

The Adoption of Lean Construction Techniques in Saudi Arabia

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Abstract:

This research study investigates the adoption of lean construction as a mediating factor to enhance construction performance outcomes in mega construction projects within Saudi Arabia's construction industry, utilising lean methodologies that serve as catalysts for improving critical performance dimensions, such as safety and sustainability enhancement. Through a comprehensive analysis of lean implementation strategies, the study has the potential to significantly improve project efficiency, reduce construction waste, and promote sustainable practices in large-scale construction projects, thereby enhancing value and delivering superior project outcomes for project stakeholders, including customers, contractors, project teams, and the overall Saudi construction industry.

Keywords — Lean Construction Adoption, Construction Performance Outcomes, Construction Industry, Project Stakeholders, Safety Enhancement, Sustainability Enhancement

I. INTRODUCTION OF THE STUDY

The construction sector in Saudi Arabia is crucial to the nation's economy, and it is experiencing significant change pushed by national development initiatives like Saudi Arabia Vision 2030. However, like several other places, the industry has obstacles, including project delays, excess spending, waste, and ineffectiveness. Lean Construction, focused on waste reduction and value enhancement, offers a potential approach to tackle these difficulties. This research study will focus on several factors such as Safety Enhancement and Sustainability Enhancement to validate their positive impact on construction performance outcomes, where lean construction adoption will be the mediator variable.

II. STATEMENT OF THE PROBLEM

Project delays hinder strategic growth by impacting competitive advantage. Research on competitive strategy indicates that strategic expansion is crucial in enhancing organizational performance. However, project delays might hinder

an organization's ability to meet market needs, undermining its competitive position (Zairbani & Jaya Prakash, 2023). Project performance is one of many challenges faced by the construction industry. The construction industry, mainly, is one of the most dangerous work environments around the world, given its high accident, injury, and fatality rates. Lean construction is the way to continually improve the construction process by decreasing waste and adding value delivered from the customer's perspective. If we relate this to the Lean framework, any lack of safety is waste and leads to delays in delivery or increased costs, etc. This wastage and social and economic expenditures are due to occupational injuries in construction projects (Khairul & Othman, 2022).

Significant environmental effects are caused by the quantity of garbage thrown from places of work during the construction phase. This waste includes plastics, wood, metal, and concrete, which will harm the environment if kept without disposal. Many development initiatives are being conducted to

enlarge and enhance urban infrastructure facilities, leading to around 30% to 40% of the demolition and construction waste in the overall waste production (Islam et al., 2024). Annually, the global production of waste from construction and demolition operations exceeds 10 billion tonnes, resulting from the construction and demolition of buildings and infrastructure (Wu et al., 2023).

III. LITERATURE REVIEW

Dr. Ashwin Raut (2024). - An article titled "Reducing non-value added (NVA) activities through lean tools for the precast industry": This study aims to examine the application of lean techniques to reduce non-value-added (NVA) tasks in the prefabricated construction sector. The results from this research indicate that the application of these lean techniques can significantly reduce non-value-added tasks, thereby enhancing efficiency and effectiveness in the precast building sector (Dara et al., 2024). This aligns with the lean techniques or tools used in this research to eliminate waste or non-value-added activities during the construction cycles.

Dr. Arviga Bigwanto (2024). - An article titled "Lean Construction: A Sustainability Operation for Government Projects": This study research discusses applying lean construction concepts to the preparation and execution stages of Design-Build (DB) projects and determines the factors affecting implementation in governmental initiatives. The results of this research indicate that lean construction can enhance efficiency and reduce waste in government construction projects, particularly within the context of Indonesia's current development initiatives (Bigwanto et al., 2024). This aligns with the research aims in terms of eliminating waste or non-value-added work throughout the construction phases.

Dr. Saad Sarhan, (2024). - An article titled "Promoting Health and Safety on UK Construction Sites Using Lean Construction Strategies": This research explores how Lean Construction techniques can enhance health and safety performance on construction sites by creating a model that links basic Lean Construction principles to the root causes of health and safety incidents in the UK. This study

demonstrates that lean can substantially enhance health and safety (H&S) performance; however, industry attitudes and awareness hinder its wider adoption (Chaudhari et al., 2024). This aligns with the research aims in terms of safety enhancement by the utilisation of lean construction tools and techniques for the construction performance outcomes.

Dr. Achamyalew Maru (2024). - An article titled "Investigating the Impact of Lean Construction Principles on Contractors' Project Performance in Ethiopia Using PLS-SEM": This study examines the influence of the concepts of lean building on contractors' achievement of projects in Ethiopia using PLS-SEM. The findings provide valuable insights for academics and professionals in identifying key factors that enhance contractors' project performance, potentially leading to improved outcomes within the Ethiopian construction sector (Maru et al., 2024). This aligns with the research aims in terms of utilisation of lean construction tools and techniques to enhance construction performance.

IV. SCOPE OF THE STUDY

The scope of this research is to assess the utilisation of lean construction tools and techniques on construction performance outcomes in the mega projects of Saudi Arabia's construction industry, addressing the particular requirements and characteristics of the sector.

V. OBJECTIVES OF THE STUDY

The primary mission of the study is to examine several aspects associated with adopting lean construction on construction performance outcomes within the Saudi Arabian construction sector. The particular goals of the study consist of:

1. Determine the effects of the safety enhancement associated with lean construction adoption on construction performance outcomes in the Saudi Arabian construction sector.
2. Determine the effects of the sustainability enhancement associated with lean construction adoption on construction

performance outcomes in the Saudi Arabian construction sector.

3. Determine lean construction adoption's effects on construction performance outcomes in the Saudi Arabian construction sector.

VI. LIMITATIONS OF THE STUDY

This research focuses exclusively on big construction projects within the Saudi Arabian industry. However, the recommendations from this study may apply to other project scales and different nations, particularly in the region's Gulf Arab countries, since the construction industry is generally similar.

VII. SIGNIFICANCE OF THE STUDY

- This study corresponds with Saudi Arabia's Vision 2030 initiative, which primarily seeks to diminish the economy's dependence on revenue from oil by increasing the reliance on non-oil industries such as construction sector which is vital to the nation's economic advancement.
- This study corresponds with Saudi Arabia's sustainable goal in Vision 2030 and achieving carbon neutrality by 2060, a vital objective of the Saudi government. Sustainability is an essential focus for the 2030 Vision, and this study is crucial in enhancing the adoption of environmentally friendly construction practices that mitigate construction and demolition (C&D) waste, which poses significant environmental challenges while conserving natural resources through waste reduction and promoting recycling.
- To enhance the pool of available information by supplying actual information on the present condition for lean construction procedures within Saudi Arabia and presenting fresh ideas for adapting these methods within the construction industry, filling an essential gap in educational studies and business practices since the current research about the practice of lean construction within Saudi Arabia is minimal.

VIII. CONCLUSIONS

Lean construction can significantly enhance project efficiency, eliminate waste across multiple dimensions, improve safety and sustainability outcomes, and provide a better experience for all project stakeholders, including clients, contractors, and project teams.

REFERENCES

- Khairul, M., & Othman, F. (2022). Awareness and Adoption of Lean Construction Tools to Enhance Safety in Construction Projects. Article in International Journal of Service Management and Sustainability. <https://doi.org/10.24191/ijssms.v7i2.19938>
- Zairbani, A., & Jaya Prakash, S. K. (2023). Competitive strategy and organizational performance: a systematic literature review. In Benchmarking. Emerald Publishing. <https://doi.org/10.1108/BIJ-04-2023-0225>
- Islam, N., Sandanayake, M., Muthukumaran, S., & Navaratna, D. (2024). Review on Sustainable Construction and Demolition Waste Management—Challenges and Research Prospects. In Sustainability (Switzerland) (Vol. 16, Issue 8). Multidisciplinary Digital Publishing Institute (MDPI). <https://doi.org/10.3390/su16083289>
- Wu, H., Zuo, J., Yuan, H., Zillante, G., Resources, J. W.-, and, C., & 2023, undefined. (2023). Investigation of the social and economic impacts of cross-regional mobility of construction and demolition waste in Australia. ElsevierH Wu, J Zuo, H Yuan, G Zillante, J WangResources, Conservation and Recycling, 2023•Elsevier. <https://www.sciencedirect.com/science/article/pii/S0921344922006462>
- Dara, H. M., Raut, A., Adamu, M., Ibrahim, Y. E., & Ingle, P. V. (2024). Reducing non-value added (NVA) activities through lean tools for the precast

industry. Heliyon, 10(7).
<https://doi.org/10.1016/j.heliyon.2024.e29148>

Bigwanto, A., Widayati, N., Wibowo, M. A., & Sari, E. M. (2024). Lean Construction: A Sustainability Operation for Government Projects. Sustainability (Switzerland), 16(8).
<https://doi.org/10.3390/su16083386>

Chaudhari, H., Sarhan, S., Abdelmegid, M., Saad, A., & Poshdar, M. (2024). Promoting Health and Safety on UK Construction Sites Using Lean Construction Strategies. Proceedings of the 32nd Annual Conference of the International Group for Lean Construction (IGLC 32), 548–559.
<https://doi.org/10.24928/2024/0178>

Maru, A., Jekale, W., & Asteray, B. (2024). Investigating the impact of lean construction principles on contractors' project performance in Ethiopia using PLS-SEM. Journal of Project Management (Canada), 9(3), 227–238.
<https://doi.org/10.5267/j.jpm.2024.4.004>