

PERCEPTIONS OF COLLABORATIVE CONTRACTS FROM THE PERSPECTIVE OF LEAN CONSTRUCTION IN CHILE

Italo Sepúlveda¹, Luis F. Alarcón² and Harrison A. Mesa^{3,4}

ABSTRACT

Pursuing more efficient and collaborative methods in the construction industry has increased interest in collaborative contracts and Lean Construction. Despite their potential benefits, there is a lack of clarity in understanding and applying collaborative contracts in Chile. This study aims to assess the level of knowledge and perceptions about collaborative contracts among construction professionals in Chile and to explore how lean tools and principles support the implementation of these contracts. It employs a two-fold research methodology: a survey to gather empirical data, followed by a comprehensive literature review. The survey focused on collecting data on the experience and perceptions of collaborative contracts, while the literature review sought to identify the intersection of these contracts with Lean Construction. The findings revealed a limited and varied understanding of collaborative contracts. Perceived benefits, such as improved efficiency and collaboration, aligned with the principles of Lean Construction. However, challenges were also identified, including the need for greater initial investment, cultural barriers, and complexity in managing multiple projects. The study emphasizes the need for a well-defined concept of collaborative contracts in Chile and posits Lean Construction as a vital tool to address challenges and bolster their implementation.

KEYWORDS

Lean Construction, Collaboration, Contracts, Management, Construction.

INTRODUCTION

Evidence from collaborative contracts demonstrates the superior performance of collaborative projects over traditional approaches (Bilbo et al., 2015; Ibrahim et al., 2020; Mesa et al., 2016). In this context, collaborative contracts emerge as a promising solution, aiming to improve the management and execution of projects through mutual trust, open communication, and better alignment of objectives among stakeholders. Parallel to this evolution, Lean Construction's principles may intersect with these collaborative contracts, suggesting a possibility for more efficient and less wasteful project management approaches. This study aims to assess the level of knowledge and perceptions about collaborative contracts among construction professionals

¹ PhD Student, Department Construction Engineering and Management, Pontificia Universidad Católica de Chile, Santiago, Chile. Professor, Faculty of Architecture, Construction and Environment, Universidad Autónoma de Chile, Santiago, Chile ilsepulveda@uc.cl, orcid.org/0000-0002-6019-9344

² Professor, Department of Construction Engineering and Management, Pontificia Universidad Católica de Chile, Santiago, Chile, lalarcon@uc.cl, orcid.org/0000-0002-9277-2272

³ School of Civil Construction, Faculty of Engineering, Pontificia Universidad Católica de Chile, Avenida Vicuña Mackenna 4860, Santiago, Chile, orcid.org/0000-0002-7050-3610

⁴ Centro Nacional de Excelencia para la Industria de la Madera (CENAMAD), Pontificia Universidad Católica de Chile, Avenida Vicuña Mackenna 4860, Santiago, Chile

in Chile and to explore how lean tools and principles support the implementation of these contracts.

To explore and better understand these trends, a research study was conducted in collaboration with the Construction Technology Transfer Center (Centro de Desarrollo Tecnológico, CDT) of the Chilean Chamber of Construction (Cámara Chilena de la Construcción, CChC) and the Productivity Commission of the CChC.

CONCEPTUALIZATION OF COLLABORATIVE CONTRACTS

Collaborative contracts take various forms in the construction industry, such as strategic alliances, partnerships, relational contracting, and integrated teamwork (Suprpto et al., 2015). These forms, though varied, consistently promote mutual trust, joint problem-solving, and open communication. Specifically, relational contracting is based on recognizing mutual benefits and "win-win" scenarios through more cooperative relationships between the contracting parties (Ling et al., 2014; Palaneeswaran et al., 2003). Such contracts represent a unified yet flexible approach to project management, adapting to the unique demands of different projects and institutional logic and facilitating coordination among multiple parties and shared risk and reward structures (Matinheikki et al., 2019). These structures are tied to the value generated by the final product, creating a system of collaboration and shared responsibility (Cleves & Michel, 2009).

Specific types of collaborative contracts, including Early Contractor Involvement (ECI), Progressive Design Build (PDB), alliances, and Integrated Project Delivery (IPD), emphasize early and ongoing collaboration among all project participants, ensuring collaboration principles permeate every project stage (Woodhead et al., 2023).

Chan et al. (2011) highlight that, despite terminological differences, these contracts share essential elements that enhance project efficiency and performance, such as "Objective Alignment" to optimize project outcomes. Such collaborative approaches surpass traditional fixed lump-sum contracts in promoting "Trust and Transparency" (Larsson & Lason, 2020; Yang et al., 2019). Additionally, they significantly contribute to risk management through "Risk Reduction" and "Conflict Minimization" (Macneil, 1985; Manu et al., 2015; Yang et al., 2019).

Bresnen (2007) observes that terms like 'partnership' and 'alliance' often overlap, but each captures the essence of long-term cooperative relationships. Recognizing these nuances is essential in grasping the multifaceted nature of collaborative contracts and their evolving role in the construction industry's landscape.

LEAN CONSTRUCTION AND COLLABORATIVE CONTRACTS

Lean Construction promotes efficiency and waste reduction through collaboration, aligning with the Collaborative Contracts ethos that encourages teamwork from the project's inception (Koskela, 1992; Sarhan & Fox, 2013). While these contracts, including models like PPC2000 and NEC3, aim for mutual trust and shared goals, challenges such as the need for attitude shifts, complexity in intellectual property management, and the risk of non-binding agreements can pose significant obstacles (Woodhead et al., 2023).

Lean Construction and collaborative contracts, which seek to improve client value through integrated practices, require careful navigation when implementing collaborative agreements due to potential drawbacks such as legal uncertainties and substantial upfront investment without guaranteed returns (McAuley & Lefèbvre, 2019). While fostering joint problem-solving and risk-sharing, these investments necessitate meticulous planning to mitigate financial and operational risks (Mossman, 2009; Woodhead et al., 2023).

Furthermore, collaborative contracts that encourage concurrent engineering facilitate the Lean Construction principle of integrating design and construction phases. Yet, this approach demands managing complex acquisition rules and potential collaboration exhaustion,

highlighting the critical need to effectively address multiple-party coordination challenges (Johansen & Walter, 2007; Woodhead et al., 2023).

In essence, while lean-oriented contracts promote cost savings and improved project outcomes by preventing inefficiencies (Sarhan & Fox, 2013), transitioning to collaborative contracts requires addressing inherent challenges, including attitude changes and the significant initial investments involved.

RESEARCH METHOD

This study utilizes a mixed-methodology approach, combining insights from a practical survey with an exploratory literature review. The authors applied the practical survey to evaluate the level of knowledge and perceptions regarding collaborative contracts within the Chilean construction industry. The survey was designed through a collaborative effort involving representatives from the Autonomous University of Chile, the Productivity Commission of the Chilean Chamber of Construction, and the Technological Development Corporation (CDT). The dissemination strategy involved a mass distribution to the CDT's comprehensive professional database, courtesy of the Chilean Chamber of Construction. This professional database included 1,400 individuals, yielding a response rate of approximately 6.14%, with 86 professionals providing their insights. This method achieved a substantial and varied industry representation, providing a robust analysis database.

The demographic and professional profiles of the survey respondents represented a comprehensive spectrum within the construction industry, encompassing a range of roles from architects and engineers to contractors and project managers. Among these, a notable 87% of participants hailed from the Metropolitan Region, with 45.5% serving in companies with a national reach and 40.9% working within firms with multi-regional coverage. The respondents also brought a significant breadth of experience; 56.5% had over 20 years in the construction sector, thereby enriching the study with seasoned insights.

Survey questions focused on participants' experiences, comprehension of collaborative contracts, and their perspectives on the associated benefits and challenges. The survey themes encompassed the utilization of collaborative contracts, the types of contracts employed, reasons for their selection, and the perceived pros and cons. Figure 1 shows the areas evaluated in the survey. The aspects investigated included the level of collaboration, collaboration barriers, quality improvements in projects, efficiency enhancements, and risk management tactics. Insights into the challenges encountered and lessons learned were also collected, alongside assessing the respondents' familiarity with collaborative contracts. The characterization of participants included detailed demographic and professional data, such as roles, experience, and company sectors.

An extensive literature review was subsequently undertaken to deepen the understanding of collaborative contracts and Lean Construction. The review utilized Google Scholar as a primary database, with searches centered on keywords such as 'Lean Construction,' 'Project Delivery Method,' 'Collaboration and Partnering,' and 'Collaborative Contract.' This examination aids in discerning the synergy between collaborative contracts and Lean Construction principles, significantly contributing to the study's main objectives, particularly regarding the benefits and challenges delineated in the survey.

Respondent Group	Evaluated Areas	Questions	
Yes - Have used collaborative contracts	Collaborative Contracts	<ul style="list-style-type: none"> • What type of collaborative contract have you utilized in your projects? • Why did you choose this type of contract? 	
	Advantages and Disadvantages	<ul style="list-style-type: none"> • Have you been able to detect any advantages or disadvantages in your experience with Collaborative Contracts? • What are the significant differences and benefits you have experienced by using a collaborative contract compared to a traditional contract? 	
	Collaboration	<ul style="list-style-type: none"> • Have you managed to evaluate collaboration in relation to the use of collaborative contracts in your projects? • The level of communication and cooperation among the different project team members. • The effective collaboration among the different project team members. • The degree of trust and teamwork among the different project team members. 	
		<ul style="list-style-type: none"> • Have obstacles been encountered in the collaboration? Please evaluate from the project stage versus barriers • Has there been an improvement in collaboration thanks to the collaborative contract? 	
	Quality	<ul style="list-style-type: none"> • How do you perceive the quality of the projects in which collaborative contracts have been used has been measured? • Besides your perception, have key performance indicators (KPIs) been used to measure and evaluate the quality of projects with collaborative contracts? 	
	Efficiency	<ul style="list-style-type: none"> • Has there been an improvement in project efficiency thanks to the collaborative contract? • How has the efficiency of the projects with collaborative contracts been measured? • Have the project risks with collaborative contracts been managed? 	
	Risks	<ul style="list-style-type: none"> • How have the project risks with collaborative contracts been managed compared to a traditional contract? • Have there been any challenges or lessons learned in the implementation of a collaborative contract? What could be improved in future projects? 	
	Level of Knowledge	<ul style="list-style-type: none"> • Are you familiar with collaborative contracts? • What do you believe would be the main challenges and lessons in implementing a collaborative contract? 	
	No - Have not used collaborative contracts		

Figure 1: Questions and evaluated areas in survey.

RESULTS

This section presents a comprehensive overview of the survey findings, delineating the discerned knowledge levels among participants concerning collaborative contracts. The section first explores the insights from industry professionals utilizing collaborative contracts, highlighting the advantages and disadvantages. Perspectives from those not engaged with collaborative contracts reveal their expectations and potential reservations. Finally, the section presents a comparative analysis, synthesizing these perspectives with the challenges and benefits identified, setting the stage for the subsequent section. Here, the authors examine how Lean principles and tools may address collaborative contracts' inherent attributes and synergies, considering aspects such as Trust and Transparency, Risk Management, Efficiency, Quality Improvement, Collaboration, Cultural Shifts, Work Structure, and the investment of initial resources. This intersection of survey results with an exploratory literature review encapsulates the current understanding and potential of collaborative contracts within the industry.

PARTICIPANT KNOWLEDGE LEVEL

The survey's initial question inquired whether participants had implemented collaborative contracts in their projects. The findings indicate a low usage rate, with only 14% of respondents confirming their participation in such contracts. On the other hand, 86% of respondents reported that they had not used collaborative contracts. However, when these professionals were further questioned about their familiarity with collaborative contracts, 28% acknowledged having knowledge of them despite not utilizing them. This discrepancy highlights a substantial opportunity for growth and educational development in the sector.

In efforts to deepen the understanding of collaborative contracts within Chile's Architecture, Engineering, and Construction (AEC) industry, it became apparent that there is a divergence in professional interpretations. For instance, one respondent mistakenly identified the Building Information Modeling (BIM) methodology as a collaborative contract. This example highlights the need for a clearer and more precise definition of collaborative contracts to ensure consistency across the industry.

Various contract types have been documented within the subset of construction professionals who have used collaborative contracts. However, no contracts that fully respond to the collaborative contract criteria have been identified. Despite implementing various

contractual practices in the industry, there remains a gap in identifying contracts that fully meet the criteria for collaborative agreements. These criteria include effective team integration, shared risk management, and open communication. This underscores the need for a precise definition of collaborative contracts and an in-depth examination of their characteristics to foster true collaboration, going beyond the simple combination of services or methodologies.

PERSPECTIVES OF PROFESSIONALS WITH EXPERIENCE IN COLLABORATIVE CONTRACTS

Professionals who declared having used collaborative contracts select these contracts principally based on economic efficiency, risk and responsibility management, expertise and quality assurance, and operational excellence and client requirements.

Participants also emphasized 'Quality, Timeliness, and Conflict Reduction,' aiming to improve execution times and quality while mitigating conflicts and ancillary costs. 'Fair and Joint Costing' was noted as a benefit, allowing the parties to achieve a target price in a jointly developed project. The need for 'Process and Cost Optimization' was also a driving force, with the recognition that these contracts could optimize processes and costs, sometimes being the preferred contracting method for certain entities.

Finally, 'Client Requirements' also played a role in the contract type selection, highlighting the client's influence in the contractual decision-making process. This range of reasons reflects a nuanced understanding and appreciation of the strategic benefits of collaborative contracts among those who have implemented them in the Chilean construction industry.

Figure 2 shows a clear consensus in identifying both advantages and disadvantages when contrasted with traditional contracts. According to the survey results, a majority have identified benefits, with improved collaboration and communication among the involved parties being the most frequently noted advantage. This is closely followed by better risk management and prompt problem resolution, increased efficiency in project execution, greater transparency in decision-making, and enhanced satisfaction and trust among stakeholders.

Advantages		Disadvantages	
Enhanced collaboration and communication among the involved parties	23,26%	Requires a greater initial investment of time and resources to establish collaboration foundations.	33,33%
Improved risk management and early problem resolution	20,93%	Can be more difficult to implement in projects with multiple involved parties.	23,81%
Increased efficiency in project delivery	13,95%	May require a cultural and mindset change in the involved parties.	23,81%
Greater transparency in decision making	16,28%	Increased bureaucracy in decision making.	4,76%
Increased satisfaction and trust among the involved parties	16,28%	Essential fiduciary compliance of the parties, which is very difficult to achieve.	4,76%
Enhanced control of the project	2,33%	Assigns all risks to the developer.	4,76%
Increased technical capacity	2,33%	Possible increase in contract management complexity.	4,76%
Reduced environmental impact	2,33%		
Meeting cost objectives	2,33%		

Figure 2: Reasons cited by practitioners: Advantages and Disadvantages

Conversely, the disadvantages reflect concerns about the need for a greater initial investment of time and resources to establish the collaboration framework, a challenge echoed by the majority of respondents. Cultural and mindset changes of the involved parties were also cited as significant impediments, along with potential increases in bureaucracy and contract management complexity. One response highlighted the specific risk of developers assuming the burden of unforeseen conditions, such as archaeological findings, without recognizing the associated repercussions.

Therefore, the "Advantages and Disadvantages" section highlights a pragmatic recognition among industry professionals. While collaborative contracts foster a more synergistic and

integrated approach to project execution, they also demand a considerable initial commitment and can introduce new complexities into the contractual landscape.

FAMILIARITY WITHOUT ADOPTION: INDUSTRY PERSPECTIVES ON COLLABORATIVE CONTRACTS

Respondents familiar with collaborative contracts but without actual use articulate several advantages such as increased trust and transparency, risk reduction, conflict minimization, improvements in efficiency and economy, early integration, alignment of objectives, and quality enhancements. These perceived benefits align with the fundamental principles of collaborative contracting, indicating an appreciation for the theoretical value these contracts can offer.

Conversely, the disadvantages cited by these respondents highlight cultural barriers, the need to foster teamwork through transparency and trust, concerns about the efficient structuring of work phases, knowledge and education gaps regarding the benefits of the contracts, and apprehensions about profitability. These perceptions reveal the perceived obstacles that could impede the adoption of collaborative contracts.

Figure 3 highlights a paradox wherein the recognized potential value of collaborative contracts contrasts with a reluctance stemming from cultural and practical concerns.

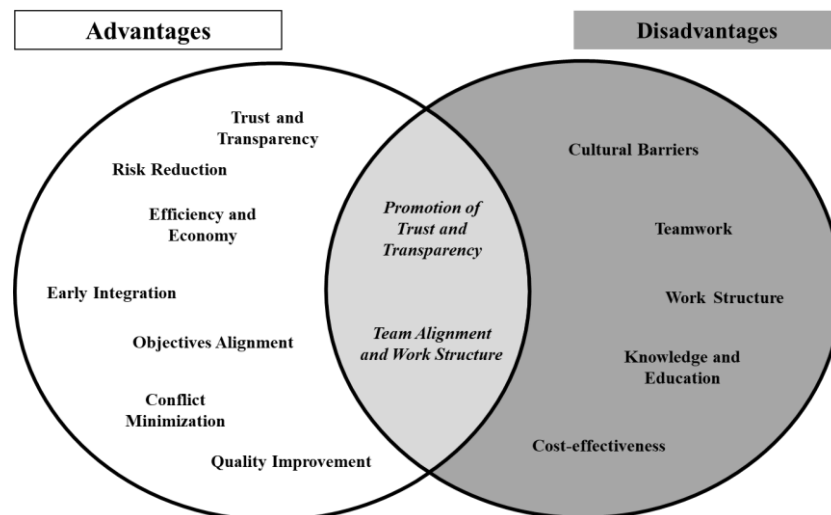


Figure 3: Intersection of Perceived Advantages and Disadvantages of those familiar but have not utilized these Collaborative Contracts.

ANALYSIS OF LEAN TOOLS AND PRINCIPLES IN ADDRESSING THE BENEFITS AND CHALLENGES OF COLLABORATIVE CONTRACTS

This section provides a focused analysis of select potential benefits and challenges of implementing collaborative contracts in the construction industry, as illuminated by Lean tools and principles. The scope is deliberately narrowed to those areas that have shown pronounced synergies with Lean methodologies and collaborative contract frameworks, thus highlighting the instrumental role of Lean Construction in enhancing the efficacy of collaborative agreements.

Experienced users, as well as those who are familiar with but have not utilized these contracts, recognize common benefits, including "Trust and Transparency," "Risk Reduction," "Efficiency and Economy," and "Improvement in Quality." Challenges such as "Cultural Barriers," "Change in Mindset," and "Work Structure" are also acknowledged by both groups, highlighting shared industry concerns.

However, differences arise between users' perspectives and those who are familiar with but have not utilized these. Users emphasize "Increased Collaboration and Communication" as a significant advantage. At the same time, they face the challenge of a "Higher Initial Investment of Time and Resources" and the complexity of "Projects with Multiple Parties." Those who are familiar with but have not utilized these may lack the direct experience to appreciate these nuances fully. Figure 4 presents an overview of the potential benefits and challenges.

Type	Detail	Lean Tool/Principle/Technique	Brief Description
Advantages	Trust and Transparency	Last Planner System® (LPS®)	Promotes transparency and trust through active planning and execution.
Advantages	Risk Reduction and Management	Kaizen	Continuous improvement to identify and eliminate risks and waste.
Advantages	Efficiency and Economy	Lean Production Practices	Reduces overburden and non-value-adding work to enhance efficiency.
Advantages	Quality Improvement	5S	Focuses on quality from design to execution, creating an efficient work environment.
Advantages	Greater Collaboration and Communication	Value Stream Mapping, LPS®, Building Information Modeling (BIM)	Enhances understanding of work flows and improves coordination.
Disadvantages	Cultural Barriers and Mindset Change	Lean Training and Workshops, Respect for People	Shifts towards a more collaborative and team-centered approach.
Disadvantages	Work Structure	Integrated Project Delivery (IPD), Value Stream Mapping (VSM)	Promotes integrated and efficient work from the project's inception.
Disadvantages	Initial Time and Resource Investment	Training, Process Restructuring	Views initial investment as short-term cost for long-term benefits.
Disadvantages	Difficulties in Multi-party Projects	IPD, LPS®, BIM	Manages complexity in projects involving multiple teams and disciplines.

Figure 4: Intersection with Lean Construction

Trust and Transparency. Trust and transparency are pivotal in collaborative contracts, a sentiment echoed by industry professionals in our survey and supported by Lean Tools. Integrating Lean tools like the Last Planner System (LPS) into project management practices enhances these elements by facilitating clearer communication and task visibility, as Ribeiro & Costa (2018) demonstrated. Their work underscores the significance of visual aids in presenting information straightforwardly, fostering improved stakeholder communication and collaborative planning. Chiu & Cousins (2020) further confirm that LPS's implementation can lead to better alignment within design teams and schedule adherence. Lühr et al. (2023) contribute a nuanced view, proposing that while transparency promotes a more accurate evaluation of partners' reliability, it does not automatically translate into trust—a reminder that transparency acts as a foundation for, but is not synonymous with, trust.

Risk Reduction and Risk Management. Survey respondents highlighted risk reduction and management as key benefits of collaborative contracts, which Lingard & Lin (2004) and Muchinsky (2006) substantiated through the lens of Lean Construction. With its focus on continuous improvement, the Kaizen principle has been pivotal in mitigating risks by fostering a constant process evaluation and enhancement cycle. Muchinsky (2006) notes the positive ripple effects of Kaizen on job satisfaction, leading to a more organized work setting and preemptive risk handling. Lingard & Lin (2004) concur, emphasizing how process standardization and a quality-centric approach from inception to completion enhance job satisfaction and bolster workers' dedication to their tasks. This collective emphasis on systematic improvement via Kaizen underpins a safer, more predictable project landscape.

Efficiency and Economy. The integration of Lean Construction principles, as identified by Cheng (2015), directly aligns with the efficiency and economic benefits highlighted in the survey regarding collaborative contracts. Lean practices, notably the elimination of non-value-adding activities, play a crucial role in enhancing project outcomes. Cheng emphasizes the importance of a continuous value flow, distinguishing between controllable aspects, like material and equipment management, and uncontrollable ones, such as supply chain and design information dynamics. This foundation of Lean Construction ensures a smoother, more efficient workflow, significantly reducing project costs and timelines, thereby boosting overall

profitability and demonstrating the practical benefits of Lean methodologies in realizing the potential of collaborative contracts.

Improvement in Quality. The emphasis on quality improvement, as a recognized benefit of collaborative contracts from survey feedback, is mirrored in Lean Construction principles, notably through adopting the 5S methodology and visual management tools outlined by Bajjou et al. (2017). The 5S framework—Sort, Simplify, Sweep, Standardize, and Self-discipline—establishes an orderly and efficient environment, laying the groundwork for high-quality outcomes in every project phase. Additionally, visual management enhances transparency and safety, facilitating improved communication among project participants. This integrated approach ensures continuous quality improvement from design to execution, demonstrating the synergy between Lean Construction practices and the quality enhancement goals of collaborative contracts.

Greater Collaboration and Communication. Survey findings identify both the enhancement of collaboration and communication as pivotal benefits and challenges within the context of collaborative contracts. Lean Construction, with its focus on fostering a collaborative culture, leverages tools like Value Stream Mapping (VSM) and the Last Planner System (LPS), as detailed by Setiawan et al. (2021) and Mossman (2005), respectively. VSM helps team members visualize the project's workflow, encouraging a unified approach by elucidating each participant's role in enhancing efficiency and customer satisfaction. Similarly, LPS fosters alignment on project goals through regular, collaborative planning sessions, minimizing misunderstandings and ensuring coherent team efforts. Additionally, the integration of Building Information Modeling (BIM), as noted by Liu et al. (2017), offers a shared digital platform that further streamlines team coordination. Together, these methodologies underscore the crucial role of advanced planning and technology in bridging communication gaps and cultivating a cooperative project environment, reflecting the dual nature of collaboration and communication as both a benefit and a challenge in implementing collaborative contracts.

Cultural Barriers and Mindset Change. As reflected in survey responses, addressing cultural barriers and the necessity for a mindset shift has emerged as a notable challenge in the adoption of collaborative contracts. As Moradi and Sormunen (2023) articulate, Lean Construction requires more than adopting tools; it calls for a profound organizational culture shift toward collaboration and team orientation. Key to navigating these barriers is engaging all organizational tiers in Lean-oriented educational activities, which underscore the philosophy's collaborative and continuous improvement ethos. Such initiatives, coupled with senior management's commitment and the promotion of respect and teamwork, are essential in cultivating an environment conducive to embracing Lean methodologies. This strategy underscores the importance of a supportive and inclusive culture in facilitating the transition towards more efficient, collaborative construction practices.

Work Structure. The reconfiguration of work structures emerges as a key challenge respondents highlight regarding implementing collaborative contracts. Adopting Integrated Project Delivery (IPD) and tools like Value Stream Mapping (VSM), Lean Construction addresses this challenge by promoting a seamless, integrated approach to project delivery. IPD, as noted by Mesa et al. (2016) and Viana et al. (2020), fosters a collaborative environment from a project's inception, ensuring alignment of interests and facilitating efficient communication and teamwork. This approach enhances performance and distributes gains and risks more equitably among all stakeholders. Additionally, VSM's role in elucidating the construction process, as demonstrated by Paciarotti et al. (2011) and Serrano et al. (2008), helps pinpoint inefficiencies, thereby streamlining operations and elevating strategic capacity. This dual emphasis on IPD and VSM underlines the importance of structured, collaborative work environments in overcoming the inherent challenges posed by new contract models.

Initial Investment of Time and Resources. The necessity for an initial investment of time and resources has been identified as a challenge in adopting collaborative contracts. This upfront commitment includes extensive staff training, process reorganization, and integration of novel tools and technologies. Despite the initial costs, it is vital to recognize these expenditures as investments towards long-term gains. Nahmens and Ikuma (2012) support this view by showing that Lean Construction can significantly decrease material waste and production hours while enhancing safety, thereby promoting sustainability. This perspective underscores the importance of effectively communicating the value of this initial investment in Lean practices, highlighting its potential to boost project efficiency, quality, and overall financial performance.

Challenges in Projects with Multiple Parties. The challenge of managing construction projects with multiple parties was underscored in survey responses, highlighting the complexity of coordinating diverse teams and disciplines. Lean Construction principles, including adopting Integrated Project Delivery (IPD), are instrumental in addressing these challenges. IPD fosters a unified approach by aligning the interests of all stakeholders and promoting collaborative decision-making, essential in complex, multi-stakeholder projects. Ebrahimi & Dowlatabadi (2018) and Hamerski et al. (2019) emphasize the hurdles encountered in maintaining collaboration and operational efficiency, selecting competent teams, and implementing IPD effectively. Furthermore, tools like the Last Planner System (LPS) and Building Information Modeling (BIM) play pivotal roles in improving project management by enhancing planning and ensuring coherent communication across teams. This approach underlines the necessity of a cohesive strategy to efficiently manage the intricacies of projects involving numerous parties.

This literature review elucidates the congruence between Lean Construction principles, tools, or techniques and collaborative contracts, illustrating how Lean Construction tools can underscore the benefits highlighted in the survey on collaborative contracts. The parallelism between trust and transparency in collaborative contracts and the Last Planner System® (LPS®), or how the Value Stream Mapping (VSM) technique aligns with promoting integrated and efficient work, resonates with the challenges identified in collaborative contracts. Nonetheless, ascertaining the level of Lean Construction knowledge among professionals is paramount to ensure that the identified synergies can be harnessed in practice, thus amplifying advantages and overcoming any disadvantages or challenges.

CONCLUSIONS

The survey underscores a significant shortfall in the uptake of collaborative contracts within Chile's construction industry, with a mere 14% of professionals reporting their deployment. Additionally, only 27% familiarity with these contracts is noted among those not currently employing them. These results suggest fertile ground for incentivizing the use of collaborative contracts, initially through educational endeavors followed by demonstrating their merits in construction projects.

In summarizing the findings from the survey, it is imperative to elucidate the definition of collaborative contracts within the Chilean construction industry to foster their application. The survey indicates a substantial potential for enhancing the adoption rates of collaborative contracts among projects and professionals. However, it also signals the need to explore the underlying reasons for their underutilization.

Building upon the survey's insights, the perceived advantages of collaborative contracts come to the forefront, emphasizing their transformative potential in the construction sector. The professionals' perceptions indicate that these advantages include the establishment of trust and transparency between stakeholders, a cornerstone for any successful collaborative venture. Moreover, they facilitate a reduction and better management of risks, ensuring a more predictable and stable project environment. The survey also identifies efficiency and economy

as key benefits, with collaborative contracts perceived to streamline processes and cutting unnecessary costs, leading to an overall improvement in quality. Notably, these contracts are seen to enhance greater collaboration and communication, which are pivotal in achieving project objectives with aligned stakeholder interests.

Conversely, the survey sheds light on several disadvantages that impede the widespread adoption of collaborative contracts. Cultural barriers and the need for a mindset change present substantial challenges, as they require a shift from traditional practices to a more cooperative approach. Work structure emerges as another obstacle, with existing frameworks often ill-suited to collaborative contracts' flexible and integrative nature. The initial investment of time and resources is a deterrent, with a clear need to demonstrate the long-term value to overcome short-term reservations. Finally, the complexity of managing multi-party projects under collaborative contracts is highlighted as a significant hurdle, necessitating adept coordination and robust conflict-resolution mechanisms. These challenges demand a strategic focus to harness the full potential of collaborative contracts within the industry.

Reviewing the literature reveals a symbiotic relationship between Lean Construction methodologies and collaborative contracts, which proposes a dynamic framework to propel the construction industry forward. Lean Construction, with its core principles and techniques such as the Last Planner System® (LPS®), Kaizen, and Value Stream Mapping (VSM), provides a structured approach that bolsters transparency and trust, key tenets in collaborative contracts. The continuous improvement and risk management inherent in Kaizen and the efficiency ethos of Lean Production Practices directly buttress the fundamental attributes of collaborative contracts focused on efficiency and economic prudence.

Furthermore, Lean Construction's commitment to quality enhancement through the 5S methodology is in harmony with the collaborative contracts' pursuit of elevated standards and greater cooperation. The employment of Value Stream Mapping, LPS®, and Building Information Modeling (BIM) within Lean Construction facilitates an advanced understanding of workflow and communication, capabilities essential to overcoming the cultural barriers and mindset changes frequently perceived as drawbacks in the realm of collaborative contracts.

Lean Construction is committed to enhancing work structures through targeted training and workshops. By promoting respect for each individual and fostering a collaborative, team-centric approach, this methodology effectively addresses the challenges faced in work environments. The initial time and resource investments, often seen as constraints in collaborative contracts, are recontextualized within the Lean paradigm as strategic investments yielding long-term returns, thereby offering a counterbalance to the initial expenditures. Ultimately, the arsenal of Lean Construction tools adeptly manages the complexities inherent in multi-party projects, thus confronting a pivotal challenge of collaborative contracts. The Lean Construction toolbox complements and intensifies the advantages of collaborative contracts, simultaneously offering strategies to surmount their intrinsic disadvantages.

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