Barriers to the Adoption of Lean Construction in the UK Construction Industry

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Abstract

Purpose: The UK construction industry has long struggled with improving quality and efficiency, despite numerous reform efforts over the years. Persistent performance issues, compounded by recent crises, highlight the need for transformative solutions. Lean construction, known for boosting productivity and efficiency, has been studied globally to identify adoption barriers. However, research shows these barriers are influenced by regional and political factors, meaning international findings may not fully apply to the UK. While earlier studies from 2013 and 2015 offer valuable insights, there is a critical need to revisit and update these findings to reflect changes in the UK construction sector.

Aim/Objectives: This study investigates the barriers to adaptation of lean construction, assessing the benefits of lean construction, analysing global challenges, and critically evaluating those specific to the UK.

Methodology: This study adopts a systematic approach, integrating a comprehensive literature review with primary data gathered through surveys and interviews. Invitations to participate in the survey were sent to 1,210 professionals within the UK construction industry, resulting in 64 completed responses. Among the 64 respondents, 56 were from organisations with more than 250 employees.

Findings: The study reveals key barriers to the adoption of lean construction in the UK, contributing new barriers to the body of knowledge. These findings highlight the need to address these challenges and implement strategies to support the broader adoption of lean construction, ultimately enhancing the resilience and efficiency of the UK construction industry.

Originality/Value: This research delivers a current and comprehensive analysis of the benefits and barriers associated with adopting lean construction practices in the UK. The findings provide actionable insights for individuals and organizations, enabling the strategic allocation of resources to overcome these barriers.

Key Words: Lean construction, Barriers to adoption of lean construction, Lean construction benefits, UK construction industry

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I.Introduction

The construction industry plays a vital role in the economic framework of any nation. In the United Kingdom, the sector reached a milestone in 2019 with new construction work valued at £119 billion (ONS, 2021). Additionally, as of March 2022, the construction workforce constituted 6% of the UK's total employment (Parliament. House of Commons, 2022). These figures highlight the sector's significant contribution, emphasizing the imperative to sustain and enhance its performance.

The need for improvement in quality and efficiency within the construction sector was first articulated nearly 25 years ago in the seminal report Rethinking Construction by Sir John Egan (Department of Trade and Industry, 1998). This call to action was later reinforced by Mark Farmer (2016), who identified enduring issues such as low productivity, minimal profit margins, and a stagnant improvement culture. Notably, these challenges have persisted despite periods of economic stability, underscoring missed opportunities for transformative progress. In the context of current global crises, these systemic inefficiencies pose an even greater threat to the industry's resilience (McKinsey & Company, 2020).

Lean construction has emerged as a potential framework to address these performance challenges within the UK construction industry. Originating from the Toyota Production System, lean methodologies have been transformative in the manufacturing sector, as highlighted by Chen and Wang (2022). The theoretical foundation for applying lean principles in construction was laid by Lauri Koskela (1992), who argued that the adoption of lean philosophies could yield substantial performance improvements. Despite this potential, critics such as Sarhan and Fox (2013) have noted limited implementation of lean construction practices in the UK, underscoring the need for further investigation into the barriers inhibiting its adoption. Identifying and addressing these barriers is critical to focusing resources on overcoming obstacles and enabling broader implementation.

Recent studies have examined the challenges and barriers to adopting lean construction in various international contexts (Bayhan et al., 2019; Balkhy et al., 2021; Demirkessen et al., 2019; Enshassi et al., 2021; Sarhan et al., 2017). However, evidence suggests that these barriers are often shaped by specific geographic and political contexts (Huaman-Orosco and Erazo-Rondinel, 2021; Shang and Pheng, 2014; Olamilokun, 2015), indicating that findings from other regions may not be fully applicable to the UK. Within the UK, Sarhan and Fox (2013) identified three primary barriers to lean construction: [1] limited awareness and understanding of lean principles, [2] lack of managerial commitment, and [3] attitudinal resistance. Similarly, Bashir et al. (2015) identified ten key challenges for UK contractors seeking to implement lean practices. While these studies provide valuable insights, they necessitate validation to account for changes in the UK construction industry since their publication.

Determining the current barriers to lean construction adoption in the UK could offer critical insights for the sector, enabling targeted efforts to overcome these challenges. Addressing these barriers could also help alleviate the systemic issues identified by Farmer (2016). Thus, this research aims to investigate the prevailing barriers to lean construction adoption in the UK

construction industry. To achieve this aim, the study focuses on four key objectives: evaluating the benefits of adopting lean construction, examining the barriers to its implementation internationally, investigating barriers specific to the UK, and critically analysing these barriers within the UK context.

To achieve the research, aim and objectives, a structured six-stage approach was employed. First, a critical literature review was conducted to identify knowledge gaps and inform the development of the research aim, objectives, and questions. Surveys were then distributed to professionals within the UK construction sector, collecting quantitative data that validated and expanded upon insights from the literature. This was followed by qualitative interviews with UK construction professionals, providing deeper insights that complemented the survey findings. The collected primary data was critically analysed in conjunction with the findings from the literature review. This analysis served as the foundation for a thorough discussion of the barriers to lean construction adoption. Finally, the study concluded with actionable recommendations aimed at overcoming these barriers and facilitating the broader adoption of lean construction practices within the UK construction industry.

II. Literature Review

Defining Lean Construction: Philosophy, Goals, and Core Principles

Lean construction is described as a philosophy aimed at achieving more with fewer resources (Oluwatosin et al., 2019). Due to its philosophical nature, the strategies for achieving its aims can vary significantly (Chen and Wang, 2022). Emuze and Saurin (2015) argue that the overarching goals of lean construction can be summarized as the elimination of waste, the optimization of resource efficiency, and the creation of value across all stages of the construction process. This perspective aligns with Tarantino (2022), who defines lean construction as a philosophy focused on continuous improvement through waste elimination.

Benefits of Lean Construction

The potential of lean construction to enhance performance within the construction industry has been a subject of scholarly attention for several decades. Koskela's foundational theory, introduced over 30 years ago, positioned lean construction as a transformative approach to improving industry efficiency (Chen and Wang, 2022). This theoretical framework has since been substantiated by a growing body of empirical research. For instance, Emuze and Saurin (2015) contend that the advantages of lean construction are well-documented and supported by extensive evidence, particularly in addressing inefficiencies pervasive in traditional construction practices. Awad et al. (2021) further expand on these findings, identifying tangible benefits such as increased productivity, cost savings, reduced project durations, and improved sustainability outcomes. Similarly, Babalola et al. (2019) emphasize the potential for lean construction to deliver superior project quality and operational efficiency.

Prevailing Barrier to lean Construction

The fragmented nature of the construction industry, as highlighted in Construction 2025 (Department for Business, Innovation & Skills, 2013), underscores the complexity of adopting lean construction. The global distribution of a vast array of construction firms contributes to the diversity of barriers encountered, many of which arise from interrelated issues. For analytical clarity, literature has commonly categorized these barriers. For instance, Enshassi et al. (2021) identified thirty-nine distinct barriers and classified them into six overarching categories, while Sarhan and Fox (2013) utilized ten categories to structure their findings. Following this precedent, the current review employs categorical grouping to critically evaluate the barriers most prominently hindering lean construction adoption.

Prevailing Barriers Internationally

An examination of international literature highlights consistent categories of barriers to lean construction adoption (Table 1). Commonly cited barriers include cultural and attitudinal resistance, lack of awareness and understanding, inadequate education, financial constraints, and deficiencies in management practices. However, a critical evaluation reveals that grouping these barriers into broad categories, while analytically useful, risks oversimplifying the nuanced contexts in which they arise. For instance, "cultural and attitudinal resistance" encompasses diverse challenges across regions. Balkhy et al. (2021) found that in Jordan, resistance to change is driven by the absence of a continuous improvement culture among construction workers. In contrast, Sarhan and Fox (2013) observed that in the UK, similar resistance is tied to fears of blame and contractual disputes.

Although both issues are categorized as "cultural and attitudinal resistance," they require context-specific solutions. This underscores the limitations of generalized categorizations in addressing practical challenges and highlights the importance of tailoring strategies to regional and cultural contexts.

Prevailing Barriers in the UK

The prevailing barriers impeding the adoption of lean construction in the UK were also investigate. Previous studies show that lean construction in the UK are the same as those identified internationally (Table 1). This finding contrasts with claims by Huaman-Orosco and Erazo-Rondinel (2021), who argue that barriers are geographically specific and shaped by local industry dynamics. The apparent uniformity in barriers may result from the broad categorizations employed, which can obscure regional nuances. For instance, cultural barriers in the UK may stem from entrenched practices, contractual rigidities, and risk-averse behaviours specific to its construction sector. These issues differ significantly from those in other regions but remain grouped under the same "cultural resistance" label. Such categorizations risk overlooking the unique socio-economic and operational factors shaping regional challenges. Thus, while the identification of common categories facilitates

comparative analysis, it also highlights the need for a more granular approach to understanding and addressing barriers in distinct geographical contexts.

The review confirms that the prevailing barriers to lean construction adoption in the UK align with those reported internationally. However, a critical analysis reveals that the grouping of barriers into broad categories may obscure the specific causes and solutions required for distinct challenges. For example, addressing resistance to change in the UK may require interventions focused on mitigating contractual risks, whereas solutions in other regions, such as Jordan, may necessitate fostering a continuous improvement culture. This analysis underscores the importance of tailoring strategies to local industry contexts to effectively overcome barriers and enhance lean construction adoption

Table 1: Prevailing Barriers in UK and Internationally

Barriers to Lean Construction	Author & Country	Sarhan and Fox (2013)	Bashir *et al.* (2015)	Sarhan and Fox (2012)	Bayhan *et al.* (2019)	Huaman-Orosco and Erazo-Rondinel (2021)	Demirkesen *et al.* (2019)	Enshassi *et al.* (2019)	Albalkhy and Sweis (2021)	Bajjou and Chafi (2018)	Neeraj *et al.* (2016)	Total
		UK	UK	UK	USA	Peru	Ireland	Gaza Strip	Jordan	Morocco	USA	
Management		✓	✓	✓	✓	✓	✓	✓	✓	✓		9
Finance		✓	✓	✓	✓	✓	✓	✓	✓	✓		9
Government					✓	✓	✓	✓	✓	✓		6
Technical Complexity			✓		✓		✓	✓			✓	5
Lack of awareness & understanding		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
Education		✓	✓	✓	✓	✓		✓	✓	✓	✓	9
Culture and attitude		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
Fragmentation and subcontracting		✓		✓						✓		3
Procurement and contracts		✓		✓		✓			✓			4
Time and commercial pressure		✓		✓						✓		3
Long implementation time			✓			✓		✓	✓			4
Lack of incentives			✓			✓		✓	✓			4
Communication							✓	✓				2

Barriers to Lean Construction Implementation

Culture and Attitude

The construction industry's complex and project-based nature has contributed to the perception that lean manufacturing principles cannot be effectively transferred to construction projects (Mason, 2021; Demirkessen et al., 2019). However, Egan (Department of Trade and Industry, 1998) contended that construction processes exhibit repeatability, allowing for improvements by leveraging lessons from manufacturing's successes. While Egan's perspective aligns with evidence supporting the benefits of lean construction, it underestimates the critical role of workforce culture and attitudes in adopting lean practices. Cultural and attitudinal factors significantly influence workforce behaviour, directly impacting the successful implementation of lean construction strategies

Previous studies suggest that resistance to change is a predominant cultural barrier. Bashir et al. (2015) highlighted a dismissive attitude, where non-critical problems are often ignored. Similarly, Cano et al. (2015) identified resistance to change as the most influential barrier to lean adoption. Albalkhy and Sweis (2021) argue that successful change requires the workforce to embrace the tools and techniques willingly. This underscores the need to address cultural and attitudinal barriers as a prerequisite for lean construction adoption, raising the question of whether these factors continue to obstruct progress in the UK construction industry.

Lack of Awareness and Understanding

A recurring barrier to lean construction adoption is the lack of awareness and understanding of its principles (Table 1). Limited exposure to lean concepts has been cited as a contributing factor (Albalkhy and Sweis, 2021). However, Bajjou and Chafi (2018) reported that 61% of surveyed construction professionals were familiar with lean practices, indicating that awareness alone does not guarantee successful implementation. Bayhan (2019) suggested that unclear definitions of lean construction contribute to this barrier, as the lack of a shared understanding complicates its adoption. Richardson (2017) expanded this view, asserting that lean construction transcends tools and techniques to represent a comprehensive mindset and collaborative approach. This implies that both awareness and a deeper understanding of lean principles are critical for effective implementation. Further research is needed to determine if the lack of awareness and understanding remains a significant barrier in the UK today.

Education

Education has been identified as a potential solution to overcoming awareness and understanding barriers, yet it remains a challenge in itself (Table 1). Bashir et al. (2015) highlighted efforts to disseminate lean knowledge through academic and organizational initiatives, but education persists as a significant barrier. Vukadinovic et al. (2017) attributed this to inadequate training, limited technical skills, and insufficient leadership support. Given that this data was based on research from 2015, it is necessary to investigate whether

educational efforts around lean construction have evolved and what specific educational deficiencies continue to hinder progress in the UK construction industry.

Finance

Financial barriers, including high implementation costs, inflation, rising resource expenses, and lack of funding, have consistently impeded lean construction adoption (Sarhan and Fox, 2013). Huaman-Orosco and Erazo-Rondinel (2021) identified financial costs as a top barrier in Peru, though economic and industry contexts differ from the UK. Additionally, Demirkesen et al. (2019) noted the cost of hiring lean consultants as a significant challenge. As economic pressures increase due to global crises, further research is required to evaluate whether financial instability has exacerbated these barriers. It is also essential to explore whether construction professionals view lean construction as a potential solution to alleviate pressures or as a financial risk with uncertain benefits.

Management

Management challenges are another recurrent barrier to lean construction adoption (Table 1). Enshassi et al. (2019) emphasized the lack of top management support and commitment, while Cano et al. (2015) identified sustained leadership as crucial for successful change. Contrastingly, Sarhan and Fox (2013) suggested that resistance might lie with middle management, which may lack the training and experience necessary to implement lean practices effectively. These differing perspectives highlight the need for further investigation into which levels of management present the greatest resistance to lean adoption in the UK construction industry.

This critical analysis has addressed objective four by identifying the prevailing barriers to lean construction adoption in the UK. These barriers include culture and attitude, lack of awareness and understanding, education, finance, and management. Furthermore, it is evident that existing research is outdated and requires validation to determine whether these barriers remain consistent or have evolved over time. Future studies should focus on reassessing these challenges to provide updated insights into the current state of lean construction adoption in the UK.

III.Research Methodology

A sequential mixed-method approach is adopted for this study, commencing with quantitative data collection through surveys, followed by qualitative data gathered via semi-structured telephone interviews. This approach facilitates a deeper understanding of the research topic by using survey results to inform and refine interview questions. Combining these methods enhances the reliability of findings through triangulation, as noted by Noam (2013). Surveys were selected as the quantitative method due to their efficiency in gathering numerical data from a large sample within a constrained timeframe. As Noam (2013) highlights, closed-ended questions are effective for identifying patterns and generalizing results, while the inclusion of two open-ended questions allows for insights beyond structured responses. Survey questions

were developed based on the research objectives and literature review, with Qualtrics chosen for its secure data handling, anonymity features, and diverse functionality. Alternatives, such as postal surveys, were ruled out due to concerns about cost, delays, and logistical inefficiency (Noam, 2019).

Survey Participants' Profile

Survey invitations were distributed to 1,210 professionals across the UK construction industry. This sample size was chosen based on Creswell's (2020) guidance, which emphasizes that larger samples improve population representation and reduce sampling errors. Due to time constraints in participant outreach and data collection, the survey garnered a total of 64 responses. The survey, consisting of 20 questions, required approximately 10–15 minutes to complete. Of the 64 respondents, 56 (88%) were from organizations with over 250 employees. Most participants were professionals in project management, construction management, and quantity surveying, with 40% based in the Southwest and London regions.

Survey Analysis

Descriptive statistics were selected as the primary method for presenting and analysing data in this research. This approach offers significant advantages, including enhanced flexibility, objectivity, and neutrality, making it particularly suited to the study's aims. By providing a clear and systematic summary of the data, descriptive statistics facilitate a robust understanding of trends and patterns within the population. Consequently, this method strengthens the reliability of the conclusions drawn, ensuring they are well-grounded and reflective of the broader population under investigation

Interview

Invitations to participate in follow-up interviews were extended to 64 UK construction professionals. These invitations were facilitated by providing participants with the option to volunteer for an interview at the conclusion of the survey. This sampling approach aligns with Creswell's (2020) confirming and disconfirming strategy, which emphasizes selecting participants capable of either supporting or challenging the survey findings. However, only three participants ultimately took part in the interviews for this research

IV. Results

Level of awareness of the term "Lean Construction"

The survey assessed respondents' awareness of Lean Construction, providing valuable insights into the general understanding of this methodology within the sample population. A significant majority (82%) of respondents reported familiarity with the term "lean construction." Among those familiar, 71% demonstrated a clear understanding of its principles, while 56% were aware of specific lean tools and techniques. Furthermore, 70% identified at least one benefit associated with lean construction. These findings indicate that most respondents possess foundational knowledge of lean construction, suggesting that awareness is

unlikely to represent a major barrier to its adoption in the UK construction industry. The relatively high awareness levels also suggest that the sample is well-suited to provide data for understanding the broader adoption of lean construction.

However, the extent of lean construction implementation reveals a more nuanced picture. While 73% of respondents reported incorporating lean practices to some degree, only 30% indicated frequent use, and 52% stated they rarely or occasionally employed such methods. Additionally, 20% were uncertain about the extent of lean implementation in their projects. These results imply that, despite widespread awareness, significant obstacles may impede broader and consistent adoption. Potential barriers include organizational resistance, resource constraints, and insufficient training, which merit further investigation. The variability in lean usage underscores the need for targeted strategies to address these challenges and foster more effective implementation of lean principles in the industry.

Benefits of Lean construction to projects

The analysis of survey responses regarding the benefits of lean construction reveals significant findings while exposing critical gaps in understanding and measuring its impacts. Notably, 20 respondents selected "N/A" when asked about the benefits of lean construction. This raises key questions: Do these respondents lack familiarity with lean practices, or do they use lean construction without recognizing its benefits? Addressing this gap is essential for clarifying the relationship between lean adoption and its perceived advantages. Despite these gaps, the survey highlights increased efficiency, reduced costs, enhanced sustainability, and improved productivity as the primary benefits reported by participants. These findings align with the widely cited advantages of lean construction in existing literature.

In addition to the survey results, interviews with participants introduce safety as another critical advantage of lean construction. Participants argue that reducing the number of personnel on-site minimizes risk, a claim supported by the premise that fewer personnel interactions and reduced exposure to physical hazards enhance safety. Importantly, safety improvements extend beyond risk mitigation, yielding secondary benefits such as reduced demand for welfare facilities, transportation, and emissions. These effects align with broader organizational goals, including sustainability and profitability, and may enhance an organization’s competitive positioning. Such findings underscore the multifaceted benefits of lean construction, offering valuable insights for both practitioners and researchers aiming to maximize its implementation.

Barriers prevent adoption of lean construction

The survey analysis identified the top three barriers preventing the adoption of lean construction as commercial pressures and time constraints, lack of knowledge or skills, and resistance to change. A critical question arises: Are these barriers based on respondents' direct experiences with lean construction adoption, or are they speculative and potentially influenced by bias? Insights from interviews provided valuable clarity on these issues.

Commercial Pressures and Time Constraints

Interview participants elaborated on the challenges of commercial pressures and time constraints. They observed that for a business to operate efficiently, it should function at 80–90% capacity rather than exceeding 100%, which leaves minimal room for innovation or improvement. Participants also highlighted the financial burden of hiring consultants to facilitate lean adoption, which reduces profit margins and deters businesses from pursuing this approach.

Lack of Knowledge and Skills

Regarding the lack of knowledge and skills, participants suggested that larger organizations often benefit from internal collaboration within the supply chain, which facilitates knowledge transfer. However, smaller firms may lack these resources. Participants emphasized that training programs are most effective when tailored to specific roles or disciplines, as this targeted approach demonstrates the direct benefits of lean construction, fostering greater buy-in.

Resistance to Change

Participants identified resistance to change as a significant barrier, particularly among professionals accustomed to traditional methods. They suggested that overcoming this resistance requires strategies aligned with stakeholders' priorities. For example, planners may be more inclined to adopt lean practices if they recognize time-saving benefits, while sharing success stories could further motivate hesitant individuals. Additionally, participants noted that younger professionals are more likely to be early adopters of lean construction, with broader industry adoption occurring gradually as these individuals advance in their careers.

This analysis highlights the interrelated nature of these barriers. For instance, resistance to change may stem from a lack of understanding of lean construction's benefits, which could, in turn, be exacerbated by time constraints that limit opportunities for training and education.

From this analysis, it is evident that efforts to address these barriers are underway. Tailored training, strategic communication, and targeted support for early adopters may represent effective approaches to overcoming these challenges. However, further research is needed to explore how these strategies can be implemented across organizations of varying sizes and capacities.

V.Findings

The findings of this research provide a comprehensive understanding of the current state of lean construction adoption in the UK construction industry. They highlight both the persistent challenges and emerging opportunities for broader implementation. By integrating insights from primary data and existing literature, the research identifies critical barriers that

hinder adoption while also emphasizing the recognized benefits and motivations for lean construction practices. These findings offer a nuanced perspective, showing that while awareness of lean construction is relatively high, significant gaps remain in its application. The following sections summarize the key findings, focusing on barriers to adoption, the awareness and benefits of lean construction, the disconnect between awareness and implementation, actionable insights for improvement, and directions for future research.

Barriers to Lean Construction Adoption

The research identifies several key barriers to the adoption of lean construction within the UK construction industry. A total of nine barriers were recognized through the literature review, many of which remain relevant today. Specifically, the primary data highlights the following three barriers as the most significant:

- Commercial Pressures and Time Constraints**:** These emerged as the most prominent barrier, with respondents citing the demanding nature of project timelines and budgetary constraints as major obstacles to the integration of lean construction practices.
- Lack of Knowledge or Skills: A critical challenge identified by respondents was the insufficient understanding or technical expertise related to lean construction, hindering its effective application.
- Resistance to Change: This barrier was particularly pronounced among long-standing industry professionals who were reluctant to adopt new practices or shift from traditional methods.

The findings indicate a shift in the relative importance of these barriers when compared to earlier literature. While many of the barriers identified in previous studies continue to persist, the research shows that commercial pressures have become an increasingly significant barrier, reflecting the evolving dynamics of the UK construction sector.

Awareness and Benefits of Lean Construction

The research also sheds light on the awareness and perceived benefits of lean construction among industry professionals. The survey results indicate that:

- 74% of respondents reported using lean construction in their projects, suggesting a relatively high level of awareness and initial adoption.
- 58% believed that lean construction would benefit their work, further underscoring the recognition of its potential advantages.

The benefits identified in the survey closely align with those highlighted in the literature, including:

- Increased Efficiency: Streamlining processes and reducing waste.
- Cost Reduction: Lowering overall project costs by optimizing resource usage.

- Enhanced Sustainability: Reducing environmental impact through efficient use of materials and processes.
- Improved Productivity: Increasing output through the elimination of inefficiencies.

In addition to these benefits, the research uncovers additional motivations for the adoption of lean construction, such as:

- Increased Profits: Lean practices are seen as a way to improve the financial performance of projects.
- Enhanced Client Value: Delivering projects that better meet client needs while reducing waste.
- Competitive Advantage: Gaining a competitive edge in the market through more efficient project delivery.

Disconnect Between Awareness and Implementation

Despite the widespread recognition of lean construction's potential benefits, the research reveals a significant disconnect between awareness and full implementation:

- Only 25% of respondents reported integrating lean construction into their corporate strategy, suggesting that while there is awareness, its systematic adoption remains limited.
- Furthermore, only 11% of respondents expressed dissatisfaction with the current level of lean construction adoption, indicating a degree of indifference or complacency, even among those who acknowledge its potential benefits.

This gap between awareness and implementation suggests that additional barriers—such as the perceived complexity of lean practices, competing organizational priorities, and contextual constraints within the industry—may be contributing to the slower rate of adoption.

Actionable Insights

The findings offer valuable insights for organizations and individuals seeking to overcome the barriers to lean construction adoption. Addressing the key obstacles could help alleviate some of the systemic inefficiencies identified in the UK construction sector. Key recommendations include:

- Tailored Training: Providing specialized training that addresses specific knowledge gaps could enhance understanding and encourage the adoption of lean practices across various levels of the workforce.
- Strategic Management of Organizational Resistance: Developing strategies to manage and overcome resistance to change, such as promoting success stories and demonstrating tangible benefits, could facilitate broader acceptance of lean construction principles.

By focusing on these interventions, it is possible to bridge the gap between awareness and action, thereby fostering greater adoption of lean practices across the sector.

V.I Discussion

The primary data reveals both encouraging trends and critical challenges in the adoption of lean construction practices. Seventy-four percent of survey respondents reported using lean construction in their projects, while 58% believe it would benefit their work. These figures suggest a general awareness of lean construction's advantages but raise questions about the depth of its implementation and its perceived value among the remaining respondents. The survey identified key benefits such as increased efficiency, cost reduction, enhanced sustainability, and improved productivity. These findings align with the literature review of 102 publications (e.g., Chen and Wang, 2022; Babalola et al., 2019). Moreover, the primary data provides novel insights by highlighting additional motivations for adoption, including increased profits, enhanced client value, and competitive advantage.

Despite these recognized benefits, the findings reveal a significant disconnect between awareness and action. Only 25% of respondents reported integrating lean construction into their corporate strategy, and just 11% expressed dissatisfaction with the current level of adoption. This indicates a degree of indifference among some respondents, even those who acknowledge lean construction's potential benefits. Understanding this gap requires further investigation into factors such as the perceived complexity of integration, competing organizational priorities, and contextual constraints specific to the UK construction industry.

The findings offer actionable insights for individuals and organizations seeking to enhance lean construction adoption. Targeted efforts to address barriers could mitigate systemic inefficiencies in the UK construction sector, as identified by Mark Farmer (2016). These efforts would not only increase adoption rates but also unlock the full potential of lean construction’s benefits across the industry.

V.I.I Conclusion

The first objective of this paper, which was to assess the benefits of adopting lean construction, was addressed through both the literature review and primary research. The literature review provided a solid foundation, identifying the widely acknowledged benefits of lean construction. However, it was noted that the extent of lean construction's implementation within the UK construction industry had not been comprehensively documented prior to this study. Through primary data collection, this research revealed the level of lean construction adoption in the UK and confirmed that the reported benefits—such as increased efficiency, cost reduction, and enhanced productivity—aligned with findings from global studies. While this research contributed valuable insights, it is suggested that a more robust understanding of these benefits could be achieved through quantitative data rather than relying solely on anecdotal evidence.

The second objective focused on investigating the prevailing barriers to lean construction adoption on an international scale. The literature review successfully identified key barriers such as commercial pressures, lack of skilled labour, and resistance to change, which have been consistently observed across different countries. These barriers remain highly relevant, and the literature review provided strong, up-to-date evidence of the challenges that the construction industry faces globally in adopting lean practices.

The third objective was to explore the specific barriers to lean construction within the UK. This objective was fulfilled through the collection and analysis of primary data, which provided context-specific insights. The study identified key barriers, including commercial pressures and time constraints, lack of knowledge and skills, and resistance to change, all of which mirrored the international findings. However, the UK-specific data also highlighted unique challenges, such as regulatory constraints and the industry's traditional culture, which further impact the adoption of lean construction in the country.

The fourth objective of the research was to critically analyse the prevailing barriers to the adoption of lean construction in the UK. The associated research question aimed to uncover the critical issues related to each of these barriers. This objective was successfully addressed through both the literature review and primary data collection. The literature review provided a broad analysis of the barriers to lean construction in the UK, identifying challenges such as resistance to change, lack of skilled labour, and commercial pressures. However, the literature's findings were considered outdated, failing to capture the current dynamics of the UK construction industry. To bridge this gap, primary data was collected through interviews, which offered deeper insights into the barriers identified in the survey. Interview participants provided detailed explanations, revealing the underlying causes of these barriers, such as organizational resistance, the absence of tailored training, and the complexities involved in integrating lean practices into established processes. Through this critical analysis, the research has contributed to a clearer, more contemporary understanding of the prevailing barriers to lean construction adoption in the UK, which could inform strategies to address these challenges going forward.

V.I.I.I Recommendation

To further advance lean construction practices, future research should focus on sector-specific challenges, particularly in areas such as infrastructure, to provide clearer and more relatable insights. Additionally, quantitative methods, such as cost-benefit analysis, are needed to generate objective and measurable evidence of lean construction's advantages. These approaches would equip organizations with practical, data-driven guidance, enabling them to develop more effective strategies for overcoming barriers and maximizing lean construction's potential. These approaches would offer a more nuanced understanding of lean construction’s impact and help to develop more effective strategies for overcoming the identified barriers.

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