analysis or conceptual modeling and simulation. Future research should also focus on integrating Lean Six Sigma with strategic Supply Chain Management issues, including supply chain resilience, cross-organizational coordination, and the role of human factors, to develop a more holistic, adaptive, and long-term-oriented Lean Six Sigma framework.

Referrence

[1] D. Maryadi, "Lean Six Sigma DMAIC Implementation to reduce Total Lead Time Internal Supply Chain Process," pp. 2086–2096, 2021.

[2] D. Maryadi, R. A. N. Moulita, M. L. King, and R. M. Veranika, "Value Stream Mapping for Warehouse Process in Automotive Manufacturing Case," vol. 12, no. February 2019, pp. 89–97, 2024.

[3] L. Bonome *et al.*, "Strengthening food supply resilience : Lean and Lean Six Sigma strategies for disruptions Strengthening food supply resilience : Lean and Lean Six Sigma strategies for," *Supply Chain Forum An Int. J.*, vol. 00, no. 00, pp. 1–15, 2024, doi: 10.1080/16258312.2024.2426446.

[4] M. KAMIŃSKA, "Improvement of warehouse processes by implementation of lean six sigma in global supply chain," *Sci. Pap. Silesian Univ. Technol. Organ. Manag. Ser.*, vol. 2021, no. 154, pp. 81–94, 2021, doi: 10.29119/1641-3466.2021.154.7.

[5] Y. Ramakrishna and H. M. Alzoubi, "Empirical Investigation of Mediating Role of Six Sigma Approach in Rationalizing the COQ in Service Organizations," *Oper. Supply Chain Manag.*, vol. 15, no. 1, pp. 122–135, 2022, doi: 10.31387/oscm0480335.

[6] A. Adeodu, R. Maladzhi, M. G. Kana-Kana Katumba, and I. Daniyan, "Development of an improvement framework for warehouse processes using lean six sigma (DMAIC) approach. A case of third party logistics (3PL) services," *Heliyon*, vol. 9, no. 4, p. e14915, 2023, doi: 10.1016/j.heliyon.2023.e14915.

[7] R. Asep, "Six Sigma Model to Improve the Lean Supply Chain in Ports by System Dynamics Approach," p. 210, 2016.

[8] G. Şişman, "Implementing Lean Six Sigma methodology to reduce the logistics cost: a case study in Turkey," *Int. J. Lean Six Sigma*, vol. 14, no. 3, pp. 610–629, 2023, doi: 10.1108/IJLSS-02-2022-0054.

[9] A. Chiarini and M. Kumar, "Lean Six Sigma and Industry 4.0 integration for Operational Excellence: evidence from Italian manufacturing companies," *Prod. Plan. Control*, vol. 32, no. 13, pp. 1084–1101, 2021, doi: 10.1080/09537287.2020.1784485.

[10] R. S. Mclean, J. Antony, J. J. Dahlgaard, R. S. Mclean, J. Antony, and J. J. D. Failure, "Total Quality Management & Business Excellence Failure of Continuous Improvement initiatives in manufacturing environments : a systematic review of the evidence," vol. 3363, no. January, 2016, doi: 10.1080/14783363.2015.1063414.

[11] M. Asmae, E. Abdelali, S. Youssef, and H. Brahim, "The utility of Lean Six Sigma(LSS) in the Supply Chain agro-industry," *Int. Colloq. Logist. Supply Chain Manag. LOGISTIQUA 2019*, pp. 1–7, 2019, doi: 10.1109/LOGISTIQUA.2019.8907300.

[12] A. Ariffien, I. Adriant, and J. A. Nasution, "Lean Six Sigma Analyst in Packing House Lembang Agriculture Incubation Center (LAIC)," *J. Phys. Conf. Ser.*, vol. 1764, no. 1, pp. 0–9, 2021, doi: 10.1088/1742-6596/1764/1/012043.

[13] W. Kosasih, I. N. Pujawan, P. D. Karningsih, and H. Shee, "Integrated lean-green practices and supply chain sustainability framework," *Clean. Responsible Consum.*, vol. 11, no. September, p. 100143, 2023, doi: 10.1016/j.clrc.2023.100143.

[14] G. Tiwari and S. Kesavan, "Lean , Green and DMADV Tool Based Approach for an Effective Execution of Residential Building Project," vol. 5013, no. 5, pp. 383–385, 2016.

[15] P. S. Parmar and T. N. Desai, "Evaluating Sustainable Lean Six Sigma enablers using fuzzy DEMATEL: A case of an Indian manufacturing organization," *J. Clean. Prod.*, vol. 265, p. 121802, 2020, doi: 10.1016/j.jclepro.2020.121802.