

Unveiling the Key Drivers of Successful Operations Management in Construction Subcontracting

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Abstract

A significant portion of construction work is executed through subcontracting (SC). If not managed properly, SC can contribute to poor project performance. Failures in subcontracting can arise in various phases, including subcontractor selection, operations, and monitoring. This study aimed to identify and prioritize the key drivers of successful operations management in construction subcontracting. A systematic literature review (SLR) was conducted to examine the available scholarly literature from Scopus, Web of Science, and ProQuest databases on the focus area of the study. From the databases, 31 studies were screened for further detailed review. A thematic content analysis, done with ATLAS.ti25, was done to identify eleven drivers of successful operations management in construction subcontracting. The findings ranked mutual trust and fairness; long-term partnership; adherence to quality standards and specifications; coordination of subcontractors; and timely payment as the top five critical drivers.

Keywords: Construction industry; drivers; operations; systematic literature review; subcontracting

1. Introduction

Subcontracting (SC) is a business strategy that main contractors employ to address construction market uncertainties and transfer risks, such as completion risks, financial risks, and employee responsibility (Schaufelberger & Holm, 2017). Subcontracting (SC) in construction has become increasingly prevalent in recent decades (Zubair et al., 2016; Mbachu et al., 2022) due to the growing complexity of construction projects, the scarcity of skilled labor, the drive to maximize profits, and the need to reduce risk. Studies indicate that in Zambia more than 50%, and in some specific sectors up to 90% of projects involve subcontracting (Mudzvokorwa, Mwiya & Mwanaumo, 2020). In South Africa, around 70% of building and 30% of civil construction project works are performed through subcontracting (cidb, 2013); while in Nigeria, a minimum of 70% of the projects rely on subcontracting (Okunlola, 2015).

Subcontracting (SC) enhances project performance if properly managed (RICS, 2021). On the contrary, poor SC has been identified as a potential risk for project performance. Previous studies have identified poor SC as one of the reasons for project delays and cost overruns (Osama, El & Wefki, 2023; Daoor et al., 2020). Olanrewaju et al. (2022) also underscored poor SC as one of the reasons for poor quality, delay, and project disputes. The subcontracting supply chain has been highlighted as problematic because of antagonistic relationships between the main contractor and subcontractor, poor communication, blame culture, a lack of focus on serving the ultimate end user, and other reasons (Rompoti, Madas & Kitsios, 2020). These factors impact project performance and highlight the

need for a structured evaluation of subcontracting success factors.

While studies have been conducted on individual SC major activities including subcontractor selection (Karaman, 2022); the contractor-subcontractor relationships (Tan et al., 2017); conflicts and disputes in SC (Magazi & Kikwasi 2022); payment issues (Daoor et al., 2020), and others. There is a knowledge gap regarding the key drivers of successful operations management in construction subcontracting. This study aims to bridge this gap by systematically identifying and ranking these key drivers to enhance subcontracting performance and project success. The findings will offer valuable insights for construction industry stakeholders to optimize subcontracting operations, enhance project performance, and minimize risks associated with poor subcontracting operations.

2. Literature Review

The construction industry is characterized by complexity and time-constrained projects. High complexity, uniqueness of activities, and the number of required technologies urged construction firms to consider outsourcing strategies, including SC (Fridkin & Kordova, 2022). Subcontracting (SC) is a well-established practice in the construction industry (Daoor et al., 2020). It is subletting the obligations of the main contractor stipulated in a separate main contract with the project owner. In some cases, a project owner directly nominates the subcontractor to carry out part of the main contract works (RICS, 2021).

The main contractor can lower its operational costs and improve competitiveness with SC. Subcontracting (SC) is also an efficient and economical means of accessing

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resources (Daoor et al., 2020). Subcontracting (SC) is invaluable for construction projects as it allows specialization and creates market access to local subcontractors. Due to the mentioned and other benefits of SC, the reliance of the construction industry on SC has increased (Magazi & Kikwasi 2022). However, rather than contributing to better project performance, SC could exacerbate project outcomes (Koshe & Jha, 2016). According to Osama, El & Wefki (2023), one of the primary reasons for the delay of construction projects is poor SC performance. If SC is not managed properly, it could result in project cost overrun and poor quality of work.

Construction project owners demand their projects to be delivered on time, on budget, free from defects, right the first time, and safely by the construction firms involved (Mbachu et al., 2022). The dependence of main contractors on subcontractors to execute the major portion of their work makes construction projects' success highly dependent on SC performance. However, it is not only the subcontractor who is the responsible party for SC performance. The other major project stakeholders, including the contractor and project owner, also contribute their share to the success or failure of SC in a project (Chamara et al., 2015).

Contracting is widespread in construction project management (Schaufelberger & Holm, 2017). The execution of construction projects involves contracting (to formally hire) an external organization. This external organization itself might involve other different organizations allied by numerous contractual agreements. Initially, the project user or owner contracts with the main contractor are sometimes mentioned as the systems development organization (SDO) responsible for the overall project.

In turn, the main contractor enters contracts with secondary parties—such as subcontractors, consultants, material suppliers, and to carry out specific portions of a construction project. These secondary parties, in turn, may establish contracts with tertiary parties, further extending the subcontracting network (Schaufelberger & Holm, 2017). The main contractor is hired by the project user or owner to manage the overall construction project. From a market point of view, where the contractor operates primarily as the buyer, it is responsible for buying materials, equipment, and services necessary for project execution. This position entails evaluating the state of the market, negotiating contracts with suppliers, and making sure the products and services acquired adhere to project requirements, quality standards, and financial limitations (Nwaguru et al., 2022). Project budgets, schedules, and success are all impacted by the contractor's capacity to handle procurement.

Conversely, from an engineering- contract perspective, the contractor assumes the role of the seller. In this

case, it will be accountable for delivering specified services, products, or completed projects to the project owner or client (Plessis & Oosthuizen, 2019). This includes adhering to regulatory requirements, contractual agreements, and industry standards throughout the project lifecycle. Subcontracting (SC) makes it possible to handle market uncertainties in the construction industry and to transfer risks, including completion and financial risks. It lowers direct costs as well as overhead, enabling the main contractor to work with firms that have reduced overhead and a better understanding of the market dynamics, practices, and processes (Daoor et al., 2020). Additionally, SC makes it easier to complete high-quality work, utilizing specialized subcontractors who possess the required expertise in particular trades. The non-adoption of SC could request a great amount of manpower and equipment that would be, at some moment, sub-used (cidb, 2013).

Operations management in subcontracting plays a crucial role in ensuring project efficiency, cost-effectiveness, and quality outcomes. It involves coordinating resources, schedules, and stakeholder relationships to optimize subcontractor performance. Effective management enhances workflow continuity, minimizes disputes, and fosters collaboration between contractors and subcontractors (Magazi & Kikwasi 2022; Tan et al., 2017).

Previous studies have identified a range of factors influencing subcontracting operations. Specifically, the effectiveness of construction subcontracting work is shaped by subcontractor-related factors (Ali et al., 2024), subcontractor-contractor interactions (Debelo & Weldegebriel, 2022), and contractor-related factors (RICS, 2021). This study seeks to systematically identify and rank the key drivers within these three categories that impact the operations of subcontracting works.

3. Research Methodology

In this study, a Systematic Literature Review (SLR) was employed to explore the existing research on the key drivers of successful operations management in construction subcontracting. The SLR focused on peer-reviewed articles and conference proceedings to explore different drivers of successful operations management. A systematic literature review (SLR) was initially adopted to examine the existing scholarly publications on the key drivers of successful operations management in construction SC. A systematic literature review (SLR) involves comprehensive searches of relevant studies on the subject of study (Saunders, Lewis & Thornhill, 2016; Mase, 2020). The researchers followed the preferred reporting items for systematic reviews and meta-analyses (PRISMA) (2020) to conduct the SLR (Matthew et al., 2021). The data were acquired from Scopus, Web of Science, and

ProQuest databases. The query strings and keywords used for the search were: ("subcontracting"), ("construction"). Regarding the exclusion criteria, the authors discarded: duplicate articles; and articles written in other than English language. Book chapters and book reviews were also excluded. Studies conducted from 2000-2024 were included. The procedures followed for the article selection are presented in Figure 1.

5. Discussions

In the pursuit of operational excellence in subcontracting works, the three discussed interrelated categories in the previous section: contractor-subcontractor collaboration, contractor-related drivers, and subcontractor-related drivers serve as essential drivers that significantly enhance project performance and efficiency.

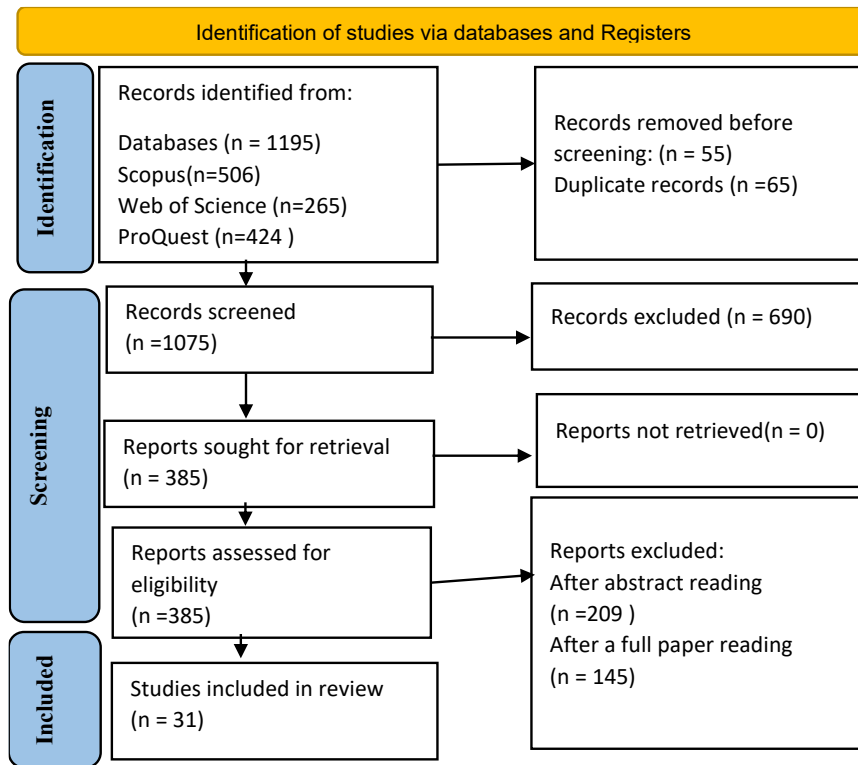


Figure 1: PRISMA 2020 flow diagram for identification of studies for synthesis

Then the screened 31 studies were reviewed to identify what has been studied regarding the key drivers of successful operations management in construction SC.

4. Results

The thematic analysis of the screened articles was done using ATLAS.ti25 software to explore the drivers of successful operations management in construction SC. The identified drivers were grouped into three categories: Contractor-related, Subcontractor-related, and Contractor-Subcontractor collaboration in the analysis. Table 1 is a summary of the drivers identified for successful operations management in SC, corresponding reference authors, and their ranks. The code-document analysis table output of ATLAS.ti25 is the input for Table 1.

Different key drivers that enhance efficiency and performance influence successful operations management in construction subcontracting were identified in the previous section. These drivers could create a collaborative and productive working environment between contractors and subcontractors ensuring effective operation in subcontracting. By working on these drivers, construction projects can achieve improved outcomes, timely completion, and higher-quality deliverables. Next, the top five key drivers identified through the Systematic Literature Review (SLR) will be discussed.

Table 1: Drivers of successful operations management in construction subcontracting

Overall Rank	Driver	Frequency	Authors
Contractor-Subcontractor Collaboration			
1	Mutual Trust and Fairness	5	(Kadan et al., 2024; Omotayo et al., 2023; White & Marasini, 2014; Wu et al., 2023; Zhang et al., 2016)
2	Long-term Partnership	4	(Cao & Wang, 2014; Omotayo et al., 2023; Lee et al., 2009)
6	Effective Communication	3	(Fridkin & Kordova, 2022; Eom et al., 2015; Lew et al., 2020)
7	Lean Construction Practice	3	(Eom et al., 2015; Kadan et al., 2024; Maturana et al., 2007)
9	Power Symmetry/Balance	2	(Deep et al., 2022; Wu et al., 2023)
Subcontractor-Related Drivers			
3	Adherence to Quality Standards and Specifications	4	(Fridkin & Kordova, 2022; Lew et al., 2012; Ng et al., 2010; White & Marasini, 2014)
8	Availing Manpower and Other Resources	3	(Eom et al., 2015; Lew et al., 2020; Yin et al., 2014)
10	Meeting Milestones/Execution Capability/	2	(Maturana et al., 2007; Shi et al., 2023)
Contractor-Related Drivers			
4	Coordination of Subcontractors	4	(Lee et al., 2009; Tan et al., 2017; White & Marasini, 2014)
5	Timely Payments	4	(Lew et al., 2020; Yin et al., 2014; Rostiyanti et al., 2020; Youssef et al., 2023)
11	Planning and Budgeting	2	(Fridkin & Kordova, 2022; Yin et al., 2014)

Source: ATLAS.ti25 Code-Document Analysis Output

5.1. *Mutual Trust and Fairness*

Mutual trust and fairness are essential elements in the relationship between the main contractor and subcontractors within the construction industry. Trust is cultivated through the expectation that both parties will act in a manner that is equitable and beneficial, even amidst the inherent risks and uncertainties of construction projects. This trust fosters collaboration and minimizes conflicts, as it encourages open communication and a willingness to share vital information (Wu et al., 2023). When subcontractors perceive fairness in their dealings—such as equitable distribution of rewards, transparent decision-making, and respectful interactions, they are more likely to engage positively and commit their resources to the project. This perception of fairness significantly enhances relationship stability and project success, as it reduces the likelihood of opportunistic behavior and promotes a cooperative environment (Kadan et al., 2024).

Furthermore, mutual trust and fairness not only facilitate smoother project execution but also contribute to the development of long-term partnerships that benefit both parties. The psychological aspects of trust, including goodwill and competence, highlight the importance of these factors in ensuring that subcontractors feel valued and respected. This, in turn, influences their commitment to the project and the overall success of the construction endeavor (Omotayo et al., 2023; Zhang et al., 2016).

5.2. *Long-term Partnership*

Long-term partnerships in construction subcontracting are characterized by ongoing collaboration between general contractors and subcontractors, extending beyond individual projects to encompass multiple engagements over time. This strategic approach contrasts with traditional, project-based relationships that often prioritize short-term gains. Long-term partnerships foster a cooperative environment where both parties can invest in each other's growth, leading to improved performance and efficiency. For instance,

general contractors may provide training and managerial support to subcontractors, enhancing their capabilities and ensuring that they can meet project demands effectively (Cao & Wang, 2014).

The benefits of such partnerships are manifold. They facilitate cross-project learning, allowing subcontractors to refine their skills and processes over time, which can lead to cost reductions and higher-quality outputs (Lee et al., 2009). Additionally, long-term relationships can mitigate the risks associated with opportunistic behavior, as both parties develop a vested interest in each other's success (Eom et al., 2015). However, establishing and maintaining these partnerships requires a commitment to mutual goals, open communication, and a willingness to share resources. As noted by Omotayo et al. (2023), the construction industry has increasingly recognized the importance of these long-term relationships in enhancing project outcomes and fostering innovation.

5.3. Adherence to Quality Standards and Specifications

In the construction industry, the success of a project heavily relies on the subcontractor's commitment to adhering to quality standards and specifications. Subcontractors are tasked with executing specialized components of a project, and their ability to meet established quality benchmarks is crucial for ensuring the overall integrity and performance of the construction work (Fridkin & Kordova, 2022; Ng et al., 2010).

Non-compliance with these standards can lead to significant repercussions, including project delays, increased costs due to rework, and potential legal disputes. Implementing a centralized subcontractor appraisal system can enhance quality assurance by providing a structured framework for evaluating subcontractor performance based on critical criteria such as workmanship, safety, and resource management. Such an approach not only identifies capable subcontractors but also promotes a culture of quality within the subcontracting community, ultimately contributing to the successful delivery of construction projects (Fridkin & Kordova, 2022; White & Marasini, 2014).

5.4. Coordination of Subcontractors

Coordination of subcontractors is essential for successful operations management in construction subcontracting, particularly concerning resource allocation and spatial organization. Effective coordination ensures that all subcontractors are aligned with project goals and timelines, which is crucial for optimizing the use of resources. When subcontractors are well-coordinated, it minimizes the risk of resource conflicts and ensures that materials, labor, and equipment are allocated efficiently. This alignment is

particularly important in complex construction environments where multiple subcontractors may be working simultaneously on different aspects of a project. By establishing clear communication channels and regular coordination meetings, main contractors can facilitate better resource management and prevent delays caused by misallocation (Tan et al., 2017).

In addition to resource allocation, effective coordination also plays a vital role in managing spatial constraints on construction sites. Construction projects often involve limited space, and the simultaneous activities of various subcontractors can lead to congestion and inefficiencies if not properly managed. Main contractors must ensure that subcontractors are aware of their designated work areas and the timing of their activities to avoid overlaps and conflicts. This involves providing timely information, resources, and support to ensure subcontractors perform their tasks effectively (White & Marasini, 2014). By implementing standardized processes and utilizing technology for better communication and information sharing, the main contractors can improve coordination efforts and reduce the likelihood of delays and conflicts.

5.5. Timely payments

Timely payments are critical in the construction subcontracting landscape, significantly influencing the operational efficiency and financial stability of subcontractors. Rostiyanti et al. (2020) emphasize that subcontract agreements must include clear payment provisions to mitigate disputes arising from late payments, which can further complicate project execution. The reliance on prompt payments is particularly pronounced among smaller subcontracting firms, which often operate on tight cash flows. Payment delays can lead to severe repercussions, including project delays, strained supplier relationships, and even bankruptcy (Youssef et al., 2023).

The operational dynamics between the main contractors and subcontractors are heavily influenced by payment practices. Conditional payment clauses, such as "pay when paid" or "pay if paid," can exacerbate cash flow issues for subcontractors, leading to a cycle of financial instability. Research indicates that a significant percentage of disputes between main contractors and subcontractors stem from payment delays, highlighting the need for clear and fair payment terms (Lew et al., 2020). By establishing transparent payment processes and adhering to timely payment schedules, construction firms can improve collaboration, reduce conflicts, and ultimately enhance project outcomes.

6. Conclusions

Using a Systematic Literature Review (SLR)-Analytical Hierarchy Process (AHP) methodology, this

study identified and prioritized the key drivers of effective operations management in construction subcontracting. The SLR provided a thorough basis for analysis by methodically extracting important drivers from the body of current literature.

The findings provided valuable insights for contractors, subcontractors, project owners, consultants, and other stakeholders to understand their gaps, and design and implement corresponding strategies to boost operational performances at projects. The study also contributed to the existing body of knowledge on

construction subcontracting where operational challenges are more pronounced. Further empirical study is recommended on the identified drivers of effective operations management in construction subcontracting.

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