Investigating the Level of Lean Construction Implementation in Malaysian Construction Projects

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DOI: https://dx.doi.org/10.47772/IJRISS.2025.914MG00231

Received: 02 November 2025; Accepted: 08 November 2025; Published: 28 November 2025

ABSTRACT

This study investigates the level of Lean Construction (LC) implementation among G7 contractors in Malaysia. Despite its proven potential to improve productivity, reduce waste, and enhance project efficiency, the adoption of LC within the Malaysian construction industry remains limited. A quantitative research design was employed, using a structured questionnaire distributed to G7 contractors to assess their familiarity, awareness, and application of key LC techniques such as 5S, Just in Time (JIT), Value Stream Mapping (VSM), Last Planner System (LPS), and Kanban. Descriptive statistical analysis, including frequency, percentage, and mean score, was used to evaluate the data. Findings revealed that most respondents demonstrated a moderate level of familiarity with Lean Construction concepts, with 5S and JIT being the most commonly recognized and applied techniques. However, the overall level of implementation was found to be low, as many respondents reported that Lean practices were rarely applied in their organizations. This may be attributed to limited awareness of LC terminology, despite some contractors informally applying Lean principles in daily operations. The study concludes that while Lean Construction concepts are partially practiced, there is a need for greater awareness, training, and institutional support to strengthen Lean adoption in Malaysia's construction sector.

Keywords: Lean Construction, Management, Performance, Implementation

INTRODUCTION

The construction industry plays a vital role in Malaysia's economic and social development through its contribution to infrastructure growth, employment creation, and national productivity. Despite this significance, the sector continues to face persistent challenges such as project delays, cost overruns, low productivity, and high levels of material waste, which collectively hinder performance efficiency (Du et al., 2022). These issues not only compromise project delivery timelines and budgets but also raise concerns about sustainability and resource management. In light of these challenges, there is an increasing need for the Malaysian construction industry to adopt innovative management approaches that enhance efficiency and reduce waste.

Lean Construction (LC) has emerged as an effective management philosophy designed to address such challenges. Derived from the principles of Lean Manufacturing introduced by Toyota, LC emphasizes waste elimination, continuous improvement, and value maximization for clients through enhanced process flow and collaboration (Issa, 2013; Singh & Kumar, 2020). Within the construction context, LC provides a structured framework that integrates people, processes, and technology to improve project performance. Previous studies have demonstrated that the adoption of LC contributes to improved productivity, reduced project duration, and better resource utilization (Maru et al., 2024).

Globally, the application of Lean Construction has gained increasing attention as a strategy for improving project outcomes. However, in Malaysia, the adoption of LC remains relatively limited. The local construction sector is still largely dependent on conventional practices that focus on output delivery rather than process optimization.

While awareness of LC concepts has been growing, implementation is often inconsistent and varies across organizations (Swefie, 2021). Furthermore, factors such as insufficient awareness, lack of technical knowledge, resistance to change, and the absence of institutional support contribute to the slow adoption of LC in the Malaysian context (Likita et al., 2022). The extent to which Malaysian contractors, particularly those managing large-scale projects, have adopted LC practices remains uncertain.

This gap highlights the need for empirical evidence on the current level of LC implementation within the Malaysian construction industry. Understanding the degree of adoption will provide valuable insight into the maturity of LC practices in the local context and indicate the readiness of the industry to embrace more efficient and sustainable construction approaches.

Therefore, this study aims to investigate the level of Lean Construction implementation in Malaysian construction projects, focusing specifically on G7 contractors within the Klang Valley. The findings are expected to offer a clear overview of how widely LC principles are applied in practice, serving as a foundation for future initiatives aimed at enhancing construction efficiency and promoting continuous improvement across the industry.

The Lean Construction Principle

Lean Construction is a management approach derived from Lean Manufacturing principles introduced by Toyota, emphasizing efficiency, waste reduction, and value creation. It is guided by six key principles: Respect for People, Optimize the Whole, Generate Value, Eliminate Waste, Focus on Flow, and Continuous Improvement (Martínez León & Calvo-Amodio, 2017). In other article, it is stated that ntegrating lean construction principles into project management promotes sustainability by reducing waste, improving resource efficiency, and encouraging continuous improvement to generate greater value across the construction process (Garcés et al., 2025). These principles serve as the foundation for enhancing productivity, improving coordination, and ensuring sustainable project delivery within the construction industry (Herrera et al., 2019).

The principles collectively aim to align project activities with client value while minimizing inefficiencies. Respect for People promotes teamwork and empowerment, while Eliminate Waste and Focus on Flow ensure smooth processes and resource efficiency. Continuous Improvement fosters innovation and learning, creating a culture of consistent enhancement. By integrating these principles, construction organizations can improve project outcomes, collaboration, and sustainability.

Lean Construction Techniques

Lean Construction techniques are practical tools designed to improve efficiency, reduce waste, and enhance project performance by translating Lean principles into actionable strategies. The 5S technique—Sort, Set in Order, Shine, Standardize, and Sustain—focuses on workplace organization and visual management to promote safety, cleanliness, and productivity (Al-Hussain, 2022). It establishes a disciplined environment where tools, materials, and processes are clearly arranged and maintained for efficiency. Implementing the Just-in-Time (JIT) approach in construction helps reduce material waste and improve productivity by ensuring reliable supply chain coordination and efficient communication among stakeholders (Hussein & Zayed, 2021). This system enhances coordination between suppliers and project teams to ensure timely delivery and reduce site congestion.

Value Stream Mapping (VSM) serves as a key lean tool that helps visualize and analyze workflows, allowing project teams to identify waste, streamline processes, and enhance overall efficiency in construction activities (Batwara et al., 2023). The Last Planner System (LPS) serves as a collaborative planning and control approach that brings together various project stakeholders to create and manage short-term plans, aiming to enhance workflow consistency and reduce process fluctuations (Agrawal et al., 2024). In other article, tools such as the Last Planner System help teams identify and control constraints that lead to inefficiencies (Prastowo, 2023). Finally, the Kanban system facilitates workflow visualization and pull-based task management, allowing construction teams to control work-in-progress, enhance coordination, and reduce variability in project processes (Fuentes-Del-burgo et al., 2024). Collectively, these Lean tools streamline processes, enhance coordination, reduce waste, and improve productivity within construction organizations, leading to higher efficiency and sustainable project performance.

METHODOLOGY

This study adopted a quantitative research design to investigate the level of Lean Construction implementation among G7 contractors in Malaysia. A structured questionnaire was developed to collect primary data, focusing on respondents' awareness, familiarity, and application of key Lean Construction techniques, including 5S, Just in Time (JIT), Value Stream Mapping (VSM), Last Planner System (LPS), and Kanban. The questionnaire consisted of both demographic questions and Likert-scale items designed to measure respondents' perceptions and levels of implementation.

The target population comprised G7 contractors registered under the Construction Industry Development Board (CIDB), as they represent the highest grade of contractors responsible for large-scale and complex construction projects. A purposive sampling technique was employed to ensure that respondents had relevant experience and involvement in project management and site operations. Data were collected through online survey distribution and follow-up correspondence to maximize response rates.

The collected data were analyzed using descriptive statistical methods, including frequency, percentage, and mean score analysis, to determine the overall level of Lean Construction awareness and implementation. The results were presented in tables clarity and interpretation. The study design provided an empirical basis for understanding the current adoption trends of Lean Construction among G7 contractors and offered valuable insights into the readiness of the Malaysian construction industry to embrace Lean practices for improved project performance and sustainability

RESULT AND FINDINGS

Demographic Background

Refer to Table 1, most respondents are Quantity Surveyors (32%) and Civil Engineers (28%), followed by Supervisors (19%), Project Managers (17%), and Directors (4%), indicating majority representation from technical and professional positions. While Table II shows the distribution of respondents according to their working experience in the construction industry. Among the 113 G7 contractor respondents, the largest group (38.9%) had 3–6 years of experience, indicating a strong representation of mid-level professionals who are actively engaged in construction project operations. This is followed by 6–10 years (25.7%) and more than 10 years (20.4%), representing experienced contractors with significant industry exposure. Meanwhile, 15.0% of respondents had less than 3 years of experience, reflecting the participation of younger professionals who may be relatively new to Lean Construction practices.

Table I Respondents' Position In Company

Position	Frequency	Percentage (%)
Director	5	4%
Project manager	19	17%
Civil Engineer	32	28%
Quantity Surveyor	36	32%
Supervisor	21	19%
Total	113	100%

TABLE II RESPONDENTS' WORKING EXPERIENCE

Working Experience	Frequency	Percentage (%)
Less than 3 years	17	15
3–6 years	44	38.9
6–10 years	29	25.7
More than 10 years	23	20.4
Total	113	100

Level of Lean Construction Implementation in Malaysia

The findings in Table III show that most respondents (28.3%) are moderately familiar with Lean Construction, while only 8.8% are very familiar, indicating a moderate overall awareness and suggesting limited in-depth understanding among G7 contractors.

TABLE III Respondents' Knowledge on Lean Construction

Knowledge on Lean Construction	Frequency	Percentage
Not at all Familiar	21	18.6
Slightly Familiar	27	23.9
Moderately Familiar	32	28.3
Familiar	23	20.4
Very Familiar	10	8.8
Total	113	100

Meanwhile, the result shown in Table IV reveals that the 5S technique (23%) is the most commonly known Lean Construction method among G7 contractors, followed closely by Just in Time (21.2%). These techniques are relatively simple and practical, focusing on site organization and timely resource management. In contrast, more advanced tools such as Value Stream Mapping (13.3%), Last Planner System (12.4%), and Kanban (8.8%) show lower levels of familiarity. This suggests that while contractors are aware of basic Lean practices, the adoption and understanding of systematic or process-oriented techniques remain limited. Overall, the results indicate that Lean Construction knowledge among G7 contractors is partial and tool-specific.

TABLE IV Respondents' Knowledge On Lc Techniques

Lean Construction Techniques	Frequency	Percentage
5S	26	23
Just in Time (JIT)	24	21.2
Value Stream Mapping (VSM)	15	13.3
Last Planner System (LPS)	14	12.4
Kanban	10	8.8

The findings show that the overall application of Lean Construction techniques among G7 contractors is relatively low. As tabulated in Table V more than half of the respondents (50.4%) reported that these techniques are rarely applied, while 28.3% stated they are used occasionally. Only a small number apply them often (9.7%) or always (2.7%). However, this low level of reported application may not necessarily indicate a lack of practice. It is possible that many respondents are not fully aware of the formal terminology used in Lean Construction but are unknowingly applying its principles—such as efficient material management, teamwork, and waste reduction—in their daily operations. This suggests that while Lean practices may exist informally on site, they are not consciously identified or labeled as part of Lean Construction methods.

TABLE V Application of Lc Techniques in Organisation

Application of Lean Construction Techniques in Organisation	Frequency	Percentage
Never	10	8.8
Rarely	57	50.4
Occasionally	32	28.3
Often	11	9.7
Always	3	9.7
Total	113	100

CONCLUSIONS

The study concludes that the implementation of Lean Construction (LC) among G7 contractors in Malaysia remains at a moderate to low level. While most respondents demonstrated some familiarity with Lean concepts, their practical application within organizations is still limited. The findings indicate that 5S and Just in Time (JIT) are the most commonly recognized and applied techniques, reflecting a focus on basic site organization and resource management. In contrast, more advanced tools such as Value Stream Mapping (VSM), Last Planner System (LPS), and Kanban are less understood or practiced.

Interestingly, the low reported application may not necessarily reflect a complete absence of Lean practices. Many contractors may be unknowingly applying Lean principles in daily operations without associating them with formal LC terminology. This suggests that the challenge lies more in awareness and conceptual understanding than in resistance to Lean practices themselves. Therefore, the study highlights the need for structured training and industry awareness programs to enhance understanding and systematic adoption of Lean Construction in Malaysia. Strengthening Lean knowledge among contractors can ultimately lead to improved productivity, reduced waste, and greater sustainability in the Malaysian construction industry.

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