Literature Study on Factors Influencing the Implementation of Lean Construction

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Abstract-- *The construction sector plays a strategic role in supporting infrastructure development in Indonesia, encompassing both new construction and building renovation projects. The rapid expansion of construction activities has led to a significant increase in the workforce; however, the sector continues to record the highest proportion of occupational accidents in Indonesia, contributing approximately 32% of total workplace incidents. This condition highlights the urgency of implementing effective management approaches to improve project performance and safety outcomes. Lean construction has been widely recognized as a systematic approach to minimizing waste, enhancing efficiency, and reducing project delays. This study adopts a systematic literature review methodology using secondary data derived from national and international journal publications between 2021 and 2025. A total of 500 relevant articles were identified through Publish or Perish and subsequently mapped using VOS viewer to examine keyword co-occurrence patterns and research trends. An in-depth review of 20 selected journals was conducted to identify critical factors influencing lean construction implementation. The findings reveal that transformational leadership, top management commitment, quality of work life, and occupational health and safety (OHS) culture are among the most significant determinants. The results indicate that lean construction research remains highly relevant and continues to provide substantial opportunities for further empirical investigation, particularly in the context of developing countries.*

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1. INTRODUCTION

The construction industry has become a fundamental driver of economic development and national competitiveness. In Indonesia, infrastructure expansion particularly toll road development has accelerated significantly in recent years. However, rapid construction growth has been accompanied by persistent occupational health and safety challenges. Data indicate a substantial rise in workplace accident claims over the past decade, with the construction sector consistently contributing the highest proportion of incidents.[1]. Indonesia, as a developing country, has numerous ongoing construction projects. One of the most crucial projects serving as vital infrastructure to support economic growth and improve connectivity particularly in developing countries such as Indonesia is toll road development. As cited from the official website of the Toll Road Regulatory Agency (BPJT) on Tuesday (16 January 2024) via Kompas.com, since 1978 until mid-January 2024, the total length of operational toll roads in Indonesia has reached 2,816 km [2].

Along with the rapid increase in construction projects, the severity of accident hazards at project sites has also increased, requiring special attention to occupational health and safety (OHS) management [3]. The implementation of projects is often disrupted by undesirable events such as workplace accidents [4] According to BPJS Employment data, workplace accident claims increased from 101,367 cases in 2016 to more than 370,000 cases in 2023. This trend indicates either increasing occupational accident risks or improvements in reporting systems. Fatality claims also increased significantly, especially in 2021, and continued rising until 2024. In 2021, fatality claims reached 44.7% of total workplace accident claims, significantly higher than in previous years [5].

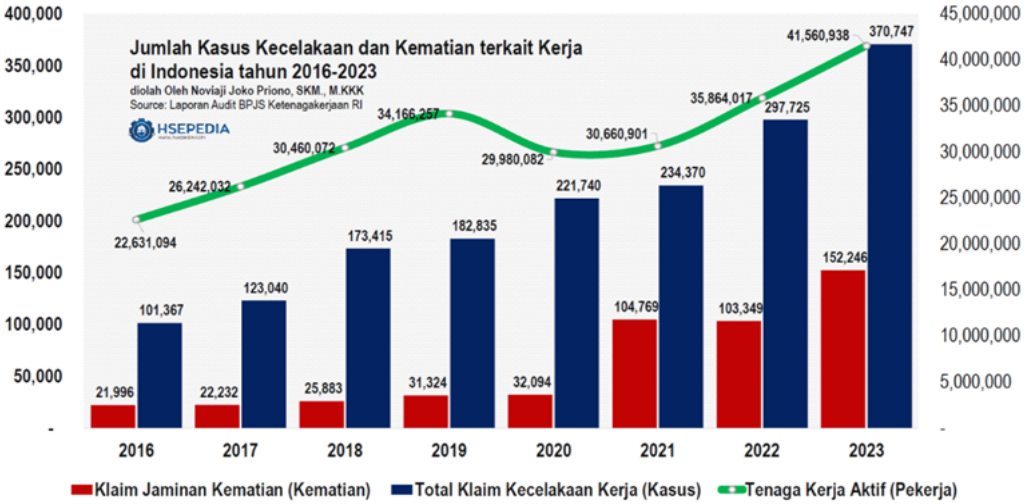

Figure 1. Number case Accident And Death related Work in Indonesia 2016-2023
Source : [5]

The construction industry remains the largest contributor to workplace accident cases in Indonesia, accounting for approximately 32% of total workplace accident cases annually [6]. The ten main causes of construction site accidents include inadequate training, alcohol and drug use, workers joking around, excessive working hours leading to fatigue, communication problems, unsafe actions, violations/non-compliance, unsafe working conditions, poor management practices, inadequate maintenance of tools and equipment, and unsafe machine operations [7].

Previous literature has identified numerous factors contributing to the success of lean implementation, such as leadership roles, organizational commitment, and collaboration importance. Several studies have examined the direct relationship between these variables and project performance, including transformational leadership and project success, or OHS culture and construction project performance. This research is a literature review examining factors influencing lean implementation success, particularly in the construction sector.

2. METHODOLOGY

This research adopts a literature review approach using secondary data from local and international journal publications. The journals analyzed were retrieved using the Publish or Perish search tool based on Google Scholar data. The publication period considered ranges from 2021 to 2025. The mapping results were visualized using VOSviewer software.

3. RESULTS AND DISCUSSION

The search for journal articles using the keywords “lean construction” and its influencing factors was conducted with the assistance of the Publish or Perish application. The search was limited to local and international journals published between 2021 and 2025, with a maximum of 500 journals. Based on the search results, 500 journal articles related to factors influencing the success of lean construction implementation were obtained. The journal search metrics are presented in the Table 1 below.

Table 1. Results Search using Publish or Perish

No	Description	Data
1	Publication Years	2021 - 2025
2	Citation Years	4 (2021 – 2025)
3	Papers	500
4	Citation	39961
5	Cites / Year	9990.25
6	Cites / paper	79.92
7	Authors/paper	2.68
8	H index	66
9	G Index	193

Referring to Table 1 above, it can be seen that during the 2021–2025 period, there were 500 studies

addressing factors influencing lean construction, with interconnections among the research publications. The number of citations per year reached 9,990.25, and citations per paper reached 79.92. These results indicate that the topic of lean construction remains highly attractive to researchers. This is further supported by the average number of citations per author, which reached 2.68. Researchers utilized VOSviewer to generate network mapping visualizations illustrating relationships among keywords.

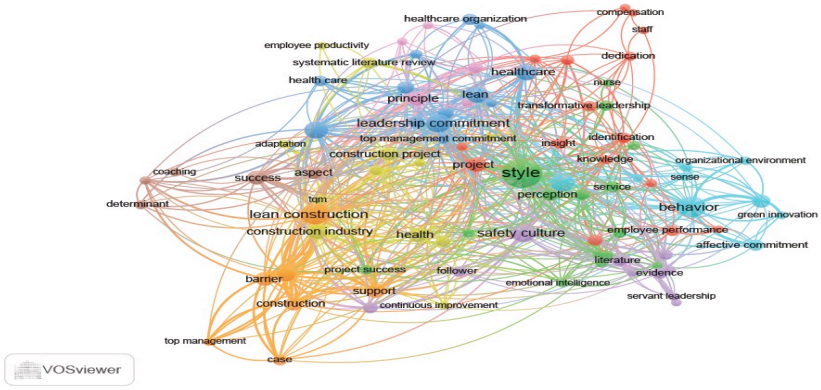

Figure 2. Netwok Visualization Results

Based on Figure 2, it can be observed that the keywords identified in the journals are interconnected. This is reflected in the network visualization, where dense linkages appear among several key terms. The network visualization illustrates that the factors influencing the successful implementation of lean construction are closely related to one another, although gaps remain in relation to other studies that have been conducted.

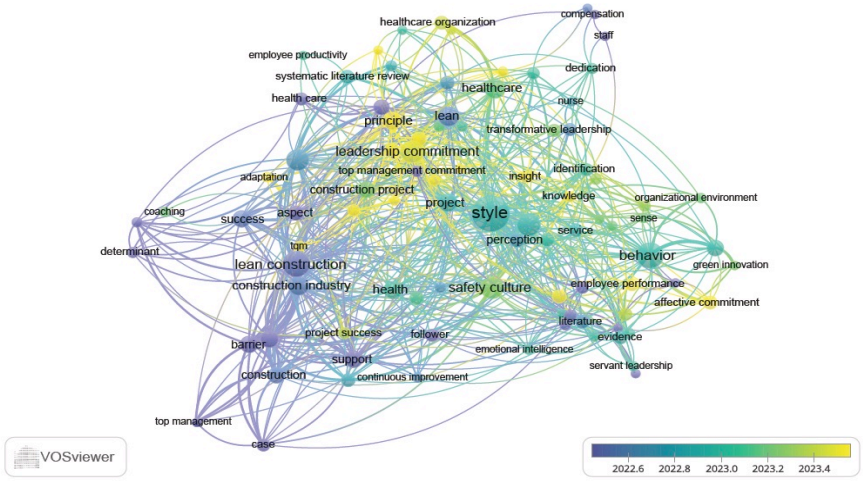

Figure 3. Overlay Visualization Results

Overlay visualization indicates that most keywords originated from research conducted between 2022 and 2023 (Figure 3). Darker colors represent older topics, while brighter colors represent more recent or emerging topics. Keywords such as leadership commitment, healthcare, and top management commitment are relatively new in lean construction research, presenting opportunities for further study.

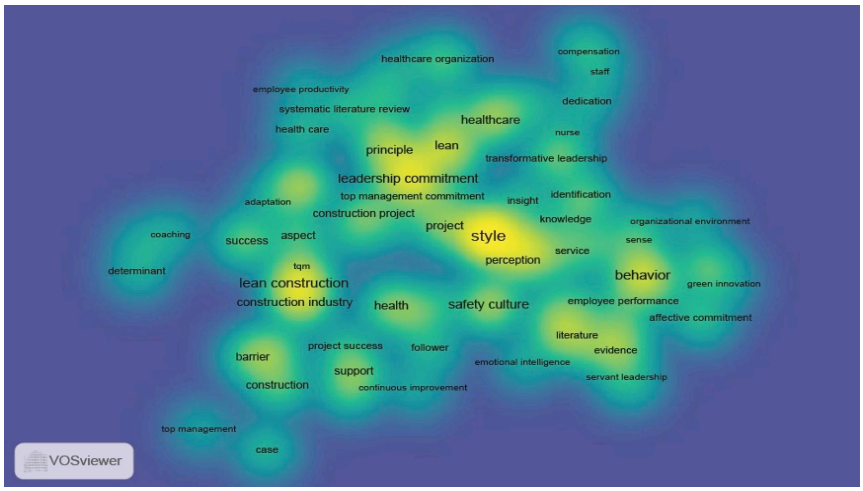

Figure 4. Density Visualization Results

Referring to Figure 4, it can be seen that lean construction still offers opportunities for further investigation. This is indicated by the lighter color, which suggests that the theme remains an area with potential for continued research. Leadership and healthcare also emerge as topics that can be explored further.

After examining the journal mapping based on themes and related keywords, the authors also conducted a review of several journals that discuss keywords with potential for further development in future research. In this literature study, the researchers selected twenty journals for a more in-depth analysis. These twenty journals consist of both local and international publications. The journals were reviewed based on factors that may influence lean construction implementation (Table 2).

Table 2. Journals studied

No	Authors (Year)	Title	Research Variable	Research Results
1.	Baskoro et al., (2021) [8]	Transformational Leadership, Knowledge Management, Work Motivation, and Employee Performance among Construction Employees in Jakarta	transformational leadership, knowledge management, work motivation, employee performance	Transformational Leadership and Knowledge Management only have an indirect effect on Employee Performance through Worker Motivation
2.	Thuy (2024) [9]	Transformational Leadership and Project Success: The Role of Leader-Member Exchange and Professional Commitment	Transformational Leadership, Leader-Member Exchange, Professional Commitment, Project Success	Transformational leadership consistently influences project success across a wide range of project types.

No	Authors (Year)	Title	Research Variable	Research Results
3.	Purwadi (2024) [10]	The Effect of Transformational Leadership on Team Performance on Construction Projects	Transformational leadership, employee performance, job satisfaction	Transformational leadership has a significant positive influence on team performance in construction projects.
4.	Abdirahman & Fatemeh (2024) [11]	Analyzing the role of leadership in promoting a positive safety culture in the construction sector	Safety culture, leadership	The importance of strong leadership commitment, effective communication, employee participation, and accountability in fostering a healthy safety culture.
5.	Arceo & Chua, (2022) [12]	Organizational Dynamics and Stewardship in Promoting Innovative Work Behavior and Commitmentat Work	Organizational dynamics, management, innovative work behavior, work commitment	There is a significant relationship between innovative work behavior and organizational dynamics. In addition, there is a significant relationship between work commitment and organizational dynamics.
6.	Ge & Wan, (2024) [13]	The impact of high-commitment work systems on organizational identification	High commitment work system, organizational identification	High commitment work systems positively influence employee organizational identification.
7.	Siagian et al., (2024) [14]	The Impact of Quality of Work Life and Work-Life Balance on Job Satisfaction: The Mediating Role of Perceived Organizational Support	Quality of work life, job satisfaction	Quality of work life and work life balance both have positive and significant effects on job satisfaction.
8.	Ratag et al., (2023) [15]	Pengaruh Kepemimpinan Transformasional dan Kualitas Kehidupan Kerja Terhadap Organizational Citizenship Behavior (OCB) pada Anggota Kepolisian di Satuan Reserse Kriminal Polresta Samarinda	Transformational Leadership, Quality of Work Life, Organizational Citizenship Behavior	Transformational Leadership and Quality of Work Life simultaneously have a significant influence on Organizational Citizenship Behavior.
9.	Bisbey et al., (2021) [16]	Safety Culture: An Integration of Existing Models and a Framework for Understanding Its Development	Safety culture, behavioral change, organizational psychology, social psychology	There are seven enabling factors that create conditions that enable employees to adopt the values, assumptions, and norms of a safety culture; and four behaviors used to make it happen.

10.	Mo et al., (2023) [17]	Proactive Personality and Construction Worker Safety Behavior: Safety Self-Efficacy and Team Member Exchange as Mediators and Safety-Specific Transformational Leadership as Moderators	Proactive personality, safety behavior, safety-specific transformational leadership	Proactive personality, safety behavior, safety-specific transformational leadership
11.	Shaqour, (2022) [18]	The impact of adopting lean construction in Egypt: Level of knowledge, application, and benefits	Lean construction	The application of lean tools in the construction sector that positively impact time, cost, quality, safety, environment and relationships, which increases the value of resources and money.
12.	Berawi et al., (2023) [1]	Lean Construction Practice on Toll Road Project Improvement: A Case Study in Developing Country	Project Performance, Lean Construction, Construction Waste	The implementation of lean practices resulted in a 19.17% reduction in project completion time.
13.	Romo et al., (2024) [19]	Statistical Analysis of Lean Construction Barriers to Optimize Its Implementation Using PLS-SEM and PCA	Training, Communication, Adaptability, Corporate Culture, Mentality, Innovation, Leadership, Commitment, and Resources	Barriers to implementing Lean construction, especially those related to corporate culture, communication, training, leadership, and the influence of mentality on business adaptability
14.	Adhi & Muslim, (2023) [20]	Development of Stakeholder Engagement Strategies to Improve Sustainable Construction Implementation Based on Lean Construction Principles in Indonesia	Sustainable construction, lean construction, stakeholder engagement, engagement strategy, stakeholder influence level	The biggest barrier to implementing sustainable lean construction is the lack of knowledge and skills in using lean tools and principles, while the biggest driver to implementing sustainable lean construction is increased time efficiency and process standardization.

The results of the review of fourteen journals indicate a number of variables that may influence the implementation of lean construction. Ten of the reviewed journals identify transformational leadership as one of the key variables considered capable of influencing lean construction implementation. ransformational leadership is reported to affect lean construction in studies by [8] [9], [10], [21];[10], [15]. [14] dan [22] are two of the six researchers who position quality of work life as a variable that influences lean construction implementation. The study by [23] identifies occupational health, safety, and environmental (HSE/K3L) culture as a variable that may influence lean construction. Researchers who examine lean construction as a variable influenced by multiple factors include[18], [19], [20].

The discussion of the journals reviewed above indicates that lean construction implementation has attracted researchers' attention for a considerable period. The journals examined in this literature study demonstrate that numerous variables may influence the adoption of lean construction across various projects. Several studies suggest that lean construction has the potential to improve occupational safety and reduce workplace accidents. This is because, in principle, lean construction seeks to streamline construction activities particularly in small scale projects so that each task can be monitored more effectively.

Occupational safety and health strongly influence both accident rates and accident severity. The low level of occupational safety and health implementation is largely attributed to limited awareness and understanding of the importance of high-quality safety and health practices. The challenges faced by companies include persistently high workplace accident risks due to insufficient emphasis on occupational safety and health (OSH) policies, as well as the continued lack of understanding or even neglect—of the importance of OSH among workers, both for their own well-being and for the organization [24].

The role of leaders in implementing and promoting a workplace safety culture in the construction sector is crucial. Strong leadership commitment, effective communication, employee participation, and a clear sense of responsibility are essential in cultivating a positive and sustainable safety culture. Leadership plays a fundamental role in shaping organizational values and objectives that become embedded within the workplace over time. Strong and proactive leadership is particularly vital in high-risk industries such as construction, where safety challenges are prevalent, in order to foster a protective culture in which all employees internalize and consistently adhere to safety compliance as a standard practice [11].

The roles of leaders and stakeholders determine the strategic actions that shape the direction of sustainable construction implementation. The greatest barrier to implementing sustainable lean construction is the lack of knowledge and skills in applying lean tools and principles, while the strongest driver is improved time efficiency and process standardization. The most effective strategy for increasing stakeholder engagement is for governments to develop regulations and standardize the use of green and sustainable materials [20].

4. CONCLUSIONS

Based on the review of the journals, it can be concluded that the implementation of lean construction is influenced by multiple interrelated variables, with transformational leadership emerging as the most dominant factor. Other variables, such as quality of work life and occupational health, safety, and environmental (HSE) culture, as well as various additional factors, also play significant roles in supporting successful implementation. In general, lean construction has been shown to improve construction process efficiency while enhancing workplace safety by reducing waste and enabling better control of on-site activities, particularly in small- to medium-scale projects.

On the other hand, the implementation of occupational health and safety remains a major challenge due to the low level of awareness and understanding among both workers and organizations regarding its importance. In this context, leadership plays a critical role in fostering a sustainable safety culture through strong commitment, effective communication, and active stakeholder engagement. Furthermore, the successful implementation of sustainable lean construction is influenced by strategic support, such as improving competencies in applying lean principles and strengthening government regulations related to the standardization of green and sustainable materials. Therefore, synergy among leadership, safety culture, and policy support is essential to drive effective and sustainable lean construction implementation.

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