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EVALUATING THE PERCEPTIONS OF UK CONSTRUCTION PROFESSIONALS ON THE ADOPTION AND IMPLEMENTATION OF LEAN CONSTRUCTION

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ABSTRACT

This study explores barriers to adopting Lean Construction (LC) principles within the UK construction industry, with particular focus on how these barriers are perceived across various job roles. The study utilises a quantitative survey of 116 professionals, including project managers, contractors, engineers, architects, and support staff. The study revealed that financial constraints, organisational culture, and regulatory requirements are perceived to be important barriers to LC implementation across all job roles. Leadership roles (e.g. project managers) and technical roles (e.g. Engineers, architects) place more importance on barriers, perhaps due to their project direction and resource allocation responsibilities. In contrast, labourers and admin staff viewed barriers as less important. Future intentions to adopt LC principles vary, with technical, administrative/support roles and leadership roles expressing a stronger willingness to adopt LC in comparison to labour roles. This research fills a gap in LC literature by examining the role-specific perceptions of barriers, providing a foundation for tailored frameworks to support LC adoption across the construction sector.

KEYWORDS

LC, Organisational culture, financial constraints, Regulatory requirements, UK construction industry

INTRODUCTION

The Machine That Changed the World (Womack et.al, 1991) is a landmark book that defines Lean methodology as the practice of achieving more with less to efficiently deliver high-quality goods and meet customer needs. The book, which is based on extensive research conducted by the Massachusetts Institute of Technology (MIT) within the International Motor Vehicle program, offers a comparative analysis of Toyota's highly efficient lean production method and traditional mass production systems commonly found in the West. Highlighting the advantages of lean methodology by showcasing advancements in quality, productivity, and responsiveness. It can be argued that Womack et.al.'s book made lean manufacturing more accessible to a global audience by showcasing its applicability and utility not only as a methodology, but as a superior system of production.

However, it is important to note that the concepts delineated in *The Machine That Changed the World* focus primarily on lean manufacturing, which is distinct from lean construction (LC), although both methodologies are undergirded by similar principles and concepts. Notably, Lauri Koskela (2020), who is widely recognised as an important figure within lean construction, defines LC as context-specific; its

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characteristics adapt to industry problems, applying similar principles differently (Tzortzopoulos, Kagioglou and Koskela, 2020). In his 1992 technical report, "Application of the New Production Philosophy to Construction", Koskela challenges the adequacy of traditional project management, which is focused solely on the time-cost-quality trade-off. He argues that within construction project management, a more robust theoretical understanding of production is needed, and he, therefore, introduced what is known as transformation flow value theory (TFV).

1. Transformation (T): The traditional view of converting inputs (materials, labour, information) into outputs (completed structures).
2. Flow (F): Conceptualising production as a flow of work, materials, and information, focusing on minimising interruptions, waiting times, and variability to ensure smooth and efficient progress.
3. Value Generation (V): Viewing production from the perspective of delivering value to the customer, emphasising the elimination of activities that do not contribute to what the customer ultimately requires.

Literature Review

Extent of LC adoption in the UK

There is evidence to support the use of lean construction in the UK, specifically the use of various techniques such as 5S, JIT, LPS, VSM, collaborative planning, prototyping, and daily/weekly reviews (Daniel et al., 2018; Sarhan & Fox, 2013). However, scholars (e.g., Alsoufi & Ahmed, 2023; Sandagomika, 2021; Albalkhy & Sweis, 2020) have identified barriers to the implementation of lean construction through organisational, financial, and regulative barriers. These barriers may explain the current landscape of productivity within the UK construction industry. At the time of writing, based on data gathered by the Office for National Statistics, the UK's construction productivity declined by 3% (2010-2022), contrasting with growth in manufacturing (+2%/yr), tech/ICT (+4%/yr, 2010-2020), and logistics (+1%/yr) (ONS, 2023). The data show that consistent construction lags behind other industries, suggesting the need for interventions, such as LC. This opens a discussion that perhaps addressing critical gaps within the lean construction literature may help address productivity issues within the United Kingdom construction industry.

Current studies largely neglect investigating barrier perceptions across different job roles (e.g. project managers, engineers, designers, quantity surveyors, and labourers). Understanding role-specific perspectives is crucial because a one-size-fits-all approach to overcoming barriers is ineffective. Strategies must be tailored to the unique challenges and responsibilities inherent in different roles to facilitate successful LC implementation and to address the industry's fundamental productivity problem. Gathering data on role-specific barrier perceptions can reveal themes and facilitate the development of holistic strategies. Addressing this knowledge gap, the current study aims to (1) identify how diverse UK construction roles perceive LC implementation barriers, focusing on role-specific challenges and perception variations, and (2) examine future intentions to use LC principles based on job roles. These findings will provide a foundation for developing tailored frameworks and strategies to address barriers and provide a basis for further studies.

Barriers to LC

Financial Barriers

Albalkhy and Sweis (2020) highlighted that financial hurdles significantly hinder the adoption of Lean Construction (LC) principles. They argue that implementing LC necessitates investment in both technology and management systems, posing considerable upfront costs for small and medium-sized enterprises. Additionally, they note that the fragmented structure of the construction industry makes it challenging for businesses to perceive immediate returns on LC investments, further discouraging adoption. The findings of Albalkhy and Sweis (2020) imply that companies may struggle to appreciate the long-term benefits of LC or lack the financial resources to wait for these results to materialise.

Organisational Barriers

Organisational barriers are primarily manifested as challenges within corporate culture (Owens et al., 2017). Therefore, the rate at which lean construction is accepted and implemented within an organisation depends on the culture fostered within the organisation. If an organisation is open to change and is not hesitant to adopt new innovative practices, then there is the possibility that Lean Construction can be adopted at a much faster pace. LC techniques such as the Last Planner System (LPS) can be hindered by an organisation's resistance to collaborative planning; some of the barriers to utilising this lean construction technique can be a lack of trust that inhibits constraint identification and reliable promise, poor communication that hinders coordination, lack of management support that undermines discipline, and hierarchical conflicts with empowering last planners. Lack of understanding of LPS principles (lookahead, constraints, PPC) leading to incorrect use; insufficient facilitation, communication, and problem-solving skills; and lack of training for all participants (incl. subs) (Soren Wandahl, 2014); this is also the case for Value Stream Mapping (VSM). Some of the barriers to implementation of this lean practice can be siloed thinking preventing holistic view, lack of trust/blame culture discouraging honest waste identification, resistance to implementing process changes identified via VSM. Lack of analytical skills for mapping, poor understanding of value versus waste, and insufficient training on VSM methodology. (Algan Tezel, 2016).

Regulatory Barriers

Lean Construction (LC) offers benefits like increased productivity, cost savings, shorter project durations, and improved safety and sustainability. However, its implementation is often constrained by regulations such as building codes, environmental protections, and safety standards (Penrice and Monib, 2025). While essential for public welfare and structural integrity, these regulations can hinder LC adoption. This analysis explores how regulations, while necessary, can impede LC by limiting flexibility, without suggesting the removal of safety standards.

Specific regulatory barriers impede LC adoption. Prescriptive building codes limit process innovation, method adaptation, and continuous improvement by preventing deviation from mandated (potentially wasteful) methods (Sarhan et al., 2018). Approval bottlenecks and permit delays disrupt the continuous flow, Just-In-Time (JIT) delivery, and reliable planning (LPS), introducing waiting for waste and undermining pull systems (Frandson and Tommelein, 2015; LetsBuild, 2024). Rigid safety mandates, in their application, restrict adaptive work methods and flexible sequencing (LPS) by hindering on-the-fly adjustments based on site conditions (Umar, Okwandu and Akande, 2024). Furthermore, a lack of enabling policies fails to provide frameworks or incentives for systemic LC implementation, hindering the shift from traditional practices (Huaman-Orosco, Erazo-Rondinel and Herrera, 2022; Moradi and Sormunen, 2023).These barriers often stem from inadequate supportive policies and cumbersome administrative processes (like permits), particularly harming LC's core mechanisms of flow and pull (Simonsen, Herrera and Atencio, 2023). Regulatory complexity and inefficiency can amplify existing LC adoption challenges like resistance to change (Penrice and Monib, 2025). The perceived difficulty of navigating regulations can make implementing LC seem overwhelming, deterring adoption (Aslam, Gao and Smith, 2025).

Applying Koskela's TFV (Transformation, Flow, Value) framework reveals how regulatory barriers hinder the flexibility crucial for LC. Regarding Flow, administrative delays like permits introduce non-value-adding steps and interruptions, obstructing the smooth, predictable workflow LC aims for, while inflexible regulations hinder efficient processes. Concerning Value, regulatory delays inflate project duration and costs, diminishing client value, and inflexible rules preventing optimal methods can reduce functionality or quality. Finally, focusing on Transformation, prescriptive codes emphasise task inputs/outputs over process efficiency, potentially stifling innovation. For instance, rigid material specifications might prevent adopting a safe, cost-effective alternative identified through value engineering, sacrificing potential benefits solely for compliance.

METHODOLOGY

RESEARCH STRATEGY AND CHOICE

This study aimed to collect data regarding the perspectives of professionals within the United Kingdom on barriers to LC; the survey employed a quantitative research approach as a tool for data collection. A Likert scale was also utilised. The amount of points on the scale differs on each question; for example, for questions pertaining to the perceived importance of barriers to LC implementation, the Likert scale operates on a 5-point basis with 1 = Not Important, 2 = Slightly Important, 3 = Moderately Important, 4 = Very Important, and 5 = Extremely Important (more on the different scales utilised can be found within the result section of this paper). Joshi et al. (2015) emphasise that the construction of Likert scales aims to understand the opinions and perceptions of participants related to a single "latent" variable. In this research, the primary aim is to comprehend the perceptions of professionals regarding barriers to LC, as well as their intent to utilise LC principles, and therefore, based on these grounds, the utilisation of a Likert scale was implemented. Furthermore, utilising the Likert scale would produce data that is easier to analyse by allowing conversion to a nominal table.

Participants were questioned on barriers established through a literature review that focused on analysing and identifying some of the most prominent Lean Construction (LC) barriers. From this review, financial, regulatory, and organisational barriers were shortlisted. The survey strategy consisted of two separate parts: the initial part focused on the participants' years of experience and job titles, while the second part asked questions delving deeper into the professionals' perceptions of these barriers. The questionnaire was conducted online using Google Forms, with data collected from May 2024 to January 2025. A purposive sampling method was used to select research participants, as there is no defined database for LC/construction professionals in the UK. Purposive sampling involves selecting a sample group based on its relevance to the study. Nyimbili (2024) states that purposive sampling can help ensure a quality sample is located without biases, potentially increasing the reliability and trustworthiness of findings.

Consequently, this entailed distributing the survey only to participants based in the UK with roles related to the construction industry. The survey was primarily distributed via email and online platforms (e.g., LinkedIn) to various groups meeting predefined eligibility criteria (must be currently working in the UK construction industry and possess an awareness of Lean Construction). To enforce these criteria, the questionnaire featured a pre-screening process where participants answered a series of questions, including a consent form and an eligibility form. If participants indicated they had not used LC principles or that their job was not related to the construction industry, the survey directed them to another page explaining their ineligibility. The number of surveys to be distributed was determined through a power analysis aiming for a 95% confidence level with a 5% margin of error. This calculation considered the UK construction industry workforce, estimated by the Office for National Statistics (ONS) to be around 2.2 million. The formula used was $n=Z2\times p\times(1-p)/E2$, where Z equals 1.96, p equals 0.5 (assuming maximum variability), and E equals 0.005 (the margin of error). Using this formula and the estimated size of the UK construction industry, the ideal sample size was calculated to be approximately 384.

Initially, 394 surveys were distributed to achieve the target number of responses. However, due to non-responses, only 116 surveys were returned, representing 29.7% of the ideal sample size. Therefore, one limitation of this research is that the sample may not be fully reflective of the UK construction industry population. Consequently, the findings should be interpreted with caution. Nevertheless, the research can be utilised as a basis upon which further research can build to contribute to the existing knowledge base.

RESULTS

RESEARCH PARTICIPANT'S OVERVIEW

The first two questions of the research survey primarily focused on determining participants' job titles and years of experience. This allowed for an overview of the sample, leading to a better understanding of the type of participants. The survey involved 116 participants: (leadership roles: 36 Project Managers, 2 Site Managers, 2 Operations Managers, 2 Compliance Managers, 1 Building Manager); (technical roles: 26 Engineers, 23 Contractors, 6 Architects, 5 Quantity Surveyors,); (admin/support roles: 2 Office

Admins, 3 Accountants, 2 Buyers, 1 Customer Service Manager, 1 IT Support); (labour roles: 2 Machine Operators, 1 Tradesman, 1 Skilled Labourer).

Table 1 summarises the results taken from Question 2 which analysed the experience levels, showing that years of experience were balanced, with 27 participants having 10 to 15 years, an equal number over 15 years, 29 with 5 to 10 years, 27 with one to five years, and 4 with less than 1 year. This diverse sample offers valuable insights, although caution is advised when generalising the results to the UK construction industry. These results can serve as a foundation for future research.

Table 1: Experience levels

Years of Experience	Count
Less than 1 year	4
Between 1 and 5 years	30
Between 5 and 10 years	29
Between 10 and 15 years	27
More than 15 years	27

Organisational culture

Table 2 below summarises the results gathered from Question 3A, asking participants to rate the importance of organisational culture as a barrier to lean construction (scale: 5 = extremely important and 1 = not important). Across all job titles, 56 people (48.3%), followed by "moderately important" by 28 people (24.1%), 18 people (15.5%) rated financial constraints as "extremely important", while respectively 9 people (7.8%) rated financial constraints is "slightly important" lastly 5 people (4.3%) rated financial constraints as "not important".

Table 2: Importance of organisational culture as a barrier to LC

Job Title	5) Extremely Important	4)Very Important	3)Moderately Important	2)Slightly Important	1)Not Important	Total
Project Manager	7	19	8	2	0	36
Contractor	3	12	6	2	3	26
Engineer	5	10	5	2	1	23
Architect	1	1	3	1	0	6
Quantity Surveyor	0	3	2	0	0	5
Site Managers	0	2	0	0	0	2
Operations Managers	0	1	0	1	0	2
Compliance Managers	0	1	1	0	0	2
Building Manager	0	1	0	0	0	1
Labour roles	0	0	2	1	1	4
Admin/support roles	2	6	1	0	0	9

An analysis of Table 2 shows that organisational culture is widely viewed as a significant barrier to LC. A strong majority, exceeding 80% of Project Managers, Contractors, Engineers, Architects, Quantity Surveyors, and Admin/Support staff rate it as Moderately to Extremely Important. Project Managers and Engineers show particularly high concern, with over 70% and 65% respectively rating it as Very or Extremely Important. Admin/Support roles also perceive it as highly critical, with 100% rating it within the Moderately to Extremely Important range. A notable divergence exists with Labour roles, where only 50% rate it Moderately Important or higher, suggesting a different perspective or experience level. This divergence highlights the theoretical implications of differing "sensemaking" within the organisation; management and technical roles perceive LC through a systemic lens, focused on collaboration and process flow, while labour roles focus on immediate task execution. This cultural divide significantly impacts specific LC tools. For instance, the Last Planner System® (LPS) relies on trust and collaborative planning; a culture of mistrust, as indicated by the differing perceptions, can undermine LPS's effectiveness. Similarly, 5S and Visual Management require a culture of shared ownership and transparency, which may be lacking based on the observed discrepancies. Overall, there is a strong consensus among management, technical, and administrative personnel regarding the importance of this barrier. The data underscores the perception that cultural factors significantly impede LC adoption across key professional roles, though less so for site labour based on this sample.

Financial constraints

Table 3 below summarises the responses to question 3B which asked participants to rate the importance of financial constraints as a barrier to LC. Across all job titles, 61 people (52.6%) rated financial constraints as "very important," followed by "moderately important" by 23 people (19.8%), 21 people (18.1%) rated financial constraints as "Extremely important," while respectively 5 people (4.3%) rated financial constraints as "Slightly important," lastly 6 people (5.2%) rated financial constraints as "Not important."

Table 3: Importance of Financial constraints as a barrier to LC

Job Title	5) Extremely Important	4)Very Important	3) Moderately Important	2)Slightly Important	1)Not Important	Total
Project Manager	8	19	8	0	1	36
Contractor	4	16	2	1	3	26
Engineer	0	17	5	0	1	23
Architect	2	1	2	1	0	6
Quantity Surveyor	2	1	2	0	0	5
Site Managers	0	2	0	0	0	2
Operations Managers	1	0	0	1	0	2
Compliance Managers	0	0	2	0	0	2
Building Manager	0	0	1	0	0	1
Labour roles	1	1	0	1	1	4
Admin/support roles	3	4	1	1	0	9

Most respondents rated financial constraints as "Extremely Important" or "Very Important," suggesting it is widely recognised as a central challenge in adopting lean construction. This strongly aligns with existing literature identifying financial constraints, implementation costs, lack of funding, and risk aversion as significant barriers globally (Nwaki, Eze and Awodele, 2021). Project managers, contractors, engineers, and architects were more inclined to rate financial constraints as "Extremely Important," "Very Important," or "Moderately Important." These roles may involve responsibility for

monitoring budgets, choosing materials based on prices (e.g., value engineering), or dealing with clients. This rating choice could be linked to organisational or change theories. The financial practice of organisations may often conflict with the foundational tenets of Lean Construction (LC), presenting challenges, particularly for organisation s resistant to transformation. A fundamental principle of LC is maximising project value while minimising waste. Traditional financial practices within construction prioritize minimising initial capital costs, often at the expense of overall value, creating inherent tension. Practices like Target Value Design (TVD), which is designed to a target cost, directly confront a culture focused on estimating cost and reactively cutting scope. The reluctance to invest upfront stems from this traditional, cost-centric financial mindset (Algan Tezel, 2016). However, it is also plausible to assume that even in cases where organisations are not reluctant to embrace new, innovative, methodologies the reason behind wide, a methodology isn't utilised as effectively may be due to an organisation simply not having enough financial resources to foot upfront costs.

Regulatory Barriers

Table 4 summarises the responses to question 3C which asked participants to rate the importance of regulatory requirements as a barrier to LC. Across all job titles, 37 people (31.9%) rated regulatory requirements as "very important," followed by "extremely important" by 33 people (28.4%), 29 people (25.0%) rated regulatory requirements as "moderately important," while respectively 11 people (9.5%) rated regulatory requirements as "Slightly important," lastly 6 people (5.2%) rated regulatory requirements as "Not important."

Table 4: importance of Regulatory requirements as a barrier in relation to LC

Job Title	5) Extremely Important	4)Very Important	3)Moderately Important	2)Slightly Important	1)Not Important	Total
Project Manager	9	16	9	0	2	36
Contractor	8	5	8	2	3	26
Engineer	5	7	4	6	1	23
Architect	0	2	3	1	0	6
Quantity Surveyor	3	1	0	1	0	5
Site Managers	0	2	0	0	0	2
Operations Managers	1	1	0	0	0	2
Compliance Managers	0	1	1	0	0	2
Building Manager	0	0	1	0	0	1
Labour roles	2	1	1	0	0	4
Admin/support roles	5	1	2	1	0	9

Regarding regulatory importance, the most common rating is "extremely important." (37 responses). This is followed by "very important" (37 respondents). Moderately important was selected by 30 respondents, showing a balance among many, while “slightly important” and “not important” received 11 and 6 responses, respectively. The data suggest that leadership roles view regulatory barriers as of higher importance. This is potentially because leadership roles are directly involved in regulatory compliance. The data suggest that those less involved with regulatory adherence contribute more to responses in categories such as slightly essential and not important. The data gathered support studies that claim that project managers must ensure adherence to regulatory requirements, which can lead to more stringent application and scrutiny of how project managers handle day-to-day activities within a project. For example, a comprehensive study by Agapiou (2024) states that, depending on the type of

project, project managers within construction must adhere to international and national regulations set around the safety of workers, the environment, and established building standards. For engineers, the data show that they often regard the importance of regulatory barriers as "moderate". This view supports the notion that the extent of the barrier may depend on the extent of design and technical compliance with government and industry standards. Additionally, concerning how the barrier manifests for labourer and support roles, individuals in these positions are more inclined to view regulatory constraints as “slightly important” or “not important at all”. This perspective may stem from the fact that much of the compliance burden is borne by management or specialised personnel.

Future intention to use LC

Table 5 below summarises the responses to question 3C which asked participants to rate the likelihood of using LC in the future.

Table 5: Future intention to use LC

Job Title	5)Definitely will use	4) Probably will use	3)Might use	2)Probably will not use	1)Definitely will not use	Total
Project Manager	11	15	7	2	1	36
Contractor	1	10	8	6	1	26
Engineer	7	12	2	1	1	23
Architect	0	1	3	2	0	6
Quantity Surveyor	2	2	1	0	0	5
Site Managers	0	2	0	0	0	2
Operations Managers	0	1	0	1	0	2
Compliance Managers	0	1	1	0	0	2
Building Manager	0	1	0	0	0	1
Labour roles	0	0	2	1	1	4
Admin/support roles	5	1	2	1	0	9

Across all job titles, 6 respondents (24.5%) indicated they "Definitely will use," while 46 respondents (43.4%) selected "Probably will use." A smaller group of 26 participants (24.5%) stated they "Might use," and only 6 respondents (5.7%) chose "Probably will not use." The smallest category was "Definitely will not use" with just 2 respondents (1.9%). On a more direct scale based on job titles, “Definitely will use” and “probably will use” categories are mostly chosen by roles more closely involved with project oversight and decision-making – project managers, engineers, and contractors; the data suggest that these job roles have higher proportions of participants who have indicated that they "will use" or "might use" LC. Overall, managerial or technical roles that oversee workflow, technical standards, and resource allocation may be more inclined to see the benefits of utilising LC. Specific roles that focus on administration and support (e.g., Accountants, Office Administrators, IT Support) have a higher proportion of participants stating that they "will not use" LC; this may reflect the perception that LC predominantly applies within contexts that favour on-site efficiency and collaboration in planning, rather than purely administrative functions. The data also show that groups (such as Buyers, Accreditation Officers, or Skilled Labour) have a varied mix of responses, indicating that while some individuals see the value in LC, others remain sceptical, causing reluctance to firmly commit to potentially utilising LC. A comprehensive report by Sandagomika and Sandanayake (2021) highlights that many barriers to LC implementation stem from insufficient awareness among stakeholders at all levels, suggesting that the best course of action should be to extend training to all stakeholders. Therefore, this would also include job roles concentrated in administration and support.

Similar arguments are also echoed by (Omari, 2023), who states that all roles within a construction project team must have a foundational understanding of LC practices to facilitate implementation and collaboration

Conclusion

Overall, the research confirms that financial constraints, regulatory requirements, and organisational culture are widely recognised as important barriers to lean construction. The future intention to utilise lean construction was generally positive among the sample participants. The data gathered in this research suggest that Project Managers, Contractors, Site Managers, Operations/Compliance/Building Managers consistently express high importance in relation to barriers associated with financial constraints, cultural barriers, and regulatory hurdles. Reflecting their direct responsibility for budgets, project execution, compliance, and team coordination. This group also showed the strongest positive intent utilise lean construction.

When considering support, focus should be placed on equipping this group with leadership capabilities for change and emphasising and offering robust tools and data to justify the utilisation and investment in lean construction (return on investment analysis or TVD training). For site-focused roles (Site Managers, Contractors), practical support for implementing tools like the Last Planner System (LPS) and visual management is crucial. Empower them to champion LC within their teams and projects. Engineers, Architects and Quantity Surveyors view cultural and financial barriers as important, with heightened importance around regulatory compliance related to design and technical standards. Their intention to use LC is generally positive, although it is possible that they may focus on more design phase applications. To support professionals within this group, provide training on collaborative design methodologies (Integrated Project Delivery concepts) and target value design to align the design with project value and cost targets. Lastly, it offers clear guidelines for efficiently integrating regulatory requirements into design processes using LC principles.

Labour roles perceive cultural barriers as less critical than management/technical roles. The group also showed more mixed intentions regarding LC. It is correct to presume that their focus was more on immediate task execution. Therefore, to support professionals within this group, training should be highly practical; for example, showing how LPS creates more predictable schedules or how 5S improves safety and workplace efficiency. Furthermore, emphasise respect for their expertise, and involve them in identifying improvements through accessible channels, such as daily huddles, doing so can ensure that there are means of relaying feedback to build trust, demonstrate value and contribute to continuous improvement. There is a subtle mix of uncertainty in regard to potentially utilising Lean Construction. Majority of admin/support staff indicate that they “definitely will use” LC suggesting that there is a recognition of the potential advantages. There is a mix of views in terms of the importance of each barrier however, one of the major limits of this research is the sample size as the sample size is 116 participants. There is a particular limitation regarding the diversity of the sample and this issue shows especially when considering admin/support staff results. The sample mainly consists of project managers, engineers, and architects. Admin/support staff as well as labour roles, only make up a small percentage of the sample, and therefore perhaps in future studies, placing an emphasis on a larger sample size may be of great benefit. Furthermore, further studies within this specific area of lean construction literature, it is recommended that scholars conduct in-depth qualitative research (e.g., interviews, case studies) to understand the precise nature of how barriers manifest in professionals' daily work (what *specific* regulations clash with LC principles in your job role? What *specific* cultural elements make labourers hesitant?) Quantify the *relative importance* of each barrier type *within* each professional group identified, moving beyond general importance rankings to understand priorities for intervention.

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