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EXPLORING IGLC LITERATURE ON SUBCONTRACTING

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ABSTRACT

Subcontractors are essential to the delivery of many construction projects. However, current approaches to subcontracting are known to be disjointed, with systemic issues such as misaligned objectives among project stakeholders, fragmented workflows, and transactional relationships often limiting subcontractors' contribution to project success. To support future research in this area, this paper explores how subcontracting has been discussed in selected IGLC literature, grouped into four themes to reflect subcontractors' involvement across project stages: Selection, Engagement, Execution, and Evaluation. Within each theme, the paper offers reflections and poses open-ended questions that may help inform future studies into the role of subcontractors in Lean Construction. While acknowledging that the observations may not capture the full breadth of existing research, this paper offers preliminary insights into how subcontracting has been addressed in the IGLC literature and suggests opportunities for future study.

KEYWORDS

Subcontracting, Lean Construction, collaboration, relational contracting, trade partners.

INTRODUCTION

Subcontractors (SC) are important to construction projects, often delivering specialized work more efficiently and cost-effectively than general contractors (GC). However, challenges such as misaligned objectives among project stakeholders, fragmented workflows, and transactional relationships are known to disrupt the collaboration between SC and GC, often leading to project delays, quality issues, and disputes.

Over the years, the International Group for Lean Construction (IGLC) has published numerous studies regarding the role and management of SC, reflecting sustained interest in addressing the challenges that limit their contribution to the delivery of construction projects. Building on IGLC's studies that have examined challenges in subcontracting and suggested ways to improve current practices and to support future research in this area, this paper explores

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IGLC publications to highlight key ideas and to identify questions for further study. The analysis is guided by the following research question: *How has subcontracting been addressed in IGLC conference papers?* Selected papers were grouped into predefined themes, and insights were synthesized to formulate open-ended research questions within each theme.

This paper is structured as follows. The next section presents an overview of Lean Construction literature related to SC, followed by a description of the approach used to explore IGLC conference papers, including the selection and thematic organization of papers. The core of the paper presents the thematic analysis structured around four phases of subcontracting: (1) Selection, (2) Engagement, (3) Execution, and (4) Evaluation. Each theme summarizes ideas from the literature and is accompanied by the authors' reflections and open-ended questions intended to support future research. The paper concludes with a summary of insights and suggestions for further study on subcontracting in Lean Construction.

In literature, the term "subcontractor" appears sometimes to be used interchangeably with the term "specialist contractor," "trade contractor," "trade partner," or "specialty trade" and similarly, "general contractor" with "main contractor." For consistency, this paper uses SC and GC to refer to subcontractors and general contractors, respectively.

LITERATURE

Lean Construction is rooted in the Transformation-Flow-Value (TFV) conceptualization of project production systems (Koskela, 1992), which frames construction not only as a series of discrete transformations, but as a dynamic flow system aimed at delivering client-defined value. In this context, SC (specialized trade professionals operating under a GC or under another SC and responsible for specific scopes of work) play a critical role in project delivery. On some projects, they may execute a very large amount if not all the work (Hinze & Tracey, 1994; Jang et al., 2007). Rather than treating SC as isolated conversion (transformation) agents, Lean Construction advocates for their integration into collaborative production systems that promote reliable workflow and value delivery (Koskela, 2000; Tommelein et al., 2022).

Given that SC are directly involved at the face of production (i.e., on-site), protecting their work from upstream uncertainties is essential for stabilizing workflows. This principle is exemplified by the commitment-based planning approach of the Last Planner System® (LPS) (Ballard & Howell, 1994; Ballard & Tommelein, 2021), that aims to shield downstream work from variability and promote proactive coordination. Coordination among SC is also vital to address inefficiencies caused by design and planning gaps (Tommelein & Ballard, 1997). Delay, rework, poor coordination, and unproductive resource utilization are all forms of waste associated with SC, i.e., wastes that Lean Construction explicitly seeks to eliminate.

Qualified SC are typically engaged with the expectation of delivering their specialized work more efficiently, at higher quality, or at lower cost than GC (Arditi & Chotibhongs, 2005). However, their involvement also introduces risk: SC practices have been identified as significant contributors to delays (e.g., Assaf & Al-Hejji, 2005). Subcontracting practices that prioritize lowest price or shortest duration can result in quality issues, too many change orders, frequent disagreements between GC and SC, and excessive costs (Bingol et al., 2024).

Ballard & Howell (1994) highlight that conventional planning fails to align the "should" with the "can," leading to low Percent Plan Complete (PPC) and increased waste. They demonstrate how LPS addresses this failure by focusing on executable works. Miller et al. (2002) emphasize that collaboration between GC and SC is often hindered by poor communication and transactional relationships, and advocate for shared goals and early SC involvement to mitigate these issues. Sacks and Harel (2006) suggest that when SC lack confidence in plan reliability, e.g., due to upstream variability or fixed-price contracts, they may reduce labor commitments, thereby harming productivity and project production rates. This leads to unreliable labor allocation and further reduces plan reliability, creating a vicious circle that LPS seeks to break

by means of improving transparency and SC involvement in planning. It is notable that Lean Construction emphasizes a collaborative relationship with SC to deliver flow and value, rather than treating them as external entities to control.

While Lean Construction has consistently emphasized the integration of SC into collaborative planning and production systems, the ways in which subcontracting is described and applied still vary across the Lean Construction literature. Some studies focus on SC involvement in planning or takt implementation, whereas others address SC procurement or performance measurement without connecting these to broader subcontracting strategies. Much of what is known about subcontracting practices in Lean Construction is embedded within wider topics such as coordination or project delivery, instead of being examined directly. Recognizing the critical role of SC and the complexity introduced by different types of contracts (or project delivery), this paper explores how subcontracting is discussed in IGLC conference papers—an important forum for advancing Lean Construction thinking. As a preliminary effort, this paper aims to support future research that identifies enablers to help SC collaborate effectively in different contract settings and with various project partners. Limited to IGLC conference papers, this study certainly does not claim to capture the full extent of overall subcontracting discourse in Lean Construction; rather, it serves as an initial step toward framing a more focused research agenda.

METHODOLOGY

This study takes an exploratory approach to characterize subcontracting practices. The guiding question for the study is: *How has subcontracting been addressed in IGLC conference papers?*

To identify relevant papers, a keyword search was conducted across IGLC conference papers through the search-box on the website https://iglc.net/Papers. As described on the website, the search finds the keyword "in title, abstract, keywords or author name(s)." The keywords included "subcontractor," "subcontracting," "specialist contractor," "trade contractor," "trade partner," and "specialty trade." Papers published between 1996 (IGLC 4 in Birmingham, UK) and 2024 (IGLC 32 in Auckland, New Zealand) were considered; this covers the full range of papers available on the website. A total of 120 papers were collected, and after checking for duplicate results from the search, finally 109 papers were selected for the study. It is worth mentioning that "trade specialist" search resulted zero papers, and other keywords were also tried but possibly resulting in similar papers therefore saved for a later effort: "subcontractors" (resulted in 74 papers), "subcontractings" (0), "specialist" (10), "specialists" (13), "specialty trades" (4), "trade specialty" (0), "partner trade" (0), and "contractor trade" (3). Table 1 shows a summary of the selected IGLC papers after removing duplicates.

A thematic analysis was conducted to organize the selected IGLC papers according to key ideas and to identify research questions for further study. Four themes were considered to reflect SC involvement across project stages: (1) Selection, (2) Engagement, (3) Execution, and (4) Evaluation. Each theme is defined using criteria such as guiding questions and examples, as described in the following paragraphs. Selected papers were then skimmed. While some papers could arguably fit into more than one of the four themes, the analysis prioritized assigning each paper to a single, most relevant theme to avoid overlap and maintain thematic clarity. In a few cases, however, papers did not clearly align with any of the predefined categories. These papers were still retained in the study and are discussed in the next section to acknowledge their relevance.

Table 1: Selected IGLC papers after removing duplicates

Keyword	Number of Selected IGLC Papers
“subcontractor”	85
“subcontracting”	6
“specialist contractor”	1
“trade contractor”	5
“trade partner”	8
“specialty trade”	4

THEME 1: SELECTION

The Selection theme focuses on how SC are identified, assessed, and selected before the work begins. The guiding question for this theme is: *How do project teams decide which SC are best suited to support their Lean Construction project’s delivery?* Signals for this theme include the use of a selection framework, mention of SC qualification criteria, or a description of SC prequalification processes. For instance, papers put in this theme discuss decision-making tools related to SC selection, or practices related to aligning SC criteria with project goals.

THEME 2: ENGAGEMENT

The Engagement theme focuses on how the selected SC are formally integrated into the project through contracting strategies, commercial terms, or collaborative arrangements. The guiding question for this theme is: *How are SC brought into the team in a way that promotes shared goals, transparency, and trust?* Signals include mentions of contracting models (e.g., IPD, alliance, Integrated Form of Agreement), risk/reward sharing, scope alignment, onboarding processes, or roles defined through contracts. Examples including studies on contracts, relational contracting, or onboarding strategies.

THEME 3: EXECUTION

The Execution theme addresses how SC are involved in the planning and execution of work (i.e., production), including coordination, production systems, and on-site collaboration. The guiding question for this theme is: *How are SC actively engaged in planning and executing work to enable reliable and lean production flow?* Signals include the discussions of LPS, takt planning, work structuring, pull planning, coordination meetings, or production tracking/measurement involving SC. Papers analyzing trade flow, collaborative work structuring, or visual management tools used by SC are considered to belong in this theme.

THEME 4: EVALUATION

The Evaluation theme focuses on how SC performance is assessed, reflected upon, and improved over time. The guiding question for this theme is: *What mechanisms are in place to evaluate and continuously improve SC performance and learning?* Signals include the use of performance metrics, post-project evaluations, continuous improvement cycles, feedback loops, or learning practices involving SC. For instance, research on Key Performance Indicator (KPI) for SC, reflection on SC contributions, or post-project reviews on SC are considered to belong in this theme.

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To establish how subcontracting has been discussed in the IGLC literature, 109 papers were skimmed and grouped into predefined themes. Within each theme, several papers are highlighted to surface open-ended questions intended to motivate future research.

Among these, Execution emerges as the dominant theme, with 66 papers discussing how SC operate within production systems. Engagement, with 31 papers, reflects how SC are integrated into projects, e.g., through contractual arrangements, partnering strategies, or early involvement. Evaluation, a smaller cluster with 5 papers, focuses on assessing SC performance and benchmarking practices. Selection, with 4 papers, touches on criteria and methods for choosing the right SC.

Not all papers neatly fit into one of the predefined themes. Three papers—grouped under a general "Subcontracting" theme—offer insights beyond the predefined themes, yet interesting, nonetheless. For instance, London & Kenley (2000) propose a *neo-industrial organization* model that reconceptualizes SC as integral components of the construction supply chain, challenging conventional fragmentation. Leiringer (2000) advocates for a detailed process modelling (e.g., IDEF0) to create shared understanding across project participants, with implications for SC coordination. Meanwhile Kärnä et al. (2004) analyze over 300 Finnish projects to observe factors influencing client satisfaction, with SC performance emerging as one of them. Table 2 presents a summary of the grouping.

Table 2: Selected IGLC papers after theme grouping

Theme	Number of Selected IGLC Papers
Selection	4
Engagement	31
Execution	66
Evaluation	5
Subcontracting	3

SELECTION THEME

Relying solely on quoted price and duration by the SC could result in significant issues further in the project (Bingol et al., 2024). Moreover, selecting SC based on an assessment of their readiness for lean practices is essential to supporting successful lean adoption (Asadian et al., 2023).

Two papers are highlighted from the IGLC literature, and it is speculated that the Selection theme remains underexplored as observed by the limited number of contributions that focus directly on this theme. Cortés et al. (2018) compare the traditional selection process (driven by cost) with the Choosing by Advantages (CBA) method, showing that the lowest-bid choice was the least favorable when judged by value-based metrics. This suggests how CBA could prevent poor SC selection. Meanwhile, El Zind et al. (2023) propose a holistic, three-layered procurement model that employ CBA and SC rating program, aiming to improve the efficiency of SC selection (procurement) process. These contributions suggest that the SC selection process is indeed not only about identifying technically competent firms, but also about designing a structured decision-making process that could identify a qualified SC which strategically fit for collaboration in delivering value. This leads to a question that could motivate future research: *How can project teams institutionalize a structured value-based SC selection practices that go beyond lowest-cost criteria or shortest-duration?*

ENGAGEMENT THEME

Macomber (2004) argues that Architecture-Engineering-Construction (AEC) projects are typically contracted in ways that usually in optimization at local or SC levels. In such arrangements, project participants may be incentivized to prioritize their individual performance—such as staying within budget or completing works quickly—without fully considering broader impacts on overall project flow. The transactional structure might limit opportunities for collaboration and may not fully support performance at the project level. The engagement of awarded SC should facilitate a transition in a supportive working relationship with the GC. Relational contracting mechanisms may help to address the risk of adversarial relationships (i.e., adopting combative and transactional interactions, Miller et al., 2002). Table 3 presents the differences between transactional and relational contracting, and Table 4 shows the Five Big Ideas (Macomber, 2004).

Table 3: Transactional versus Relational Contracting (adapted from Miller et al., 2002)

Aspect	Transactional Contracting	Relational Contracting
Focus	Short-term agreements, cost-driven, and work-specific	Long-term partnerships, mutual benefit, and collaboration
Personal Involvement	Limited	High
Communication	Minimal and formal	Extensive and cooperative
Valuation	Primarily monetary	Includes both monetary and non-monetary values
Agreement Duration	Short-term, specific, and binding agreements	Open-ended, focusing on continuity of relationships
Participants	Typically, two parties	Often multiple parties involved
Problem Handling	Problems are not expected and resolved formally when they arise	Problems are expected and resolved cooperatively as a normal part of business
Outcome	High potential for conflicts and mistrust	Promotes trust and cooperation
	Higher ex-post costs	Reduces transactional costs
	SC are alienated from decision-making	Foster innovation and SC integration

Table 4: The Five Big Ideas (adapted from Macomber, 2004)

Big Idea	Summary
Collaborate	Engage all stakeholders throughout the project.
Optimize the Whole	Focus on project-wide success rather than isolated works.
Learn in Action	Use feedback loops to improve continuously.
Commitment-Based Projects	Treat projects as networks of reliable commitments.
Build Relationships	Foster trust and teamwork for better outcomes.

Several models of project delivery for Lean Construction exists, notably with the Integrated Project Delivery (IPD, with the Integrated Form of Agreement or IFOA) or early SC involvement (e.g., during design phase). However organized implementation of Lean concepts should be applicable to any form of project delivery model to generate outcomes for stakeholders (LCI, 2025).

Several IGLC studies suggest that SC engagement may be strengthened through relational approaches. Shimizu & Cardoso (2002) offer a conceptual insight by framing subcontracting as part of a cooperation network, emphasizing how strategic project partnering that involves SC may support increasing their competitive advantages in a project and foster longer-term working relationship. Jang et al. (2007) explore how SC engagement improved when GC promoted transparency in the working environment, and argue that trust and shared problem-solving (rather than formal authority) enabled smoother coordination and commitment from SC. Ferstad et al. (2023) suggest that strategic partnering between clients, GC, SC could improve project outcomes, with shared risk and reward, early GC and SC involvement, clear hierarchy for conflict resolution, and continuity of key personnel as success factors. Walter et al. (2020) develop a requirement model for construction managers (lean leadership requirement), identifying specific behaviors such as coaching, listening, and providing psychological safety that help GC empower SC to take initiative and collaborate proactively. While there are various contexts offered by the studies, of note is that engagement of SC is shaped not only by contract structures, but also by leadership behaviors, communication structures, and shared commitment (i.e., shared risk and reward).

The exploration suggest that SC engagement is not solely a product of contractual formality but is also conditioned by the quality of relationships and behaviors on site. This raises a question that could motivate future research: *How can leadership behaviors and relational contracting mechanisms be leveraged to foster sustained SC engagement and collaboration throughout the project lifecycle?*

EXECUTION THEME

Execution is the most frequently subcontracting theme in the IGLC literature, reflecting a strong interest in improving how work is performed on-site. O'Brien (2000) proposes a conceptual model for multi-project resource allocation—illustrating how SC dynamically shift resources across different projects to optimize their own productivity under constraints—and suggest practical approaches for GC in developing schedules (and negotiating contracts). Chen et al. (2003) simulate information flows with an integrated process model that affect CPM schedule, suggesting that making information dependencies between construction activities and taking them into account during process planning and scheduling could improve SC coordination. Walsh et al. (2003) argue that the hyper-specialization in U.S. residential construction – which resulted in shorter cycle times—increase the number of interfaces and handoffs between SC, contributing to longer project duration.

Aslesen et al. (2013) present a model to integrate safety analyses in production planning and control (with LPS levels), arguing that the planning of production is useful for safety. Frandson & Tommelein (2014) introduce a tool for the automatic generation of daily space schedules, addressing workspace congestion and sequencing conflicts in interior fit-out scopes of a healthcare project.

Vatne & Drevland (2016) investigate the practical benefits of takt planning through a case study, reporting improved flow and coordination and suggesting ideas on the incentive system. Gardarsson et al. (2019) examined how takt planning being implemented by different companies, emphasizing that SC involvement in defining work sequences and constraints was central to effective implementation. Brioso et al. (2024) show the integration of LPS and Building Information Modelling (BIM) to support collaborative planning among SC for gas installations within repetitive housing projects and offer a novel approach to determine optimal takt time for schedules to enhance predictability and reliability of SC work.

It is argued that the studies on SC within the execution theme has evolved from being seen as a black-box operation to a dynamic, analyzable system influenced by tools, planning processes, and constraints. The literature shows increasing sophistication in how field-level

execution is understood and shaped, and a question is raised to motivate future research: *How might SC be empowered to proactively shape project planning and execution processes—not merely adapt to them?*

EVALUATION THEME

Similar to the Selection theme, the Evaluation theme appears to be underexplored in the IGLC literature. Nonetheless, structured reflection and feedback loops (e.g., informing future SC selection process) should play a critical role for continuous improvement in subcontracting. Maturana et al. (2004) propose an onsite SC evaluation methodology designed to connect performance feedback with future selection (i.e., through benchmarking), aiming to shift the basis of subcontracting from price to demonstrated value. Biesek et al. (2008) develop a performance evaluation method that classifies SC based on their strategic importance, aiming to systematically capture post-project performance and translate it into actionable insights for future selection decisions. The studies highlight the potential of evaluation systems to support continuous improvement and long-term relationship building, yet it is interesting to ask how such practices are sustained and institutionalized across projects and organizations. This raises an important question: *How can project teams structure and institutionalize post-project SC evaluations to meaningfully inform future selection and collaboration?*

DISCUSSION

This paper attempts to contribute to Lean Construction discussions by offering an exploration of subcontracting literature within IGLC publications, organizing 109 selected papers into four predefined themes: (1) Selection, (2) Engagement, (3) Execution, and (4) Evaluation. Selection refers to how project teams identify, assess, and choose SC before work begins, while Engagement refers to how selected SC are formally and relationally integrated into the project. Execution focuses on how SC are involved in planning and delivering work, and Evaluation addresses how SC's performance is measured and reflected upon after project delivery. It is observed that Execution is the most frequently discussed theme in the IGLC literature, followed by Engagement. However, Selection and Evaluation themes appear to be underexplored.

The exploration of the Execution theme leads to a speculation that involving SC more actively in planning and coordination activities is a growing interest, which suggests a shift from considering SC as work executors to production partners. Engagement-themed papers point to the importance of relational contracting and leadership behaviors. Exploration of Selection and Evaluation themes leads to the observation that more studies are needed on how SC are selected based on their readiness for collaboration (in delivering value) and how their performance is assessed post-project to support continuous improvement.

Although this paper does not attempt to define subcontracting as a holistic process, the exploration suggests that future research may benefit from doing so—by examining subcontracting as a continuous journey from selection through to post-project evaluation. Understanding how the stages connect could improve both theory development and project outcomes. For researchers, the paper offers a preliminary mapping of where the literature is concentrated (and where it is sparse). For practitioners, while the study is not prescriptive, it may serve as a prompt to reflect on SC-related practices and the factors that shape them throughout a project.

Indeed, this study has important limitations. The review is limited to IGLC conference papers and excludes many other publications, and the authors do not claim to have mastered all the selected papers. The thematic categorization of papers relies on subjective interpretation and was not externally validated. Additionally, the selected papers were not inherently linked, making it challenging to identify consistent theoretical development across studies. The analysis was based on keyword filtering and skimming rather than formal in-depth literature

review, and no practitioner input was gathered to assess the practical relevance of the themes. Additionally, the term "subcontractor" is used variably across publications—sometimes referring to upstream supply chain participants, and in other cases to field-level trade partners involved in execution. Clearly, the studies capture projects with different complexities (e.g., scales, scopes) and with different theoretical foundations. This variation in scope and point of involvement complicates direct comparison and underscores the need for caution when interpreting the thematic groupings and overall observations.

To motivate future research, the following open-ended questions are posed:

1. How can project teams institutionalize structured value-based SC selection practices that go beyond lowest-cost criteria or shortest-duration?
2. How can leadership behaviors and relational contracting mechanisms be leveraged to foster sustained SC engagement and collaboration throughout the project lifecycle?
3. How might SC be empowered to proactively shape project planning and execution processes—not merely adapt to them?
4. How can project teams structure and institutionalize post-project SC evaluations to meaningfully inform future selection and collaboration?

It is suggested that future research may consider capturing subcontracting as a comprehensive process, connecting upstream selection decisions, midstream collaboration, and downstream learning for continuous improvement.

CONCLUSIONS

This paper presented an exploration of how subcontracting has been discussed within the IGLC. It was based on organizing 109 selected IGLC conference papers into four predefined themes: (1) Selection, (2) Engagement, (3) Execution, and (4) Evaluation. The study highlights where attention has been concentrated and where further inquiry may be valuable. Execution and Engagement appear to be more frequently discussed, while Selection and Evaluation remain limited in coverage.

Rather than aiming to provide a framework or definitive conclusions, this study sought to raise questions that may inform future research. The exploration suggested that subcontracting in Lean Construction is still approached in a fragmented way, with limited study on how different stages of subcontractor involvement relate to one another. Although this study did not attempt to define subcontracting as a complete process, of note is that future studies may benefit from doing so by capturing the full journey of subcontractor involvement from selection to evaluation.

The intention of this paper was to support ongoing discussions, not to generalize findings. The thematic organization presented was intended to assist future studies in identifying areas for further exploration. While the paper was not prescriptive, it aimed to prompt academics as well as practitioners to reflect on subcontracting practices.

It was important to acknowledge the limitations of this study. The review focused solely on IGLC conference papers, and the thematic categorization was based on subjective interpretation. In addition, the term "subcontractor" varied across publications, which may have influenced how findings were understood and categorized. These limitations suggested that caution should be exercised when interpreting the results, and that further work was needed to validate and expand upon the observations presented.

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