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ABOUT JCBM

The **Journal of Construction Business and Management (JCBM)** is an open access journal published bi-annually by the University of Cape Town Libraries, South Africa. The Journal is hosted by the Construction Business and Management Research Group of the University of Cape Town. The journal aims to explore the experience of construction industry stakeholders and trends in the global system. It aims to publish peer reviewed and highly quality papers emanating from original theoretical based research, rigorous review of literature, conceptual papers and development of theories, case studies and practical notes. The journal also welcomes papers with diverse methodological research approaches including qualitative, quantitative, and mixed methods. Contributions are expected from academia, public administrators, professionals in the public sector and private practice (such as contracting organizations and consulting firms) and other related bodies and institutions (such as financial, legal and NGOs).

The scope of **Journal of Construction Business and Management (JCBM)** covers but is not limited to construction management and project delivery, strategic management, decision making, skills development, organizational practices and procedures in construction business. The specific areas in construction management, sustainability in construction and project delivery include project planning/feasibility studies, procurement, resource management, international construction, ethical issues, industrial relations, legislative requirements and regulations, construction education, information and communication technologies, housing policies, and urban design and development. Strategic management in construction covers risk management, quality management, resilience and disaster management, cultural and societal management, project life cycle management, and knowledge creation and management. Among issues in construction organizational practices and procedures covered are business development strategies, human resources and career development, continuous professional development, leadership systems, marketing strategies, gender issues and corporate social responsibility.

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Innovative and Strategic Approaches for Overcoming Challenges in the Construction Industry

Editorial December 2024

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Introduction

The construction industry, a major contributor to economic development, continues to face challenges and opportunities. This December 2024 issue of the Journal of Construction Business and Management features diverse research articles, bringing new perspectives and solutions to pressing issues within the construction industry, particularly how project success is shaped by the ethos of fair financial and contract practices, leadership, technology and price escalation. These articles were contributed by a total of 17 authors from Malaysia, Nigeria, South Africa and Zambia, highlighting the pathway towards enhancing the sustainability, integrity, and performance of the construction industry. Although, the articles are contextualised on issues that are prevalent in developing countries, researchers around the world would find these articles useful for their additionality to theory building, scientific rigour and construction as a global discourse.

Discussion of the papers

Hailu and Makgopa (2024) examine the critical role of subcontracting in construction in their paper. Their paper proposes a framework integrating strategic elements such as information technology and risk management to improve subcontracting performance in developing nations. Adopting this framework will enhance transparency, trust, and continuous improvement within subcontracting chains, ultimately boosting industry competitiveness.

Further, Abdulazeez et al. (2024) explore the effects of consultant performance indicators on the success of public construction projects in Nigeria. Their findings underline the importance of resource adequacy, competency and communication with clients as pivotal factors determining project success. The authors recommend strategic resource allocation and the involvement of qualified professionals in the construction process to optimize project delivery.

In Uganda, Kasimu et al. (2024) also explore the dimensions of participative leadership that contribute to the success of government construction projects. Their research highlights the significance of stakeholder consultation and joint decision-making over delegation, promoting a collaborative environment that fosters project success.

Moreover, Coleman et al. (2024) examine the challenges of financial risks in construction projects, using the Ghanaian construction industry as a case study. The paper assesses financial integrity risks, economic instability, and management issues. It highlights the need for strong financial risk management strategies to mitigate premature contract terminations and promote positive project outcomes.

Lastly, Tembo, Kahanji and Mwanaumo (2024) examine the sociopolitical and macroeconomic effects of tender price inflation in Zambian public projects. The authors present a novel tender price management model that enhances predictability and reduces cost overruns, contributing to more efficient resource allocation and sustainable infrastructure development.

Conclusion

This issue of the Journal of Construction Business and Management provides insights into the challenges and innovative solutions within the construction industry. From improving subcontracting practices to controlling tender price inflation in public projects, the articles propose actionable strategies for fostering a more resilient and efficient industry.

We extend our gratitude to the authors for their valuable contributions, the reviewers for their rigorous evaluation of the papers and the editorial board for their continued support. We invite feedback and discussions from our readers to further strengthen the quality and impact of the journal, ensuring it continues to serve as a key resource for advancing the construction industry. We hope the insights from the articles presented in the volume will inspire further research and find practical applications to improve the construction industry's capacity to contribute effectively to economic growth and improved living standards in developing countries and globally.

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A Conceptual Framework for Enhancing Subcontracting Performance in the Construction Industry of Developing Countries

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Abstract

A significant portion of construction work is executed through subcontracting (SC), making a study on SC performance instrumental. The study aimed to develop a holistic conceptual framework to enhance SC performance for the construction industry of developing nations. A systematic literature review (SLR) was conducted to examine the available scholarly literature from Scopus, Web of Science, and ProQuest databases. From the databases, 27 studies were screened for a detailed review. A thematic content analysis was conducted to explore different themes from the screened studies analysed using ATLAS.ti23 software. These themes then served as components to be intricately linked and build the framework. The framework encompasses SC strategy, business constraints, adoption of information technology, uncertainties, and capabilities impacting the four core activities of SC performance: bidding and selection of subcontractors, subcontract management, operations management, and monitoring and evaluation of subcontract works. Adopting the framework's principles will cause a push towards fairness, symmetric information and dependency, mutual trust, and continual improvement efforts along the SC value chain, resulting in the overall growth and competitiveness of the construction industry of developing countries.

Keywords: subcontracting performance; conceptual framework; systematic literature review.

1. Introduction

The construction industry significantly contributes to the economic development of developing countries. It accounts for over 8% of the GDP in developing countries (WEF, 2016). The industry is also a major employer with an estimated average of 7 percent of total global employment or 220 million people (ILO, 2019). The majority of construction project works are executed through subcontracting (SC), with the main contractor focusing on managing, resourcing, coordinating, and controlling the subcontractors involved in the project. Subcontracting (SC) is a business strategy employed by main contractors to address construction market uncertainties and transfer risks, such as completion risks, financial risks, and responsibility for employees (Schaufelberger & Holm,2017). Subcontracting 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 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).

According to cidb (2013), there are three types of subcontractors. The first is a domestic subcontractor, who is appointed at the discretion of the main contractor. The second is a nominated subcontractor, chosen by the employer. The third type is a selected subcontractor, who is chosen by the contractor in consultation with the employer, based on the contract's

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requirements (cidb, 2013). This study focuses on domestic subcontractors that are appointed by the main contractor.

Subcontracting (SC) enhance 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 zzzzpoor 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).

Different studies have been conducted on individual SC components 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. Studer et al. (2021) identified a set of 19 core elements that have a prominent role in construction subcontracting. Despite the different studies conducted on isolated aspects of SC, there remains a significant gap in understanding how these components interrelate within the broader SC performance framework.

This gap undermines efforts to systematically enhance SC efficiency and effectiveness, crucial for timely project delivery and cost management in resource-constrained environments. This study aims to develop a comprehensive conceptual framework to enhance SC performance for the construction industry of developing countries. The specific objective of the study is to explore the core components of SC, the different elements of the core components, and the antecedents affecting the core activities/components of SC.

2. Literature Review

The construction industry is characterized by complexity and time-constrained projects. High complexity, uniqueness of activities, and the amount of required technologies urged construction firms to consider outsourcing strategies, including SC (Fridkin & Kordova, 2022). Subcontracting (SC) is a well-established practice in 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. Subcontractiong is also an efficient and economical means of accessing 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 might itself involve other different organizations allied by numerous contractual agreements as illustrated in Figure 1. Initially, the project user or owner contracts with the main contractor sometimes mentioned as the systems development organization (SDO) responsible for the overall project.

In turn, the main contractor gets into contract with the secondary parties: subcontractors, vendors, consultants, material suppliers, and contract labor for specific portion of a project; these secondary parties in turn could get into contract with other tertiary parties (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.

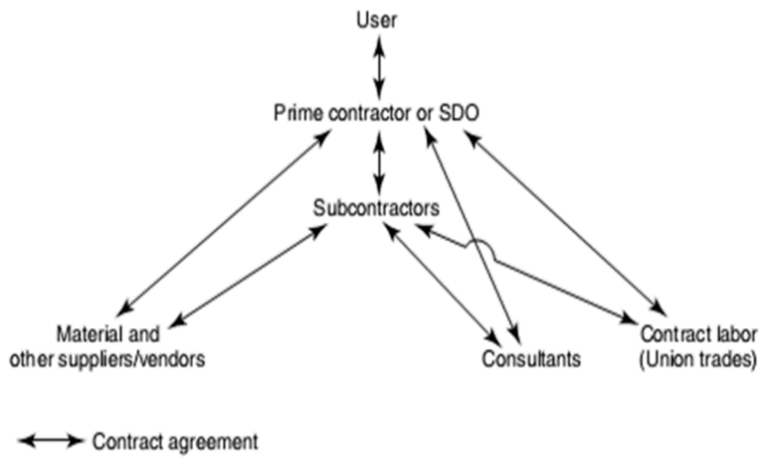

Figure 1: Contracting parties in a project Source : (Nicholas & Steyn, 2017)

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. The contractor must manage resources efficiently, maintain quality control, and meet project milestones to meet contractual obligations and satisfy the client. The contractor's tasks are further complicated by the fact that they oversee subcontractors in addition to these other roles. This needs managing subcontract works and making sure they adhere to the conditions, timelines, and established quality standards (Schaufelberger & Holm, 2017).

Clear coordination, communication, and dispute resolution are necessary for effective subcontractor management during project execution. In the current fierce construction market, construction firms put their effort into improving their competitiveness.SC is among these strategies. It is also an effective means of involving medium, small, and micro enterprises in construction project work (Nwokocha & Nwankwo, 2020).

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 specialised subcontractors who possess the required expertise in particular trades. The non-adoption of SC could require a significant amount of manpower and equipment, which may eventually become underutilised. (cidb, 2013).

3. Research Methodology

A systematic literature review (SLR) was adopted to examine the existing scholarly publications on SC performance. A systematic literature review involves comprehensive searches of relevant studies on the subject of study (Saunders, Lewis & Thornhill, 2016). In contrast to traditional reviews; SLR employs a transparent, scientific, and replicable procedure that involves a thorough assessment of the literature based on the analysis of previous studies (Mase, 2020). The different components of the proposed conceptual framework and their relationship were identified at this phase.

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") and ("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. The filtering involved screening relevant articles based on the following inclusion criteria: Studies done in the context of developing countries were included. Studies on social sciences; engineering; decision sciences; business, management, and accounting were encompassed. Studies conducted from 2000-2023 were included. The procedures followed for the article selection are presented in Figure 2.

The 27 screened studies were then reviewed to determine what has been investigated on the topic of construction SC performance. The studies were analysed to identify the components required to build a conceptual framework to enhance successful SC performance in the construction industry of developing countries.

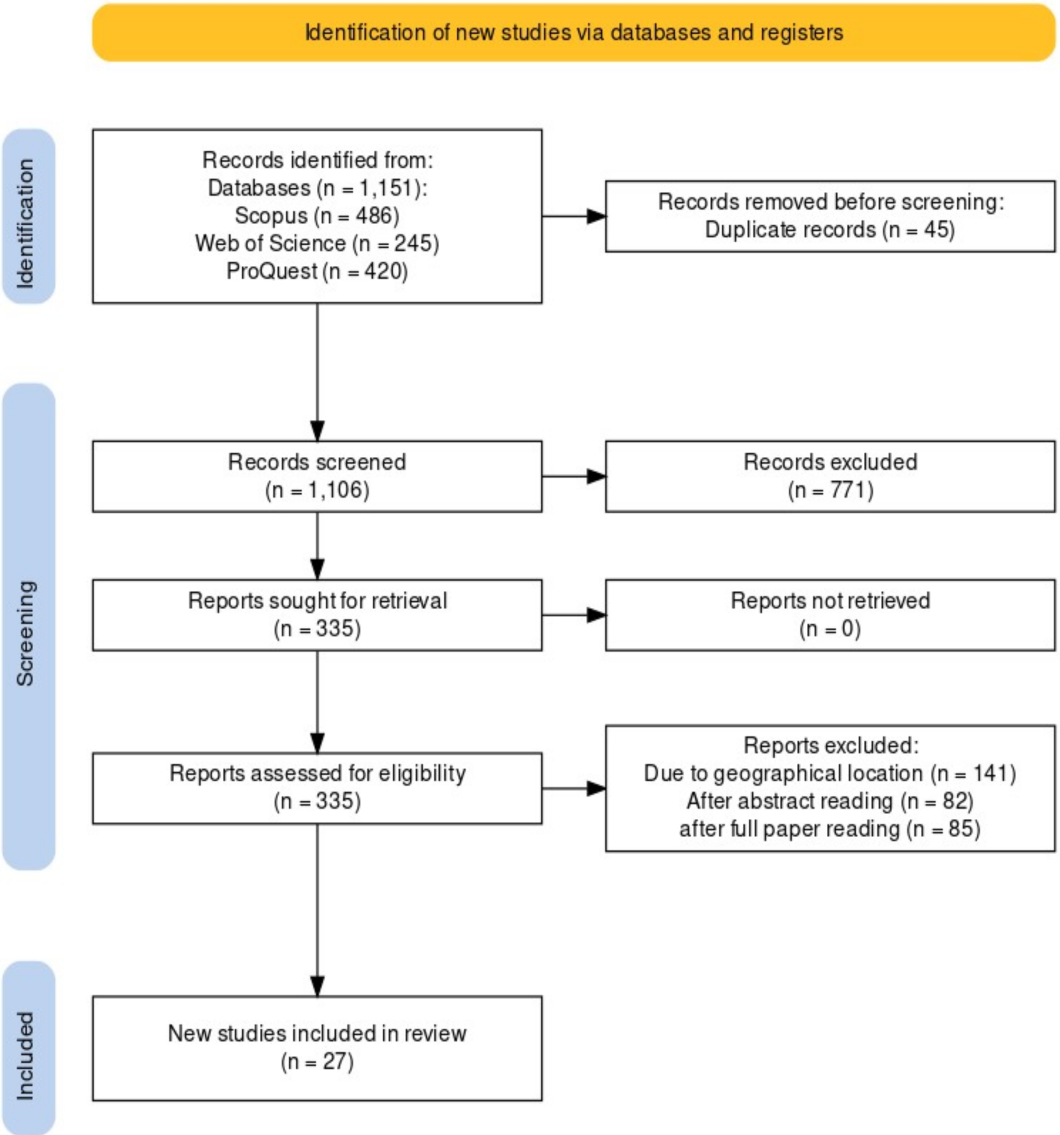

Figure 2: PRISMA 2020 flow diagram

4. Results

The screened articles were analysed with thematic analysis using ATLAS.ti23 software to explore the various components required to construct the intended conceptual framework. To overview the underlying concepts of the articles, initially, a word cloud was generated. Figure 3 illustrates the word cloud generated with a word frequency query. This helped to capture the underlying concepts of the publications included in the SLR in a single view.

For the analysis using ATLAS.ti23, different codes were initially generated from the quotations extracted from the screened articles. Figure 4 illustrates a sample coding procedure. It includes a sample quotation, code, and a source article. Subsequently, meaningful code groups and categories that are associated with the SC performance theme were established.

The network diagram, shown in Figure 5, serves as a tool to visualize the findings that emerged from the reviewed documents and to identify conceptual relationships among the identified SC components. This facilitates the process of building a conceptual framework.

The different elements of the network diagram, which in turn would be components of the proposed conceptual framework, are discussed next.

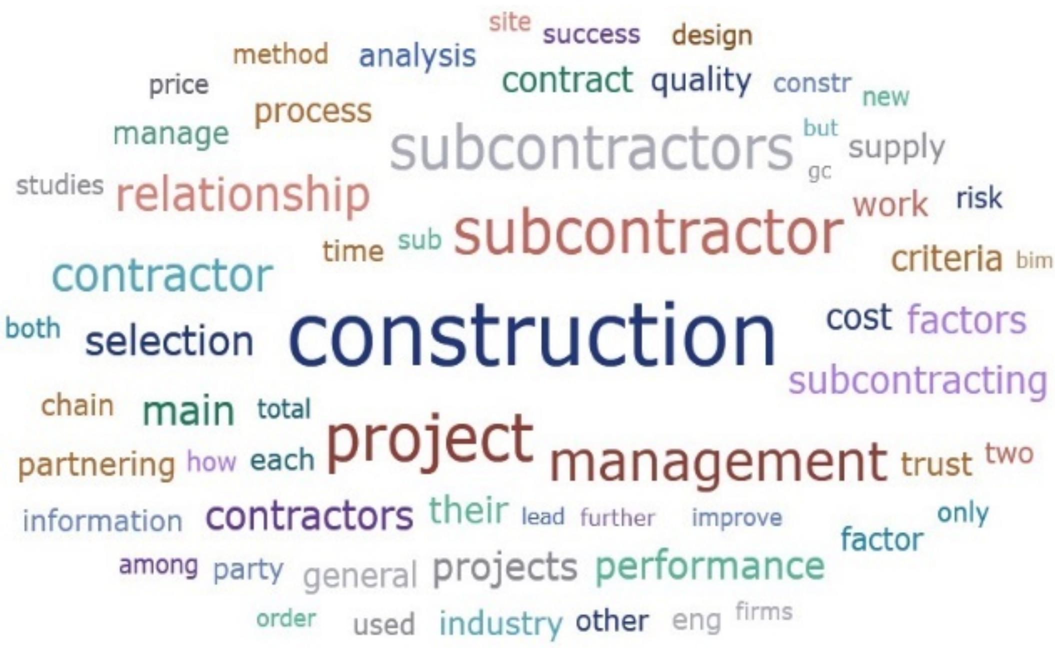

Figure 3: Word Frequency Query Source: ATLAS.ti23 output

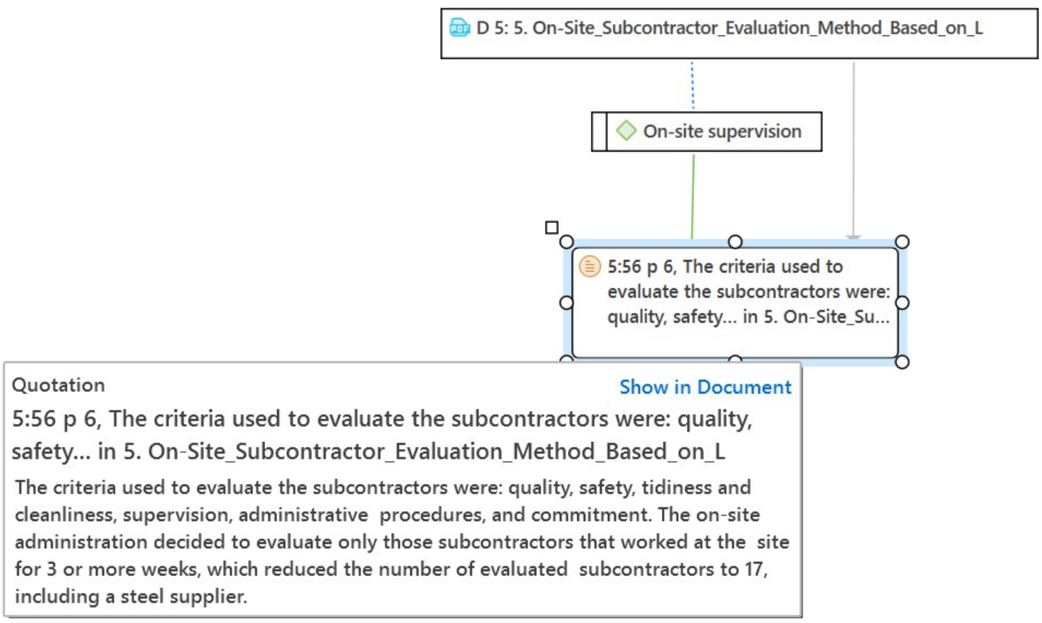

Figure 4: Sample Coding/ partial to fit the page/ Source: ATLAS.ti23 output

5. Discussion of the findings

5.1 Antecedents Influencing SC

The core activities of SC performance are affected by different antecedents directly or indirectly as illustrated in the network diagram (Figure 5). Next, the five major antecedents (colored yellow in the network diagram) influencing the SC core activities are discussed.

5.1.1 Business Environment

Government policies, resources; legal and regulatory frameworks, marketing; socio-cultural conditions, and other related external elements impact SC performance in construction (Eom et al., 2015).

Government policies should open the door to successful partnerships in construction (Rostiyanti et al., 2020). This, through the involvement of small construction firms, enables more job creation and wealth distribution in the developing context. Cremers and Houwerzijl (2021) also stressed the value of governments in assigning regulatory bodies to facilitate and monitor the policy implementation on SC.

Different developing countries have set a policy for a minimum percentage of project works to be allocated to local subcontractors to promote economic growth and local industry development. South Africa (cidb, 2018) and Zambia (Mudzvokorwa et al., 2020) are examples of this. These policies are designed to enhance local participation, transfer skills, and foster economic inclusion within the construction industry (cidb, 2018).

According to Suresh and Nathan (2020), when it comes to operations in subcontract works, a sudden change in government rules and regulations could make it difficult for the subcontractor/contractor to access resources.

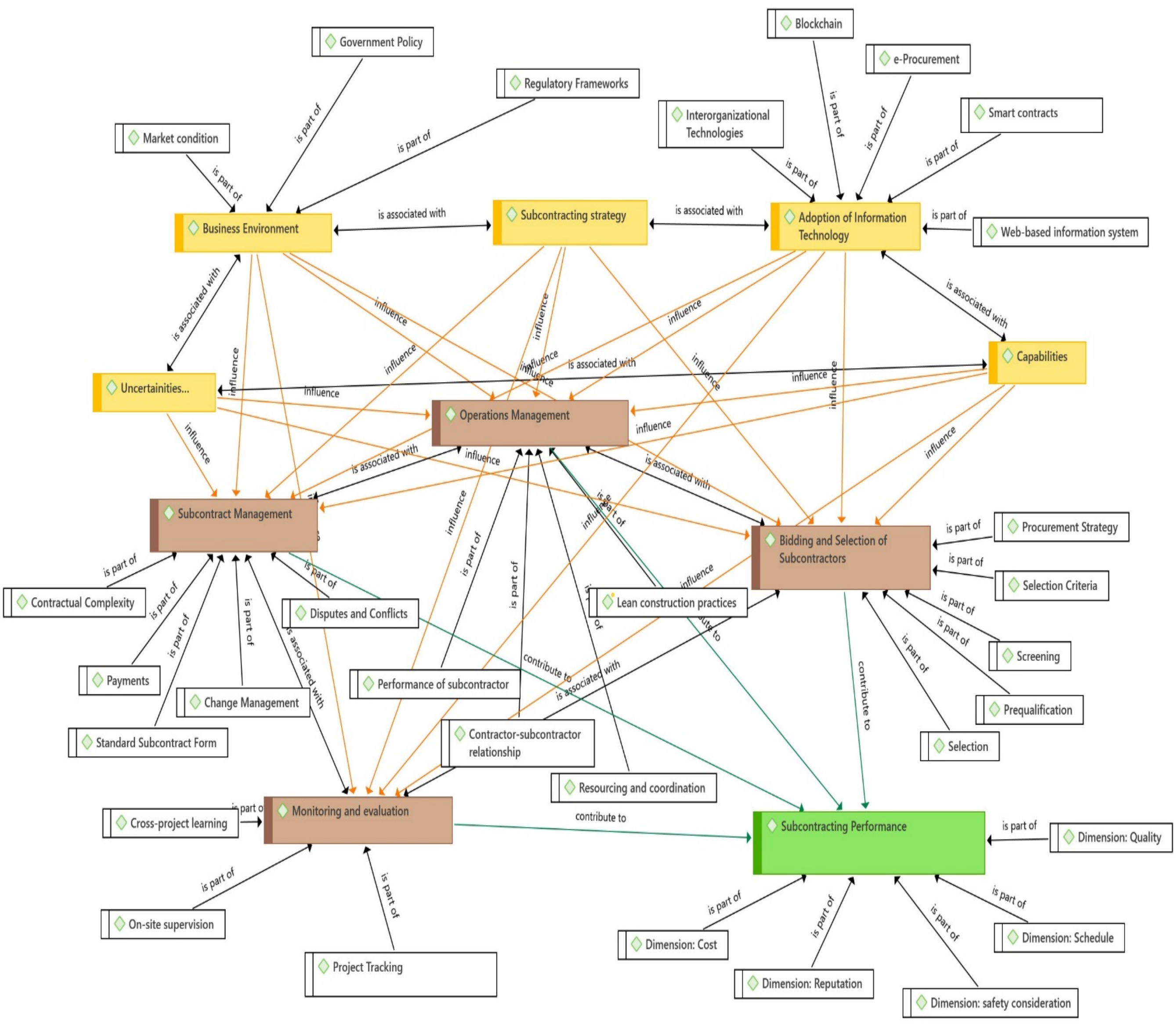

Figure 5: Network Diagram of SC Performance
Source: Literature Analysis by the Authors (ATLAS.ti23 output)

5.1.2 Adoption of information technology

The adoption of information technology is among the identified antecedents that affect the performance of construction SC by bringing higher collaborative working efficiency (Lew et al., 2018; Tan et al., 2017). This includes adoption of E-procurement, inter-organizational technologies, smart contracts, blockchain, and a web-based information system.

5.1.3 Uncertainties/Risks

Uncertainty has been recognised as the major source of project complexity, and one of the primary purposes of project management is dealing with uncertainty (PMI, 2017). It refers to changes in a project's environment that are difficult to precisely foresee. Uncertainty encourages opportunistic behaviour and increases transaction costs.

With SC, the contractor might combine or split jobs, reducing uncertainty in each package and creating value. However, unlike certain and consistent situations, the contractor's alliance management skill may be challenged to deal with uncertainties. SC dispersion increases project interfaces, making it more difficult for the contractor to integrate various subcontractors in uncertain contexts (Shi et al., 2023).

When multiple subcontractors operate on the same project, the contractor needs to make a clear identification of tasks and assign them. Furthermore, uncertainty may disrupt the initial sequence, procedures, and duty allocation, complicating the contractors' ability to adjust. The contractor must ensure that all parties collaborate amicably through strong coordination (Le & Nguye, 2024).

5.1.4 Capabilities

Construction projects vary in their technical requirements, scope, and scale which impacts the capabilities needed from subcontractors and contractors. For instance, complex projects with specialized technology and complicated designs require subcontractors with advanced technical and management capabilities (El-khalek et al., 2019).

Subcontractors should work on the improvement of their internal working systems and enhance their capabilities to adapt to uncertain project environments (Deep et al., 2024). The overall performance of the project can be positively impacted by the subcontractors' capability. Acquiring a higher level of technical expertise and resources would enable them to carry out their given responsibilities efficiently (Kshaf et al., 2022). Also, the contractor’s capability to coordinate the subcontractors is critical for successful subcontracting (Chen et al., 2021).

5.1.5 SC Strategy

Making a strategic decision to practice SC in a project and study on its general arrangement is a critical initial step before selecting subcontractors and fully entering into operations (Shi et al., 2023). An SC strategy is a long-term plan developed by the main contractor for selecting and managing its subcontractors (Eom et al., 2015). Assessing the previously discussed influencing factors: business environment, adoption of information technology; uncertainties, and capabilities, provides invaluable inputs for crafting a realistic SC strategy. In addition, Nwokocha and Nwankwo (2020) posit that the contractor should evaluate its internal weaknesses and strengths in the preparation of the strategy.

5.2 Core activities of SC

The antecedents discussed in the previous section: uncertainties/risks; business environment; capabilities of parties; adoption of information technologies, and subcontracting strategy influence the four core activities/components of SC: bidding and selection of subcontractors; subcontract management; operations management, and monitoring. These relationships are illustrated in the network diagram with brown colour (see Figure 5).

5.2.1 Bidding and selection of subcontractors

Subcontractor selection decisions are of prime importance in construction SC (cidb, 2013). The selections are exercised by main contractors multiple times on every single project. The approaches of main contractors on subcontract procurement have changed recently towards adopting a more long-term and strategic partnership philosophy (Eom et al., 2015). The bidding and selection processes have a direct impact on SC performance in construction (Fridkin & Kordova, 2022).

The bidding and selection of subcontractors need to commence with the preparation of the procurement strategy. The procurement strategy for subcontract works sets out how the various subcontract works will be procured (Schaufelberger & Holm, 2017). It involves reviewing and setting requirements (e.g. the division of the main contract works into various subcontract works, quality, scope, time, and cost), and assessing such requirements against associated risks. It is a ‘live’ document subject to revision as circumstances require (RICS, 2021).

A strategic choice between a qualification-based selection of subcontractors and an open bidding system should be made for the selection of subcontractors. The recommended practice is to initially screen a few subcontractors with a prequalification criterion and then invite them to submit a bid (quotation) for the scope of work (Schaufelberger & Holm, 2017). The initial screening is commonly performed based on criteria such as experience, technical capability, health and safety, quality performance, management capability, reputation, timely delivery, past performance (Eom et al., 2015; Karaman, 2022).

A web-based subcontractor evaluation system in which subcontractors are evaluated and selected based on pre-set criteria is recently being practiced (Abbasianjahromi et al., 2014). If the selection of subcontractors is properly conducted, it contributes to the establishment of a productive SC relationship, fostering collaboration, and minimizing disruptions in project execution (Olanrewaju et al., 2022).

5.2.2 Subcontract management

A subcontract is defined as a commercial contract (for the provision) of labor, works, and materials between a main contractor and a subcontractor (Cremers & Houwerzijl, 2021). Subcontract management is in the post-award life cycle phase of contract management, and it is in the "perform contract" domain among the standard project management processes (PMI, 2017).

Subcontract management could also be explained as contract management of subcontracts. It incorporates ensuring quality performance of work, responding to requests for information, issuing change orders when needed, and promptly paying subcontractors for accepted work (Schaufelberger & Holm, 2017).

Standard forms of subcontract

Fair allocation of project risk and responsibilities through the conditions of a contract is pivotal for coordination, uninterrupted execution of works, dispute resolution, and maintenance of positive relationships among contracting parties (Zubair et al., 2016). To fulfill this, the construction industry has for a long time recognised the benefit of using standard forms of contract, which contain conditions that apply to a wide range of construction projects (RICS, 2021). Similarly, different types of standard forms of subcontract have been developed or adopted for SC. Standard forms of subcontract could be used as an "off the shelf" contract, with minor revisions, for the contracting in SC (Zubair et al., 2016).

FIDIC(International Federation of Consulting Engineers) Conditions of Subcontract for Works of Civil Engineering Construction, 1994 (FIDIC 1994) and The Red Book Subcontract-Conditions of Subcontract for Construction for Building and Engineering Works, Designed by the Employer, First Edition 2011 (FIDIC 2011), and other standard forms of subcontract prepared by different professional associations have been used as model in the formulation of the general conditions of subcontracts in different countries (Zubair et al., 2016).

Payments

In traditional contractor-subcontractor relationships, issues related to subcontractor payment are among the major impediments to construction subcontracting (Mudzvokorwa et al., 2020). A cause of this problem is the commonly employed conditional payment provisions in subcontracts including the 'pay-when-paid' and 'pay-if-paid' conditions which severely affect subcontractors as they are not in a better position to absorb the financial burden than the main contractor (Rostiyanti et al., 2020). The second challenge is an underpayment, which is paying the subcontractor below the certified amount (Mudzvokorwa et al., 2020).

Conflicts and Disputes

Construction projects are temporary endeavors with multi-stakeholders where conflicts often occur. Specifically in SC, conflicts and disputes arise due to poor communication, contractual problems, limited resources, payment delays, coordination issues, design issues, and other different reasons (Shivanthi et al., 2019). Sub-subcontracting (multi-layer SC) without the consent of the main contractor and poor coordination are also other possible sources of a contractual dispute (Lew et al., 2012).

Conflict mitigation is significant for building sustainable relationships in SC. Explicitness and elaborateness of a contract, and contractual complexity, reduce task conflict and relationship conflict in SC (Wang et al., 2023). The use of standard subcontracts has been identified as an effective tool to minimize disputes related to risks and uncertainties (Shivanthi et al., 2019). Timely contractual enforcement also plays a crucial role to reduce conflicts and disputes in SC relationships (Wang et al., 2023).

5.2.3 Operations management

Prior studies have identified poor operations management as a major factor that affects SC performance (Yong, 2015). The same study explained that the operational failure was caused due to the main contractors' financial problems; delay in subcontract progress payment; interruption and termination of work by the contractor, absence of continuous follow-up of subcontracted works; and lack of coordination of the different subcontractors.

Contractor –subcontractor relationship

The traditional contractor and subcontractor relationship is typically designed as an antagonistic and transient structure with low-efficiency collaboration. This relationship must transition from a traditional adversarial pattern to a cooperative and collaborative long-term relationship (Olanrewaju et al., 2022).

In construction SC, the uneven status of transaction parties makes weaker parties vulnerable to unfair treatment (Wu et al., 2023). Subcontractors in such situations tend to absorb the pain rather than take appropriate measures as per the conditions of their contract due to asymmetric dependence. The "pay-when-paid" clause in some subcontracts exemplifies the power imbalance between a contractor and subcontractors. This clause shifts financial risk to subcontractors, who only get paid once the contractor receives payment from the project owner, often causing significant cash flow issues (cidb, 2013). Such an asymmetric dependence condition readily leads to interest conflicts, increasing information asymmetry and negatively impacting SC performance. This aggravates the unfairness perception by subcontractors. Unequal status and information asymmetry are considered a normal trend in construction SC (Ivic & Ceric, 2023).

Subcontractors, as the weaker party in contractor-subcontractor relationships, experience a pricing power disadvantage and uneven value allocation, which reduces their perceived fairness. Furthermore, stronger parties' compulsive decision-making practices, lack of clear communication, and unwillingness to share information all undermine the perception of fairness (Tan et al., 2017). In such a scenario, main contractors tend to micromanage and interfere with the decision-making of weaker subcontractors to ensure profit maximization(Kshaf et al., 2022). In a contractor-subcontractor collaborative environment, the main contractor may go beyond fulfilling the contractual obligations regarding subcontractor payment and bonds. This includes offering additional incentives such as waiving the bid bond, giving priority to the subcontractor advance payment, and raising the percentage of progress payments (Wu et al., 2023).

An excessive power control imbalance is also common in traditional contracting practices but not relational contracts – leading to a perceived lack of trust and hindering contractor-subcontractor cooperation (Chen et al., 2021). Designing and implementing a reliable conflict resolution process is crucial for sustaining the contractor-subcontractor relationship in construction SC (Wang et al, 2022).

Performance of work

Subcontractors are expected to deploy the required resources for a project according to their contractual conditions and specifications (Ng & Skitmore, 2014). Executing construction works below the standards stipulated in the technical specifications of the contract will hamper the SC relationship (Basaran, Aladag & Isık, 2023). Weak management practices, especially financial and cash flow management, and lack of a working system by the subcontractor affect its ability to execute project tasks.

Resourcing and coordination

In many developing countries, a shortage of construction materials, components, and other resources poses a serious problem. Establishing an agile supply chain in SC could respond flexibly and promptly to changes in the external environment (World Economic Forum, 2016). Once the subcontract is awarded and construction begins, the project manager and the project core team must collaborate closely with the subcontractor to schedule and coordinate their work, ensuring the project is completed on time, within budget, and under contract requirements(Schaufelberger & Hol, 2017). Since most of the construction work is being performed by subcontractors, efficient resourcing and coordination of their work is crucial (Basaran, Aladag & Isık, 2023).

Lean construction

Implementing lean construction principles offers an effective solution for optimizing operation management in SC. A lean approach would be beneficial for this as it decreases uncertainty and complexity by reducing non-value-adding activities and waste throughout the entire SC value chain(World Economic Forum, 2016). This reduces transaction costs. The lean approach brings improvements not only in cost and delivery time but also in safety and quality (Le & Nguye, 2024). By integrating lean practices at every stage of subcontracting, construction projects can achieve significant improvements in cost-effectiveness, timeliness, safety, and overall project outcomes.

5.2.4 Monitoring and evaluation

For monitoring and evaluation of subcontractors during the construction stage, different studies have suggested different criteria. For example, Lew et al. (2018) recommended five main categories of criteria: awareness of the environment, health and safety; communication and relationship; progress of work, resource management; and workmanship. The monitoring and evaluation should be conducted regularly and continuously (RICS, 2021).

Project Tracking

Regular and continuous project meetings are effective in strengthening the partnering spirit of the different stakeholders in SC and resolving impediments in real-time (RICS, 2021). It is essential to understand the concerns of subcontractors and the proper work sequencing to ensure their success.

For this, the project core team needs to establish a cooperative relationship with the subcontractors and their crew by conducting frequent coordination and progress meetings to discuss their concerns (Schaufelberger & Holm, 2017). Standup and progress meetings coupled with mutual goals will help foster subcontractor relationships that are built on trust (PMI, 2017). The use of different project management information systems would enable to have real-time information for project tracking and for making early informed decisions(Englund & Graham, 2019).

On-site Supervision

The quality and efficiency in construction can be attributed to the performance of subcontractors assigned to complete actual works (Basaran, Aladag & Isık, 2023). To ensure this, subcontractor performance appraisal on-site is instrumental. This needs to be done with preset evaluation criteria. Then feedback should be forwarded to the project core team to take remedial actions on the identified performance gaps.

A preset evaluation criteria that is outlined in the quality management plan of the contractor, serves as a strategic tool for monitoring and evaluating subcontractor performance against defined quality standards and project objectives. By integrating these evaluation criteria into daily on-site supervision, the contractor can oversee subcontractor activities more effectively, identify potential deviations early, and proactively address issues to maintain project quality and adherence to schedules (Karim et al., 2006). This collaborative approach not only enhances communication and coordination between parties but also fosters a culture of continuous improvement, where feedback and lessons learned are integrated into future project phases.

Cross-project learning

Cross-project learning is a process or practice of capturing the learning from projects so that it is available for use by other projects. Cross-project inter-organizational learning seldom occurs in a competitive relationship (Cao & Wang, 2014). However, contractors and subcontractors with a partnership approach could benefit from cross-project learning.

5.3 Conceptual Framework

The discussed components, in the previous sections, of SC performance and their relationships were illustrated in the network diagram Figure 5. However, the network diagram in Figure 5 is too complex. Accordingly, a conceptual framework is developed as portrayed in Figure 6, demonstrating the linkage of bidding and selection, subcontract management, operation management, and monitoring & evaluation components toward a successful SC performance. The internal and external environmental components including SC strategy; adoption of information technology; uncertainties; and capabilities are also illustrated in the framework. The different elements within the components are also illustrated in the framework.
The conceptual framework is developed to be used by contractors, subcontractors, and other project stakeholders for crafting and implementing their corresponding policies, strategies, structural arrangements, and processes to enhance SC performance at projects.

The conceptual framework illustrated in Figure 6 could be used to enhance SC performance in construction projects. Initially, the main contractor needs to revisit its own capability, and the capability of the subcontractors and other project stockholders involved. Regarding the business environment, the market conditions in the industry and the government policies and regulatory frameworks related to construction and specifically to SC should be assessed. Also, the potential risks in SC including health and safety risks, quality assurance risks, availability of material and skilled manpower, political instability, and other risks need to be identified.

According to the proposed model, the main contractor should make a strategic decision on the prioritization, selection, and implementation of the specific information technology appropriate for managing SC in a construction project. A well-crafted SC strategy would be vital for the contractor to get the roadmap on how to address the discussed components that influence the four core activities of SC(Nwokocha et al., 2019). A proper selection of qualified subcontractors is pivotal for successful SC and project success as illustrated in the proposed framework.

Olanrewaju et al. (2022) emphasized that poor subcontractor selection can result in costly claims, delays, litigation, cost overruns, poor quality, and loss of profit. Preparing a procurement strategy is crucial in understanding how the various subcontract works will be procured. The subcontractor selection should be followed by effective subcontract management. Employing explicit contracts is the first critical step toward successful subcontract management.

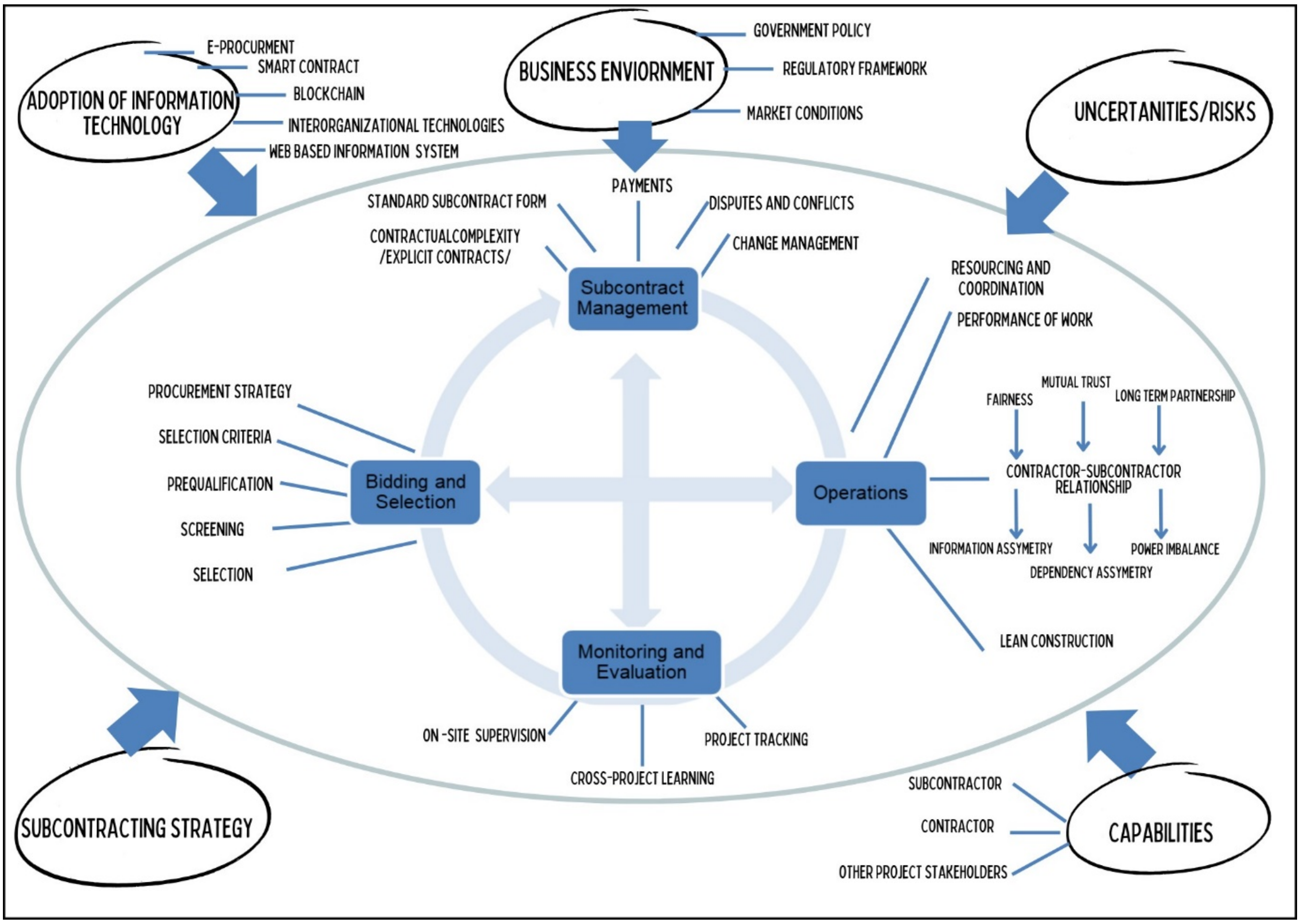

Figure 6: Conceptual framework for enhancing SC performance in the construction industry of developing countries

Standard subcontract forms, at the industry level, are commonly utilized in public construction projects. Setting standard procedures for managing changes and prompt accrual of subcontract payment for certified work are also tasks within subcontract management. Disputes and conflicts in SC need to be settled according to the conditions and procedures stipulated in subcontract agreements. Nonetheless, trust also plays a crucial role in the negotiation and resolution of disputes in SC (Wang et al., 2023).

Regarding the operation management in SC, the framework highlighted that subcontractors should execute contractual obligations, while main contractors need to provide support in resourcing and coordination, especially in resource-constrained environments. Implementing lean construction principles is recommended in the framework to optimize operations, reduce waste, and enhance efficiency and quality across the SC value chain (Le & Nguyen, 2024).

Shifting from adversarial to collaborative contractor-subcontractor relationships is a crucial step toward a successful SC (Studer et al., 2021). This demands fair pricing, transparent communication, and mutual trust. Designing transparent communication channels and fostering mutual trust to mitigate information and dependency asymmetry in contractor-subcontractor relationships is crucial for improving collaboration and enhancing overall project performance in construction (Wu et al., 2023).

The framework positioned monitoring and evaluation of subcontractors as another core activity in SC. It involves setting criteria and evaluating the performance accordingly. Regular monitoring ensures performance gaps are identified and addressed for project success. Progress meetings aid real-time issue resolution and stakeholder collaboration, while on-site supervision ensures accountability and quality. This approach fosters trust and enhances overall project efficiency (Tan et al., 2017).

The contractor, project owner, and subcontractor can each utilize the proposed framework to enhance SC performance by focusing on their respective roles. For instance, contractors can implement IT solutions for streamlined bidding, selection, and performance management while fostering trust through fair contracts and adopting lean construction principles to reduce waste and improve quality.

Project owners can ensure qualified subcontractors are selected and encourage collaboration, transparency, and timely project delivery by promoting fair contract terms and regular performance monitoring. Subcontractors can leverage the framework to upskill their workforce, adopt better project management tools, and maintain open communication with contractors to enhance operational efficiency and ensure fair treatment through standardized contracts and prompt payments. Together, these stakeholders can create a more transparent, efficient, and collaborative construction process.

To support the proposed framework for enhancing SC performance in the construction industry of developing countries, governments can enact or modify policies in several key areas. First, procurement regulations need to promote a transparent bidding process, standardized subcontract agreements, and local content policies to ensure fair subcontractor selection and effective management. Vocational training programs and skill development grants will build subcontractor capabilities. Additionally, establishing specialized construction arbitration courts and requiring mediation before litigation will improve dispute resolution. Governments should also invest in better supply chain infrastructure, regulate material markets to stabilize prices, and incentivize sustainable construction practices. Through implementing these policy measures, governments can create a conducive environment that aligns with the framework, improving SC performance, fostering collaboration, and boosting the competitiveness of the construction industry.

6. Conclusions

Designing a conceptual framework for improving subcontracting (SC) performance in developing nations' construction industries is an important step toward overcoming the inherent SC performance disparities. The framework offers a structured approach for the contractor, subcontractors, and other project stakeholders to navigate and respond appropriately to the dynamic and unpredictable subcontracting and construction environment.

The study has identified the different components influencing core SC activities. The emphasis on SC strategy formulation, effective subcontractor selection, subcontract management, technology adoption, operational optimization, relationship building, and strong monitoring and evaluation systems highlights the multifaceted aspect of subcontracting performance.

The implementation of the proposed framework demands a joint effort from the main contractor, subcontractors, regulatory authorities, and other project stakeholders. It needs a push towards fairness, symmetric information and dependency, mutual trust, and continual improvement efforts along the SC value chain. By adopting the framework's principles, stakeholders can improve SC, project performance, and ultimately contribute to the overall growth and competitiveness of the construction industry of developing countries.

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Impact of Consultant Performance Indicators on Project Success in Public Construction Projects

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Abstract

This research examines the impact of performance indicators of consultants on the success of construction projects in public tertiary institutions in Bauchi State, Nigeria. The paper adopted a purposive sampling technique, whereby a structured questionnaire was administered to 144 construction professionals to elicit information on consultant project performance factors that impact the successful delivery of projects. A total of 125 (86.8%) participants completed the survey. Descriptive statistics such as mean (M), and standard deviation (SD) were used to interpret the data. The result shows major factors of consultants' performance are *resource adequacy and understanding of client's requirements* (M=4.25, SD=0.73), *competency and experience* (M=4.16, SD=0.66), and *commitment and flexibility* (M=4.10, SD=0.58). However, *adequacy of resources* and *understanding the client's requirements* are the main elements used for evaluating consultant performance and are mostly considered for measuring the project's success. The study, recommends that stakeholders in the delivery of public construction projects should endeavour to implement the findings of research to improve project performance. Also, appropriate professionals should be used on projects to achieve cost effectiveness, quality, and timely delivery of projects. Consultants should also ensure adequate communication and allow the participation of relevant professionals throughout project implementation.

Keywords: construction professionals, consultants, experience, project performance, project success.

1. Introduction

The construction industry produces shelter and infrastructural projects such as transportation, industrial and specialist developments. These trigger significant effects on a nation's economy and economic sustainability of developing nations. However, the industry faces performance issues, which robs off on public perception regarding its success. Project performance (PP) is the extent to which projects are delivered based on client's requirements. PP issues are common in developing countries as well as developed countries. PP encompasses successfully completing projects within allocated budget, specified timeframe, and agreed-upon quality standards (Hassan et al., 2022). Project success can be evaluated based on specific parameters such as performance, management, supervision, aestheticism, stability, safety, and the quality of service rendered. Further, the successful execution of construction projects requires sound engineering judgment, from design to supervision through planning to production stages.

Contrary to stakeholders' intention, many projects experience extensive overruns (Alaloul, et al., 2016). Traditionally, project success is analysed based on performance and quality in relation to budget and schedule. Additional success criteria stated by Kerzner and Saladis (2017) are efficiency of planned resource utilization and client satisfaction. Society generally desires that all projects be successful and become less tolerant of failure (Shepherd et al., 2011).

Majority of construction projects in Nigeria experience overruns. Where projects are existential to organizations' success, every organization must measure its performance in relation to projects in

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order to remain competitive. Incidentally, Ogunde et al. (2017) and Auma (2014) have reported performance issues as a global debacle. In developing countries such as Nigeria, the rate of poor performance is higher. Zailani, et al. (2019) reported that less than 50% of the projects studied were successful with regards to time, cost and quality specifications. They found project delivery issues are not limited to inadequate planning and scheduling complexities. This is evident in several abandoned projects that take an extended period to complete and projects that became protracted because of chaotic inflationary trends.

Callistus et al. (2014) stated the need to evaluate critical factors affecting quality performance of project. Sweis et al. (2014) reiterated that improvement can only be ascertained when performance is measured. Performance measurement is a standard for measuring the progress for any organization (Hamidu et al., 2024). According to Aghimien and Aigbavboa (2018), about 86% of the assessed public tertiary institution projects in Nigeria experienced a time overrun of 66% to 86%. Whereas Gambo et al. (2017) revealed that 43% of the projects studied were not completed within their contracted schedule and cost. Further, over 70% of construction projects started in Nigeria are likely exceed their schedule, whilst over 50% will exceed their budget (Okweto, 2012). However, each construction project is unique, and the characteristics and project deliverables differ from one project to another. Points of difference include topography, nature of soil, location, cultural setting, quality, material application and technological requirements amongst others. Project performance now becomes a significant issue for the successful delivery of a project.

A recent study by Masengesho et al. (2021) identified various obstacles hindering the effective management of construction projects. These obstacles include appropriate engagement of project consultants, insufficient knowledge and experience in project consulting, shortage of well-trained project consulting professionals, limited training opportunities for construction project managers, resistance from senior management, and a dearth of local project consulting guidelines and information. Dosumu and Aigbavboa (2019) reported that the level to which construction professionals, especially consultants, render their services to construction clients is below expectation, and this causes performance gaps in terms of accuracy in the cost of construction works estimates and project delivery. Construction project requires a project consultant to enhance its success by minimizing and conserving the overall project lifecycle costs by the client's requirements. The consultant's responsibilities include ensuring the project is completed on time, enhancing the quality of the project deliverables for current and future needs, dealing with significant deviations that affect the construction project and result in increased costs, and offering advice on required actions. This study evaluates consultant's performance indicators on project success in public construction projects of tertiary institutions in Bauchi State.

2. Literature Review

2.1. Construction Project Success

Success of a construction project is an essential issue for economic development of a country, project owners and users (Oyekunle, et al., 2024a; Ramlee et al., 2016). The outcome of a construction project could either be a success or failure. Therefore, once a project fails to be delivered, it is deemed a failure. Hence, project performance is measured by predicting the project outcome, whether it succeeds or fails (Omran *et al.,* 2012). Project success is often evaluated based on timely completion, estimated cost, and expected quality. In the field of project management, numerous researchers have thoroughly examined the topic of project success. Most research on project success focuses on measuring its success and other specific factors that affect its success (Albert et al., 2017). For architects, project success may be based on aesthetic performance; for contractors, success is achieved when they benefit more (Al-Tmeemy et al., 2011). Rolstadås et al. (2014) pointed out that project success is related to completion time, cost, and quality objectives and requires relevant education to the project management community. Developing project success is setting standards and criteria to help participants complete the project with the best possible outcomes (Castro et al., 2019). Completing cost, time, and quality goals was considered direct project management success. Project success involves meeting the project goal (Sudhakar, 2016).

2.2. Project Success Factors (PSFs)

Various factors influence project performance, with certain factors being more critical to a project's success than others. The achievement of critical success factors directly correlates to a project's success (Naseer et al., 2022). However, measuring project success requires using key performance indicators such as cost, time, quality, health and safety performance, and other relevant factors (Enshassi et al., 2009; Babu, 2015). Project success factors (PSFs) are applied to promote project success. PSF is defined as a limited number of fields in which, if those outcomes are satisfactory, will assure the successful performance of the project organization (Masengesho et al., 2020). However, many factors are beyond the control of project management, and could determine project success or failure. They are called critical success or failure factors (Oyekunle et al., 2024b; Oyekunle, et al., 2023; Alzahrani & Emsley, 2013).

2.3. *Critical Success Factors of Construction Project in Nigeria*

There limited literature on CSFs of construction projects in Nigeria. The research conducted by Ihuah et al. (2014) highlights the importance of 22 critical project management success factors (CPMSF) for the successful and sustainable delivery of social housing estates in Nigeria. The performance of a project can be affected by various factors, such as the effectiveness of the project manager, the organization responsible for overseeing the project's development, the attributes of the team members, and the external environment in which the project operates. Ogwuleeka (2011) highlighted the crucial elements that impact project performance in Nigeria. The six necessary key factors include effective management of objectives, design management, technical aspects, strong support from top management, risk management, and mental and financial support. Incredibly, elements such as active involvement from the community, adherence to legal requirements, fostering mutually beneficial relationships, and addressing environmental concerns were deemed less important in achieving project success despite being statistically significant factors. This is particularly noteworthy in today's construction industry, where there is a growing emphasis on collaboration, sustainability, and the implementation of green building practices. Sustainability and implementing green building practices are becoming increasingly popular also (Agboola et al., 2023a). A study conducted by Akintoye et al. (2003) identified critical success factors for projects procured using the private finance initiative. These factors encompass detailed risk allocation, project duration, cost commitment, technical innovation, technology transfer and accountability.

2.4. *Criteria for Evaluating Success or Failure of Projects*

Project success is measured on the bases of time, cost and quality. Sebestyen (2017) identified these three criteria as the "Iron Triangle". Apart from these three basic criteria, Pinto and Pinto, (1991) argued that measures for project success should also include the satisfaction of interpersonal relationship with project team members. The inclusion of satisfaction as a success measure can also be found earlier in the work of Albert et al. (2017). A variety of criteria was elicited in their study. These include meeting budget, schedule, and quality of workmanship, client and project manager's satisfaction, transfer of technology, friendliness of environment, health and safety. The major project performance criteria are explained below.

2.4.1. Cost

Cost performance evaluates the degree to which the general conditions promote the completion of a project within the estimated budget (Mir & Pinnington, 2014). Cost is an amount provided for the general in a construction project. Cost is not only confined to the tender sum or the contract sum only, it is the overall cost that a project incurs from inception to completion. Cost includes any costs arising from fluctuations, variations, modifications during construction and the cost created by legal claims such as litigation and arbitration (Ashworth & Perera, 2018). When this cost exceeds the initial contract or tender sum due to these additional costs, the term 'cost overrun' is often used (Cunningham, 2017).

2.4.2. Quality

Quality in the construction industry is defined as the totality of features required by a product or services to satisfy a given need – that is, fitness for purpose (Ansah, 2018). Quality is the assurance of the products that convince the customers or the end users to purchase or use. Specification is one of the criteria that were advocated. Folorunso and Awodele (2015) defined this as the workmanship guidelines provided to contractors by clients or the client's representative at the commencement of project execution. The measure of technical specification is to what extent the technical requirements specified can be achieved. Actually, technical specification is provided to ensure that buildings are erected to good standard and by proper procedure. Fageha and Aibinu (2016) extended the definition of technical performance with scope and quality. So, meeting technical specification is grouped under the 'quality' category and when it falls below the client's expectation or satisfaction upon the completion of a project, it is often referred to as "substandard quality of work". According to Oyekunle et al. (2023) interpersonal relationship among team members lead to quality work and success of any project. Proper communication among team members supports project success as quality is guaranteed (Yu et al., 2021).

2.4.3. Time

According to Choo (2014), time is the duration from start to completion of a project. It is scheduled to enable the building or a structure to be used by a date determined by the client's future plans (Baldwin & Bordoli, 2014). Effectiveness is a measure of how well a project is implemented or the degree to which targets of time and cost is determined from the start-up phase to full production. According to Lindhard, et al. (2022), time can be measured in terms of construction time, speed of construction and time overrun. Construction time is calculated as the unit of time taken in a project from start to practical completion (Oso, 2020).

2.5. *Consultants Performance*

In this context, consultants refer to the scenario where an individual or a group of individuals who work as a team are appointed to take responsibility for the design, management and construction of a development project from conception to operation. Consultants must be able to operate effectively on a day-to-day basis to ensure a positive impact on the overall quality of their projects (Dadzie et al., 2012). For this to happen, consultants must be nurtured and encouraged (Dadzie et al., 2012). Salleh (2009) asserted that stopping or hindering the performance of the consultants will only stop or hinder the team's "chemistry" and project results. To be most efficiently used, it is said that consultants need to be "'generalists'" rather than specialists. They must "deal with the day-to-day demands of their position while maintaining a strategic vision for the project" (Dadzie, et al., 2012). Studies have shown that work environments that foster creativity and innovation are linked to higher overall productivity and likely significantly influence consultants' effectiveness (Somech & Drach-Zahavy, 2013). A more bureaucratic management style has been found to hinder innovation (Torfing, 2013). Therefore, it is suggested that a balance between well-defined systems that ensure efficient product delivery and the freedom to foster creativity and innovation within those systems be struck, allowing for quick adaptation to changing needs (Knight & Harvey, 2015). Long working hours are also likely to be a significant source of inefficiency amongst consultants. These are increasingly endemic and a significant cause of productivity loss in the construction industry in general (Dadzie et al., 2012).

2.5.1. Consultants Performance Indicator

According to Dadzie, et al. (2012) a project manager should possess skills such as, a high level of leadership and communication skills, ability to manage client issues, authority approval, design and construction processes and risks. Further, a consultant project manager should understand the client, the project, the design, tender processes and construction processes, and technical requirements of a project. They should be able to develop of risk management strategies and communicate effectively. Nitithamyong and Tan, (2007) state that 12 underlying performance measurement for consultant (PMC) factors formed the PMC success model as presented in Figure 1.

3. Research Methodology

This study sets out to identify the impact of the consultant performance variables on the timely delivery of construction projects in Bauchi, Bauchi State. Respondents targeted were professionals involved as consultants in public construction projects within higher institutions of learning in Bauchi State. Their professional titles include Architects, Civil Engineers, Quantity Surveyors and Builders. Bauchi was considered for this study based on the recommendation of Zailani et al. (2019) that many public projects of tertiary institutions need more space available for teaching and learning with project abandoned and many delayed. The study employed a primary source of data, which is the use of a questionnaire. A self-administered questionnaire was administered to professionals using a purposive sampling technique. Purposive sampling technique was adopted in order to obtain relevant and valid information for the study (Saunders et al., 2016). The basis for selection of respondent was due to the qualities the respondent possesses and the ability to provide relevant information (Alam, 2021). This method was crucial for the research to study sample of population with certain knowledge pertaining to the research. A total of 144 questionnaires were administered to respondents in the study area. However, only 125 questionnaires were completed, returned, and used for analysis because they were filled correctly. These 125 questionnaires represented an 86.8% response rate. This response rate is higher than Emuze's (2011) 25.4% and less than Agboola et al.'s (2023b) 87.1%, being low-end and high-end benchmarks reported in relevant construction research.

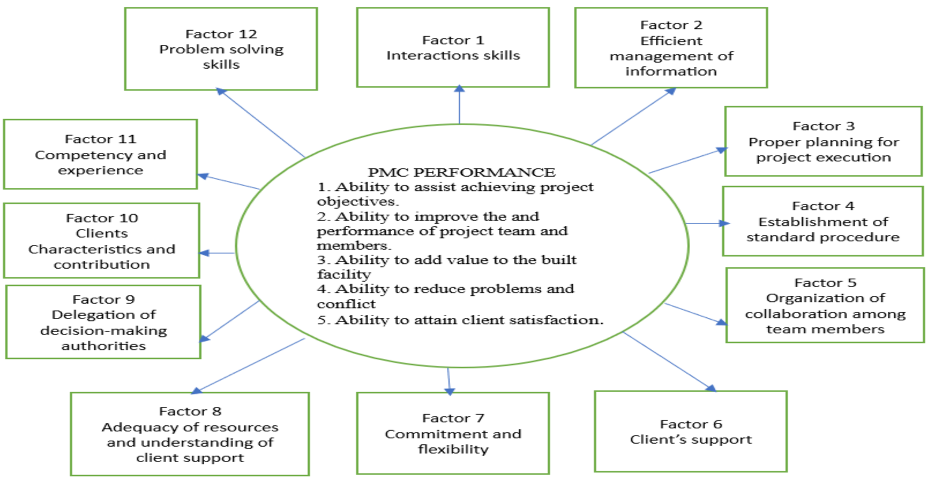

Figure 1: Success Model for Performance Measurement for project Consultants (PMC)

Source: Nitithamyong and Tan (2007)

The questionnaire consisted of two sections. Section 1 covered the demographic background of the respondents such as educational background, professional background, project management experience and number of projects managed. Section 2 asked respondents to rate the importance of each identified project performance variable. IBM Statistical Package for Social Sciences (SPSS) version 25 was used to analyse the data obtained from the questionnaire responses using mean and standard deviation to illustrate the study's descriptive statistics. A literature search was conducted in order to obtain knowledge and identify consultant performance indicators (Nitithamyong & Tan, 2007; Dadzie, et al., 2012). The information obtained from the reviewed studies related to the current study, guided the design of the structured questionnaire (Saunders et al., 2016). Forty (40) identified factors underlying the 12 broad categories of consultant performance indicators were adopted for the study. The main reason for using previous factors is to provide an opportunity of comparing the findings with those from other studies (Sospeter, 2023). Data for the impact of consultant'sproject performance variables on the timely delivery of construction project, utilized a 5-point Likert scale with 1 being Strongly disagree (SD), 2 being Disagree (D), 3 being Neutral (N), 4 being Agreed (A), and 5 being Strongly Agreed (SA). In describing the data, the study writes out the facts the way they are in transparent and fair descriptive reporting. Also, it filters out those matters which are not relevant to the research problem

4. Result and Discussion

4.1. Respondents Profile

Table 1 below presents the profiles of the respondents. 33.6% were from an architecture background. 23.2% are from a civil engineering background, 24% are from a quantity surveying background, 11.2% are from a building background, and 8% are from another background. The result shows that the professionals are almost evenly represented. 51.2% have 11-15 years of experience, 28.8% have 6-10 years of experience, 11.2% have 1-5 years of experience, and 8.8% have 15 years and above experience. 45.6% of the respondents have handled 6-10 projects yearly, 28.8% have 1-5 projects, and 25.6% have 11 and above projects yearly. Also, 36.8% of the professionals hold bachelor's degrees, 57.6% hold master's degrees, 3.2% hold higher national diplomas, and 2.2% hold ordinary national diploma certificates. Findings from the professional's demographic profile reveal that respondents are well-experienced and educated enough to respond to this research enquiry.

4.2. Performance of consultants in public construction projects

There are six interaction skills for evaluating consultant performance in public construction projects. Consultants with the needed negotiation skills have a mean (M) of 4.14 and standard deviation (SD) of 0.71. Respondents agreed that negotiation skills measure consultant performance in public construction projects. Consultants who have leadership skills have a mean of 3.97 (SD=0.80). The consultant's requisite leadership skills improve the construction projects' performance. Consultants with the needed team-building skills have a mean of 4.06 (SD=0.73). This means a consultant must have the needed team-building skills to perform in the delivery of a construction project. Consultants with the needed interpersonal skills have a mean of 4.04 (SD=0.75). Result shows interpersonal skills are crucial to consultant performance for successful construction projects. The consultant has political skills and a mean of 4.09 (SD=0.40). This means that political skill is an

Table 1: Respondents' Profile

S/N	Demographic descriptors	Response	Frequency	Per cent
1	Professional background	Architecture	42	33.6
		Civil Engineering	29	23.2
		Quantity Surveyor	30	24.0
		Building	14	11.2
		Others (M&E)	10	8.0
2	Year of experience	1-5 years	14	11.2
		6-10 years	36	28.8
		11-15 years	64	51.2
		15 and above	11	8.8
3	No. of Projects handled yearly	1-5	36	28.8
		6-10	57	45.6
		11 projects and above	32	25.6
4	Highest level of education	OND/NCE	3	2.2
		HND	4	3.2
		BSc.	46	36.8

important attribute to be possessed by a consultant. Consultants can identify that decision-maker skills have a mean of 3.54 (SD=0.56). Respondents felt that this consultant's knowledge of identifying decision-makers would assist the project in being carried out more systematically and organized.

Consultant performance in construction projects was measured through proper planning for project execution. The client clearly defines the project scope and objectives with consultants (M=3.86). This means that respondents agree that a clear definition and understanding of the project scope and objective from the client to the consultant enhances consultant performance and aids in successfully delivering the construction project. The client clarifies the project's needs and requirements with consultants (M=3.73). Respondents felt that clarifying the needs and requirements of a project with the consultant improves consultant performance and the success of the project. Consultants who have managerial skills and techniques have a mean of 4.17. The result shows that consultant having the requisite management skills and techniques will improve their performance. Consultants understand that the project environment has a mean of 3.59. The result shows that understanding the project environment will enable the consultant to define his scope properly and make decisions for project performance. The client defines the consultant's tasks and responsibilities has a mean of 3.45. The result reflects that defining the task and responsibility of consultant's aids in their performance and successful project delivery. Consultants implement appropriate project management software (M=3.26. Respondents agreed that implementing appropriate project management software is essential for the consultant's quality performance and successful project output.

Table 2: Interaction Skills (I.S.)

Interaction Skills (I.S.)	Mean	Std. Deviation	Remark
Aggregate	3.971	0.431	Agreed
Consultants have the needed negotiation skill	4.136	0.711	Agreed
Consultants have the needed leadership skill	3.968	0.803	Agreed
Consultants have the needed team-building skill	4.056	0.733	Agreed
Consultants have the needed interpersonal skill	4.040	0.745	Agreed
Consultants have political skill	4.088	0.402	Agreed
Consultants can identify decision-makers	3.536	0.562	Agreed

Consultant performance in construction projects was measured using efficient management of information. Consultants promptly inform affected parties about decisions made (M=3.68). When decisions are made promptly, activities are done with the required standards. Project participants frequently exchange information with consultants (M=3.97). This enables the consultant to be aware of all activities on site. Affected parties regularly ensure that activities on schedule (M=3.71). A consultant must ensure that activities are carried out within quality specifications and a specific time frame. Project participants provide cooperation with consultants (M=3.78). This enables the consultant to be actively involved in the process of activities, which ensures quality output from the operation and consultant team. Team members have regular meetings with consultants (M=3.69). A consultant is involved in all activities and ensures quality during regular meetings. Consultants can anticipate risks and develop appropriate responses (M=3.66). When the consultant is actively involved, proper risk response is prepared before its occurrence. Clients have frequent consultations with consultants (M=4.10). Quality is assured when frequent consultation and the client's wants and preferences are captured in every project process.

Table 3: Efficient Management of Information (EMI)

Efficient Management of Information	Mean	Std. Dev.	Remark
Aggregate	3.799	0.410	Agreed
Consultants promptly inform affected parties about decisions made	3.680	0.643	Agreed
Project participants frequently exchange information with consultants	3.968	0.695	Agreed
Affected parties regularly ensure that activities are on schedule	3.712	0.682	Agreed
Project participants cooperate with consultants	3.784	0.799	Agreed
Team members have regular meetings with consultants	3.688	0.615	Agreed
Consultants can anticipate risks and develop appropriate responses	3.664	0.595	Agreed
The client has frequent consultations with consultants	4.096	0.677	Agreed

Table 4: Proper Planning for Project Execution (PPPE)

Proper Planning for Project Execution	Mean	Std. Deviation	Remark
Aggregate	3.676	0.557	Agreed
The client clearly defines the project scope and objectives with the consultants.	3.864	0.892	Agreed
The client clarifies the project's needs and requirements with the consultants.	3.728	0.892	Agreed
Consultants have managerial skills and techniques	4.168	0.821	Agreed
Consultants understand the project environment	3.592	0.794	Agreed
The client defines the consultant's tasks and responsibilities clearly	3.448	0.929	Agreed
Consultants implement appropriate project management software	3.256	0.695	Agreed

Consultant performance in construction projects was measured using established standard procedures. Consultants established standard approach for significant tasks and issues (M=3.87, SD=0.98). This means that consultants have an established standard approach for significant tasks and issues, which makes work done strategically.

Table 5: Establishment of Standard Procedures (ESP)

Establishment of Standard Procedures	Mean	Std. Deviation	Remark
Consultants establish a standardized approach for major tasks and issues	3.872	0.984	Agreed

Consultant performance in construction projects was measured in terms of the organization of collaboration among team members. Team members have a proper line of communication with consultants (M=3.98). All project participants clarify the project's objectives with consultants (M=3.90). Consultants can coordinate project participants (M=3.72). Consultants can resolve conflicts and problems (M=3.98). This result reflects that proper organizational leadership enhances team members' collaboration and clarity of project scope and aids in efficiently resolving conflict in project administration and operation.

Consultant performance in construction projects was measured in terms of client support. The client assists consultants in resolving problems (M=3.42). The client provides support to facilitate efforts by consultants (M=3.54). Respondents agreed that client support is essential for contractors' performance in a construction project. This will ensure projects are delivered on time, within budget and with the required quality.

Table 6: Organization of Collaboration among Team Members (OCT)

Organization of Collaboration Among Team Members	Mean	Std. Dev.	Remark
Aggregate	3.894	0.466	Agreed
Team members have a proper line of communication with consultants	3.976	0.466	Agreed
All project participants clarify the project's objectives with consultants	3.896	0.579	Agreed
Consultants can coordinate project participants	3.720	0.867	Agreed
Consultants can resolve conflicts and problems	3.984	0.695	Agreed

Table 7: Client's Support (CS)

Client Support	Mean	Std. Dev	Remark
Aggregate	3.480	0.755	Agreed
The client assists consultants in the resolution of problems	3.416	0.844	Agreed
The client provides support to facilitate efforts by consultants	3.544	0.778	Agreed

Consultant performance in construction projects was measured through commitment and flexibility. Consultants are strongly committed to achieving the project's objectives (M=4.10). Consultants can adapt to new situations flexibly (M=4.10). These findings confirmed that commitment and flexibility are essential to measuring consultant performance for a successful project.

Table 8: Commitment and Flexibility (CF)

Commitment and Flexibility	Mean	Std. Dev.	Remark
Aggregate	4.104	0.583	Agreed
Consultants have a solid commitment to achieving project objectives.	4.216	0.691	Agreed
Consultants can adapt to new situations with flexibility	3.992	0.641	Agreed

Consultant performance in construction projects was measured through the adequacy of resources and understanding of the client's requirements. Consultants have adequate expertise and resources (M=4.17). Consultants can understand clients' requirements and needs (M=4.33). These findings confirmed that the adequacy of resources and understanding of the client's requirements lead to successful project delivery as project construction meets the client's demands and satisfaction.

Table 9: Resources Adequacy and Understanding of Client Requirements (RA&UCR)

Resource adequacy and understanding of Client Requirements	Mean	Std. Dev.	Remark
Aggregate	4.248	0.729	Agreed
Consultants have adequate expertise and resources	4.168	0.820	Agreed
Consultants can understand client's requirements and needs	4.328	0.749	Agreed

Table 10: Client Delegation of Decision-Making Authority (CDDMA)

Client Delegation of Decision-Making Authority	Mean	Std. Dev.	Remark
Aggregate	3.478	0.641	Agreed
The client carefully selects a qualified and capable consultant	3.880	1.013	Agreed
Client delegates sufficient decision-making authority to consultants	3.408	0.862	Agreed
The client clarifies the responsibilities and authority of each member with the consultants	3.176	0.934	Moderate
Client ensures that consultants receive decisions on time	3.448	0.724	Agreed

Consultant performance in construction projects was measured through the ability to delegate decision-making authority. The client carefully selects a qualified and capable consultant (M=3.88). Client delegates sufficient decision-making authority to consultants (M=3.41). The client clarifies the responsibilities and authority of each member (M=3.18). Client ensures that consultants receive decisions on time (M=3.45). Consultants agreed on elements of delegation of decision-making upon authority as an indicator of performance, except for the client clarifying the responsibilities and authority of each member with the consultants with a moderate response. Delegating authority to a capable individual can give the client confidence that the project will be carried out efficiently, resulting in high performance and reducing the risk of failure.

The client's characteristics and contribution measured consultant performance in construction projects. The client has full trust in consultants (M=4.00). 'Financially stable clients' has a mean of 3.55. Client financial stability influences consultant performance and successful delivery of construction projects. The client conducts a thorough feasibility study of the project with consultants (M=3.43). The feasibility of a project influences consultant performance and the successful delivery of the project.

Table 11: Client's Characteristics and Contribution (CCC)

Client's Characteristics and Contribution	Mean	Std. Dev.	Remark
Aggregate	3.661	0.667	Agreed
The client has full trust in the consultants	4.000	0.898	Agreed
The client is financially stable	3.552	0.756	Agreed
The client conducts a thorough feasibility study of the project with consultants	3.432	0.797	Agreed

Consultant performance in construction projects was measured through competency and experience. Consultants who are competent in multidisciplinary fields have a mean of 4.18. Consultants with substantial experience handling similar projects have a mean of 4.13. Competence and substantial experience in similar projects will aid consultant performance in ensuring the successful delivery of construction projects.

Table 12: Competency and Experience (CE)

Competency and Experience	Mean	Std. Dev	Remark
Aggregate	4.156	0.656	Agreed
Consultants are competent in multidisciplinary fields	4.184	0.797	Agreed
Consultants have substantial experience in handling similar projects	4.128	0.718	Agreed

Consultant performance in construction projects was measured through problem-solving skills. Consultants who can deal with unanticipated problems (M=3.63). For a consultant to perform excellently, he must have problem-solving skills and knowledge. This will bring about performance and a risk-free project.

Table 13: Problem-Solving Skill

Problem-Solving Skill	Mean	Std. Dev.	Remark
Consultants can deal with unanticipated problems	3.632	0.757	Agreed

Table 14 presents the results of consultant performance indicators. The result shows that adequacy of resources and understanding of client's requirements (M=4.23, SD=0.73) ranks first. Competency and experience (M=4.16, SD=0.66) ranks second. Commitment and flexibility (M=4.10, SD=0.58) ranks third. Interaction skills (M=3.97, SD=0.43) ranks fourth. Organizational collaboration among team members (M=3.89, SD=0.47) ranks fifth. Establishment of Standard Procedures (M=3.87, SD=0.98) ranks sixth. Efficient Management Information (M=3.79, SD=0.41) ranks seventh. Proper Planning for Project Execution (M=3.68, SD=0.56) ranks eight. Clients Characteristics and Contribution (M=3.66, SD=0.76) ranks ninth. Problem Solving Skill (M=3.63, SD=0.76) ranks tenth. Clients' Support (M=3.48, SD=0.76) ranks eleventh. Delegation of Decision-Making Authority (M=3.48, SD=0.64) ranks twelfth. Resource adequacy and understanding of client's requirements ranks first as significant criteria for evaluating consultant performance in a construction project.

Table 14: Consultants Performance Indicators (CPIs)

	CPIs	Mean	Std. Dev.	Rank	Remark
ARU	Adequacy of Resource and Understanding of Client's Requirements	4.23	0.729	1st	Agreed
CE	Competency and Experience	4.16	0.655	2nd	Agreed
CF	Commitment and Flexibility	4.10	0.583	3rd	Agreed
IS	Interaction Skills	3.97	0.431	4th	Agreed
OCT	Organizational Collaboration Among Team Members	3.89	0.466	5th	Agreed
ESP	Establishment of Standard Procedures	3.87	0.984	6th	Agreed
EMI	Efficient Management Information	3.79	0.410	7th	Agreed
PPPE	Proper Planning for Project Execution	3.68	0.557	8th	Agreed
CCC	Client Characteristics and Contribution	3.66	0.667	9th	Agreed
PSS	Problem-Solving Skill	3.63	0.757	10th	Agreed
CS	Clients' Support	3.48	0.755	11th	Agreed
CDMA	Delegation of Decision-Making Authority	3.48	0.641	12th	Agreed
	Aggregate	3.83	0.401		Agreed

5. Discussion of Findings

5.1. Interaction skills

Interaction skill is an essential factor for measuring consultant performance. From the findings, a high level of leadership, communication skills, and the ability to manage client issues and negotiate tasks are essential for successful project delivery. The findings of this study are related to Toor and Ogunlana (2008), who state that leadership skills, interpersonal skills, teamwork, and competencies are central elements to be considered for successful construction projects. According to Al-Kazaz and Shibani (2016), interaction and leadership skills are critical for construction project performance. According to Dainty et al. (2005), adequate resources for obtaining information held off-site, careful assembling of a multi-skilled team with managerial, technological, and analytical abilities, and use of management tools to ensure programming and progress data is continually revised and available to all parties, are critical factors for project performance.

5.2. Efficient Management of Information

To measure consultant performance efficient management of information. Consultants promptly inform affected parties about decisions made, and Project participants frequently exchange information with consultants. Affected parties regularly ensure that activities are on schedule. Project participants provide cooperation with consultants. Team members have regular meetings with consultants. Consultants can anticipate risks and develop appropriate responses. Clients have frequent consultations with consultants, which are all factors of efficient information management; however, efficient information management is required to measure consultant performance in a construction project. This study is in line with the assertion of Nitithamyong and Tan (2007) that effective performance in any project must involve effective management of information and interaction. According to Cheng et al. (2006), to manage a construction project and perceive the performance of a consultant to be good, there would be an efficient transition of information. Efficiency in the role of a consultant involves the organizational process of managing, technical and risk management, and efficient dissemination of information (Dadzie et al., 2012).

5.3. Proper Planning for Project Execution (PPPE)

Consultant performance was measured in terms of proper planning for project execution (PPPE). Consultants have managerial skills and techniques. The client clearly defines the project scope and objectives with the consultants The client clarifies the project's needs and requirements with the consultants. Consultants understand the project environment. The client defines the consultant's tasks and responsibilities clearly. Consultants implement appropriate project management software are all major factors for proper planning for project execution. According to Cheng et al. (2006), to manage a construction project and perceive the performance of a consultant to be good, there would be an efficient and proper planning for project execution. There should be a clear expectation for a consultant to be able to define a task and plan for project activities (Belkhodja et al., 2012).

5.4. Established Standard Procedures

Consultant performance was measured using established standard procedures. Consultants establish a standardized approach for significant tasks and issues. This means that consultants have an established standard approach for primary tasks and issues, which makes work done strategically. A detailed understanding of the established standard procedures is essential to define significant tasks and minimize the construction and issues leading to consultant performance and successful delivery of construction projects. If established mechanisms exist, challenges and issues will be reduced ahead, and issues will be tackled as they surface (Ambos & Schlegelmilch, 2009). Creating and diffusing activities and adapting to the framework in approach reduced problems in project performance and improved consultants' ability (Apostolou & Mentzas, 1999). Professionals should have an established ethical standard for carrying out project activities (Agboola et al., 2021). Consultants solve problems created by powerful forces and create change, roles and tasks to promote project success (Verlander, 2012).

5.5. Organisation Collaboration among Team Members

Consultant performance was measured in terms of organization and collaboration among team members. Team members have a proper line of communication with consultants. All project participants clarify the project's objectives with consultants. Consultants can coordinate project participants. Consultants can resolve conflicts and problems. This result reflects that proper organizational leadership enhances team members' collaboration and clarity of project scope and aids in efficiently resolving conflicts in project administration and operation. Collaboration among team members requires a favourable organizational arrangement and a favourable environment for performance (Assbeihat, 2016). Process, systems tools and, most importantly, cultural organization must foster collaboration among team members (Rosen, 2007). Supporting collaboration and communication among team members with proper organization leads to contractor performance in a construction project (De-Vreede et al., 2016).

5.6. Client Support

Consultant performance was measured in terms of client support. The client assists consultants in the resolution of problems. The client provides support to facilitate efforts by consultants. Respondents agreed that client support is essential for contractors' performance in a construction project; this will ensure projects are delivered on time, within budget and with the required quality. The result reflects a good relationship between the client and the consultant. Client and consultant have a strong correlation and the prospect of making the project successful (Park & You, 2021). According to Dadzie et al. (2012) client support as a performance indicator is critical in making a project successful.

5.7. Commitment and Flexibility

Consultant performance was measured through commitment and flexibility. Consultants have a solid commitment to achieving the project's objectives. Consultants can adapt to new situations with flexibility. These findings confirmed that commitment and flexibility are essential to measuring consultant performance for a successful project. Robinson et al. (2015) state that consultant commitment and flexibility improve measures to sustain organizational performance and project success. Constructive changes depend on leaders' vision and flexibility, which aid project performance (Naik, 2012). According to Banai and Tulimieri (2013) the consultant's knowledge, skills, commitment and personality will make the project effective and successful.

5.8. Adequacy of Resources and Understanding of Client's Requirements

Consultant performance was measured through the adequacy of resources and understanding of the client's requirements. Consultants have adequate expertise and resources. Consultants can understand client's requirements and needs. These findings confirmed that adequate resources and understanding of the client's requirements lead to successful project delivery as project construction will meet the demand and satisfaction of the client. Adequate use and sharing of information and the knowledge of managing resources will improve project performance (Lindhard & Larsen, 2016). Consultant adequacy in terms of personal and resources measures project success (Dosumu & Aigbavboa, 2019). In evaluating the performance of a consultant, there should be an adequate set of resources, an understanding of project requirements, and time management (Kärnä & Junnonen, 2017).

5.9. Delegation of Decision-Making Authority

Consultant performance was measured through the ability to delegate decision-making authority. The client carefully selects a qualified and capable consultant. The client delegates sufficient decision-making authority to consultants. The client clarifies the responsibilities and authority of each member with the consultants. The client ensures that consultants receive decisions on time. Consultants agreed on elements of delegation of decision-making authority as an indicator for client performance, except for the client clarifying the responsibilities and authority of each member with the consultants with a moderate response. When the client delegates authority to a capable individual, they can be confident that the project will be successfully executed without any performance issues. Focal decision-making structure, delegation to experts, representing setting an informed team of construction members, and improving construction project success (Csaszar & Eggers, 2013). Critical decision-making authority, knowledge and skills in handling critical issues and values in structures will enable consultant performance in successful project delivery (Doctor, 2015). The ability to establish the structural organization, decision-making process, and delegation of authority improves consultant performance (Badi et al., 2022).

5.10. Client's Characteristics and Contribution

Consultant performance was measured through the client's characteristics and contribution. The client has complete trust in consultants. Clients are financially stable. Client financial stability influences consultant performance and successful delivery of construction projects. The client conducts a thorough feasibility study of the project with consultants. They conduct the feasibility of a project to influence consultant performance and successful project delivery. Also, for a project to be successful, project resources must be free from constraint. For consultant performance to improve, the client must improve their attitude, learn to trust and appreciate advice from the consultant and contribute to the process through value addition (El-Dine & Taher, 2020). Knowledge transfer between consultant and client improves project performance (Martinez et al., 2016). Constructive relationships between client and management consultant improve the project's performance and add value to organizational structure. Client contribution and consultant characteristics of managing information are among the measures of evaluation consultant performance (Lam, 2017).

5.11. Competency and Experience

Consultant performance was measured through competency and experience. Consultants are competent in multidisciplinary fields. Consultants have substantial experience in handling similar projects. Competence and substantial experience in similar projects will aid consultant performance in ensuring the successful delivery of construction projects. Park & You (2021) suggest consultants must be experienced professionals to perform project activities. The target of the period, budget, scope and quality can be met with consulting project maturity from the consultant (Park & Lee, 2021). Consultants with knowledge, competence, experience, and capacity will successfully handle a less risky project within the budget and quality required (Kim & You, 2022). Professionals should be selected based on established competence and experience (Agboola, et al., 2023c). Skill and experience managing time, budget, and quality and a continued learning process in managing resources improve consultant performance (Hong, et al., 2021).

5.12. Problem-Solving Skill

Consultant performance was measured through problem-solving skills. Consultants can deal with unanticipated problems. For a consultant to perform excellently, he must have problem-solving skills and knowledge; this will bring about performance and a risk-free project. Experience in consulting and competency in problem-solving processes improve the performance of projects (Park & You, 2021). Knowledge and experience in time and budget management are tools for measuring consultant performance (Kim & You, 2022). Consultant competence in managing resources is essential to project performance (Hong et al., 2021). Competency in managing resources and problem-solving skills is measured for evaluating project success (Lee et al., 2016). When problems persist in a construction project, they may cause project delays, undermine team spirit, increase project costs, and damage continuing business relationships (Abdul-Rahman et al., 2010).

5.13. Consultant Performance Indicators in Construction Project

Evaluating consultant performance indicators in a construction project, the study shows that adequacy of resources and understanding of client's requirements, competency and experience, commitment and flexibility are key to measuring consultants' performance in construction projects. Other considerations include interaction skills, organizational collaboration among team members, the establishment of standard procedures, efficient management information, proper planning for project execution. Further, client characteristics and contribution, problem-solving skill, clients' support, delegation of decision-making authority are also critical. According to Oda et al. (2022), key performance indicators for measuring consultants are experience, interaction and communication skills, organizational collaboration among team members and establishment of standard procedure. Problem-solving skills and BIM use are critical indicators of consultant performance (Sarkar et al., 2015). To achieve project performance, design, experience, competence, proper project planning, and organizational collaboration are key performance indicators (Budawara, 2009). Benchmarking Project performance can be achieved through experience, competence skills, communication and collaboration among team members (Kärnä & Junnonen, 2016).

6. Conclusion

This research evaluates the consultant's performance indicators on project success in public construction projects. The research found interaction skills, efficient management information, proper planning for project execution, the establishment of standard procedures, organization of collaboration among team members, clients' support, commitment and flexibility, adequacy of resources and understanding of client's requirements, delegation of decision-making authority, clients characteristics and contribution, competency and experience and problem-solving skill were agreed to be the fundamentals consultants performance indicators of construction project success. Furthermore, the consultants' performance indicators (CPIs) significantly influenced the timely success of public construction projects. Therefore, project success can be improved by improving on the quality consultants' performance indicators. Competent and experienced consultant professionals should be entertained in awarding such projects to achieve good and quality work projects. In order to achieve better performance and minimize issues; consultant should be able to state in details the project objectives which will assist the contractor to achieve desired performance level. The study recommends that Consultants should communicate effectively and involve clients at every stage of the project cycle to achieve project success. Consultants should ensure adequate communication and allow the participation of every professional during the implementation of public projects.

6.1. Limitations and areas for further studies

The study was restricted to consultant handling public construction project in Bauchi State Nigeria, however the findings may not be generalized to different countries with contradicting management, planning, political and economic settings and practices. Similar research can be replicated in other area since the findings in Bauchi might not be generalizable to other areas. The study did not look beyond public higher institution of learning the extent at which performance affect other public and private project was not assessed. The study did not look at how major performance factors influence consultant performance indicators. Future study should focus on assessment of project performance factors on consultant and contractor performance indicators. The research is also limited to quantitative approach, future studies may explore the problem further using the qualitative research approach or using the mixture of both quantitative and qualitative approaches known as mixed approach. The study should also assess how project stakeholders' roles influence project performance factors in public-infrastructure projects.

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Participative Leadership and Success of Government Construction Projects in Uganda: Testing the Participative Leadership Dimensions

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Abstract

This paper aimed at establishing whether all dimensions of Participative Leadership, namely consultation, delegation, and collective decision making, matter in the Success of Government Construction Projects in Uganda. The study employed a cross-sectional and quantitative approach utilising a self-administered questionnaire to gather data. Stratified random sampling was used to select a sample of 100 construction projects from a population of 120 from the five divisions of Kampala district (KCCA website). Later, purposive sampling was used to select a project manager, engineer, contractor and local council leader from each of the 100 projects arriving at a total of 400 respondents. Using SPSS, correlation analysis examined the association between variables while linear regression analysis assessed each participative leadership dimension to project success. Results revealed stakeholder consultation and joint decision making are the most significant participative leadership style dimensions on project success. Theoretically, this study provides maiden evidence of the insignificant contribution of delegation on success of government construction project, highlighting stakeholder consultation and joint decision making as key components in project success based on findings from Uganda. In practice, while executing managers should ensure that they consult and jointly take project decisions with stakeholders to realise project success.

Keywords: Consultation, Delegation, Leadership, Participative, Project, Success, Uganda.

1. Introduction

Normally, construction project initiators set targets at pre-design stage for achievement, such parameters form the basis for measuring the project's success at completion (Akinwale and Oluwafemi, 2022). Notable targets include; project scope, timeframe, quality and cost (Ssenyange et al., 2017). Several studies have focused on construction project success achievement due to its relevance to national economic development (Ashkanani and Franzoi, 2022; Oyaya, 2016). This focus is important because construction projects contribute approximately 80% of the total assets (Rafael, 2023). In addition this sector produces 10% GDP, employment opportunities and over 50% of wealth in fixed assets (Owoo and Lambon-Quayefio, 2018; International Labour Organization, 2015). However, despite several studies such as Ssenyange and Kudakwashe (2023), Magassouba et al. (2019), Kariuki, (2018), Eja and Ramegowda(2020) that have tried to provide guidance about how to achieve project success, most construction projects embarked on have failed to meet their set targets (Al-Edenat, 2022, Office of the Auditor general, 2018, Tayebwa, 2014) causing many researchers to investigate factors that influence project success. It should be noted that the success of a project is heavily dependent on the leadership style chosen by the project manager (Thoha and Avandana, 2020, Nakato, 2019). Moreover, many studies have established that participation leadership is pivotal in realising

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project *success* targets (Ahmad et al., 2022, Raghavan and Chinta, 2023; Al-Edenat, 2022).

Despite studies on the influence of participation leadership to project success, none established the contributions of delegation, stakeholder consultation and joint decision-making towards achieving success of public construction projects (Raghavan and Chinta, 2023; Namiyingo et al., 2016; Nangoli et al., 2016). Besides, no study in Uganda has used path goal theory to explain the relationship between project success and participation leadership dimensions, more so, on the components that impact project success more. Therefore, this study aims to fill the existing gaps in the relationship between participative leadership dimensions and the success of government construction projects. Specifically the study will address these objectives;

- To examine the relationship between stakeholders consultation and success of government construction project.
- To explore the relationship between delegation and success of government construction project.
- To establish the relationship between joint decision making and success of government construction project.
- To examine the contribution of each dimensions of participation leadership on success of government construction project.

This paper consists of a literature review that discusses the appropriate theory and developed the hypotheses. This section is followed by the study methodology. The results section is thereafter presented, which is followed by discussion of the findings. The last section is conclusion, implications and future directions.

2. Literature Review

2.1. Path Goal Theory

This paper adopts reformulated path goal theory (House, 1996) as a framework for understanding participation leadership dimensions and their influence on project success. This theory addresses the impact of leaders' behaviours on the motivation, satisfaction, and abilities of stakeholders to successfully perform assigned work (Farhan, 2017; Atsebeha, 2016). The theory explains that leaders that employ suitable leadership styles may effectively clarify and eliminate impediments that hinder stakeholders in their pursuit for both individual and organisational goals (Grimm, 2018). This enables a leader change the attitude, motivation, behaviours and satisfaction of stakeholders towards the desired performance levels that yield project success (Cheong and Mustaffa, 2017). Therefore, the responsibility of leaders is to assist stakeholders attain their goals and provide the necessary support and direction to ensure that their goals are compatible with the overall project objectives (Northouse, 2016). Thus, the path-goal theory promotes participation leadership as a strategy leaders use to achieve the desired project success.

As per the theory, participation leadership necessitates leaders' inclusion of stakeholders in the process of establishing stakeholder's performance objectives, devising strategies for executing project tasks, determining criteria for success and implementing rewards (Monzani et al., 2015; House, 1996). Under this leadership style, leaders refrain from making autonomous decisions (Bhatti et al., 2019). Instead, they foster an environment where stakeholders are encouraged to openly share their views and suggestions throughout the project planning, formulation, and implementation process. This process enhances the understanding of project objectives and tasks, leading to stakeholders feeling appreciated as integral members of the management team (Kiplangat, 2017). As a result, stakeholders are motivated, committed, and trusting, providing support and contributing innovative ideas and knowledge that drive project success (Taylor, 2018; Gyasi, 2015). Based on path-goal theory, project leaders must cultivate effective stakeholder participation skills and create an appropriate environment to enhance stakeholder performance in order to attain established project objectives (Akpoviroro et al., 2018).

The path goal theory advances consultation, delegation, and joint decision-making as components of participation leadership that can be adopted to impact government project performance (Sagnak, 2016). Stakeholder consultation entails leaders soliciting and integrating stakeholders' perspectives and concerns in order to establish project objectives, incentives, project task implementation methodologies, and other project-related determinations (Monzani *et al*., 2015). For delegation, leaders assign tasks and responsibilities originally performed by leaders to stakeholders and they concentrate on strategic and management decisions (Rumman and Alzeyadat, 2019; Zhang *et al*., 2017). Furthermore, leaders specify limits within which the final decisions fall and only delegate tasks exclusively to competent stakeholders to avoid project delays (Sloof and Von Siemens, 2021). Lastly, joint decision making project involves leaders and stakeholders coming together with equal influence to discuss and make ultimate project decisions (Magassouba *et al.,* 2019). Therefore, as per the path goal theory project leaders that adopt participation leadership through consultation, delegation and joint decision making motivate stakeholders to execute quality projects on time and within budget. The next discussion involves project success.

2.2. Project Sucess

Extant literature lacks consensus on the definition of project success. Consequently, different opinions on what constitutes project success have been advanced (Kariuki, 2018; Egwunatum, 2017). In this study, project success refers to the ability to complete the (i) project on time, (ii) within budget, and (iii) meeting quality expectations (Magassouba *et al.,* 2019; Oboirien, 2019; Pollack, Helm and Adler, 2018; Kariuki, 2018; Shah, 2016). Project time is the duration from the start of a project to its completion, which is calculated in terms of the percentage increase in the actual completion period over planned completion period (Kerzner, 2022; Odhiambo, 2020). Consequently, projects whose percentage delay falls below 10% are regarded as outstanding time performance; those that fall between 10% to 20% are regarded as average while those above 20% are regarded as unsuccessful projects (Bello, 2017). (ii) Cost success refers to the difference between current costs allocated for the project work against budgeted costs allocated for the project work in place completed to date (Salari *et al.,* 2015). According to Bello (2017), projects that post a percentage cost overrun above 20% are regarded as poor projects, projects that lie between 10% and 20% are regarded as average projects; while projects whose percentage cost overrun fall below 10% are regarded as an outstanding project and efficient cost/ budget utilisation. (iii) Project quality refers to the conformance with stated project specifications as set out in the contract document (i.e. architectural designs, bills of quantities, specifications) and supplementary documents such as variation orders that form a basis for its measurement (Bello 2017; Leong *et al*.,2014). Project quality success is measured by comparing the final project product with the specifications provided at the design stage and various variation orders issued during the course of the construction process. The next section focuses on hypothesis development.

2.3. Hypothesis Development

2.3.1. H^1:' Consultation of Stakeholders Positively Influences Project Success

Consulting stakeholders in projects positively influences project success (Saad et al., 2022). The project planning stage involves choosing a project that will benefit and solve community needs (Fewings and Henewele, 2019). It also involves defining project goals, analysing costs, identifying sources of project funds, and schedule (Nyabera, 2015). Consulting stakeholders at this stage enables leaders to understand and capture stakeholders' goals and views about the project right from inception of the project (Magassouba et al., 2019; Malachira, 2017). This enables leaders to clarify and realign project goals in line with stakeholder's goals and views thereby building their consensus and commitment to pursue a common goal (Nangoli et al., 2016). As such, these stakeholders are less likely to withdraw from the project work, thus saving the project time of supervision and costs of replacing as well as training new stakeholders who would be quitting every time. Besides, consulting stakeholders at this stage increases the level of project acceptance that helps to reduces project resistance that increase chances of project success (Rathenam and Dabup, 2017). Furthermore, project success is a function of performance from each stakeholder in the project (Ika and Pinto, 2022). Projects require creative ideas and strategies for their successful executions (Ndunda *et al.,* 2017). Stakeholder's consultations specifically at the project design stage gives stakeholders an opportunity to share their experiences and opinions about the projects (Magassouba *et al*., 2019). This gives a platform that integrates leaders and stakeholders information and ideas together (Wu *et al*., 2017). As a result of this integration, acceptable and creative decisions, and ideas are generated that enable completion of quality projects on time and within budget. Besides, consulting stakeholders throughout the project helps leaders to clarify roles, tasks, and develop joint strategies to execute tasks (Ekung *et al*., 2014**). This improves on stakeholders' efficiency and effectiveness in executing those tasks and roles which increases chances of project success (**Bogere, 2019).

The relevance of stakeholders' consultation in project success has been acknowledged, however, stakeholder consultation is criticised for delaying projects; escalating costs; bringing tension and conflicts which affect projects success (Nguyen, Chileshe, Rameezdeen and Woods, 2019). After consultations, stakeholders expect incorporation of their ideas in the project. However, it is difficult to balance multiple inputs from all stakeholders consulted resulting in project conflicts and delays (Cottrell *et al.,* 2015). In addition, it requires hiring experts to harmonise the different stakeholders' views and aspirations which increase project costs (Fischer *et al.,* 2014). Furthermore, it is difficult to find the right stakeholders to consult which process delays the project and sometimes consulting the wrong stakeholders which affect the entire project (Leviton and Melichar, 2016).

Researchers have made pertinent conclusions for and against stakeholder consultation in projects success (Mwaisaka, 2019; Ndunda *et al.,* 2017; Nyabera, 2015; Cottrell *et al.,* 2015). This justifies the need to conduct research to establish whether stakeholder consultation contributes to project success. Beleiu et al. (2015) revealed that stakeholder consultation accounts for only 40% of project success, implying that additional aspects of participation such as delegation and joint decisions may also have an impact on project success as hypothesised in our study.

2.3.2. 'H^2: Stakeholders Delegation Positively Influences Project Success

Delegation of authority and responsibility to stakeholders involves stakeholders taking decisions and reporting back to delegating leaders (Mitchell, 2021). Such inspires and creates a friendly work relationship between leaders and stakeholders (Nanjundeswaraswamy and Swamy, 2014). This friendly work environment creates commitment among stakeholders to ensure projects succeed (Kariuki, 2015). Besides, delegation of roles informs stakeholders of how leaders trust them as capable, able to deliver tasks, important in the project, and need satisfying (Obop, 2016). Also, inspiring stakeholders to stay and perform highly to ensure that they realise project goals (Mwaisaka, 2019). Moreover, project success calls for stakeholders' efficiency and effectiveness on the assigned tasks (Kiiza and Picho, 2015). Delegation requires leaders to allocate project roles and responsibilities according to stakeholders' capabilities for successful executions (Lehtinen and Aaltonen, 2020). Such requires proper stakeholders' analysis and alignment of responsibilities such that each stakeholder is assigned responsibilities and roles they can perform best (Wen *et al.,* 2017). Such enables stakeholders execute tasks with limited wastage and delays. Furthermore, delegation requires leaders to clearly define responsibilities and tasks assigned to stakeholders to accomplish (Mathebula and Barnard, 2020). Responsibilities are written down and stakeholders get a clear view of how important completing these tasks contribute to their individual and project-goals (Coglianese, 2019). This enables leaders to explain tasks and also gain full utilisation of stakeholders' capabilities to realise project targets (Fewings and Henewele, 2019). Equally, stakeholders are able to take on extra roles and contribute directly to the project, thereby saving project costs in hiring extra manpower and resources provided by stakeholders (Wen *et al*., 2017). Besides, it prevents duplication of roles, responsibilities and redundancies that would increase project costs (Tomescu-Dumitrescu and Mihai, 2019).

In addition, delegation of authority and responsibilities result into new and more advanced skills to execute quality projects tasks with fewer defects (Obop, 2016). During delegation, project leaders get time to concentrate on long-term project goals and leave short-term goals to delegated stakeholders (Drouin, Müller, Sankaran, and Vaagaasar, 2021). This provides leaders with time to strategically think, generate better ideas and skills on how to effectively utilise available resources to successfully execute project tasks (Hubbard, 2016; Assaf *et al.,* 2014). Clearly, when leaders concentrate on strategic goals and getting solutions to challenging tasks that require more attention, there level of productivity towards project success is increased (Riisgaard *et al*., 2016). Moreover, project success requires timely, informed and quality decisions at all stages of a project (Guo *et al.,* 2014). For example, at the project execution phase, there are numerous plan modification decisions that require swiftness and quality information for the project to progress smoothly. Delegation of authority and responsibility enables these stakeholders gain project exposure, experiences and knowledge to take quality and informed project decisions in a short time (Jiya, 2018), thereby reducing on project delays and associated costs.

Although delegation contributes to project success (Aidoo *et al.,* 2018; Kombo *et al*., 2014), However, fruitful delegation requires training stakeholders to take up leaders' responsibilities which require time and resources resulting into increase in project costs (Polverari et al.,2024). Moreover, during delegation stakeholders are empowered to make decisions on their own with less supervision (Mwaisaka, 2019). In most cases stakeholders arrive at wrong decisions that compromise project quality (Jayed, 2014). Additionally, delegating authority to stakeholders who in most cases lack project knowledge and skills, cause problems to projects like wastages and reworks that increase costs and time (Watt, 2014). Nonetheless, it is hypothesised in this study that delegation impacts project success.

2.3.3. 'H^3: Joint Decision Making Positively Influences Project Success

Joint decision making plays a vital role in the success of government construction projects (Imam and Zaheer, 2021; Zhuang et al., 2019). Government construction projects exhibit complex, ambiguous tasks, goals, and stressful situations throughout their life cycle (Liphadzi et al., 2015). Involving stakeholders in generating decisions at different project stages enables leaders and stakeholders understand all these situations, tasks and environments before decisions are made (Ssenyange and Kudakwashe, 2023). This builds teamwork and morale among stakeholders because stakeholders understand what is expected of them and means of achieving the set goals. Further, majority of decisions made in projects affect stakeholders and attainment of project goals (Magassouba et al., 2019). Stakeholders need to accept and embrace these decisions from onset if projects are to succeed (Ademola *et al*., 2017). This requires leaders and stakeholders to come together and generate these decisions for stakeholders to embrace them (Mwaisaka, 2019). When stakeholders embrace these decisions they work hard to ensure that these decisions are implemented successfully (Chebbi *et al*., 2020). It also helps to reduce stakeholders' resistance and associated costs that affect scheduled delivery of the project (Nederhand and Klijn, 2019). Indeed, project leaders facing resistances from stakeholders are advised to involve stakeholders in generating decisions to overcome such resistances (Ssenyange *et al*., 2017). Besides, stakeholders understand their needs better, have the expertise and knowledge of the true problems the project intends to solved (Ferreira *et al*., 2020). Joint project decision especially at the planning stage helps to capture stakeholders' needs and aspirations from the project onset, which stimulates them to comply positively during project implementation to achieve set goals (Nederhand and Klijn, 2019). Moreover, it allows stakeholders to generate a variety of ideas from an informed point of view that increases chances of successful project execution and fulfilment of stakeholders' needs and priorities (Nygaard *et al.,* 2021). Although joint project decision making contributes to project success, Liphadzi *et al.* (2015) established that shared project decisions have low relationship with project success; it only makes stakeholders feel good about their tasks with less impact on project success. Besides, during joint project decisions more rights are given to stakeholders in higher positions than lower levels leading to low levels of commitment, trust, motivation, and cooperation from low level stakeholders (Saha and Kumar, 2017). The above findings reveal that joint decision making has a negative relationship with project success. Nonetheless, it is hypothesised in our study that joint decision making influences project success. Hence, the need to undertake this study to establish the extent of joint decision making that causes success or failure of projects.

3. Methodology

3.1. Research Design, Study Area, Population, and Sample

The current study adopted a quantitative paradigm. While surveys *are* used to collect data from a specific sample, quantitative methods were found more effective for examining leadership styles, traits and profiles. This research also adopted across sectional approach due to the need to capture quantitative data about the relationship between participation and project success (Bryman, 2016). The population for this study contained 120 government construction projects, as identified in the KCCA sample frame, which served as the unit of analysis. 100 construction projects were chosen to form the sample size (Krejcie and Morgan, 1970). The selection of these projects was guided by stratified random sampling with division of Kampala (Central, Makindye, Rubaga, Nakawa, and Kawempe) serving as the basis for stratification. From each selected project, purposive sampling was used to select four (4) participants (project manager, contractor, engineer, and local council chairperson). This resulted in total of 400 respondents, forming the unit of inquiry. These respondents were selected due to their experiences, perceptions, and varying roles played in KCCA project (Kariuki, 2015). A total of 335 out of the 400 distributed questionnaires were found usable representing a response rate of 91%.

3.2. Measurement of Variables

The study variables were measured as follows:

I. Project success was measured by considering time, cost and quality which are the key criteria for measuring project success according to the project management body of knowledge (Magassouba et al., 2019; Pollack et al., 2018; Kariuki, 2018; Shah, 2016).

II. Participative leadership style was assessed using a modified stakeholder involvement questionnaire advanced by Kanungo (1982) and Arnstein (1969). The cited researchers above identified 'consultation', 'delegation', and 'joint decision making' as levels and measures of participative leadership.

3.3. Sources of Measurement Errors

Unchecked biases can cause type I and II measurement errors that inevitably impact study results (Nsereko, 2020). In this study, procedural remedies were used to avoid common method bias. As such a six- point Likert scale was utilized for all variables in the study which made items in the questionnaire simple, avoided "double–barrelled" questions, used different anchors, and adopted measures from previous works as Aybek and Toraman (2022) and Taherdoost (2019).

3.4. Validity and Reliability

Following the creation of the data collecting tool, the Cronbach's coefficient and the content validity index (CVI) were used to conduct validity and reliability analyses for the participation, leadership, and project success elements. In accordance with Oboirien (2019), the research variables were declared reliable as all results for all the constructs were above the threshold of 0.70.

3.5. Data Analysis

The analysis of quantitative data was conducted using the statistical Package for social science (SPSS) 27. Correlation analysis was adopted to examine the relationship between individual participation leadership dimensions and government project success. Thereafter, the linear regression analysis was conducted to find out the contribution of each dimension of participation leadership on success of government construction project to choose which dimension contributes more to project success.

4. Results

4.1. Descriptive Statistics

Out of the 335 respondents, it is shown in Table 1 that male posted a larger percentage of representation (59.1%) than female (40.1%). This suggests that majority of individuals involved in government construction projects under KCCA re males as opposed to women. Results further revealed that majority of project stakeholders are aged between 31 and 45 (54.6%), with relatively few being beyond 75 years old. This suggests that as people get older, the bulk of them stop being active in government construction projects. Moreover, this result implies that majority of government construction projects are dominated by the youth between 31-45 years; this is the age where people are still energetic to execute tasks diligently. In terms of level of the period spent in government construction projects, majority had spent between 6-10 years (44.8%), implying that most project stakeholders are experienced to run these projects and could also competently share their experience about government project executions. The results also show that majority of government construction project stakeholders possess a diploma certificate (31.0%).

Table 1: Descriptive Characteristics of Respondents

Category		Number	Valid percentage
Gender	Male	198	59.1
	Female	137	40.9
	Total	335	100
Age group	18-30	59	17.6
	31-45	183	54.6
	46-65	70	20.9
	66-74	19	5.7
	75+	4	1.2
	Total	335	100.0
Education qualification	Primary	7	2.1
	O- level	13	3.9
	A- Level	12	3.6
	Certificate	30	9.0
	Diploma	104	31.0
	Bachelors	99	29.6
	Postgraduate Degree	59	17.6
	Masters	10	3.0
	Others	1	.3
	Total	335	100.0
Work experience	1-5 Years	111	33.1
	6-10 Years	150	44.8
	11-15 Years	55	16.4
	Above 15 Years	19	5.7
	Total	335	100.0
Project stakeholder category	Project Manager	28	8.4
	Contractor	51	15.2
	Engineer	40	11.9
	Local council chairperson	196	58.5
	Others	20	6.0
	Total	335	100.0

Source: Primary data (2024)

4.2. Correlation Results

As indicated in Table 2, results reveal that 'consultation' and 'project success' were discovered to be positively and significantly related (r =. 577 p<.01). These results prove that stakeholders' consultation during projects execution gives stakeholders an opportunity to share their experiences and opinions about the projects, thereby generating creative decisions and ideas that enable completion of quality projects on time and within budget. Results further reveal that delegation and project success are positively and significantly related (r= .487 p<.01). These results confirm that delegation provides project leaders time to concentrate on long-term project goals and leave short-term goals to delegated stakeholders. This accords time to leaders to strategically think, generate better ideas and skills on how to effectively utilise project available resources to execute quality projects tasks with fewer defects. Lastly, results indicate that joint decision making and project success are significantly and positively related (r=.563 p<.01). These results attest that when stakeholders and project leaders jointly make project decisions, they are able to embrace these decisions, reducing on stakeholders' project resistance and associated costs towards the project that affect delivery of projects as planned.

4.3. Regression Results

Linear regression results indicated in Table 3, show that the most significant predictor of 'project success' was 'consultation' (β = .333, t= 5.413, P. <.01) followed by 'joint decision making' (β = .274, t= 4.208, Sig. <.01). Results also showed that 'delegation' has the least and insignificant contribution to project success (β = .093, t= 1.520, Sig. <.129). The regression model was statistically significant (p<.01).

Table 2: Pearson Correlations

Variable	1	2	3	4
Consultation (1)	1			
Delegation (2)	.626**	1		
Joint Decision Making (3)	.679**	.678**	1	
Project Success (4)	.577**	.487**	.563**	1

**. Correlation is significant at the 0.01 level (2-tailed).

5. Discussions

Drawing on the Path goal theory, the study examined whether all the dimensions of participative leadership (consultation, delegation, and joint decision making) matter in the success of government construction projects in Uganda. The study established that 'consultation' has a positive correlation with government project success, thus supporting H1. This implies that when project leaders consult stakeholders during the execution of government projects, creative project ideas and skills are generated, commitment and consensus among stakeholders to pursue a common project goal are built, and costly stakeholders' resistance is avoided, all of which enhance the success of government-funded construction projects. These results are consistent with findings of Magassouba et al. (2019) that found that when stakeholders are consulted early on in the project, project managers can better comprehend and record their objectives and points of view. Consistent with the study's conclusions, Nangoli et al. (2016) affirmed that stakeholder consultation aids project managers to define and realign project objectives in order to better foster stakeholder consensus and commitment to a shared objective. As a result, these stakeholders are less likely to abandon the project, saving project management time and money on hiring and educating new stakeholders who would otherwise depart frequently (Jayasuriya et al., 2020).

The study findings also demonstrated that collaborative decision making has a substantial effect on the success of government construction projects, Supporting H_3). These results are consistent with Andersen, Hansen and Selin (2021) assertion that leaders and stakeholders can better comprehend all project scenarios, tasks, and surroundings prior to making decisions when they involve stakeholders in decision-making at various project stages. Toukola and Ahola, (2022) confirm that this builds teamwork and morale among stakeholders because stakeholders understand what is expected of them and means of achieving them. Furthermore, Ademola et al. (2017) and Mwaisaka (2019) established that joint decision making enables stakeholders accept and embrace project decisions from the onset of the project which makes them work hard to achieve set project goals. Relatedly, Castro-Arce and Vanclay (2020) argue that joint decision making allows stakeholders to generate a variety of ideas from an informed point of view that increases chances of successful project execution and fulfilment of stakeholder needs and priorities.

Regarding H_2, results showed that delegation has the least and insignificant contribution to project success. These results contradict the findings of Oviawe (2015) and Polverari et al. (2024) who states that fruitful delegation increase project time and costs due to the time and resources spent training stakeholders to take up leaders' responsibilities. However, the results are in agreement with Jayed (2014) who established that during delegation stakeholders arrive at wrong decisions that compromise project quality. This is because stakeholders are empowered to make decisions on their own with less supervision (Mwaisaka, 2019). Furthermore, delegating authority to stakeholders who lack project knowledge and skills increases costs and delays on projects (Watt, 2014).Thus, confirming an

Table 3: Regression Results

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.251	.171		7.297	.000
	Consultation	.313	.058	.333	5.413	.000
	Delegation	.093	.061	.093	1.520	.129
	Joint Decision Making	.274	.065	.274	4.208	.000

Source: primary data (2024)

insignificant contribution to government project success.

6. Conclusion, Implication and Research Direction

6.1. Conclusion

This study aimed to test whether all the three dimensions of participative leadership are vital for project success. From the study results it can be concluded, while using participation leadership, it is only stakeholder consultation and joint decision making that are vital in enhancing success of government construction project. As such project managers should always ask stakeholders for suggestions on how to execute project tasks and involve stakeholders in deciding the timeframe for the project to enhance chances of government project success. This will enhance their commitment, motivation to work hard to realise project goals.

6.2. Theoretical and Practical Implications

This study offers both theoretical and practical implications. Theoretically, the study contributes to the body of literature regarding the influence of the dimensions of participative leadership on the success of government construction projects. More so, the study provides maiden evidence on the insignificant influence of delegation on the success of government construction projects which is rare in the literature. Managers of government construction projects should prioritise consultation and joint decision making with stakeholders in order to enhance chances of government construction projects success. Rather than delegating tasks to stakeholders, they should make sure stakeholders are involved in project decisions. This approach will make stakeholders feel valued and motivated to work hard to achieve the goals set for government construction projects. These study results also imply that when project leaders consult and involve stakeholders in making decisions when executing government projects, the success of these projects tend to improve. Therefore, even if project leaders ignore delegation of tasks and responsibilities to stakeholders, quality, timely, and cost effective projects will be realised.

6.3. Limitations and Research Directions

Although this study has made an important contribution, it also presents a number of limitations and opportunities for future research. Firstly, the study examined government construction success in terms of cost, quality and time success. Thus, future studies can examine government construction success by focusing on stakeholder satisfaction. Also, the study did not discover the distinctive contribution of each participation leadership dimension on each of the dimensions of government project success. Therefore, future research could be undertaken to establish the contribution of each participative leadership dimension on each of the dimensions of project success. Lastly, the study embraced a cross sectional method, future studies could use a longitudinal approach to explore what dimension of participation leadership contributes more to project success over a long period of time.

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Financial Challenges Leading to Premature Contract Termination in Ghanaian Construction Industry: Causes and Mitigation Strategies

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Abstract

This study examines the link between financial challenges and premature construction contract termination in Ghana's construction industry. The study is grounded in Keynesian economics, which offers insights into the broader economic impacts of these financial challenges, and cash flow management theories, which help analyze the financial viability and liquidity issues that exacerbate these risks. Additionally, financial risk management models are employed to assess the risks related to banking disputes and economic instability, providing a comprehensive framework for understanding the financial difficulties contributing to contract termination. Employing a quantitative research approach, Data from 315 industry professionals revealed three key dimensions of financial challenges: Financial Integrity Risks (FIR), Financial Mismanagement and Economic Instability Risks (FMEIR), and Financial Risk Due to Banking Disputes and Instability (FRBDI). Structural equation modelling confirmed the robustness of the proposed model, highlighting the strong correlations between these financial risks and contract termination. The findings emphasize the need for proactive risk management and comprehensive contractual strategies to prevent contract disputes and ensure project viability. For stakeholders in the construction industry, this study underscores the practical importance of implementing rigorous financial risk management strategies. By enhancing project planning, fostering stakeholder collaboration, and ensuring robust contractual arrangements, the industry can mitigate the adverse effects of financial instability and improve overall project outcomes.

Keywords: Ghana, Construction, Financial Challenges, and Contract Termination.

1. Introduction

The construction industry plays a pivotal role in the global economy, contributing significantly to infrastructure development, economic growth, and employment generation (Khan et al., 2014; Dakhil et al., 2013). Globally, this industry is characterized by firms of varying sizes, from small-scale enterprises to large multinational corporations, with their capacity to undertake projects being heavily influenced by client needs and available resources. Despite its importance, the Ghanaian construction sector faces numerous challenges, particularly in terms of financial stability (Dao et al., 2017; Azim, 2011). One prominent issue is the fragmentation of the industry, with numerous small and medium-sized enterprises (SMEs) coexisting alongside larger firms. This fragmentation often results in resource allocation challenges, inefficient workflows, and an increased likelihood of financial mismanagement. For instance, small firms may lack the financial resilience to absorb cost overruns or delayed payments, while larger firms face complexities in managing extensive project portfolios. The confluence of these factors leads to inefficiencies that manifest as cash flow issues, budget overruns, and, ultimately, financial instability. These inefficiencies are further exacerbated by the inability of some firms to align their operational capacity with the dynamic and often stringent demands of clients.

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Ghana's construction industry is also ranked among the more dynamic in Africa, yet it faces significant hurdles in terms of project financing, cash flow management, and financial risk management. A critical outcome of these challenges is premature contract termination, a pervasive issue in the Ghanaian construction industry. Premature contract terminations disrupt project timelines, inflate costs, and tarnish the reputations of stakeholders involved, from main contractors and subcontractors to clients and financiers. Despite the profound impact of such terminations, existing research often focuses narrowly on legal and dispute resolution aspects, neglecting the broader financial challenges that precipitate these disruptions (Wang et. al, 2000), or changes in project scope (Knowles, 2012; Mathilda, 2017; Shay, 2019).

Premature contract termination can have far-reaching implications for all parties involved in construction projects, including contractors, subcontractors, clients, suppliers, and financiers (Mayeko, 2014). From a financial perspective, the consequences of premature contract termination can be substantial. Contractors may incur additional costs associated with demobilization, lost profits, and potential legal expenses (Zhang et al., 2015). Subcontractors may face payment delays or non-payment for work already completed, leading to cash flow problems and financial instability (Peters et al., 2019; Amoako, 2011). Clients may experience delays in project delivery, increased costs, and reputational damage (Okereke, 2020; Abdul-Rahman, Kho, and Wang, 2014).

The reasons behind premature contract termination are diverse and multifaceted. They may include disputes over project specifications, changes in client requirements, unforeseen site conditions, delays in payments, or breaches of contract by either party (Abeynayake and Kumara, 2013; Evans and Reynolds, 2018). Additionally, economic factors such as inflation, currency fluctuations, and market downturns can exacerbate financial pressures and contribute to contract terminations (Abeynayake, and Kumara, 2013).

Despite the profound impact of premature contract termination, there is a significant research gap in understanding its underlying financial causes, consequences, and mitigation strategies (Liu, Wang, Zhang, and Guo, 2023). Existing studies often focus on the legal aspects or dispute resolution mechanisms, neglecting the broader financial challenges that stakeholders face (Hagedoorn and Hesen, 2007). Therefore, there is a need for comprehensive research that examines the financial dimensions of premature contract termination in the construction industry. By exploring the causes, consequences, and mitigation strategies related to financial challenges, stakeholders can gain valuable insights into how to effectively manage and mitigate the risks associated with premature contract termination.

This research aims to address this gap in the literature by providing a thorough analysis of the financial implications of premature contract termination and offering recommendations for improving project management practices and enhancing stakeholder outcomes in the construction industry.

1.1.Main Objective

The main objective of this study is to explore and analyze the financial challenges that lead to premature construction contract termination in the Ghanaian construction industry, with the aim of identifying key risk factors and proposing effective mitigation strategies to enhance project success and stakeholder outcomes.

1.2.Specific Objectives

To identify and categorize the key financial challenges contributing to premature construction contract termination in the Ghanaian construction industry.

1.3.Significance Objectives

This study is vital in the global construction industry as it sheds light on the financial challenges that can lead to premature contract terminations, a common issue that undermines project success. The findings contribute to a better understanding of how financial instability impacts the construction sector, offering insights that are relevant not only in Ghana but also in other developing economies facing similar challenges.

2. Literature Review

Premature contract termination in construction projects poses significant financial challenges to all parties involved, including contractors, subcontractors, and project owners. Understanding the causes and implications of these terminations is crucial for developing effective strategies to mitigate their impact. This literature review explores the various factors contributing to premature contract termination and its financial implications, integrating findings from multiple studies to build a cohesive understanding of this issue.

2.1. *Causes of Premature Contract Termination*

The factors leading to premature contract termination in construction projects are complex, with financial instability, project mismanagement, and unforeseen challenges being the most prominent. Amoah, and Steyn (2023) highlight that financial failures of contractors and delayed payments by clients are dominant causes of contract cancellations. These financial difficulties often stem from broader economic issues such as inflation and currency fluctuations, which can exacerbate cash flow problems, leading to contract terminations (Roy, Desjardins, Ouellet-Plamondon, & Fertel, 2021).

In addition to financial challenges, design-related issues play a critical role. Defective designs, including miscalculations and inadequate specifications, can create significant execution problems, leading to increased costs and project delays. Siddiqui (2019) found that many road construction projects in Nigeria were awarded without sufficient knowledge of site conditions, resulting in cost overruns and subsequent contract cancellations. This suggests that poor project planning and inadequate risk assessment are key contributors to premature contract termination.

Human factors and regulatory hurdles further complicate project execution. Henriod et al., (2020) emphasize that human errors, whether through omission or commission, can create major difficulties and even cause total project breakdowns. Similarly, Zaki, Yehia, and Hamed (2024) point out that bureaucratic inefficiencies and legal disputes can prolong the approval process, escalating tensions among stakeholders and increasing the likelihood of contract termination.

Changes in project scope also emerge as a significant factor. Lüthi, and Wolter (2021) argue that evolving client requirements and market dynamics can necessitate modifications to the original project scope, leading to disputes and a loss of stakeholder confidence. This highlights the importance of flexible project management practices that can adapt to changes without compromising project viability.

The lack of effective communication and risk management systems further exacerbates these challenges. Dingiswayo (2022) link many construction project failures to communication-related issues, emphasizing the need for systematic and transparent communication channels. Van Thuyet, Ogunlana, and Dey (2019) support this by identifying the absence of a robust risk management system as a dominant factor influencing construction project failure in Vietnam. These insights suggest that improving communication and risk management could significantly reduce the incidence of premature contract terminations.

2.2. *Financial Challenges Leading to Premature Contract Termination*

Financial challenges leading to premature contract termination in construction projects are multifaceted and can significantly disrupt project timelines and completion.

One of the most common financial challenges is inadequate or inconsistent funding from clients, which can occur due to poor budget forecasting or delays in securing loans or other financing options (Mathilda, 2017). When clients struggle to secure the necessary funds, contractors are often left with unpaid invoices, which creates a cash flow problem and delays project progress (Dehaini, 2021).

Additionally, contractors may face financial difficulties due to mismanagement of funds, insufficient working capital, or limited access to credit, which impedes their ability to purchase materials, pay workers, or keep up with operational costs (Nguyen et al., 2020).

Fluctuating material prices and unpredictable exchange rates can also significantly increase project costs, as contractors may have underestimated expenses during the budgeting phase, leaving them unable to complete the project without additional financial resources (Abdul-Rahman et al., 2013). These financial pressures often result in the contractor or client deciding to terminate the contract prematurely, especially when projects become financially unfeasible or when delays accumulate, affecting the project's overall success.

To mitigate these financial risks, it is crucial to improve financial planning, ensure timely payments, and develop risk management strategies that can help manage cost fluctuations and access necessary capital (Osei et al., 2017).

2.3. Financial Implications for Contractors

The financial repercussions of premature contract termination are profound, particularly for contractors who often bear the brunt of the losses. Misnan, Ismail, and Yan (2024) observe that contract termination often results in substantial financial losses for contractors, who must contend with unrecovered costs and forgone profits. These losses are compounded by the sunk costs associated with mobilizing manpower, procuring equipment, and acquiring materials, which further strain the contractor's financial viability (Nahlik, & Jackson, 2021).

Legal battles resulting from contract termination can also have long-term financial implications. Khadka and Maharjan (2017) note that contractors may become entangled in protracted legal disputes, which not only incur significant legal costs but also damage their reputation. In an industry where trust and reputation are critical, such negative perceptions can deter future job opportunities and erode client loyalty. The ripple effects of contract termination extend beyond immediate financial losses to encompass broader business prospects. As contractors' face declining market standing and reduced client trust, their overall business sustainability is jeopardized. This underscores the need for contractors to develop robust financial and legal strategies to mitigate the risks associated with contract termination.

2.4. Impact on Subcontractors and Suppliers

Premature contract termination has a cascading effect on subcontractors and suppliers, who are integral to the construction process. Tan, Xue and Cheung (2017) highlight that these entities are particularly vulnerable to the financial fallout of contract termination, as they often provide goods and services in alignment with the original project timeline and scope. When a contract is terminated, unpaid invoices and outstanding payments can lead to severe cash flow problems for subcontractors and suppliers, jeopardizing their financial stability.

Ramachandra, and Rotimi (2016) emphasize that delayed and non-payments can lead to low performance, disputes, and even bankruptcy among subcontractors and suppliers. This disruption to cash flow can result in a liquidity crisis, further exacerbating financial vulnerabilities and impeding business continuity. The impact is particularly severe for subcontractors, who often operate on narrow profit margins and lack sufficient contractual protections against termination (Handayani et al., 2021). The financial instability of subcontractors and suppliers can, in turn, disrupt the entire construction supply chain, leading to project delays and increased costs. This highlights the need for greater contractual transparency and risk-sharing mechanisms to protect these stakeholders from the adverse effects of premature contract termination.

2.5. Owner's Perspective

From the perspective of project owners, premature contract termination introduces significant uncertainty and financial strain. Chen et al. (2018) note that delays resulting from contract termination not only impede project progress but also lead to additional costs, as owners must allocate resources towards mitigating these delays and resuming project activities. This is consistent with findings from Aydin and Osman and Mohamud (2022), who observe that time and cost overruns are global trends in the construction sector, often exacerbated by contract terminations.

Moreover, owners face the challenge of finding replacement contractors, renegotiating contracts, and rectifying incomplete or defective work left by the terminated contractor (Aydin & Mihlayanlar, 2018). These unplanned expenditures can strain project budgets, diminish financial reserves, and ultimately erode project profitability. The legal proceedings associated with contract termination further exacerbate financial strain, diverting resources from core project activities and hindering project success.

The reputational damage resulting from contract termination can also have long-term implications for project owners. Javed, Hussain, Al Aamri, and Akhtar, (2022) point out that the fallout from terminated contracts can tarnish the owner's reputation within the industry, deterring future investment opportunities and damaging long-term business prospects. This underscores the importance of effective risk management and dispute resolution strategies to protect project owners from the adverse effects of contract termination.

2.6. Mitigation Strategies

Given the significant financial risks associated with premature contract termination, it is essential for stakeholders to adopt proactive mitigation strategies. Comprehensive due diligence, performance bonds, advanced project management tools, collaborative contracting models, and effective dispute resolution mechanisms are among the key strategies that can help mitigate these risks and enhance project resilience (Olawale & Sun, 2015; Sykes, 2016; Mullen & Davison, 2019).

These strategies, when tailored to the specific challenges of the Ghanaian construction industry, can provide a framework for managing the financial implications of contract termination and improving overall project outcomes. By integrating these best practices into the construction process, stakeholders can reduce the likelihood of premature contract terminations and enhance the stability and sustainability of construction projects in Ghana.

2.7. Critical Analysis

One of the most significant inconsistencies in the literature is the variation in the emphasis placed on different causes of premature contract termination. While some studies focus primarily on financial factors, such as contractor insolvency and delayed payments (Elsawalhi and Eid, 2012; Ramachandra and Rotimi, 2015), others emphasize non-financial aspects, including design errors, human failings, and regulatory challenges (Henriod and Masurier, 2002; Rostiyanti et al., 2019). This fragmented approach limits the ability to develop a comprehensive understanding of how these factors interact to precipitate contract termination. Furthermore, the literature often treats these causes in isolation, failing to account for the cumulative and interrelated nature of the risks that may lead to premature contract termination. A more holistic approach that integrates financial and non-financial factors is necessary to accurately capture the complexity of this issue.

Another area of debate in the literature concerns the financial implications of premature contract termination for different stakeholders. While the adverse effects on contractors are well-documented, including financial losses, legal battles, and reputational damage (Chen et al., 2018; Faniran et al., 2015), there is less consensus on the extent and nature of the impact on subcontractors, suppliers, and project owners. Some studies suggest that subcontractors and suppliers face severe financial strain and increased risk of bankruptcy (Ramachandra and Rotimi, 2015), while others argue that the impact on these parties is often overlooked or underestimated. Additionally, the literature provides limited insight into how project owners manage the financial fallout from contract termination, with some studies highlighting the increased costs and delays they face (Olatunji and Afolabi, 2019), while others suggest that owners may have more resources and mechanisms at their disposal to mitigate these impacts. This disparity in focus calls for a more balanced exploration of the financial implications for all stakeholders involved in construction projects.

A notable gap in the existing literature is the lack of empirical studies that quantify the financial impact of premature contract termination on construction projects. Most studies rely on qualitative assessments or case studies, which, while valuable, do not provide a robust framework for understanding the magnitude of the financial losses incurred. Quantitative research that measures the financial consequences of premature contract termination across different types of projects and contexts would greatly enhance the field's understanding of this issue. Such studies could also help identify the most significant risk factors and inform the development of targeted mitigation strategies.

2.8. Theoretical Review

This theoretical review aims to provide a comprehensive framework for understanding the financial challenges leading to premature contract termination in the Ghanaian construction industry. It integrates key economic and project management theories to explain the connections between financial difficulties and contract disruptions.

2.8.1. Keynesian Economics (KE)

The Keynesian Economics theory provides a macroeconomic perspective relevant to financial challenges in construction projects. Keynesian theory emphasizes the role of government intervention and economic policies in stabilizing economic cycles (Keynes, 1936). In the context of construction, KE can help explain how economic fluctuations, such as recessions or inflation, impact financial stability and project financing. For instance, during economic downturns, reduced government spending and credit tightening can lead to cash flow problems and financial strain on construction firms, increasing the risk of contract termination.

2.8.2. Cash Flow Management

Cash Flow Management is a critical economic concept for understanding financial difficulties in construction projects. Effective cash flow management involves monitoring and controlling the inflow and outflow of cash to ensure that sufficient funds are available to meet financial obligations (Brigham and Ehrhardt, 2013). In the construction industry, cash flow problems can arise from delayed payments, budget overruns, and unexpected expenses. Poor cash flow management can exacerbate financial stress, leading to premature contract terminations. By applying cash flow management principles, construction firms can better anticipate financial challenges and develop strategies to mitigate their impact.

2.8.2. Project Funding Structures

Project Financing Structures are essential for understanding how financial arrangements affect project outcomes. The choice of financing structure such as equity financing, debt financing, or a combination affects the financial stability of construction projects (Project Management Institute, 2017). For example, high levels of debt financing can increase financial risk, making firms more vulnerable to cash flow issues and contract terminations. Understanding different project financing structures helps in identifying potential financial vulnerabilities and developing strategies to address them.

2.9. Financial Risk Management Models

Financial Risk Management models provide frameworks for identifying, assessing, and mitigating financial risks in construction projects. These models often involve techniques such as risk assessment matrices, scenario analysis, and stress testing (Hull, 2012). In the construction industry, financial risk management models can help firms anticipate potential risks related to economic volatility, project delays, and cost overruns. By applying these models, stakeholders can develop comprehensive risk management strategies to minimize the likelihood of financial challenges leading to contract termination.

2.9.1. Project Risk Management

Theory focuses on the systematic process of identifying, assessing, and managing risks throughout the project lifecycle (Hillson, 2009). This theory is pertinent to understanding how financial risks, such as insolvency or cash flow issues, can lead to project disruptions. Effective risk management practices, including risk identification, risk analysis, and risk response planning, are crucial for mitigating financial challenges and preventing premature contract terminations.

2.9.2. Integration of Theoretical Concepts

Integrating these economic and project management theories provides a robust framework for understanding the financial challenges leading to premature contract termination. Keynesian economics offers insights into how macroeconomic factors influence financial stability, while cash flow management and project financing structures provide practical tools for addressing financial difficulties. Financial risk management models and project risk management theory offer strategies for mitigating risks and ensuring project success.

3. Research Methodology

3.1. Research Design and Approach

A quantitative research approach was employed to facilitate the collection and analysis of numerical data essential for this study. A closed-ended questionnaire was used as the primary data collection tool. The adoption of the questionnaire survey technique is prevalent in project management research, as evidenced by previous studies (Ning, 2014; Deng et al., 2014; Adeleke et al., 2016).

The study employed both purposive and random sampling techniques. Purposive sampling was chosen to focus on key individuals who possess specialized knowledge and experience relevant to the study. By targeting procurement officers, project managers, engineers, quantity surveyors, and contract managers with a minimum of six years of experience, the study ensures that the data collected comes from experts who have a deep understanding of the complexities involved in construction contract management. This method allows for the acquisition of detailed and informed perspectives on the financial implications of premature contract termination, which is crucial for addressing the specific research questions. The expertise of the respondents adds significant value to the study by providing nuanced insights into the subject matter.

In contrast, random sampling was employed to achieve a broad and representative sample across different regions and sectors. This technique helps in capturing a diverse range of perspectives from various geographic locations (Greater Accra, Central, Western, and Eastern regions) and industry roles. Random sampling is instrumental in minimizing selection bias and ensuring that the findings are not confined to a particular subgroup but reflect a more comprehensive view of the construction industry. This broad representation is essential for generalizing the study's conclusions to the wider population, thus enhancing the applicability of the results.

The combination of purposive and random sampling methods thus offers a balanced approach to data collection. Purposive sampling provides the depth of expertise necessary for detailed analysis, while random sampling ensures that the findings are representative of the broader industry context. This dual approach strengthens the overall reliability and validity of the study by integrating expert insights with a wide-ranging perspective.

3.2. Data Collection and Analysis

A total of 400 questionnaires were randomly distributed to selected procurement officers, project managers, engineers, quantity surveyors and contract managers that have practiced for at least six years in the Greater Accra region, Central region, Western region and Eastern region of Ghana. A total of 315 questionnaires were retrieved, yielding a response rate of 78.75%. This constituted the dataset upon which the study was based.

This sample size was deemed sufficient for Structural Equation Modeling (SEM) analysis. According to Kline (2015), a critical sample size of 200 responses is generally adequate for conducting SEM, allowing for robust estimation of model parameters and validation of factor structures. With a response rate of 78.75% from 400 distributed questionnaires, the sample size of 315 exceeds this threshold, providing a solid foundation for the analysis. The research instrument was a questionnaire used to collect the data from key experts. The questionnaire used a five-point Likert scale to gauge the respondents' responses, requiring them to indicate their level of agreement on a scale ranging from 1 (no extent) to 5 (very large extent) related to financial risks and impacts.

The instrument was developed based on a comprehensive review of existing literature and expert input. It underwent validation through expert reviews, pilot testing, and statistical analysis to ensure its reliability and validity. Cronbach's alpha was used to assess internal consistency, while Confirmatory Factor Analysis (CFA) verified the factor structure of the questionnaire. This rigorous validation process ensured that the questionnaire effectively captured the relevant dimensions of financial challenges and provided accurate and reliable data for analysis.

The data analysis for this study was conducted using SPSS version 26 and AMOS version 22, focusing on various statistical techniques to explore and validate the financial challenges associated with premature contract terminations. The following describes the specific procedures and tests employed:

Exploratory Factor Analysis (EFA): Initially, EFA was performed using SPSS to identify the underlying factors that explain the correlations among the variables. This step involved extracting factors and rotating them to achieve a clearer structure. Principal Component Analysis (PCA) was used as the extraction method, with Varimax rotation to enhance interpretability. Factor loadings above 0.50 were considered significant for inclusion in the factor solution. The Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity were used to assess the adequacy of the data for factor analysis, with KMO values above 0.70 indicating sampling adequacy.

Confirmatory Factor Analysis (CFA): CFA was conducted using AMOS to validate the factor structure identified in the EFA. CFA tested whether the data fit the proposed measurement model by assessing the relationships between observed variables and latent factors. Key fit indices included the Chi-square test, Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA). A CFI value above 0.9 and an RMSEA value below 0.08 were considered indicative of a good fit.

Model Specification and Estimation: After validating the measurement model through CFA, SEM was used to explore the relationships between latent variables and their impact on financial challenges. AMOS was employed to specify the structural model, incorporating paths between latent constructs and observed variables based on theoretical and empirical insights. The SEM analysis assessed the direct and indirect effects of financial challenges on premature contract termination. The fit of the structural model was evaluated using several fit indices, including Chi-square, CFI, and RMSEA, as previously described. Model modifications were made if necessary, based on modification indices and theoretical justification. The goal was to achieve a model that accurately represented the data and provided a clear understanding of the relationships between financial challenges and contract termination.

Internal consistency of the constructs was assessed using Cronbach's alpha, with values above 0.70 considered acceptable. This step ensured that the items within each factor reliably measured the same underlying construct.

The results from EFA and CFA were used to refine the measurement model, ensuring that the identified factors were valid and reliable. The SEM analysis provided insights into the relationships between financial challenges and premature contract termination, helping to identify significant predictors and their effects. Findings were reported with detailed descriptions of model fit indices and statistical significance levels, providing a comprehensive understanding of the data and its implications.

3.3. Power Analysis

To ensure that the sample size used in this study is sufficient for detecting meaningful effects and ensuring the robustness of the Structural Equation Modelling (SEM) results, a power analysis was conducted. Power analysis is a statistical method used to determine the minimum sample size required for detecting an effect of a given size with a certain level of confidence (Kang, 2021). In SEM, an adequately powered study reduces the risk of Type II errors (failing to detect a true effect) and enhances the reliability of the findings (Wang, and Rhemtulla, 2021).

For SEM, it is generally recommended that the sample size should be large enough to provide adequate power, typically around 0.80 or higher, which means there is an 80% chance of detecting an effect if it exists (Moshagen, and Bader, 2024). Using the common guidelines for SEM, which suggest a minimum ratio of 10:1 for the number of participants to the number of estimated parameters, the sample size of 315 respondents in this study was evaluated (Jak, et al., 2021).

Considering the complexity of the model, the number of observed variables, and the expected effect sizes, the sample size of 315 exceeds the minimum requirements for most SEM analyses. Specifically, with a medium effect size ($f^2 = 0.15$), a significance level of 0.05, and power set at 0.80, the required sample size would typically range between 200-300 participants for a model with moderate complexity. Therefore, the sample size of 315 not only meets but exceeds this threshold, ensuring that the study is adequately powered to detect meaningful effects and providing confidence in the robustness of the SEM results.

3.4. Observation of Respondents' Behaviour and Ease in Providing Feedback

In addition to administering the structured questionnaire, this study included an observational component to assess respondents' behaviour and their ease in providing feedback. Observing respondents during the data collection process provided valuable insights into their engagement with the survey and potential challenges they encountered. Non-verbal cues, such as hesitations, body language, and overall demeanour, were noted to gauge the level of comfort and understanding of the questions.

For example, if a respondent hesitated or appeared confused while answering specific questions, it indicated potential issues with the clarity or sensitivity of those items. Observations of the respondents' behaviour also helped to identify any discomfort or reluctance to answer certain questions, which could suggest areas where the questionnaire might need further refinement. Additionally, the speed and confidence with which respondents provided their answers were considered indicators of how well the questions aligned with their experiences and understanding.

3.5. Limitations

The decision not to explore additional areas such as market forces, legal systems, macroeconomic factors, cultural and geographical influences, and comparisons with other regions or industries in this research was primarily driven by the study's focus on financial challenges specific to the Ghanaian construction industry. The research aimed to provide a targeted analysis of the financial issues leading to premature contract termination within this context, ensuring depth and specificity. Expanding the scope to include these broader areas would have diluted the focus, potentially complicating the analysis and making it more challenging to draw clear, actionable conclusions relevant to the Ghanaian industry. Additionally, the constraints of time and resources necessitated a more streamlined approach, allowing for a detailed exploration of the most critical financial factors directly affecting project success in this specific setting. Future research could build on these findings by incorporating these additional dimensions to provide a more comprehensive understanding of the construction industry's challenges.

Moreover, it does not delve into how different stakeholders, such as government departments and the banking sector, could implement these risk management strategies. Addressing these limitations in future research could provide a more comprehensive understanding of financial risks in construction projects across various contexts.

4. Results

4.1. Respondents Demographics

An assessment of the respondents' demographic information was undertaken. Of interest was the categorization of the respondents' organizations or sector of the industry, level of expertise and the years of practice. This was appropriate for bolstering the validity of their answers and the overall study results, while it is an important way to increase the reliability and credibility of the responses and results in a survey (Bryman, 2011).

The summary of the results of the background characteristics data is presented in Table 1. In terms of academic qualifications, as evident from Table 1, more than half (52.4%) of the respondents had a bachelor's degree, this was followed by a master's degree (43.8%) and a Higher National Diploma (HND) (2.5%) while the least qualified was doctorate degree (1.3%) respectively. With regards to the years' practice, the results showed that 37.1 percent of the respondents had worked between 6 and 10 years, 28.3 percent had worked between 11 and 15 years, 21.9 percent had worked between 16 and 20 years, and 12.7 percent of the respondents had been working for over 21 years. All have knowledge or experience in the issues of financial challenges and contract termination. With regards to current specialization, 39.7 percent were building and civil works. About 38.4 percent of the respondents were building works only and 21.9 percent were civil works only. The results on professional qualification showed that, majority of the respondents were employed under public sector, representing 78.7 percent while 21.3 percent of the respondents were employed by the private sector.

The background information indicates that the respondents who participated in the study were academically and professionally qualified as shown by Table 1.

Financial problem as a cause of construction contract termination in Ghana. Financial problem contained twelve (12) items. Among the twelve items,

Table 1: Profile of Respondent

Demographic Characteristics	N	%
Profession		
Contract manager	25	7.9
Procurement officer	84	26.7
Quantity surveyor	104	33
Engineer	73	23.2
Architect	12	3.8
Project manager	12	3.8
Lecturer	5	1.6
Qualification		
HND	8	2.5
BSc/BTech	165	52.4
Masters	138	43.8
PhD/DPhil/DTech	4	1.3
Years Practiced		
6-10 years	117	37.1
11-15 years	89	28.3
16-20 years	69	21.9
21 years and above	40	12.7
Current specialization		
Building works only	121	38.4
Civil works only	69	21.9
Building and civil works	125	39.7
Employer		
Public sector	248	78.7
Private sector	67	21.3
Total	315	100

Source: Researcher's Fieldwork (2023)

Table 2: Financial Challenges Factors (FCF)

	Mean	SD	Rank
Insolvency of both parties	4.36	0.879	1
Contractor and client's cash flow problems	4.32	0.77	2
Inability of client to attract fund	4.25	0.95	3
Budget deficit/Contracts overrun	4.19	0.808	4
Embezzlement and misappropriation	4.19	0.854	5
Poor financial feasibility assessment	3.99	0.833	6
Project lost its economic value	3.96	0.975	7
Fragile financial environment	3.83	0.785	8
Hiigh interest rates from banks	3.82	0.879	9
Poor cost planning and wrong cost estimating	3.73	0.918	10
Blacklisted contractor by banks	3.55	0.981	11
Disagreement between contractor's bankers	3.37	0.974	12

contractor's and client's insolvency was rated 1st as a large extent causes of construction contract termination with mean score of 4.36 (SD = 0.879). From Table 2, other indicators expressed as extent cause of construction contract termination include: contractor and client's cash flow problems with a mean score of 4.32 (SD = 0.770), inability of client to attract fund with a mean score of 4.25 (SD = 0.950), budget deficit or overrun of contracts with a mean score of 4.19 (SD = 0.808) and embezzlement and misappropriation with a mean of 4.19 (0.854) and were ranked from 2nd to 5th. Similarly, the remaining indicators of financial problems were rated as a large extent cause of contract termination.

4.2. Exploratory Factor Analysis of Financial Challenges Factors (FCF)

Exploratory factor analysis was used to evaluate the underlying structure of the indicators of financial challenges as a factors that cause construction contract termination. In essence, the process was relied upon to identify the number of indicators associated with other indicators in the construct which are more interrelated to each other. It also contributes to the strength of the relationships among the indicators and the components which subsequently improve the reliability and validity of the model.

The financial challenges as a construct were made up of twelve (12) indicators and were subjected to factor analysis. The EFA estimation was carried out using principal component method of extraction, with varimax rotation method to enhance interpretation of the component matrix. The number of components extracted was based on Kaiser's criterion with eigenvalue ≥ 1.00 retained.

4.3. Model Diagnostic for the EFA Model for Financial Challenges Factors (FCF).

Communalities indicate the proportion of each variable's variance that is accounted for by the factors

Table 3: Initial Communalities for Financial Challenges Factors (FCF)

	Initial	Extraction
Contractor's and client's insolvency	1	0.693
Budget deficit or overrun of contracts	1	0.673
Contractor and client's cash flow problems	1	0.597
Fragile financial environment	1	0.562
Disagreement between contractor's bankers	1	0.709
Blacklisted contractor by banks	1	0.594
Poor cost planning and wrong cost estimating	1	0.485
Project lost its economic value	1	0.528
Inability of client to attract fund	1	0.549
High interest rates from banks	1	0.563
Embezzlement and misappropriation	1	0.682
Poor financial feasibility assessment	1	0.532

Extraction Method: Principal Component Analysis extracted in the analysis. In Table 3, the initial communalities are all set to 1, representing the total variance of each variable before extraction. After extraction, the communalities reveal how much of each variable's variance is captured by the retained factors. High extraction values suggest that the factors extracted in the analysis account for a substantial portion of the variance in the corresponding variables. For example, the variables "Disagreement between contractor's bankers" (0.709) and "Contractor's and client's insolvency" (0.693) have high communalities, indicating that the extracted factors explain a significant portion of their variance. This suggests that these variables are strongly represented by the underlying factors identified in the analysis. Conversely, "Poor cost planning and wrong cost estimating" (0.485) have a lower communality, indicating that a smaller proportion of its variance is explained by the extracted factors, suggesting it might be less central to the core financial challenges.

Factor loadings are coefficients that represent the correlation between each variable and the extracted factors. High factor loadings suggest that a variable is strongly related to a particular factor, while low loadings indicate weaker relationships.

In this analysis, variables with high communalities and factor loadings, such as "Disagreement between contractor's bankers" and "Embezzlement and misappropriation," are well-represented by the extracted factors. These variables contribute significantly to the factors identified and validate their relevance in understanding financial challenges. The relatively lower communalities for variables like "Project lost its economic value" (0.528) and "Poor financial feasibility assessment" (0.532) indicate that these variables are not as strongly represented by the factors as others. This could suggest the need for additional factors or a more nuanced understanding of these issues to fully capture their variance. The results of the factor analysis inform the identification and validation of financial challenges factors by highlighting which variables are most effectively captured by the extracted components. High communalities and factor loadings validate the relevance of these factors in representing the underlying financial issues affecting construction projects. For instance, high loadings on factors related to insolvency and banking disputes underscore the critical importance of these issues in the context of financial challenges.

Conversely, variables with lower communalities suggest areas where the extracted factors may not fully capture the complexity of financial challenges. This insight can guide further refinement of the factor model, potentially leading to the identification of additional factors or a re-evaluation of the variables included in the analysis.

The Table 4 presenting the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity for Financial challenges plays a critical role in assessing the suitability of the dataset for factor analysis. These statistical measures provide insights into the adequacy of the sample for extracting meaningful factors and the overall appropriateness of applying factor analysis to the financial problems dataset. The KMO Measure of Sampling Adequacy is a crucial indicator that evaluates the proportion of variance in the variables that might be caused by underlying factors. In this case, the KMO value is 0.850, which is considered quite high. KMO values range from 0 to 1, and a higher value indicates better suitability for factor analysis. A KMO value above 0.6 is generally acceptable, and a value above 0.80 is considered good. The KMO value of 0.850 suggests that the dataset for financial problems is highly adequate for factor analysis, indicating substantial correlations among the variables. Bartlett's Test of Sphericity further supports the decision to proceed with factor analysis. The approximate chi-square value is 1292.400, with 66 degrees of freedom, and a significance level (Sig.) of 0.000. The significance level being well below the conventional threshold of 0.05 provides strong evidence to reject the null hypothesis that the correlation matrix is an identity matrix. This implies that there are significant correlations among the financial challenge, justifying the use of factor analysis to explore the underlying factors influencing these issues.

The Table 5 illustrating the Total Variance Explained for financial challenges offers valuable insights into the distribution of variance across different principal components derived from a Principal Component Analysis (PCA). This statistical technique aims to distill the essential patterns within the dataset by identifying principal components that account for the majority of its variability.

Table 4: KMO and Bartlett's Test for Financial Challenges Factors (FCF)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.850
Bartlett's Test of Sphericity	Approx. Chi-Square	1292.4
	Df	66
	Sig.	0

Table 5: Total Variance Explained for Financial Challenges Factors (FCF)

Comp. (PC)	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.745	39.539	39.539	4.745	39.539	39.539	2.694	22.451	22.451
2	1.402	11.686	51.225	1.402	11.686	51.225	2.3	19.169	41.619
3	1.021	8.504	59.729	1.021	8.504	59.729	2.173	18.11	59.729
4	0.835	6.96	66.689						
5	0.764	6.371	73.059						
6	0.649	5.41	78.469						
7	0.606	5.05	83.519						
8	0.472	3.934	87.453						
9	0.461	3.839	91.292						
10	0.4	3.331	94.623						
11	0.353	2.939	97.563						
12	0.292	2.437	100						

Extraction Method: Principal Component Analysis

Examining the results, the initial eigenvalues for each principal component signify the amount of variance attributed to that particular component. The first principal component (PC1) emerges with an eigenvalue of 4.745, explaining 39.539% of the total variance. Notably, PC1 alone contributes significantly to the overall understanding of the financial challenges, as evidenced by the cumulative percentage of 39.539%.

The second principal component (PC2) continues to contribute meaningfully, adding 11.686% to the cumulative variance, resulting in a cumulative percentage of 51.225%. As we progress through subsequent principal components, the cumulative percentages continue to increase, albeit at diminishing rates. The lower-numbered components capture a more substantial portion of the overall variance. Importantly, Table 6 provides a cutoff point where, for example, the first three principal components (PC1, PC2, and PC3) collectively contribute to a cumulative percentage of 59.729%. This implies that these three components encapsulate a significant portion of the dataset's variability.

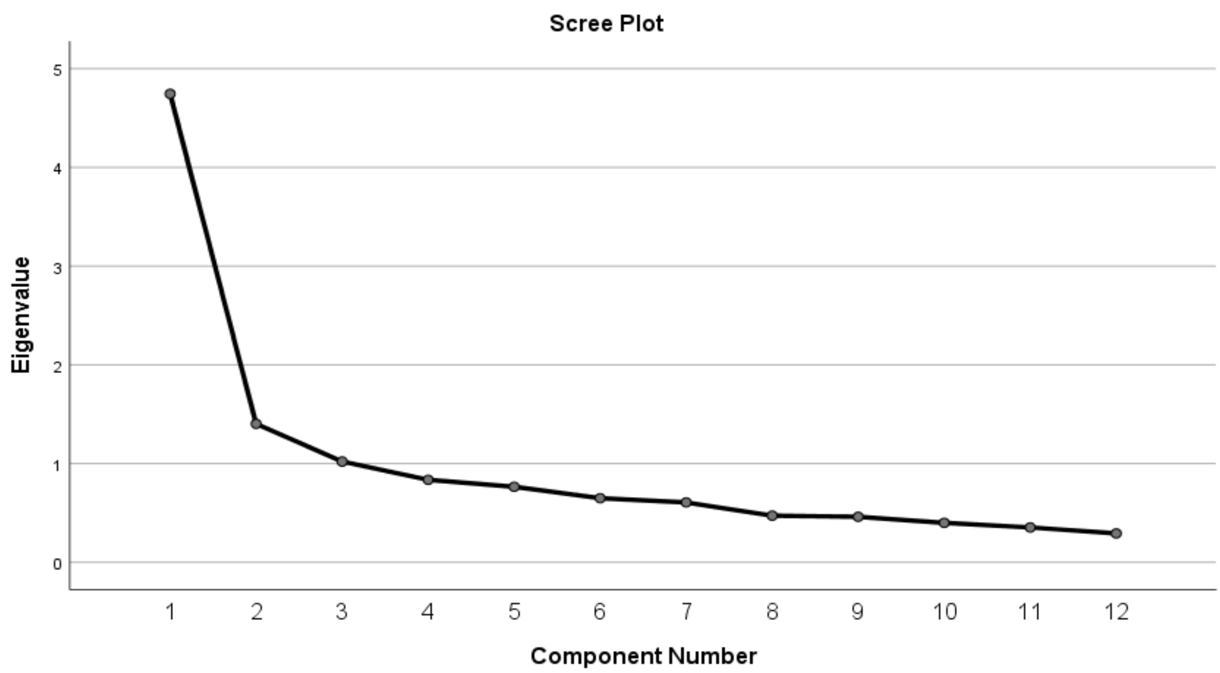

Figure 1: Scree Plot for Financial Challenges Factors (FCF)

In Figure 1, the scree plot illustrates the eigenvalues of Financial Problems components in a descending curve, arranging them from the highest to the lowest. The scree test identifies the "elbow" at component three, where the eigenvalues appear to stabilize. Consequently, retaining three components of financial challenges to the left of this point is considered significant, as suggested by Dmitrienko et al., (2007).

The EFA was used to determine the Financial Challenges Factors (FCF) construct's one-dimensionality and dependability. The extraction and rotation method employed was Maximum Likelihood with Varimax Rotation (ML Varimax). The Construct was measured with ten different factors.

The findings showed that the data may be subjected to factor analysis. All the twelve items (FCF1, FCF2, FCF3, …, FCF12) which are expected to measure employer default factors loaded three components. A factor loading threshold of 0.5 was advocated by Field (2005) and Hair, et al., (1998), This exceeds the recommended threshold of 0.50 all items exhibited factor loadings surpassing 0.5 for their respective components.

In the first component, five items surpassed the threshold of 0.5. They are "Contractor's and client's insolvency", "Budget deficit or overrun of contracts", "Contractor and client's cash flow problems", "Project lost its economic value", and "Inability of client to attract fund". These items measure Financial Integrity Risks (FIR). Thus, the items will be called Financial Integrity Risks (FIR).

The Second component, four (4) items surpassed the threshold of 0.5. They are "Embezzlement and misappropriation", "High interest rates from banks", "Poor financial feasibility assessment", and "Poor cost planning and wrong cost estimating". These items measure Financial Mismanagement and Economic Instability Risks (FMEIR). Thus, items will be called Financial Mismanagement and Economic Instability Risks (FMEIR).

The third component, three (3) items surpassed the threshold of 0.5. They are "Disagreement between contractor's bankers", "Fragile financial environment" and "Blacklisted contractor by banks". These items measure Financial Risk Due to Banking Disputes and Instability (FRBDI). Thus, items will be called Financial Risk Due to Banking Disputes and Instability (FRBDI).

The item-total correlation adjusted for the items within the component was extracted using the proposed cut-off value of 0.30 after utilizing the EFA to extract the component. The items were considered reliable measures of the components, as evidenced by the Cronbach's alpha coefficient for the component (FIR) was 0.809, for the component (FMEIR) was 0.811 and that of the third component (FRBDI) was 0.815, showing satisfactory internal reliability (Nanually and Bernstein, 1994).

4.4. *Structural Equation Model (SEM) for Financial Challenges Factors (FCF) Construct*

After the constructs demonstrated sufficient evidence of one-dimensionality and reliability using EFA, a

Table 6: Unidimensionality and Reliability of Financial Challenges Factors (FCF)

	Component			Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
	1	2	3			
Contractor's and client's insolvency	0.823			0.607	0.769	0.809
Budget deficit or overrun of contracts	0.784			0.64	0.761	
Contractor and client's cash flow problems	0.729			0.593	0.775	
Project lost its economic value	0.557			0.595	0.774	
Inability of client to attract fund	0.525			0.565	0.783	
Embezzlement and misappropriation		0.736		0.441	0.685	0.811
High interest rates from banks		0.715		0.51	0.641	
Poor financial feasibility assessment		0.661		0.513	0.64	
Poor cost planning and wrong cost estimating		0.525		0.531	0.629	
Disagreement between contractor's bankers			0.797	0.465	0.708	0.815
Fragile financial environment			0.711	0.603	0.535	
Blacklisted contractor by banks			0.708	0.552	0.605	

Extraction Method: Principal Component Analysis
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 6 iterations.

CFA was then administered. The analysis strategy of goodness of fit for Financial Challenges Factors (FCF) Construct followed a three statistics strategy of fit indexes as recommended by (Hu and Bentler, 1999).

The sample data on FCF model yielded the S – Bχ2 of 2.204 with 51 degrees of freedom (df) with a probability of p = 0.0000. This chi-square value indicated that the departure of the sample data from the postulated model was significant and hence, indicative of good fit. The chi-square test is very sensitive to sample size and is used more as a descriptive index of fit rather than as a statistical test (Byrne, 2012). The fit indices presented in Table 7 offer a comprehensive evaluation of the structural equation modelling (SEM) results, assessing the model's goodness-of-fit. Understanding these indices is crucial for evaluating the validity and robustness of the SEM model used to analyse the Financial Challenges Factors (FCF).

The CFI measures the improvement in fit of the specified model relative to a baseline model. A CFI value of 0.969, which exceeds the acceptable threshold of 0.90, indicates a good fit of the model. This suggests that the model adequately represents the relationships between the financial challenge factors and supports the validity of the model in explaining the data.

The PCFI accounts for model complexity, penalizing models with excessive parameters. The value of 0.671 is below the ideal threshold of 0.80 but still indicates a good fit when considering model parsimony. This suggests that while the model is relatively complex, it maintains a balance between goodness-of-fit and simplicity.

The RMSEA measures the discrepancy per degree of freedom, with lower values indicating a better fit. The RMSEA of 0.01, which is well below the acceptable threshold of 0.08, reflects an excellent fit of the model. The 95% confidence interval (0.007-0.015) further supports the conclusion that the model fits the data well, providing reassurance about the robustness of the model.

The NFI compares the fit of the model with the null model, with values greater than 0.90 indicating a good fit. The NFI value of 0.937 suggests that the model provides a significant improvement over the null model, affirming the model's validity.

The IFI measures the proportion of improvement in fit relative to the null model, with values greater than 0.90 considered indicative of a good fit. The IFI value of 0.97 indicates that the model performs well in representing the relationships among the factors. Like the PCFI, the PNFI accounts for model complexity. The value of 0.647 is below the ideal threshold of 0.80 but still supports the model's adequacy given the complexity of the data.

The RMR measures the average discrepancy between observed and predicted values, with values less than 0.05 indicating a good fit. The RMR value of 0.033

Table 7: Robust fit index for Financial Challenges Factors (FCF)

Fit Index	Cut-Off Value	Estimate	Comment
S – Bχ^2		2.204	
Df	0≥	51	Acceptable
CFI	0.90≥ acceptable 0.95≥ good fit	0.969	Good fit
PCFI	Less than 0.80	0.671	Good fit
RMSEA	Less than 0.08	0.01	Acceptable
RMSEA 95% CI	0.00-0.08 "good fit"	0.007-0.015	Acceptable
NFI	Greater than 0.90 "good fit"	0.937	Good fit
IFI	Greater than 0.90 "good fit"	0.97	Good fit
PNFI	Less than 0.80	0.647	Good fit
RMR	Less than 0.05 "good fit"	0.033	Good fit
GFI	Greater than 0.90 "good fit"	0.997	Good fit

Note: s-bx^2 = Chi-Square, DF = Degree of Freedom, CFI = Comparative Fit Index, PCFI =Parsimony Comparative Fit Index, RMSEA = Root Mean Square Error of Approximation, RMSEA 95% CI = Root Mean Square Error of Approximation 95% Confidence Interval, NFI = Normed Fit Index, IFI = Incremental Fit Index, PNFI = Parsimony Normed Fit Index, RMR = Root Mean Residual and GFI = Goodness of Fit Index.

suggests that the model adequately fits the data, with minimal residuals.

The GFI assesses the proportion of variance accounted for by the model, with values greater than 0.90 indicating a good fit. The GFI value of 0.997 is significantly higher than the threshold, indicating an excellent fit and strong representation of the data.

The overall strong fit indices indicate that the model effectively represents the relationships among financial challenge factors, providing confidence in its validity. However, while the fit indices are favourable, the model's complexity and the lower values for some indices like PCFI and PNFI suggest areas for potential refinement. Adjustments could include simplifying the model to improve parsimony or incorporating additional factors to enhance the explanation of variance. It is also important to consider that fit indices alone do not guarantee a perfect model; they should be interpreted in the context of theoretical and empirical validation.

Unidimensional model for Financial Challenges Factors (FCF) features are presented (Figure 2 and Table 8). Out of the twelve (12) indicator variables, twelve (12) were obtained and used for the final CFA analysis (Abd-El-Fattah, 2010; Joreskog and Sorbom, 1988). From the 315 cases analyzed for this construct, twelve (12) indicator variables made up of three (3) components realized as FIR (FIR1, FIR2, FIR3, FIR4 and FIR5), FMEIR (FMEIR1, FMEIR2, FMEIR3 and

Table 8: Final Conceptual Model Indicator Variables for Financial Challenges Factors

Latent Component	Indicator Variables	Measurement Variables	Label
Financial Integrity Risks (FIR)		Contractor's and client's insolvency	FIR1
		Budget deficit or overrun of contracts	FIR2
		Contractor and client's cash flow problems	FIR3
		Project lost its economic value	FIR4
		Inability of client to attract fund	FIR5
Financial Mismanagement and Economic Instability Risks (FMEIR)		Embezzlement and misappropriation	FMEIR1
		High interest rates from banks	FMEIR2
		Poor financial feasibility assessment	FMEIR3
		Poor cost planning and wrong cost estimating	FMEIR4
Financial Risk Due to Banking Disputes and Instability (FRBDI)		Disagreement between contractor's bankers	FRBDI1
		Fragile financial environment	FRBDI2
		Blacklisted contractor by banks	FRBDI3

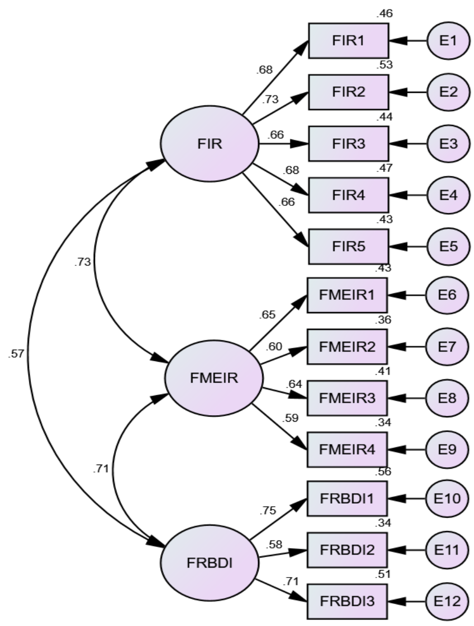

Figure 2: CFA Model for Financial Challenges Factors (FCF)

FMEIR4) and FRBDI (FRBDI1, FRBDI2, and FRBDI3).

Table 9 shows the correlation values, standard errors and the test of statistics of the final twelve-indicator model. All the correlation values were less than 1.00, and all the p-values were less than the significant value of 0.05 and show appropriate signs. The estimates were therefore deemed reasonable, as well as statistically significant. The parameter with the highest standardized coefficient was the indicator with variable FRBDI1 and its parameter coefficient was 0.748.

Most of the parameter estimates had high correlation values close to 1.00. The high correlation values suggest a high degree of linear association between the indicator variables and the unobserved variables (FIR, FMEIR and FRBDI**)**. In addition, the R Square values were also close to the desired value of 1.00 indicating that the factors explained more of the variance in the indicator variables.

The results therefore, suggest that the indicator variables significantly predict the unobserved components, because all the measured variables are significantly associated with the components (FIR, FMEIR and FRBDI) under financial challenge factors.

5. Discussions of Results

The findings revealed three main components: Financial Integrity Risks (FIR), Financial Mismanagement and Economic Instability Risks (FMEIR), and Financial Risk Due to Banking Disputes and Instability (FRBDI). These components were identified through exploratory factor analysis (EFA) and confirmed using confirmatory factor analysis (CFA).

5.1. Financial Integrity Risks (FIR)

This encompasses issues such as contractor and client insolvency, budget deficits, and cash flow problems. These findings are consistent with prior research highlighting the significance of financial stability and integrity in construction projects (Jha and Iyer, 2006). FIR reflects the challenges associated with ensuring financial viability and solvency throughout the project lifecycle, which are crucial for project success and continuity.

5.2. Financial Mismanagement and Economic Instability Risks (FMEIR)

It includes factors like embezzlement, high interest rates, and poor financial feasibility assessment. This component underscores the importance of effective financial management practices and the impact of economic instability on project outcomes. These findings align with literature emphasizing the role of financial mismanagement in project delays and cost overruns (Ogunlana et al., 2002).

5.3. Financial Risk Due to Banking Disputes and Instability (FRBDI)

This addresses challenges arising from disagreements between contractors' bankers, fragile financial environments, and contractor blacklisting by banks. This component highlights the intricate relationship between project financing and banking institutions, echoing existing literature on the vulnerability of construction projects to external financial disruptions (Liu et al., 2013).

Table 9: Factor Loading and P-Value of Financial Challenges Factors (FCF)

Hypothesised relationships (Path)	Unstandardised Coefficient (λ)	Standardised Coefficient (λ)	P-Value	R- Square	Significant at 5% Level
FIR1 → FIR	1.00	0.681	0.00	0.463	Yes
FIR2 → FIR	0.985	0.729	0.00	0.531	Yes
FIR3 → FIR	0.854	0.664	0.00	0.440	Yes
FIR4 → FIR	1.111	0.682	0.00	0.465	Yes
FIR5 → FIR	1.047	0.659	0.00	0.435	Yes
FMEIR1 →FMEIR	1.00	0.654	0.00	0.428	Yes
FMEIR2 → FMEIR	0.949	0.603	0.00	0.364	Yes
FMEIR3 →FMEIR	0.953	0.639	0.00	0.409	Yes
FMEIR4 → FMEIR	0.91	0.585	0.00	0.342	Yes
FRBDI1 → FRBDI	1.00	0.748	0.00	0.560	Yes
FRBDI2 → FRBDI	0.626	0.582	0.00	0.338	Yes
FRBDI3 → FRBDI	0.958	0.712	0.00	0.506	Yes
FMEIR ↔ FRBDI			0.00	0.708	Yes
FIR ↔ FMEIR			0.00	0.734	Yes
FIR ↔ FRBDI			0.00	0.573	Yes

5.4. *Integration with Existing Literature*

The study's findings align with and extend the existing literature on financial challenges in construction projects. The identification of FIR, FMEIR, and FRBDI provides an understanding of how various financial risks manifest and interact within the construction industry. While previous studies, such as those by Yap, Lee, and Skitmore (2020) and Azibaraniyar (2023), have explored aspects of financial integrity and mismanagement, this study offers a more integrated view by combining these issues with financial risks related to banking disputes. The results confirm the importance of financial stability and effective management practices while also introducing new insights into the role of banking relationships in project performance.

However, this study also presents opportunities to challenge and refine existing theories. For example, while the results support the notion that financial integrity is crucial, they also reveal additional dimensions of financial risk, such as banking instability that previous studies may have underexplored. By highlighting these aspects, the study not only corroborates existing findings but also contributes to a more comprehensive understanding of financial challenges in construction projects.

5.5. *Market Forces*

The findings of this study highlight that financial instability in the Ghanaian construction industry is exacerbated by fluctuations in market forces, particularly the costs of materials and labour. For instance, contractor insolvency and cash flow problems are often linked to sudden price surges in essential materials like cement and reinforcement bars. The study also revealed that market-driven budget overruns are a significant factor contributing to contract termination. Comparatively, industries in neighbouring countries like Nigeria face similar challenges, suggesting a regional trend that could inform the development of better financial planning strategies to mitigate these issues.

5.6. *Legal Systems and Structures*

While the study focused on financial challenges, its findings suggest that weak enforcement of financial agreements and the absence of robust legal frameworks contribute indirectly to premature contract termination. For example, disputes over delayed payments were identified as a key issue, which could be mitigated by stronger legal mechanisms to enforce timely payments and contractual obligations. A comparative perspective with South Africa, where standardized construction laws are more robust, highlights the potential benefits of enhancing Ghana's legal frameworks to ensure project continuity.

5.7. *Macroeconomic Factors*

The study found that macroeconomic factors, including inflation and high interest rates, significantly impact financial viability in construction projects. High interest rates were identified as a major factor under the Financial Mismanagement and Economic Instability Risks (FMEIR) component, complicating access to financing for both contractors and clients. Currency fluctuations were also noted to worsen cash flow issues, especially for projects reliant on imported materials. These findings underscore the need for adaptive financial models to account for macroeconomic volatility, which is a recurring challenge across developing economies.

5.8. *Cultural and Geographical Influences*

The findings revealed that financial challenges vary by geographical and cultural contexts within Ghana. Projects in rural areas face logistical challenges that increase costs, while urban projects benefit from better access to resources. Additionally, informal cultural practices, such as reliance on non-formal dispute resolution mechanisms, often delay effective conflict management. These insights suggest that tailored financial risk management strategies that account for regional and cultural differences could improve project outcomes.

5.9. *Comparisons with Other Regions and Industries*

The study's identification of financial risks, such as disagreements between contractors and bankers, aligns with challenges observed in other industries within Ghana, including manufacturing. However, the construction industry's dependence on long-term financing makes it uniquely vulnerable to financial instability. Comparatively, other sectors have adopted innovative financial solutions, such as supply chain financing, which could serve as a model for addressing similar issues in construction. Regional comparisons with East Africa indicate that public-private partnerships (PPPs) have effectively mitigated some financial challenges, offering a strategy for Ghana's construction sector to consider.

6. Findings

The study's findings highlight the significant role of financial challenges in influencing premature contract termination within the construction industry. Through a quantitative research approach involving a diverse sample of 315 construction industry professionals, including procurement officers, project managers, quantity surveyors and contract managers, the study elucidates the various financial factors contributing to contract termination.

6.1. *Contractor and Client Insolvency*

The analysis of financial challenges revealed several key insights. First, contractor and client insolvency emerged as the foremost cause of contract termination, followed closely by cash flow problems and the inability of clients to attract funds. These findings underscore the critical importance of financial stability among project stakeholders in ensuring project continuity and success.

6.2. Negative Cash Flow and Fund Mismanagement

Moreover, factors such as budget deficits, embezzlement, and misappropriation were identified as significant contributors to contract termination, highlighting the pervasive nature of financial risks within construction projects. Poor financial feasibility assessment, high interest rates from banks, and disagreements between contractors' bankers further compounded these challenges, exacerbating financial instability and increasing the likelihood of contract termination.

6.3. Factor Analysis and Model Fitting

The exploratory factor analysis (EFA) conducted to evaluate the underlying structure of financial challenges identified three distinct components: financial integrity risks, financial mismanagement and economic instability risks, and financial risks due to banking disputes and instability. Each component encapsulates specific financial factors contributing to contract termination, providing a comprehensive framework for understanding the multifaceted nature of financial challenges within construction projects.

Furthermore, the confirmatory factor analysis (CFA) corroborated the one-dimensionality and reliability of the financial challenges construct, affirming the validity of the study's findings. The CFA model exhibited good fit indices, indicating that the proposed model adequately described the sample data and effectively captured the relationship between financial challenges and contract termination.

7. Conclusion

The findings of this study suggest the pervasive nature of financial risks within construction projects, with contractor and client insolvency, cash flow problems, and budget deficits emerging as primary contributors to contract termination. These challenges, compounded by issues such as embezzlement, poor financial feasibility assessment, and high interest rates, underscore the complexity of financial management within construction projects and its profound impact on project outcomes.

The exploratory factor analysis (EFA) delineated three distinct components of financial challenges: financial integrity risks, financial mismanagement and economic instability risks, and financial risks due to banking disputes and instability. This nuanced understanding of the underlying structure of financial challenges provides valuable insights for stakeholders seeking to develop targeted interventions to mitigate financial risks and enhance project resilience.

Moreover, the confirmatory factor analysis (CFA) affirmed the validity and reliability of the financial challenges construct, demonstrating its robustness in capturing the relationship between financial factors and contract termination. The CFA model exhibited good fit indices, indicating that the proposed model effectively encapsulated the complexity of financial challenges within construction projects.

8. Recommendations

8.1. Way Forward

Based on the 3 key findings obtained from the study, this paper suggests the following recommendations for addressing financial challenges of contract termination:

I. To ensure project viability and identify potential financial risks from the outset, it is crucial to implement detailed financial feasibility assessments at the project inception stage. This process should involve comprehensive cost-benefit analyses that include in-depth cash flow forecasts and sensitivity analyses. Using financial modeling tools such as Monte Carlo simulations can help assess the impact of varying financial scenarios on project viability. Project managers should consider incorporating best practices and frameworks from successful large-scale infrastructure projects to guide these assessments.

II. Enhancing cash flow management requires implementing advanced strategies to ensure timely payments and efficient invoicing processes. Contractors and clients should adopt automated invoicing systems that integrate with project management software to provide real-time financial oversight and streamline payment tracking. Regular reviews of cash flow projections, based on up-to-date project data, should be conducted to manage liquidity effectively. Practical examples include utilizing cash flow management software to facilitate real-time financial oversight and ensure timely financial decision-making.

III. To address financial risks throughout the project lifecycle, it is important to establish comprehensive risk management protocols. These protocols should include systematic procedures for identifying, assessing, and mitigating financial risks, as well as developing contingency plans to manage unforeseen challenges. Organizations should create clear guidelines and provide training to ensure the effective implementation of these protocols.

IV. Before engaging in contractual agreements, it is vital to conduct thorough financial due diligence on all project participants, including contractors, subcontractors, and clients. This due diligence should assess each participant's financial stability, track record, and creditworthiness to mitigate risks associated with insolvency and financial mismanagement. Establishing clear criteria and processes for evaluating financial stability can help in making informed decisions and avoiding potential financial pitfalls.

8.2. Recommendations' Feasibility

While the recommendations are aimed at mitigating financial risks, their implementation may face several challenges. For instance, conducting thorough financial feasibility assessments requires access to accurate and comprehensive financial data, which may not always be readily available. To address this, organizations could establish partnerships with financial experts or consultants who can provide the necessary data and analysis.

Additionally, enhancing cash flow management may involve upfront investment in new technologies and training, which could be a barrier for smaller firms. To overcome this, phased implementation strategies and scalable solutions should be considered, allowing gradual integration of new systems. Establishing comprehensive risk management protocols may also face resistance due to organizational inertia or lack of expertise. Developing clear guidelines, training programs, and a risk management culture within the organization can facilitate the adoption of these protocols. Engaging with stakeholders to ensure their buy-in and providing support during the transition can further enhance the feasibility of implementing these recommendations.

8.3. Practical Implications

To effectively apply these findings, stakeholders such as project managers, contractors, and clients can adopt specific strategies and tools based on the recommendations. Project managers can integrate financial feasibility assessments into their project planning processes, using tools such as financial modelling software to simulate different scenarios. Contractors can enhance their cash flow management by implementing electronic invoicing and automated payment tracking systems, while clients can establish clear payment terms and schedules.

Furthermore, both contractors and clients should develop and regularly update comprehensive risk management plans to address potential financial challenges. By incorporating these practical strategies, stakeholders can better manage financial risks, improve project viability, and reduce the likelihood of contract termination due to financial issues.

8.4. Further Research

The present study lays the groundwork for further exploration and inquiry into several key areas within the domain of financial challenges and premature contract termination in the construction industry. Building upon the insights garnered from this research, future studies could consider the following avenues for investigation: Conduct a longitudinal study to track the impact of financial risk management strategies over time and assess their effectiveness in different project phases. This approach can provide insights into the long-term benefits and challenges associated with implementing these strategies.

In addition, explore cross-cultural variations in financial risk management practices and their implications for contract termination outcomes, providing insights into the influence of cultural factors on project governance and decision-making processes.

Moreover, based on the findings, future research should also explore: The impact of inflation and interest rates on project viability over time, using longitudinal studies. The effectiveness of legal reforms in reducing payment delays and enforcing contractual agreements.

Cross-industry and regional strategies to adapt innovative financial solutions, such as PPPs and supply chain financing, to the construction sector in Ghana.

By leveraging these findings, stakeholders can better address the multifaceted financial challenges affecting construction projects in Ghana, fostering greater stability and resilience in the industry.

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Socio-Political and Macro-Economic Impact of Tender Price Inflation in Zambian Public Construction Projects

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Abstract

A well-managed tender price allows governments to improve sustainable construction. Currently, there is no tender price management model to regulate tender price inflation in public projects in Zambia. The paper aims to develop a model that proposes a practical solution to critical challenges related to tender price inflation in public projects in the Zambia. The study utilized mixed methods, in which purposive snowball sampling was used to identify 14 participants for interviews to investigate socio-political factors, and a questionnaire survey administered to 170 project management practitioners to investigate economic factors that influence tender price inflation in the Zambian construction industry. Equations were derived from ordinary least squares (OLS) method to determine an optimum domain-specific tender price, while the qualitative data provide the basis for socio-political strategies. Findings show that the model has unlimited prediction capabilities while accounting for various correlations between volatilities. Further, combining the quantitative and qualitative platforms of the model facilitates a low variable tender-price output that is critical to the predictability and certainty in determining the ability of the project to meet interest and fund redemption. Key practical benefits of providing a construction model with low inflation in tender-price include of improved cost predictability. The conclusion of the study is that a model that reduces inflation in tender prices enables more accurate budgeting, helping stakeholders plan projects with a higher degree of certainty. This reduces the risk of cost overruns and allows for better resource allocation. The value of this study lies in its originality, as it presents the first comprehensive tender price management model specifically tailored to public construction projects in Zambia, offering an innovative solution to the persistent challenge of tender price inflation, and contributing significantly to the improvement of sustainable infrastructure development.

Keywords: construction, infrastructure development, management model, public sector, tender price.

1. Introduction

Contractors determine the tender price by maximizing expected profit while factoring in the probability of winning the bid, underlying conditions of bid items, client characteristics, and competition level. However, Wang et al. (2012) affirm that making accurate pricing in a bid is enormously expensive and time-consuming. Historical data must be readily available to predict the bid price. Necessary documentation and processes for adjusting unit costs must be available also. Underutilization of historical project cost data exacerbates cost control challenges during tendering (Zhang et al., 2015). Also, simplified and streamlined pricing models often involve the imposition of arbitrary and subjective constants and price limits (Cattell et al., 2007). Using such arbitrary values fails to provide a scientific basis by which to construct an optimum tender price. Kissi et al. (2019) hypothesized the existence of a relationship between the different pricing strategies and the factors that influence the pricing of a tender. Tender price management is the most crucial consideration for bid success. However, due to complex interrelationships, it is easier to express project success in terms of cost and budget variance (Yismalet & Patel, 2018).

Currently, there is no tender price management model to regulate tender price inflation in Zambia. This has far-reaching implications beyond economic inefficiencies. Tender price inflation has

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led to stalled or incomplete public projects, compromising the development of critical social infrastructure such as schools, hospitals, and transportation systems. The ripple effects are particularly severe in such an emerging economy like Zambia, where public construction projects are often essential for addressing social inequities and promoting economic development. When project costs are unpredictable and inflated, government budgets are strained, leading to resource allocation challenges and delays in delivering essential services to the population.

This study aims to develop a tender price management model specifically tailored to public construction projects in Zambia. The importance of this model is beyond financial predictability, it is crucial for ensuring the sustainability and timely completion of public infrastructure projects that are key to social development. While tender price management may havereceived considerable attention in normative literature, existing models are either generic or not specific to the unique socio-political and macro-economic conditions of Zambia. This geographical and contextual focus is essential as it aims to fill a gap by creating a model that addresses local challenges.

Tender price inflation in Zambia is not merely a financial issue but one that significantly impacts social outcomes. For instance, inflation-driven project delays or cancellations disrupt the provision of essential infrastructure, affecting public health, education, and transportation. This study acknowledges that the absence of a standardized tender price management model has contributed to inefficiencies and uncertainty in public sector projects, with substantial social implications. Therefore, the study's objective is to provide predictability and control over these price fluctuations through a context-specific model that considers both quantitative economic factors and qualitative socio-political influences.

The contribution of this study lies in its contextual adaptation, providing a model that considers local economic volatility, exchange rate fluctuations, and the influence of political factors on public construction projects. This holistic approach is relatively novel in the discourse of tender price management and represents an advancement in managing prices in unpredictable economies.

By focusing on macro-economic and socio-political factors, this study bridges the gap between existing tender price management models.

2. Literature Review

Tender price inflation poses significant challenges to the successful implementation of public construction projects, particularly in developing economies like Zambia. While the phenomenon of tender price volatility has been widely explored in global construction literature, there is limited research that addresses the specific socio-political and macro-economic factors contributing to this in Zambia. Developing a robust model to mitigate tender price inflation requires an understanding of both external factors, such as inflation and currency fluctuations, as well as socio-political influences, including governance, policy shifts and institutional stability. This literature review examines existing models of tender price management by focusing on their applicability to public sector infrastructure projects. Further, the review explores critical socio-political and macro-economic factors that influence tender price inflation in Zambia. This review highlights the gaps in current models and provides a foundation for developing a tailored solution for Zambia's unique construction sector challenges.

2.1. Understanding Tender-Price Inflation

Tender price inflation refers to the sustained increase in the cost estimates provided by contractors for identical scopes of work in a construction project, primarily driven by persistent rises in input costs such as labor, materials, and equipment. Unlike general price inflation, which reflects broader economic trends, tender price inflation is specific to the construction sector and is influenced by both internal project dynamics and external market conditions, including supply chain disruptions, regulatory changes, and market demand. It leads to consistently higher tender bids over time, rather than mere price fluctuations among contractors. While bid variation may occur due to competitive strategies or project-specific risks, inflation inherently results in upward pressure on prices rather than reductions.

Several key factors contribute to tender price inflation. These include the cost of labor and equipment, which can increase due to shortages or rising wages, and material supply constraints, where local availability or reliance on imported materials may drive up prices. External market conditions, such as global economic shifts, currency fluctuations, and inflation rates, also play a significant role (Vu, et al., 2020). Additionally, site-specific challenges like safety requirements, access limitations, or geographical constraints can increase the cost of execution, reflecting in higher tender prices. Effectively managing tender price inflation requires a thorough understanding of these influences and the ability to anticipate fluctuations. Strategic pricing of risk factors—such as unpredictable market conditions or site constraints—enables more accurate budgeting and risk management, ensuring project costs remain firm while minimizing the impact of tender price volatility (Cho, et al., 2024).

2.2. Benefits of Low Variability in Tender-Price Output

A principle of management in any organization is that future conditions are uncertain, and such uncertainty poses a significant risk to the success of the project. Thus, construction stakeholders try to make an effort to reduce the impacts of future uncertainty during project processes. Variability in the tender price output, following a tender period, is treated in this research as a critical factor seeking attention in project controls to help in the development of construction project success. Therefore, understanding one of the outputs of a tendering process, i.e. the variability in tender price output, is a crucial factor for clients involved in construction projects. The main concern for a project client at the tender price level output is cost certainty (Cunningham, 2015). This aids in budgeting for a particular project at the construction phase, in a bid to either plan for an additional source of payment, and to gauge sources of project finance to avoid project abandonment resultin from shortage of fund. Fund shortage occurs because actual project costs exceeds tender price without variations to project scope. Results have also shown that clients can anticipate having a proactive duty-setting mechanism ahead of time to offset such shortage of funds.

2.2.1 Cost Certainty

Project budgeting is a prominent step in the acquisition process of any new project, detailing if any, to what extent, and in which categories the expenditure of a project impacts upon a particular owner's portfolio (Aje, et al., 2016). It is the cost consultant's responsibility to design a cost plan that can be used to validate the commercial viability of a particular development proposal. Predictability and certainty in tender-price outputs allow investors to determine the ability of the business or project to meet stakeholders' interests and maintain a dividend payout that keeps the firm or equity investment in good standing with the investors. Investors require reliable data on costs to objectively compare investment opportunities. Without the aid of providers of construction models with low variability at the time of contract award, operating an efficient construction contract appears most difficult and remote to achieve.

2.2.2 Enhanced Risk Management

Providing a construction model with low variability in its tender price outputs offers benefits to those who participate in such tenders. Hence, this creates the opportunity to provide the skills, materials and services in the construction projects that are eventually commenced. Risk management practices assume that an accurate risk assessment can be made, but low variability in tender prices suggests that pricing dynamics are predictable. Anticipation of what can happen in the immediate future is the ability to perceive change before it occurs. Pricing dynamics predictability should be used to create project-specific risk communications from in-depth analysis to superficial overviews that match risk-taking and risk-deterring behaviors of various stakeholders. It can also be used as input for project-specific risk monitoring plans. Enhanced risk management should reduce unplanned expenses, other impacts, and their accumulation throughout project lifecycle (Keshk, et al., 2018). The more aggressive risk bearers require, the more detailed risk communications are. It is also important because active risk management is shown by low variability in tender prices. The most efficient use of these initial resources is for the tenderer to use tender documentation that can be completed and submitted for as many tenders as possible (Akintoye & Fitzgerald, 2000).

2.3. *Factors Influencing Tender Price Inflation*

Many diverse internal, sometimes risk-related, and external elements influence tender price inflation. Market demand and competition directly lead to price inconstancy over time. In addition, it is necessary to consider two rational contractor behavioral theories. One contractor is positioned upmarket and, compared to another, is thus the price leader, and it thereby tends to reflect or set market-only tender prices theoretically. The reactions of the other contractors to input price variations over time are determined by their lifecycle costs and experience profiles. Short-term cost variations are averaged out in the contractors' tender pricing by zeroing local construction project operation losses against their wider portfolio and operational profits. Unstable crude oil prices are also weighted into local transportation costs only and thereafter into local labor, building material, and equipment construction costs, which are then incurred by contractors.

2.3.1 *Sociopolitical Factors*

Socio-political factors are predetermined by traditional and political stimulus in which the government and society influence a sector's ability to achieve broader economic goals. Zhang et al. (2006) explain how existing theoretical principles of project risk management are inadequate about realistic considerations. Thus, risks remain unallocated and are unreasonably priced at the project onset. For example, Naji & Ali (2017) found that one of the main risks for consideration is the financial capacity of the client, whether they are able to pay the contractor timely. Failure to do so often leads to project delays and cost estimation errors. Further, the failure of a construction firm to fully consider or estimate the impact of risk events on construction operations could cause construction prices to escalate. Laryea & Hughes (2008) found no evidence suggesting that construction project pricing was systematic. Therefore, they doubted the justification of pricing models for contractors as their final price depends on a varying range of complex microeconomic indicators and risk factors. Their argument hinges on efficient pricing for risk while encountering and estimating various factors. Gudienė et al. (2013) and Tembo et al. (2020) identified and classified these factors into seven major groups, namely: external, institutional, project-related, project team management-related, project manager-related, client-related and contractor-associated factors. Further, Gudienė et al. (2013) developed a model that grouped project success factors to investigate how these factors influenced the success of a construction project. However, they did not explore underlying relationships among the elements.

Nguyen & Q. Nguyen (2020) argue that construction price level is very informative on changes in the construction industry as it arises from a combination of results regarding labor, materials, and equipment cost variables. They identified five critical factors that affect construction tender prices. These include consumer price index, gross domestic product, interest rates, foreign exchange rate, and total imports and exports. On the other hand, Vansteenkiste et al. (2019) argue that labor wages and price inflation show a dynamic interaction primarily dependent on the state of the economy. This means, in practice, labor costs are passed on to price inflation, and are exercebated with demand shocks. Cruywagen (2014) argues that several factors, including data availability, influence the establishment and the composition of the relevant tender price index. Other factors by Cruywagen include the base year or period, choices of weights and construction method. Once established, the index works as a deflator for construction prices. In summary, in a free market, the bidder presents an item price uniquely dependent on the construction technique (Cattell et al., 2010).

2.3.2 *Economic Factors*

Table 1 summarizes the literature review on macroeconomic variables relating to construction tender prices and shows that exchange rate, inflation, interest rates, labor force, and unemployment rate are crucial to the price level in construction. In addition, the paper adds other local macroeconomic factors that experts recommend when implementing construction projects.

Zambia's Macroeconomic Context

Inflation rate

Inflation rate in Zambia averaged 9.68% between 2005 and 2019, reaching an all-time high of 22.90% in February 2016 and a record low of 6% in December 2011 (Trading-Economics, 2022). The construction tender price is subject to the effects of inflation (Bai, 2014). Monfared & Akin (2017) agree that "an increase in foreign exchange rates also raises inflation", increasing general prices in the broader economy, including construction tender prices. To promote economic growth, the government should keep inflation low (Kasidi & Mwakanemela, 2013).

Interest rate

Interest Rate in Zambia averaged 10.25% between 2012 and 2019, reaching an all-time high of 15.50% in November 2015 and a record low of 9% in May 2012 (Trading-Economics, 2022). Instead of paying attention to the relationship between interest rate and price level, Thornton (2012) argues that money is even more essential for economic activity in the construction sector and determining the price level, not interest rates.

Public debt

Government Debt in Zambia increased from USD8.915 billion in 2017 to USD10.05 billion in 2018. The debt averaged USD4.61 billion between 2002 and 2018, reaching an all-time high of USD10.05 billion in 2018 and a record low of USD1.11 billion in 2007 (Trading-Economics, 2022). Zambia's debt to Gross Domestic Product was 59 percent in 2018. Further, Zambia's external debt rose from USD8.3 billion in 2017 to USD9.15 billion in 2018, averaging USD4.5 billion between 2008 and 2018, and an all-time high of USD 9.21 billion in 2016 and a record low of USD0.91 billion in 2008 (Trading-Economics, 2022). Public debt significantly affects inflation and *vice versa.* This is because a high government debt depresses income and stimulates direct price level (Maitra, 2019).

2.4. *Techniques for Achieving Low Variability*

In construction projects, achieving a consistent tender price output with minimal variability is essential for reducing commercial disputes and supporting informed decision-making. Here are three main techniques from literature that help achieve low variability in tender prices:

- **Detailed market analysis**: Conducting thorough market research allows for evidence-based decisions, which help in setting realistic and competitive prices (Pascucci, et al., 2023). By understanding current market trends, labor costs, material availability and demand, decision-makers can anticipate fluctuations and make adjustments that promote price stability.

- **Utilizing historical information from within the organization:** Leveraging historical data from past projects provides insights into cost structures, efficiency levels and pricing strategies that had worked in the past (Yaiprasert & Hidayanto, 2024). This technique relies on an organization's own experience and allows for more accurate forecasting by recognizing patterns and

Table 1: Macroeconomic variables affecting construction price

Variables	(Arditi et al., 2000)	(Ngowi et al., 2005)	(Enshassi et al., 2009)	(Oladipo & Oni, 2012)	(Choi, et al., 2013)	(Jiang & Liu, 2015)	(Chilongo & Mbetwa, 2017)	(Cheelo & Liebenthal, 2018)	(Asamoah et al., 2019)	(Kirchberger, 2020)	(Musarat et al., 2021)	(Makoye et al., 2022)
Exchange rate				x					x			
Inflation			x	x					x		x	x
Interest rate	x			x		x	x	x	x			x
Imports				x								
Money supply				x								
Export				x		x						
Gross Domestic Product				x					x			
External debt				x								
Money supply				x								
Labor force			x		x	x	x	x		x		x
External reserve				x								
Balance of payment				x								
Industry weakness	x											
Poor growth prospect	x											
Consumer price index									x			
Black market									x			
Cost of raw materials										x		
Unemployment rate				x	x	x				x		
Construction price level					x	x						
Globalization		x										

Source: Authors

identifying cost drivers that influence variability.

- **Utilizing similar projects from the past:** Reviewing data and outcomes from similar projects conducted by other organizations can offer valuable insights into potential pricing models and benchmarks (Fleckenstein, et al., 2023). This approach broadens the knowledge base by incorporating external perspectives, helping to anticipate potential risks and cost variations that may not be immediately apparent from internal data alone.

Each of these techniques provides a strategic foundation for developing consistent tender prices. Combining these approaches can offer a comprehensive understanding of market conditions and historical trends, helping project stakeholders to plan and adjust tender prices effectively. Early identification of pricing variables through these methods, along with continuous refinement during stakeholder workshops, allows for more accurate and stable pricing that aligns with project requirements.

2.4.1 Models Regarding Construction Tender Price

Table 2 summarises strengths and weaknesses observed in relevant previous studies that developed models regarding construction tender prices. Closely associated models tend to focus on predicting movements in the tender price index, simulating the bidder's profit and determination of profit ratio and forecasting the tender-price index (Wong & Ng, 2010: 1255; Yiu & Tam, 2006: 475; Akintoye, 1991; and Jaśkowski & Czarnigowska, 2019: 159). Other studies with a similar focus include those of Kissi et al. (2018: 70; 2017: 252) and Olatunji (2008: 60). Wong & Ng (2010), Yiu & Tam (2006), Akintoye (1991) and Jaśkowski & Czarnigowska (2019) have focused on similar issues, offering frameworks that calculate profit ratios or forecast price indices. However, these models often fail to provide a comprehensive solution, as they emphasize either the economic aspect of tender price prediction or focus narrowly on profit optimization, without integrating broader market or project-specific variables. Similarly, Kissi et al. (2018, 2017) and Olatunji (2008) have explored tender price prediction models. Olatunji (2008: 60) explains how ordinary least squares (OLS) is used to predict tender prices in Nigeria. However, this model only focuses on the analytical computation and lacks adaptability to varying market conditions. The research highlights the challenges in managing and developing tender price models, emphasizing that existing models primarily concentrate on predicting tender price index movements, simulating bidder profit margins, and forecasting tender prices. In contrast, this current research's focus is identical to Ho (2013: 1248) which developed a Grey model for forecasting price indices and the likely tender price of a given project. The model is also statistically unstable for small sample sizes, involves solving complex equations. However, Ho's model is time-consuming to implement. It is also rigid and does not incorporate new information. The key issue across these models is their rigidity, complexity, and the absence of mechanisms to incorporate new market data dynamically. Therefore, this current research seeks to address these limitations by developing a flexible and comprehensive model, integrating both economic factors and socio-political influences to better predict and manage tender prices in the Zambian public construction sector.

2.4.2 How Reviewed Models Shape the Proposed Framework

Grey Model (GM) was developed by Ho (2013) for forecasting tender price indices. It is limited by adaptability and struggles with small sample sizes. This proposed framework will incorporate mechanisms for flexible data inputs and a broader sample range. Additionally, Olatunji's (2008) OLS-based model. Whilst the model analytically useful, it fails to incorporate socio-political dynamics. The new framework corrects this by integrating both economic and socio-political factors to provide a more comprehensive model suited for Zambia's public sector projects. Each of these models, although successful in specific contexts, contributes specific lessons on how to better manage tender price variability in Zambia. By clearly identifying these potential contributions, further discussions in this section will flow into and shape the conceptual framework, ensuring that the framework builds on the strengths and addresses the weaknesses of previous models.

The literature review has highlighted critical gaps and insights from existing studies, which collectively informs the rationale and development of a tender price management model specifically tailored for Zambia's public construction projects. Below is a synthesis of how the identified gaps shape the proposed model.

- **Integration of Socio-Political and Macro-Economic Factors:** Existing models, such as those by Olatunji (2008) and Ho (2013), focus heavily on economic predictions, neglecting socio-political influences that play a critical role in tender price variability, especially in volatile economies like Zambia's. These models fail to account for local governance issues, political stability, and institutional capacities, which are central to Zambia's construction sector's challenges. The proposed model incorporates these socio-political factors by integrating governance structures, political interference, and regulatory dynamics alongside macro-economic variables such as inflation, exchange rates, and interest rates. This multidimensional approach provides a comprehensive framework to predict and manage tender price inflation effectively.

  Adaptability to Dynamic Market Conditions: Ho's (2013) Grey Model (GM) and Kissi et al.'s (2018) ARIMAX model are limited in their adaptability to fluctuating market conditions and small sample sizes. These models often lack the flexibility to incorporate new market data dynamically. The proposed model addresses this limitation by leveraging mechanisms for continuous data inputs and real-time adjustments. The inclusion of Ordinary Least Squares (OLS) regression ensures that the model remains responsive to economic changes and allows for accurate predictions under varying conditions.

- **Bridging Analytical and Contextual Gaps:** Zhang et al. (2015) and Wang et al. (2007) emphasized the importance of robust analytical frameworks but overlooked the contextual realities of emerging markets. For instance, Zambia's unique economic volatility, high levels of government debt, and external market dependencies are not reflected in existing models. By combining quantitative methods with qualitative assessments, the

Table 2: Summary of previous studies on models regarding construction tender price

Continent	Country	Author	Model	Strength	Weakness
Asia	China	Zhang, et al. (2015: 606-614)	System for construction tender price evaluation based on big data	Use big data to give a reasonable project cost range Establish price controls	How to revise and refine algorithms to improve the degree of automation of bid data and result accuracy
	Malaysia	Hassim, et al. (2018: 443-457)	Estimating model for pre-tender estimation process using fuzzy logic combined with neural network method	Assist with the pre-tender estimation, enabling the client to make early funding arrangements. Assist contractors in coming up with more accurate tender-price estimations.	The model estimated cost is subject to the accuracy of the rating of factors.
	Taiwan	Wang, et al., (2007: 223–235)	Simulation-based cost model	Assesses cost uncertainties Improves bid price decision quality	The model does not account for the effects of tendering method and project type.
	Hong Kong	Tan & Goh (2017: 173-198)	Grey model (GM) for forecasting price indices	Forecast the likely tender price of a given project	The model performs poorly in the face of dramatic fluctuation in the dependent variables, as is the case with developing countries Statistically unstable for small sample sizes It involves solving complex equations Time-consuming The model does not incorporate new information
		Wong & Ng (2010: 1255–1268)	Vector error correction model	Provides medium-term forecasts in tender price movements	Limited to predictions of tender price index patterns
		Yiu & Tam (2006: 475-484)	Real options model	Describes bidders' underpricing phenomenon	The model does not consider correlations between the option value and macroeconomic volatilities.
Europe	United Kingdom	Akintoye & Skitmore (1990: 31-47)	Construction price causal model using simultaneous equations focusing on construction demand and supply models	Predict movements in the tender-price index.	The model does not incorporate changes in the composition of the construction market aggregate tender-price
	Poland	Jaśkowski & Czarnigowska (2019: 159–166)	Modified Friedman's Model with correlations	Simulates bidder's maximum profit margin and determination of profit ratio	Assumes positive correlations between competing bid prices
	Macedonia	Petruseva, et al. (2016: 143-151)	Support Vector Machine (DTREG Software Package)	Predicts bid price with high accuracy	The algorithm underperforms for large data sets and requires higher training time.
Africa	Ghana	Kissi, et al. (2018: 70-82)	Autoregressive integrated moving average with exogenous (ARIMAX) model	Forecasting tender-price index	Difficulties in predicting accumulated time series
		Kissi, et al. (2017: 252-268)	Structural model for tender price determination	Provides causal relations regarding the degree of influence of factors that affect tender pricing	The model does not forecast accumulated time series and fails to account for the effects of extant price levels.
	Nigeria	Olatunji (2008: 60-79)	Model for predicting project final construction cost and period	Investigate the relationship between tender price and final construction costs	The model fails to account for sociopolitical issues relating to non-economic dimensions of the industry

Source: Authors

proposed model bridges this gap. The inclusion of qualitative data, such as stakeholder interviews and thematic analysis of governance factors, ensures that the model reflects Zambia's unique socio-economic landscape.

Improving Cost Certainty and Risk Management: Laryea and Hughes (2008) underscored the importance of cost certainty and risk management in construction tendering. However, their approach was primarily theoretical, with limited application to developing economies facing external shocks. The proposed model extends this work by providing actionable strategies for mitigating risk factors at the inception of projects. The integration of predictive analytics and qualitative insights enables project stakeholders to anticipate cost fluctuations, enhancing cost certainty and reducing the risk of tender price inflation.

- **Local Relevance and Tailored Interventions:** Existing models, such as those developed in Asia and Europe (e.g., Wong & Ng, 2010; Akintoye & Skitmore, 1990), focus on stable markets where tender price dynamics are influenced primarily by supply-demand principles. These models are less applicable to Zambia, where political instability, corruption, and market unpredictability significantly influence tender prices. The proposed model is designed specifically for Zambia, incorporating localized factors such as currency depreciation, delayed government payments, and reliance on imported materials. This contextual adaptation ensures that the model addresses the root causes of tender price inflation in Zambia.

Alejandro and Zhao (2024) investigate the critical role that institutional frameworks play in stabilizing construction price volatility in emerging markets. Their study highlights how robust governance structures, clear regulatory guidelines, and anti-corruption policies can significantly reduce uncertainties in tender pricing. The authors draw on case studies from three emerging economies to show that stronger institutional frameworks foster transparency, improve contractor confidence, and encourage competitive pricing. Their research also emphasizes the importance of aligning institutional policies with macro-economic realities, such as inflation and currency fluctuations, to enhance price stability. This study is particularly relevant for Zambia, where weak institutional oversight has been a major contributor to tender price inflation, suggesting that strengthening governance mechanisms could help mitigate these challenges.

In their research, Musarat, Alaloul, and Liew (2024) delve into the interplay between inflation rates, labor market dynamics, and construction tender prices in Sub-Saharan Africa. They demonstrate that inflationary pressures, combined with high labor turnover and skill shortages, significantly inflate project costs, thereby impacting tender prices. Using data from multiple Sub-Saharan countries, their study identifies strategies for mitigating these effects, such as indexing tender prices to inflation rates and implementing workforce stabilization programs. Their findings provide actionable insights for Zambia, where tender price inflation is exacerbated by rapid cost escalations in labor and materials. This study underscores the need for policies that address economic volatility and workforce issues to ensure more predictable and competitive tender pricing.

Grand-Guillaume-Perrenoud, Geese, and Uhlmann (2023) propose a mixed-methods approach to tender price modeling that combines quantitative economic data with qualitative assessments of socio-political influences. Their research argues that relying solely on quantitative models often overlooks contextual factors, such as governance challenges and contractor behavior, which are pivotal in tender price determination. By integrating stakeholder interviews, policy reviews, and economic simulations, the study provides a holistic framework for analyzing tender price variability. The proposed approach is particularly useful for Zambia, where socio-political factors such as policy instability and delayed government payments often interact with economic variables to influence tender prices. This study supports the need for models that incorporate both economic and qualitative dimensions to address the complexities of public sector tendering.

Fleckenstein, Obaidi, and Tryfona (2023) focus on the application of big data analytics to predict tender price indices in developing economies. Their research highlights how large datasets, including historical project costs, macro-economic indicat (Alejandro & Zhao, 2024) (Musarat, et al., 2024) (Grand-Guillaume-Perrenoud, et al., 2023) (Fleckenstein, et al., 2023)ors, and contractor performance records, can improve tender price forecasting accuracy. They showcase case studies where machine learning algorithms were used to analyze complex, multi-dimensional data, leading to more precise and reliable tender price estimates. This study has strong implications for Zambia, where the underutilization of historical data is a known issue in tender price management. By integrating big data analytics into existing frameworks, Zambia's construction industry could enhance price predictability and mitigate the risks of cost overruns and inflated bids.

2.5. Conceptual Framework

The basis of the structure of the proposed model in this study is the conceptual framework presented in Figure 1. The groups include macroeconomic (quantitative) and socio-political (qualitative) factors. The conceptual framework of this study is grounded in both economic and socio-political factors, recognizing that tender price inflation in public construction projects is shaped by a dynamic interplay between these two domains. Economic factors such as inflation rates, currency fluctuations, material costs, and labor pricing directly influence the cost structures of construction projects, creating variability in tender submissions (Musarat, Alaloul, & Liew, 2024). These factors determine the financial feasibility of projects and impact the accuracy of budget forecasts. In addition, socio-political

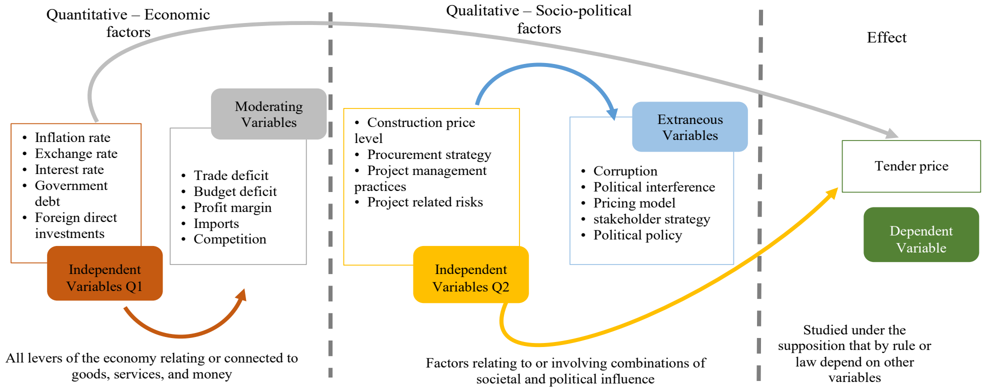

Figure 1: Conceptual framework.
Source: Authors

factors—including government policies, regulatory environments, political stability, and institutional governance—affect the decision-making processes within public sector projects (Aiyede, 2023). Changes in political leadership, policy shifts, and regulatory uncertainty can lead to fluctuations in tender prices by altering the operational landscape of the construction industry. By integrating these two sets of influences, the conceptual framework offers a comprehensive understanding of the forces driving tender price inflation, providing a robust basis for developing strategies to mitigate price volatility and improve project cost management.

2.5.1 Theory Underpinning the Conceptual Framework

The conceptual framework is built upon the systems theory and institutional economics theory. Systems theory views the construction tender price management process as a dynamic system influenced by multiple interconnected factors, including economic variables, socio-political influences, and institutional constraints (Boateng, et al., 2017). Institutional economics further supports the framework by highlighting the role of governance structures, regulations, and market forces in shaping economic activities, including tender pricing in public projects (Arwani & Unggul, 2024). This combination helps explain the complex interrelationships between socio-political and economic factors in influencing tender price inflation.

2.5.2 Theory Shaping the Conceptualization and Hypothesized Relationships

The conceptualization of the framework is shaped by economic theory (particularly market efficiency and supply-demand principles) and political economy theory. Economic theory informs the quantitative relationships between factors such as inflation, material costs, and labor pricing, which directly affect tender price variability. Political economy theory explains how political stability, governance, and regulatory environments impact public sector procurement and construction pricing. The hypothesized relationships are derived from the interaction between these economic drivers and socio-political conditions, proposing that tender price inflation is a result of both macroeconomic fluctuations and socio-political dynamics.

2.5.3 Rationale for Qualitative and Quantitative Approaches

Socio-political factors were assessed qualitatively because they involve complex, context-specific elements such as governance, political stability, and institutional frameworks that are better understood through in-depth interviews, case studies, and thematic analysis (Alejandro & Zhao, 2024). These factors are less easily quantified, and qualitative methods allow for a nuanced understanding of how these influences affect tender prices.

Economic factors, on the other hand, were assessed quantitatively using data-driven methods (e.g., OLS regression analysis) because they involve measurable variables like inflation rates, material costs, and labor pricing (Stanić & Račić, 2019). These variables can be analyzed statistically to determine their direct impact on tender price fluctuations, allowing for predictive modelling.

2.5.4 Impact of Different Approaches on the Framework's Validity

The use of mixed methods—qualitative for socio-political factors and quantitative for economic factors—enhances the validity of the proposed framework by ensuring that the model is both comprehensive and contextually grounded. By combining qualitative insights with quantitative rigor, the framework can better capture the complexity of real-world tender price dynamics. Qualitative assessments provide depth and context, ensuring that the model considers factors beyond numerical data, while the quantitative approach ensures that the relationships between economic variables are statistically validated. This mixed-methods approach improves the overall construct validity, ensuring that the framework accurately reflects the multifaceted nature of tender price management (Grand-Guillaume-Perrenoud, et al., 2023).

3. Methodology

3.1. Research Design

The study is phenomenological-driven within a qualitative and quantitative paradigm (Johnson & Onwuegbuzie, 2004; Yu & Khazanchi, 2017). The study utilized a triangulation design of mixed methods to obtain different yet supplementary data on construction-tender price inflation. The study conducted structured interviews with officials (contractors, consultants, and government officials) from the Zambian construction industry. In this study, the questionnaire set six constructs, including government, contractor, industry, procurement, legal, and related strategies extracted from interviews. Ordinary Least Square regression models were used to develop the analytical aspect of the model.

3.2. Population, Sample, and Response Rate

For quantitative samples, the study utilized a proportionate stratification approach for determining the sample size in each category due to the distinctive categorical nature of the population under consideration (Bless et al., 2020; Sibanyama et al., 2012). The sample size determination considered a 5% margin of error and a 95% confidence level and adopted Cochran's method or formula for calculating the categorical quantitative data sample size (Cochran, 1977; Bartlett et al., 2001).

$$n_s = \frac{pqt^2}{d^2} = \frac{0.5x0.5x1.65^2}{0.05^2} = 272$$

Where pq is the estimated variance = 0.25
Where t is the value of selected alpha level =1.65 for a level of 0.025 in each tail
Where d is the acceptable margin of error = 5%

Therefore, for a population of 454, the required sample size is 272. However, since the sample size is 26% (exceeds 5%; [454*0.05=22.7]) of the population, the study utilized Cochran's (1977) formula to recalculate the final sample size as follows:

$$n_f = \frac{n_s}{\left(1 + \frac{n_s}{population}\right)} = \frac{272}{\left(1 + \frac{272}{454}\right)} = 170$$

The study randomly selected practicing participants to ensure relevancy and provision of the necessary information on tender price information. Out of 170, the study accepted 147 usable questionnaires, resulting in a response rate of 86.5%.

For the qualitative sample, as shown in Table 4, field research shows that a representative sample of twelve interview participants is adequate to reach theoretical data saturation (Braun & Clarke, 2016; Boddy, 2016; Guest et al., 2006). The study employed purposive and snowball sampling methods described by Martínez-Mesa et al. (2016) and McGrath et al. (2019) to select

Table 3: Determination of quantitative sample size

Category	Category population (N_c)	Proportion $f = \frac{N_c}{N}$	Category sample $n_s = f.N_c$	Final sample (Cochran's) and questionnaires distributed	Questionnaires received	Response rate (%)
Contractors NCC grade 2 (Zambian Construction Firms)	124	0.27	34	46	37	80.4
Client (Public Infrastructure-Based Institutions): Ministries, utility organizations, local authorities	135	0.30	40	51	50	98.0
Consultants-Civil/Structural (ACEZ registered firms)	88	0.19	17	33	26	78.7
Architectural Firms (ZIA registered firms)	74	0.16	12	28	24	85.7
Quantity Surveying Firms (Q.S. Registration Board)	33	0.07	2	12	10	83.3
Total	$\sum N_c$=454	$\sum f$ =1	$\sum n_s$ =106	**170**	**147**	**86.5**

Source: Authors

14 interview participants, considering the homogeneity of the research population (Hennink & Kaiser, 2022).

3.3. Data Collection

Data was collected from 23 June to 10 August 2022. The questionnaire sets six constructs (government, contractor, industry, project, procurement, legislation) with Likert-scale type statements indicating strategies requiring improvement and development to mitigate high construction tender price inflation. Respondents were requested to indicate their agreement to lower construction tender prices. For qualitative data, the study asks the following interview questions:

1. What is your perception regarding the significance of a tender price in a construction project?
2. What do you think are factors for developing tender prices in construction?
3. How do you think high construction tender prices affect the construction sector?
4. What challenges do you face regarding global competition and the emergence of foreign construction firms?
5. What is your experience regarding the significance of the procurement function and its contribution to the price performance of public infrastructure projects?
6. What is your understanding of current controls and their success or failures in mitigating escalating construction tender prices?
7. How can the government overcome overpricing and maintain or increase its appetite for construction projects?

3.4. Sample Techniques and Justification

In this study, purposive sampling and snowball sampling were employed to select participants for qualitative interviews. These methods were chosen to ensure the inclusion of participants with relevant expertise and direct experience in the Zambian construction sector, particularly those involved in tendering processes for public projects. The rationale for these approaches is detailed below:

Purposive Sampling was used to deliberately select participants who possess specific knowledge, experience, or insights relevant to the study's objectives. For instance, individuals such as procurement officers, project managers, and policymakers were targeted because of their direct involvement in tender price determination and management. This approach was critical in capturing nuanced perspectives on how tender prices are influenced by Zambia's unique socio-political and economic conditions, which are central to the development of the proposed model.

Snowball sampling was employed to identify additional participants through referrals from the initial purposively sampled individuals. This method was particularly useful in accessing hard-to-reach participants, such as senior government officials or construction sector consultants, who may not have been directly accessible through conventional recruitment methods. Snowball sampling helped capture a broader range of perspectives, particularly from individuals who may have insights into informal or less-documented practices that influence tender price inflation.

3.5. Data Analysis and Validation

For the questionnaire survey, mean scores were measured using a scale where 1 = strongly disagree (1.00 ≤ 1.80); 2 = disagree (1.81 ≤ 2.60); 3 = neutral (2.61 ≤ 3.40); 4 = agree (3.41 ≤ 4.20), and 5 = strongly agree (4.20 ≤ 5). Only mean score ratings above 3.5 were considered and reported as critical price management strategies. The study adopted Cronbach's alpha (α) score above 0.7, indicating a robust internal consistency of results to assess reliability for homogeneity or internal consistency of the constructs (Heale & Twycross, 2015). The study used content analysis for the interviews to transcribe, code, and group data into crucial management strategies to lower construction price inflation. For content and construct validity, the study followed the content validity index (CVI) (Zeraati & Alavi, 2014; Polit, Beck, & Owen, 2007).The study reports only items with CVI scores greater than 0.51 for fourteen respondents per the Lawshe table (Lawshe, 1975). The content validity index is calculated as follows:

$$CVR = \frac{n_e - \left(\frac{N}{2}\right)}{\left(\frac{N}{2}\right)}$$

Where CVR is the content validity ratio, n_e is the number of respondents informed of the item's essentiality, and N is the total number of respondents. The study further adopted regression analysis to predict the effects of strategy interventions on construction tender price inflation (Perneger, 2021; Lewis et al., 2011). This study utilized the Likelihood ratio test to assess the goodness-of-fit criteria for strategies for the model. All the data analysis for this study was done using the statistical package of IBM SPSS Statistics 23.0.

3.6. Model Validation

Firstly, a practical validation of the quantitative aspect of the model. The study corrected tender prices for 12 selected projects that case firms procured in 2015. The validation involved using the ordinary least square method to establish the annual optimum tender price. Secondly, a whole-model validation through a nested sampling of 20 key informants to validate the model (Goodwin et al., 2020).

3.7. Ethical Considerations

Ethical considerations were rigorously addressed to ensure the integrity of the research process and the protection of participants' rights. Participants were provided with a detailed information sheet outlining the study's purpose, objectives, and their role, alongside a consent form that explicitly stated their voluntary participation and the ability to withdraw at any stage without penalty. Confidentiality and anonymity were ensured by anonymizing data through pseudonyms or codes, supported by robust data security measures, such as password-protected files and encrypted storage. Participants were informed their insights would be used solely for academic purposes and were given the option to skip any questions they were uncomfortable answering. The study was approved by the appropriate ethical review board, ensuring compliance with research standards, and interviews were conducted with cultural sensitivity to respect the socio-political and professional contexts in Zambia. Questions were carefully framed to avoid leading or judgmental language, fostering a safe and comfortable environment for participants.

4. Findings

4.1. Qualitative Results

4.1.1 Interview Profile

All respondents were construction-project managers. Among the respondents, one had a Ph.D., two had bachelor's degrees, and eleven had master's degrees (Table 4).

The study developed an interview schedule to ascertain the level of acceptability of a construction management practice that lowers tender pricing. Table 5 shows the turnaround strategies developed through the CVR scores. Findings reveal that thirteen attributes exhibited significant Lawshe content validity scores above 0.51.

4.2. Quantitative Results

The study utilized the goodness-of-fit criteria to determine how well the sample data represented the population. Table 6 summarizes the goodness-of-fit criteria and shows that the chi-square test of the null hypothesis that the coefficients are different from zero

Table 4: Participants for research interviews

Description	Participant ID	Academic qualification	Area of expertise/Years of practice
Purposive participants	PS1	Bachelor of Engineering (Civil & Environmental Engineering)	Civil engineering consultant/22 years
	PS2	MSc Project Management	Contractor/18 years
	PS3	MSc (Construction Management & Economics)	Quantity surveying and construction management/40 years
	PS4	Bachelor of Engineering (Civil & Environmental Engineering)	Civil Servant/Public Infrastructure-Based Institution/27 years
	PS5	MSc Business Management Bachelor of Engineering (Civil Engineering)	Contractor/17years
	PS6	MEng Construction Management BSc Architecture	Architectural consultant/15years
	PS7	MSc Project Management BSc Building Science	Quantity surveying consultant/25years
	PS8	MSc Architecture PGDip. Project management and Building Law BSc Architecture	Architectural consultant/30years
	PS9	MSc Logistics & supply chain management BSc Procurement management Dip. Chartered Institute of Purchasing & Supply	Civil Servant/Public Infrastructure-Based Institution/22years
Snowballing participants	SS1	Ph.D. (Transportation Economics) MEng Civil (Pavement & Transportation) BEng Civil & Environmental Engineering	Public project financing/24years
	SS2	MEng Civil (Pavement Design) BEng Civil & Environmental Engineering	Civil engineering consultant/30years
	SS3	MEng Construction Management BEng Civil & Environmental Engineering	Civil engineering consultant/25years
	SS4	MEng Project Management BEng Civil & Environmental Engineering	Contractor/22years
	SS5	MSc Construction Management BSc Quantity Surveying	Quantity surveying consultant/35years

Source: Authors

Table 5: Turnaround management strategies

No. of participants	Participants' I.D.	Turnaround practices from Expert Quote	Sector group	Lawshe value (CVR)
12	PS1, PS2, PS3, PS4, SS2, PS6, SS3, PS7, SS4, PS8, SS5, PS9	1. Develop funding projections and ensure readily available funds 2. Guarantee availability of project funding 3. Control interest, value-related, and time-related costs 4. Ensure timely payment to contractors	1. Government	*0.71
12	SS1, SS2, PS6, SS3, PS8, SS1, PS7, PS9, PS5, SS4, PS2, PS3	5. Develop well-informed cost estimates. 6. Plan and design execution of projects. 7. Utilize various professionals to develop cost norms and value engineering	2. Contractor	*0.71
11	PS2, PS3, SS3, PS7, PS8, PS9, SS1, PS4, SS4, SS5, PS5	8. Prepare project plans with robust designs and costing	3. Project	*0.57
12	PS1, PS4, SS2, PS5, PS8, PS9, PS7, SS1, PS8, SS3, PS6	9. Ensure that control systems like the e-GP and materials price index are realistic. 10. Hire experienced consultants early enough in the project stages	4. Procurement	*0.71
13	PS3, PS7, SS1, PS8, SS3, PS7, PS8, PS1, SS1, SS2, SS3, PS8, SS5	11. Develop models for rate build-up 12. Produce indices timely 13. Avoid the "text-book" approaches	5. Industry 6. Legal	*0.85

Source: Authors

is insignificant. Nagelkerke's R^2 is close to 1.000 at 0,773, demonstrating the strategies' better-fit of the model. The Pseudo R^2 indicates that the multinomial model explains 62.5% only of the inflation between the independent variables and construction tender price inflation.

Table 6: Goodness-of-fit and Pseudo R-Square

Goodness-of-Fit				Pseudo R-Square (R^2)	
	Chi-Square	**df**	**Sig.**	Cox and Snell	0.625
Pearson	131.539	152	0.883	Nagelkerke	0.773
Deviance	91.397	152	1.000	McFadden	0.593

Source: Authors

Table 7: Classification

Observed	**Predicted**			
	3	4	5	Percent Correct
3	9	0	0	100.0%
4	0	31	15	67.4%
5	0	5	87	94.6%
Overall Percentage	6.1%	24.5%	69.4%	86.4%

Source: Authors

Table 7 indicates that the estimated multinomial regression functions correctly classify 86.4% of the model.

Table 8 (In Appendix) shows the results of the tender price management strategies (data sets), including areas requiring improvement and development. The analysis indicates that the data sets have mean values ranging from 3.96 (lowest mean of the data set) to 4.49 (highest mean of the data set). These results indicate that the respondents agreed that specific strategies could yield manage construction tender price inflation. Based on the chi-square ranking, the top strategies included in the model development are GD10, CD1, CD5, ID9, ID14, ID8, PD12, PD10, PD1, and MD3. Of these, those with the highest likelihood ratio were CD1 (13.675), CD5 (10.972), and PD12 (8.610). All strategies had a Cronbach's alpha of 0.988. This implies that the instrument used to measure the effects of construction tender price inflation is highly reliable.

5. Discussions

The findings of this study offer important insights into the dynamics of tender price inflation in public construction projects, particularly in the Zambian context. These results contribute to the understanding of tender pricing by highlighting the complex interplay between economic factors (such as inflation, interest rates, and exchange rate) and socio-political influences (such as governance, regulatory frameworks, and political stability). In line with the literature, the study reaffirms that both sets of factors significantly shape tender price variability, which is critical for project planning and cost management. Previous research, such as the works of Wong & Ng (2010) and Yiu & Tam (2006), emphasized forecasting tender price indices and understanding economic drivers. However, this study extends beyond those models by incorporating qualitative socio-political dimensions, as suggested by Zhang et al. (2006), who identified gaps in existing risk management theories that fail to account for realistic socio-political factors. This broader approach provides a more comprehensive model, particularly suited to volatile markets like Zambia's, where economic uncertainty and political instability frequently impact public projects.

The findings also reveal that predictability and risk management are critical for mitigating tender price inflation. The literature highlights the importance of cost certainty for project stakeholders (as discussed by Laryea & Hughes, 2008), and this study supports those findings by showing that projects with lower variability in tender price outputs enable better budgeting, resource allocation, and risk management. The emphasis on cost certainty and risk mitigation strategies, such as the integration of project management practices with accurate forecasting techniques, aligns with the broader theoretical frameworks of tender price control in construction management. Furthermore, the study contributes to existing literature by proposing a model that effectively balances both economic and socio-political factors, addressing a gap in the current understanding of tender price inflation management. Previous models, like those developed by Olatunji (2008) and Ho (2013), focused heavily on economic predictions but lacked adaptability to socio-political changes. This study's model rectifies that limitation, offering a context-specific framework that can adapt to the political and economic realities in Zambia's public construction sector. The results of this study provide valuable contributions to both theory and practice, enhancing the understanding of tender price management in public construction projects. By integrating economic and socio-political factors, the proposed model addresses key limitations in previous approaches, offering a more holistic framework for managing tender price inflation in volatile markets.

The findings of this study align with institutional and risk management theories, which emphasize the importance of robust governance structures and adaptive policies in mitigating systemic risks such as tender price inflation. Institutional theory highlights how formal rules and norms—such as procurement regulations and anti-corruption measures—shape organizational behavior. In the Zambian context, the absence of standardized tender price management frameworks has perpetuated inefficiencies and opportunistic behaviors in public construction projects. By aligning policy recommendations with institutional theory, this study advocates for the establishment of transparent and enforceable procurement guidelines that address governance deficiencies. For example, strengthening regulatory oversight and mandating the use of historical data for tender price estimation can mitigate the risks associated with cost overruns and unpredictable price inflation.

Furthermore, risk management theories underscore the need for dynamic models that incorporate both quantitative and qualitative factors to enhance decision-making under uncertainty. The proposed tender price management model integrates socio-political and macro-economic variables, offering a practical tool for policymakers to forecast and stabilize tender prices. This aligns with the theoretical perspective that effective risk management relies on proactive identification and mitigation of vulnerabilities. Policy implications, such as creating real-time monitoring systems for exchange rates and inflation trends, would not only operationalize this model but also promote data-driven decision-making. These measures, combined with targeted capacity-building initiatives for procurement officers, provide a sustainable pathway for improving public sector efficiency and ensuring the timely delivery of essential infrastructure projects in Zambia.

5.1. Implications of Qualitative Results

Based on a high content validity ratio, the study identifies a possible range of existent and non-existent practices for mitigating construction tender price inflation that includes planning the execution of projects, developing funding projections, guaranteeing the availability of project funding, controlling interest, value-related and time-related costs, and hiring experienced consultants early enough in the project stages. Other practices include developing well-informed cost estimates, avoiding "text-book" approaches when developing price indices, ensuring timely payment to contractors, and preparing project plans with robust designs and costing. The study further interlinks turnaround practices into construction sector groupings. The objective of mitigating construction tender price inflation is achievable through achieving institutional goals. Six sector groups are identified as areas of responsibility for managing tender price inflation: government, procurement function, legal function, project, and industry.

5.2. Implications of Quantitative Results

Based on the goodness of fit criteria (Chi-squared test), the results suggest that adopting innovative systems, improving technical abilities, developing resource capabilities, mitigating risk factors at inception, mitigating project costs, upholding project duration specifications, removing industry uncertainties, and instilling sector confidence are critical tender price controls for successfully implementing an economically sustainable construction sector. Other essential tender price controls include legislating rate analysis and ensuring the presence of experienced consultants. The findings of the statistical study of the quantitative data indicate a strong correlation between the independent variables and construction tender price. Regression functions correctly classify 86.4% of the inflation effect of tested predictor variables on construction tender price. The study evidences a more significant influence of independent variables on tender price.

5.3. Model Development

The paper develops an integrated model (Figure 2) that mathematically and categorically describes the beliefs about construction tender prices. However, mathematical modeling for optimal construction tender price requires elements of compromise since the majority of interacting variables are far too complicated. The first level of compromise includes identifying the most critical factors affecting tender pricing. The second level of compromise includes selecting the type and amount of meaningful mathematical manipulation. The mathematical model developed in this paper is applicable in several scenarios depending on the state of knowledge about tender-price inflation, including enhancing scientific understanding of the phenomenon through quantitatively expressing existing knowledge and supporting strategic and tactical decisions made by managers and planners.

The descriptive aspects of the model allow more informed decision-making that guides the management of public infrastructure projects. The element is critical for developing project management analytics for institutions to make better decisions and improve the performance of tender prices by identifying trends and patterns. This aspect helps the production of key performance indicators and metrics for public infrastructure projects regarding tender construction price. Thus, this aspect focuses on the prominence of patterns observable in historical and current information.

4.1.1 The Analytical (Quantitative) Aspect of the Model

The analytical aspect of the model presents a closed-form solution to equations describing changes to construction tender-price expressed in a mathematical analytic function. The quantitative nature of the analytical characterization is crucial for making specific decisions regarding the reliability of engineers' estimates and the performance of the related strategies. The study expresses the analytical aspect of the model with sufficient precision to allow formal and reliably supported analysis. The dynamic analytical element represents the time-varying state of construction tender prices. For this paper, a model simulates the execution based on actual conditions. It allows the model to recreate simulations on instances related to the simulation environment. The model further applies actual initial conditions of the cases and later uses mathematical equations to determine changes as a function of specific independent variables.

4.1.2 Model Assumption

This paper assumes that, without other limiting and encouraging factors, tender pricing is positively proportional to interest rate, exchange rate, inflation rate, foreign direct investment, and national debt. A mechanistic or empirical model, which describes such a price in construction infrastructure projects, is an equation of the form:

$$Y : f(I + R + E + Fdi + D) \text{ .... [Equation 1]}$$

Where Y is the construction tender price, which is the dependent variable, the independent variables consist of I (inflation rate), R (interest rate), E (Exchange rate), D (Government debt), and Fdi (Foreign direct investment). The study utilizes statistical processes to estimate the relationship between construction tender price and the independent variables in this modeling. The study proposes a regression model of the form:

$$Y_i = f(X_i, \beta) + e_i \text{ .... [Equation 2]}$$

Y_i is a function of X_i and β in which e_i represents an additive error representing un-modeled determinants of Y_i. The study proposes a simple multivariate regression to estimate the function $f(X_i, \beta)$ of the form:

$$Y_i = \beta_0 + \beta_1 x_i + \beta_2 x_i^2 + e_i \text{................[Equation 3]}$$

The form represents a reasonable approximation of the statistical process and a convenient form for the function $f(X_i, \beta)$. The study utilizes the proportion of variance (R-Squared) values describing the relationship of each independent variable with construction tender price. Table 9 shows that the polynomial regression with the highest R-Squared values represents the optimum effect on tender price.

The standard form of the adopted polynomial function is:

$$f(x) = \beta_n x^n + \beta_{n-1} x^{n-1} + ... + \beta_2 x_i^2 + \beta_1 x_i + \beta_0$$
….. [Equation 4]

Where β_n and βn-1 are real number constants, β_n cannot equal zero, and n is a non-negative integer. In this function, all exponents of the variable are whole numbers. However, this is still a linear regression despite quadratic expression in the independent variable. The function is linear in the parameters β_0, β_1, and β_n. The straight-line case thus suffices, given a random sample from the population, in estimating the population parameters through a linear regression model:

$$y_i = f(Inflation + Interest + forex + Fdi + Debt) + \varepsilon_i$$
…… [Equation 5]

Table 10 summarizes the variables used in multinomial regression analysis. The variable values are annual averages, which may affect the significance and prediction level of the model. However, the research is in accordance with and appropriate to regression model development.

Table 11 shows the model variables, summary, and analysis of variance. The analysis further presents respective means and standard deviations for valid observations for all 11 and 10 case studies. Where ε_i

Table 9: Model function and regression for upgrading roads to bituminous standards

Independent Variable	Model	Regression type	The proportion of variance R-squared (R^2)	Optimum effect on the tender price
Forex rates	$y = 2.7471e^{0.1041x}$	Exponential	$R^2 = 0.5371$	• polynomial
	$y = 0.8295x + 1.1566$	Linear	$R^2 = 0.6864$	
	$y = 9.4795\ln(x) - 11.489$	Logarithmic	$R^2 = 0.7576$	
	$y = -0.0642x^2 + 2.4333x - 7.1354$	Polynomial	$R^2 = 0.7671$	
	$y = 0.4939x^{1.2466}$	Power	$R^2 = 0.6508$	
Inflation rates	$y = 4.4337e^{0.0573x}$	Exponential	$R^2 = 0.1928$	• polynomial
	$y = 0.429x + 5.2757$	Linear	$R^2 = 0.2175$	
	$y = 5.2137\ln(x) - 1.9979$	Logarithmic	$R^2 = 0.2092$	
	$y = 0.0116x^2 + 0.1117x + 7.0459$	Polynomial	$R^2 = 0.2195$	
	$y = 1.5518x^{0.7304}$	Power	$R^2 = 0.204$	
Interest rates	$y = 0.4707e^{0.1238x}$	Exponential	$R^2 = 0.4918$	• polynomial
	$y = 0.9338x - 11.672$	Linear	$R^2 = 0.563$	
	$y = 20.387\ln(x) - 53.797$	Logarithmic	$R^2 = 0.5577$	
	$y = -0.0169x^2 + 1.6895x - 19.849$	Polynomial	$R^2 = 0.5645$	
	$y = 0.0019x^{2.6761}$	Power	$R^2 = 0.4774$	
External Debt (U.S. $ 'Bn)	$y = 2.8732e^{0.1077x}$	Exponential	$R^2 = 0.7576$	• polynomial
	$y = 0.8043x + 2.0486$	Linear	$R^2 = 0.8503$	
	$y = 4.5114\ln(x) + 0.999$	Logarithmic	$R^2 = 0.7346$	
	$y = 0.0046x^2 + 0.7199x + 2.2958$	Polynomial	$R^2 = 0.8509$	
	$y = 2.1598x^{0.6767}$	Power	$R^2 = 0.8209$	

Source: Authors

Table 10: Summary of variables

Case	Year	Tender price (ZMW'million/km)	Forex rates	Inflation rates	Interest rates	FDI (U.S. $ 'Bn)	External Debt (U.S. $ 'Bn)
Upgrading of roads to bituminous standards	2008	1.438825829	4.2	12.5	19.1	0.94	0.91
	2009	1.811932233	4.9	13.4	22.1	0.69	2.25
	2010	1.373748439	4.8	8.5	20.9	1.73	1.72
	2011	2.684805086	7.3	8.7	18.8	1.11	1.68
Valid N (listwise) = 11	2012	4.599107964	5.14	6.6	19.1	1.73	0.92
	2013	4.690770679	5.39	7	16.3	2.1	2.13
	2014	4.260340586	6.15	7.8	18.7	1.51	5.02
	2015	6.874454978	8.63	10	21.1	1.58	8.08
	2016	7.053690932	10.31	18.2	28.1	0.66	9.21
	2017	8.706679835	9.54	6.6	26.9	1.11	12.45
	2018	14.39574954	10.45	7.5	24	0.41	12.1
	Mean	5.263	6.9827	9.709	21.373	1.2336	5.1336
	Std.	3.888	2.36470	3.6231	3.6519	0.53474	4.51533
Periodic maintenance of feeder roads	2012	0.162880317	5.14	6.6	19.1	1.73	0.92
	2013	0.690114967	5.39	7	16.3	2.1	2.13
	2014	0.466011329	6.15	7.8	18.7	1.51	5.02
	2015	0.58755172	8.63	10	21.1	1.58	8.08
Valid N (listwise) = 10	2016	0.878497449	10.31	18.2	28.1	0.66	9.21
	2017	1.43244782	9.54	6.6	26.9	1.11	12.45
	2018	1.405497777	10.45	7.5	24	0.41	12.1
	2019	1.20648096	12.91	9.1	25.6	0.55	15.05
	2020	1.555681335	18.28	15.7	26.8	-0.17	16.45
	2021	1.623899147	20.05	22.1	25.7	0.19	17.7
	Mean	1.001	10.6850	11.060	23.230	9.9110	0.9670
	Std.	0.51196	5.11445	5.5670	4.1148	5.87104	0.74772

Adapted from Tembo *et al*. (2023a)

is an error term and subscript i indexes a specific observation. $\ell_i = y_0 - y_i$, is the residual or the difference between the predicted value of the construction tender price and its actual value. The regression coefficients of the model, as shown in Table 10, indicate an R-Squared value of 0.742. Macroeconomic indicators under study explain at least 74.2% of the variance of the construction tender price.

The analysis of variance summarizes information regarding multiple correlations to test the significance of the model regarding the extent to which asset of macroeconomic indicators (independent variables) predict construction tender prices (Table 12). The Sig. column represents the *p*-value for the test of significance of the model and, in the case $p<0.05$ for a *p*-value of 0.028, so the set of indicator variables is significantly related to construction tender prices.

The other columns provide the details of how the *p*-value is determined. The sum of squares for regression (26.334) is the mean of the square for regression. The sum of squares labeled residual (19.480) is the sum of

Table 11: Model Summary

Model	Case study	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	Upgrading of roads to bituminous standards	0.933[a]	0.871	0.742	1.9739
	Periodic maintenance of feeder roads	0.927[a]	0.859	0.683	0.2882
a. Predictors: (Constant), External Debt (U.S. $ 'Bn), Inflation rates, FDI (U.S. $ 'Bn), Interest rates, Forex rates					

Source: Authors

Table 12: Analysis of variance

Model[a]		Sum of Squares	df	Mean Square	F	Sig.
Upgrading of roads to bituminous standards	Regression	131.670	5	26.334	6.759	.028[b]
	Residual	19.480	5	3.896		
	Total	151.150	10			
Periodic maintenance of feeder roads	Regression	2.027	5	.405	4.879	.075[b]
	Residual	.332	4	.083		
	Total	2.359	9			

a. **Dependent Variable: Tender price (ZMW'million/km)**
b. **Predictors: (Constant), External Debt (U.S. $ 'Bn), Inflation rates, FDI (U.S. $ 'Bn), Interest rates, Forex rates**

Adapted from Tembo *et al*. (2023a)

differences between the predicted values and the actual values of y, which is the sum of squared deviations of the data around the regression line. The square root of the variance of residuals, 3.896, is 1.974, which is the standard error of the estimate. To estimate the regression equation, the coefficients table, Table 13 presents the least squares estimates of the intercept and slope of the regression line. Five values of regression weights (b, 0.638, -0.241, -0.334, -1.561, 0.577) are listed in column headed B, while the regression intercept is (a, 9.255). Respectively, the equation of the least squares is the therefore:

$y = 9.255 + 0.638x_1 - 0.241x_2 - 0.334x_3 - 1.561x_4 + 0.577x_5$…............................. [Equation 6]

In which x_1 = forex rates, x_2 = inflation rate, x_3 = interest rates, x_4 = FDI and x_5 = government debt.

- Validation of analytical aspect

The study corrected tender prices for 12 selected projects that case firms procured in 2015. Table 14 lists the selected contracts. Table 15 shows the utilization of the ordinary least square method to establish the annual optimum tender price for the year 2015 and OLS-generated coefficients.

The independent variables include inflation rate (10), the foreign exchange rate (8.63), foreign direct investment (U.S. $1.58 billion), External government debt (U.S. $8.08 billion), and interest rate (21.1). To illustrate, the computer-generated OLS equation ($Y = 9.255 + 0.638x_1 - 0.241x_2 - 0.334x_3 - 1.561x_4 + 0.577x_5$) determines the optimum tender price for the year 2015 to be ZMW7,499,320.00/km. By illustration, three factors, road length, price per kilometer, and annual optimum tender price, are later used to generate the

Table 13: Regression coefficients

Model[a]		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
Upgrading of roads to bituminous standards Periodic maintenance of feeder roads	(Constant)	9.255	8.105		1.142	.305	-11.581	30.091
	Forex rates	.638	.699	.388	.913	.403	-1.158	2.435
	Inflation rates	-.241	.262	-.225	-.920	.400	-.915	.433
	Interest rates	-.334	.385	-.314	-.868	.425	-1.325	.656
	FDI (US $'Bn)	-1.561	1.661	-.215	-.940	.390	-5.831	2.709
	External Debt (U.S. $ 'Bn)	.577	.447	.670	1.290	.253	-.573	1.727
Upgrading of roads to bituminous standards	(Constant)	.145	1.785		.081	.939	-4.812	5.101
	Forex rates	.022	.105	.222	.210	.844	-.270	.315
	Inflation rates	-.018	.043	-.201	-.430	.689	-.138	.101
	Interest rates	.007	.063	.057	.111	.917	-.168	.182
	External Debt (U.S. $ 'Bn)	.068	.079	.775	.854	.441	-.152	.287
	FDI (U.S. $ 'Bn)	-.010	.389	-.015	-.027	.980	-1.089	1.069

a. Dependent Variable: Tender-price (ZMW'million/km)

Adapted from Tembo *et al*. (2023a)

tender-price error (error =L (P-Y) as shown in Table 13. As a case in point, a negative error indicates a low tender price, while a positive error indicates a high tender price. Notably, the bid for upgrading Selected urban roads (20.02km) to the Bituminous standard of Mkushi in the Central Province indicated a tender price of ZMW123,142,060.36. The analysis in Table 15 shows the negative tender-price error of ZMW28,344,203.64.

Consequently, this is a low-priced bid such that the corrected tender price shows an upward adjustment to ZMW151,486,264.00. Whereas, the bid for upgrading of selected urban roads (9.6km) to the bituminous standard of Zambezi in the Northwestern Province by Roads and Paving Ltd at a tender price of ZMW129,403,184.05 gives a positive tender-price-error of ZMW57,409,712.05. The corrected tender price arising from this high-priced bid is ZMW71,993,472.00.

4.1.3 Descriptive (Qualitative) Aspect of the Model

The descriptive aspect of the model allows public institutions to monitor trends and track tender-pricing goals. Public institutions can utilize the descriptive aspect of performance in different strategies (strengths and weaknesses). Correspondingly, this aspect allows for generating results and obtaining long-term benefits through effective continuous improvement.

4.1.4 Descriptive of Model Components

Brief descriptions of each component of the model are as follows:

Tender-price level: This is the annual average of the previous year's tender prices per kilometer (in the case

Table 14: List of contracts reviewed

S/N	Contract name	Length (Km)	Contract sum (Zmk)	Award date
1	Upgrading of Isoka – Muyombe- Chama- Lundazi Road to Bituminous Standard in Eastern Province of Zambia Lot 4 (Muyombe Road Junction) to Lundazi (Km40+000 on D103) to (84 km)	84	585,556,978	December 2015
2	Upgrading of Isoka – Muyombe – Chama - Lundazi Road to Bituminous Standard in Eastern Province of Zambia Lot 5 (Muyombe Road Junction) to Lundazi (Km40+000 on D103) to (84Km)	84	417,108,471	December 2015
3	Construction of Mazabuka Bypass road	5	57,014,787.00	2015
4	Upgrading of Isoka – Muyombe – Chama - Lundazi Road to Bituminous Standard in Eastern Province of Zambia Lot 5 (Muyombe Road Junction) to Lundazi (Km40+000 on D103) and 15Km of Lusuntha	56	417,108,471.29	2015
5	Upgrading and realignment of Nakonde-Kanyala-Sansamwenje Road (M14/RD69)	83.9	367,218,609.29	2015
6	Upgrading of Nsemuka via Kayambi to Chozi to D001, including 18km from Chimba to Chitimukulu and 35km of selected urban roads in Mungwi District Lot 2	82	631,194,336.31	2015
7	Upgrading of Selected urban roads (15km) to Bituminous standard of Sinda in the Eastern Province	15	123,936,213.56	March 2015
8	Upgrading of Selected urban roads (20.02km) to the Bituminous standard of Mkushi in the Central Province	20.02	123,142,060.36	2015
9	Upgrading of Selected urban roads (11.4km) to the Bituminous standard of Kapiri Mposhi in the Central Province	11.4	109,660,183.91	2015
10	Upgrading of Selected urban roads (9.27km) to the Bituminous standard of Kasempa in the Northwestern Province	9.27	115,405,395.11	March 2015
11	Upgrading of Selected urban roads (20.5km) to the Bituminous standard of Solwezi in the Northwestern Province	20.5	220,867,715.90	March 2015
12	Upgrading of Selected urban roads (9.6km) to the Bituminous standard of Zambezi in the Northwestern Province	9.6	129,403,184.05	March 2015

Source: Authors

Table 15: OLS corrected tender price for each reviewed contract

S/N	Variable	Value = X	Regression coefficient (Rc)		Weighting = RcX (ZMW/Km)	
-	intercept	-	9.255		9.255	
1	Forex rates	8.63	0.638		5.50594	
2	Inflation rates	10	-0.241		-2.41	
3	Interest rates	21.1	-0.334		-7.0474	
4	FDI (US $'Bn)	1.58	-1.561		-2.46638	
5	External Debt (U.S. $ 'Bn)	8.08	0.577		4.66216	
2015 Annual optimum tender price (Y)		$Y = 9.255 + 0.638x_1 - 0.241x_2 - 0.334x_3 - 1.561x_4 + 0.577x_5$			7,499,320.00	
Length (Km) = L	Tendered Price (T.P.) ZMW	Price = (P) ZMW/Km	P-Y	error (e) = L(P-Y)	Comment on the tender price	Corrected TP = TP-e ZMW
84	585,556,978.00	6,970,916.40	(528,403.60)	(44,385,902.00)	low	629,942,880.00
84	417,108,471.00	4,965,577.04	(2,533,742.96)	(212,834,409.00)	low	629,942,880.00
5	57,014,787.00	11,402,957.40	3,903,637.40	19,518,187.00	high	37,496,600.00
56	417,108,471.29	7,448,365.56	(50,954.44)	(2,853,448.71)	low	419,961,920.00
83.9	367,218,609.29	4,376,860.66	(3,122,459.34)	(261,974,338.71)	low	629,192,948.00
82	631,194,336.31	7,697,491.91	198,171.91	16,250,096.31	high	614,944,240.00
15	123,936,213.56	8,262,414.24	763,094.24	11,446,413.56	high	112,489,800.00
20.2	123,142,060.36	6,096,141.60	(1,403,178.40)	(28,344,203.64)	low	151,486,264.00
11.4	109,660,183.91	9,619,314.38	2,119,994.38	24,167,935.91	high	85,492,248.00
9.27	115,405,395.11	12,449,341.44	4,950,021.44	45,886,698.71	high	69,518,696.40
20.5	220,867,715.90	10,774,034.92	3,274,714.92	67,131,655.90	high	153,736,060.00
9.6	129,403,184.05	13,479,498.34	5,980,178.34	57,409,712.05	high	71,993,472.00

of a road project, as is the case with this study). Therefore, the tender-price level is a suppositious measure of inclusive prices for an actual construction good or service set.

Tender-price improvement barriers include barriers to implementing adequate tender-price management controls, such as unrealistically low prices, corruption, poor documentation, and resistance to change.

Economic indicators or quantitative variables include measures of a country's macroeconomic performance, such as GDP, government debt, inflation, exchange rate, government budget, international trade, investment, prices, and balance of payments.

The ordinary Least Squares regression (OLS) method is a mathematical technique for estimating economic indicators' coefficients. It utilizes linear regression equations to describe their relationship with tender price.

Technical assistance: Technical assistance in obtaining targeted support from organizations or consultants with developmental knowledge regarding tender-price indices or identifying statistically applicable quantitative-independent variables.

Tender-price-level objectives are goals a public institution establishes to meet the central governments' and other stakeholders' construction tender-price needs and expectations.

Tender-price negotiations: This requests a better price, additional value formation, and favorable terms between the client and potential contractor.

Tender-price management practices: These are formal processes, working methods, innovations, work systems, and activities developed by public institutions to guide effective tender-price management direction and actions to influence and improve the behavior of tenderers. This study indicates that these shall be within the dominions of strategies related to the central government, procurement, existing legal framework, contractors, industry, and projects.

Tender-price management outcomes: Includes expected results that motivate price management practices and continual improvement.

Tender-price monitoring: This is a process of gathering intelligence through analysis and determination of tender-price internal and external variables to optimize management strategies and practices.

Tender-price evaluation: A process of evaluating the effectiveness and performance of tender-price management strategies and practices through identifying key performance indicators critical for successfully optimizing tender prices.

Tender-price improvement: A process of developing corrective and preventive actions through identifying causes to ensure the execution of public projects with even better prices than the best-quoted sector prices.

Tender-price controls: A set of actions that serve as a guideline for tender-price strategy implementation. These may include such things as formal tender-price documentation.

Tender-price rationalization: Changing the price level by ensuring a more goal-oriented pricing system centered on specific rules.

Validation of engineer's estimates: Certifying the accuracy of project cost estimates by verifying information and methods utilized during estimation.

Continual improvement: An ongoing process of continuously improving tender prices by seeking incremental, breakthrough improvements and other opportunities focusing on directing and concentrating effort.

4.1.5 The Distinctiveness of the Model

The model shows similarities to other developed models and their components, such as the model by Olatunji (2008). The study focuses on the conceptual development of the model that accentuates how to revise and refine algorithms to improve the degree of automation of bid data and results accuracy. Although the model shows statistical invalidity for small sample sizes (due to the use of averages in this example), it does not involve solving complex equations and is less time-consuming. The model allows for continuous improvement due to its easy incorporation of new information. It gives the model unlimited prediction capabilities while accounting for various correlations between volatilities.

Moreover, the model quickly forecasts accumulated time series and accounts for the effects of extant price levels while accounting for the sociopolitical strategies of public project implementation. Based on the conceptual framework in Figure 2, the proposed model consists of two integrated components. The model is helpful to clients (mainly public institutions), contractors, and consultants in bridging contemporary gaps regarding tender price inflation.

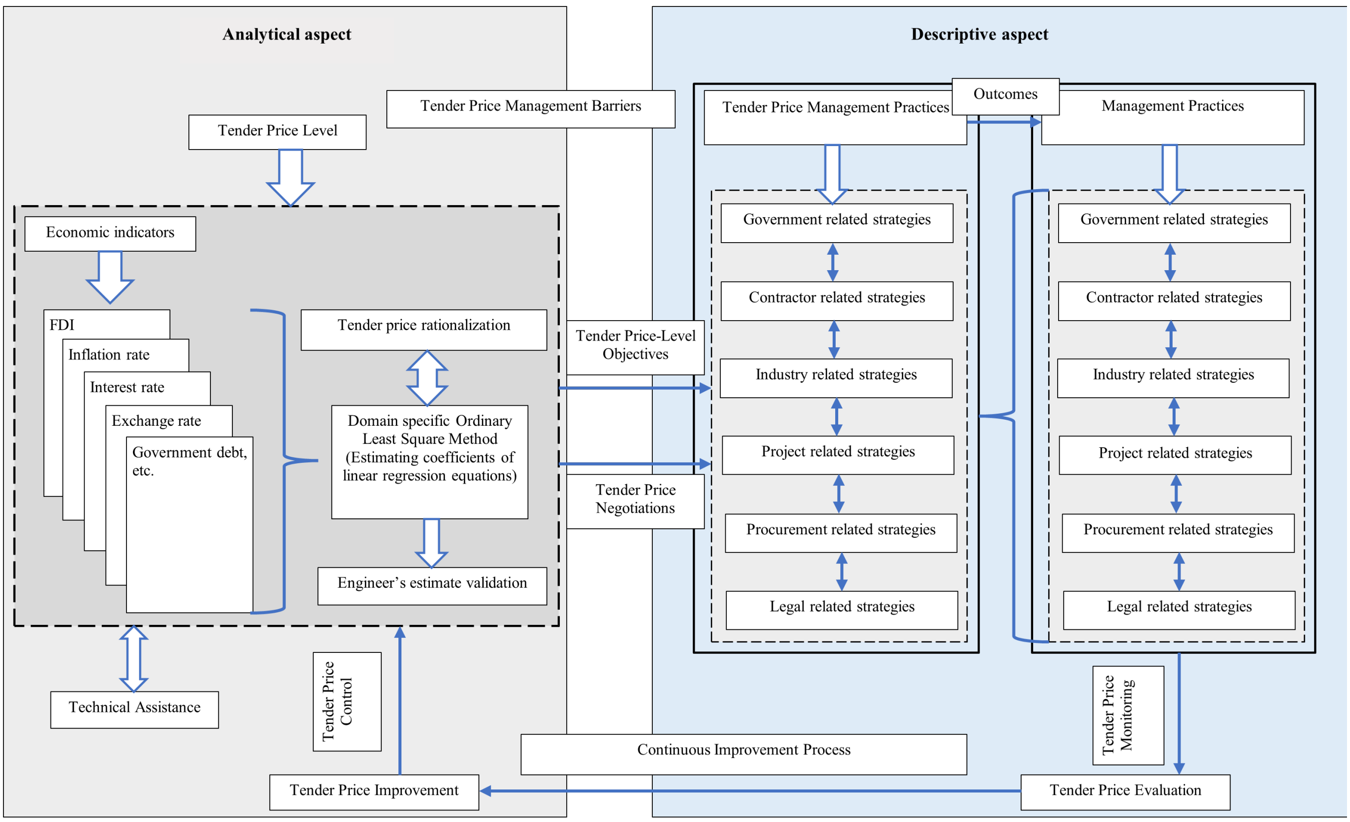

Figure 2: Proposed Integrated Model for Tender-Price Management
Source: Authors

Table 16: Background information of respondents

Category of Practice	Frequency	Percentage
Client (Public Sector)	9	47.37
Consultant	6	31.58
Contractor	4	21.05
Total	19	100

Source: Authors

4.1.6 Model Validation

The study utilized nested sampling to determine a sample size of 20 critical informants to validate the model. Of the 20 key informants, only 19 returned the online questionnaire, bringing the response rate to 95%. Accordingly, a high nested response rate for this study is essential as representativeness affects the validity of findings (Goodwin et al., 2020). Table 16 shows that 47.37% of critical informants characterize clients in the public sector, with consultants (31.58%) and contractors (21.05%).

Table 17 shows that the results of the validation exercise are probably reliable due to low standard deviations (between 0.496 and 0.653) obtained across critical validation elements. Based on normal distribution, 70% of these observations lie within one standard deviation of their mean. Overall, the results show a mean of 3.35 and a 0.57 standard deviation across all model price management and implementation elements. This indicates that 68% of experts in the industry agree that the model is client-focused, inspires stakeholder engagement, facilitates the process and information-based decision-making, and improves tender-price management. Regarding the focus of the tender-price management model, results show a mean of 2.95 and a standard deviation of 0.62. Only 30% of industry experts disagree that the model is client-focused.

However, the model shows effective stakeholder engagement with a mean of 3.26 and a standard deviation of 0.65. It reflects 70% of an effective stakeholder-engagement structure within the Zambian public construction sector on the improvement of tender-price management, a higher mean of 3.32 and a standard deviation of 0.58. 68% of experts agree the model offers some intrinsic improvements to tender-price management in public infrastructure delivery. It establishes that all responses are statistically significant at $p<0.05$, echoing a high standard of validity, acceptability, and usefulness.

In identifying factors affecting the implementation of the model, key informants reveal the following:

1. Lack of mechanisms for working out costs from basic prices.
2. Failure by state institutions to make adequate budget provisions.
3. Procurement-related problems and
4. Failure to ring-fence project funds.

The key experts recognized the following considerations for the functionality of the model:

1. Foreign contractors must increase knowledge and equipment ownership transfer as they participate with local firms that may not have technical and equipment capacity.
2. The government should encourage or form construction sector banks with lower borrowing rates to support the local construction companies.
3. Need to develop solicitation documents that respond to the needs of clients/owners.
4. The procurement staff of the client/owner must be fully knowledgeable of construction project management.
5. Project monitoring should be encouraged through clients' M&E teams. Must develop an award-and-penalty regime for those who comply, exceed requirements, and fail to comply.

The paper discusses the study's results on construction tender-price management and attempts to rationalize perceived rising construction tender prices in Zambia. The discussion considers other literal research findings, construction experts in the sector, and documentary reviews. The debate emphasizes three inherent results:

1. There is a need to identify and manage country-specific factors affecting construction infrastructure management.
2. There is a need to identify and weave together industry-specific strategies for addressing tender-price inflation and perceived inflation.
3. The model developed by this study needs to be adopted because of its unlimited prediction capabilities and implementation flexibility.

Table 17: Implementation of the tender-price management system

S/N	Critical elements of the validation exercise	Strongly agree (%)	Agree (%)	Disagree (%)	Strongly disagree (%)	Mean	Std. Deviation	Std. Error Mean	t	Sig. (2-tailed)
1	Implementation of the model is client-focused	15.79	63.16	21.05	0	2.95	0.621	0.143	20.679	0.000
2	Implementation of the model enables the engagement of industry players	36.84	52.63	10.53	0	3.26	0.653	0.150	21.770	0.000
3	The model enables a process-based approach	63.16	36.84	0	0	3.63	0.496	0.114	31.941	0.000
4	The model is an improvement on tender-price management systems	36.84	52.63	5.26	0	3.32	0.582	0.134	24.817	0.000
5	The model enables evidence-based decision making	57.89	42.11	0	0	3.58	0.507	0.116	30.754	0.000
***1 = strongly disagree … 4 = strongly agree *Valid N (listwise) = 17 *Significant at p<0.05**										

Source: Authors

6. Conclusion

The model integrates analytical (quantitative features based on economic factors) and descriptive (qualitative characteristics based on sociopolitical factors) aspects of tender-price inflation. The combined quantitative factors and variables utilize the equations of ordinary least squares (OLS) to determine an optimum domain-specific tender price, while the qualitative base integrates sociopolitical strategies. Combining the two platforms provides the model with a low inflation tender-price output. The model is versatile and adaptable. The quantitative aspect of the model does not require any external content management systems (CMSs) and is programmable to support web-based solutions. The model requires comprehensive data collection regarding public construction projects to establish a database or an information management system. The model functions correctly in both validation steps, as the corrected tender price obeys operational principles set out in the assumptions. It confirms that further investigations into the model behavior are not necessary. However, the model requires many datasets to guarantee improvement in its tender-price prediction and statistical significance of input variables.

The study's findings have significant implications for practice in the construction industry. First, the proposed model, with its low variability in tender price outputs, offers a tool for enhanced cost predictability. This allows contractors, clients, and project managers to forecast project costs with greater accuracy, leading to more efficient resource allocation and improved financial planning. Additionally, by addressing both economic and socio-political factors, the model provides a comprehensive strategy for managing price fluctuations, which is critical in markets where political and economic instability often disrupt construction projects. Moreover, the study's focus on risk management strategies—such as incorporating market dynamics into price modeling and enhancing procurement processes—demonstrates practical ways to mitigate tender price inflation. These insights could influence policy reforms in the public sector, ensuring more transparent and stable governance practices in the tendering process. For industry professionals, the findings underscore the importance of developing flexible pricing strategies that account for both internal project conditions and external economic forces, fostering more sustainable construction practices in Zambia and similar developing economies.

7. Recommendations

Based on conclusions, the main recommendation of this study include:

1. Compulsory use of engineer's estimates.
2. Adoption of the integrated model for public sector construction management.
3. Establishment and updating of domain-specific databases or information management systems for variables.
4. Calibration of the model for use in specific type and nature of project or work description thereof.

8. Limitations

When interpreting the findings, consider the following limitations of the study:

1. The analytical aspect of the model (OLS equations) developed from case firms evaluates, in particular, two leading performance indicators on road infrastructure: length (Km) and tender price (Zambian Kwacha - ZMW).
2. The lack of detailed project data from case firms led to the use of limited factors such as length and tendered prices only. More specific information regarding road width, layer thickness, loading capacity, number and type of culverts, and number and type of bridges would have permitted better project categorization for analyzing more similar projects and significantly improved model prediction. However, the study took caution in using such available data to successfully demonstrate the model's operational principles.
3. The analytical aspect of the model, specifically the OLS equations, is limited to road sector information obtained from case firms. Thus, the study findings only apply to other projects after developing domain-specific OLS equations. It requires more refined categorization regarding the type of project, work description, and their respective tendered prices reflected. It implies that OLS findings of a category of tasks, such as a kilometer of a specified road section, are not generalizable for, e.g., bridges or buildings.

9. Practical Implications

Providing a construction model with low inflation in tender-price output has several practical implications, particularly in the areas of cost estimation, project management, and stakeholder confidence. Key practical benefits include:

1. Improved Cost Predictability: A model that reduces inflation in tender prices enables more accurate budgeting, helping stakeholders plan projects with a higher degree of financial certainty. This reduces the risk of cost overruns and allows for better resource allocation. The model developed through this study offers a tool that significantly improves the predictability of tender prices, allowing government agencies and construction firms to plan more effectively and allocate resources with greater confidence. By integrating both economic and socio-political factors, the model helps project managers and policymakers forecast tender price inflation more accurately and develop risk mitigation strategies.
2. Enhanced Stakeholder Confidence: With predictable tender prices, clients, contractors, and financiers are more likely to trust the bidding process and the viability of the project. This fosters a more stable environment for collaboration and investment.
3. Competitive Bidding: Low inflation in tender prices ensures that bids are more competitive and reflect realistic project costs, minimizing the chances of underbidding (which could lead to project failure) or overbidding (which could reduce a company's chances of securing a project).
4. Efficient Resource Allocation: Accurate cost models allow for better planning and allocation of resources such as labor, materials, and equipment. This helps in avoiding resource wastage or shortages during the project lifecycle.
5. Risk Mitigation: A model that minimizes cost deviations also reduces the potential financial risk for both the contractor and the client. With fewer price fluctuations, projects can proceed with greater assurance of staying within budget, thereby minimizing the need for contract renegotiations or amendments.
6. Enhanced Tender Price Management: For practitioners in the public procurement and construction sectors, the model provides a comprehensive framework for managing tender price variability, reducing the risk of cost overruns and ensuring that project budgets are more reliable. The application of OLS regression alongside qualitative socio-political insights allows practitioners to account for market volatility, enabling better budget management.
7. Policy Formulation and Governance: Government agencies can use the findings to reform tendering processes by incorporating the identified socio-political factors. The insights gained from this study suggest that more transparent and stable governance practices can reduce tender price volatility, making infrastructure development more sustainable and cost-effective.

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Appendix

Table 8: Tender management strategies

Sector group	Code	Descriptions based on the interviewee's quote	Quantitative Likert-scale statements	Model Fitting Criteria (-2 Log Likelihood of Reduced Model)	Likelihood Ratio Tests (Chi-Square)	Mean	Sig.	Log-likelihood score ranking	Selected Strategy (significant at p<0.05)
Theme 1: What strategies can the government deploy to address tender price inflation?									
Government strategy	GD10	Adapt and change behaviour following prevailing circumstances.	Adopting innovative system	99.466	5.847	3.96	*0.054	1	GD10
	GD4	Invest in information management to support and implement appropriate estimation models and processes. Apply appropriate industry comparators.	Benchmarking price performance	98.926	5.306	4.09	0.070	2	
	GD7	Employ competitive processes that result in desired outcomes.	Improving procurement methods	96.252	2.633	4.32	0.268	3	
	GD3	Consider capacity provision through training programs for local contractors and adopting lean concepts and principles.	Ensuring Continuous capability and capacity enhancement	94.809	1.190	4.22	0.552	4	
Theme 2: What strategies can the contractor deploy to address tender price inflation?									
Contractor strategy	CD1	Develop expertise to perform construction project-related tasks efficiently and costly.	Improving technical ability	107.294	13.675	4.17	*0.001	1	CD1 CD5
	CD5	Develop a competitive advantage through a collection of resources and possessions. Utilize the company's existing internal resources to create strategies and develop the potential for creating a competitive advantage.	Developing resource capabilities	104.591	10.972	4.08	*0.004	2	
	CD7	Develop an understanding of the series of steps and activities involved in procurement.	Developing knowledge of procurement processes	98.147	4.528	4.28	0.104	3	
	CD3	Endeavour to keep expenses low to generate efficient profit margins without worsening the clients' financial or economic results.	Managing profit margin estimations	97.523	3.903	4.05	0.142	4	
	CD2	Ensure delivery of complex projects on time by developing desired capacity and ability to perform—endeavour to employ competent and qualified personnel.	Improving the qualification and competence of the contractor	95.639	2.020	4.12	0.364	5	
Theme 3: What strategies can the industry deploy to address tender price inflation?									
Industry strategy	ID9	Develop strategies for positive stakeholder participation and ensure the timely availability of resources.	Removing industry uncertainty	101.034	7.415	4.20	*0.025	1	ID9 ID14 ID8
	ID14	Develop frameworks that sustain high economic growth levels. Identify and address factors leading to the sector's prolonged state of decline. Improve supply chain management, which builds long-term supplier alliances.	Instilling sector confidence	100.154	6.535	4.13	*0.038	2	
	ID8	Develop deliberate equipment ownership policy and equipment ownership systems.	Encouraging ownership of equipment	99.930	6.311	4.09	*0.043	3	
	ID10	Improve the quality of specification and design.	Managing the number of competitors	97.886	4.267	4.27	0.118	4	
	ID3	Reduce the cost of borrowing. Reconcile interest rates with project cost before tendering.	Mitigating interest rate impacts	95.799	2.179	4.29	0.336	5	
	ID5	Maintain the value of the local currency to guarantee the economic performance of a project and its stakeholders. Maximize utilization of local building materials.	Reducing imports	95.439	1.820	4.14	0.403	6	
	ID1	Understand the justifications for protecting local participation in the industry and developing protectionism policies.	Ensuring the protection of local firms	95.183	1.564	4.19	0.458	7	

	ID12	Disseminate information regarding market fundamentals to guarantee results and reduce the need to recreate the wheel at each tender.	Ensuring market predictability	94.978	1.359	4.16	0.507	8	
	ID17	Develop structured assessment tools to gauge the efficacy of contractors and the workforce. Encourage contractor-management training programs to increase competency and capacity among local contractors.	Providing training	94.668	1.048	4.35	0.592	9	
Theme 4: What strategies can the project deploy to address tender price inflation?									
Project strategy	PD12	Anticipate constraints before tendering the project.	Mitigating risk factors at inception	102.229	8.610	4.34	*0.014	1	PD12 PD10 PD1
	PD10	Ensure implementation of adequate cost controls and management practices.	Mitigating project costs	100.415	6.795	4.31	*0.033	2	
	PD1	Prepare practical and realistic project schedules with a limited timeframe and minimum cost implication.	Upholding project duration specifications	99.923	6.304	4.33	*0.043	3	
	PD5	Encourage good communication regarding the progress of different projects and construction material management. Give special attention to material estimates and handling.	Mitigating the impact of material-price escalations	99.536	5.916	4.20	0.052	4	
	PD4	Develop practical project, scope-managed models. Ensure informed decision-making through project scope.	Clarify the scope of the project from inception	98.405	4.786	4.23	0.091	5	
	PD6	Pursue efficient utilization of equipment. Ensure utilization of advanced and contractor-owned equipment.	Accounting for nature and type of equipment	95.586	1.967	4.06	0.374	6	
	PD13	Anticipate and mitigate the risk of negative stakeholder involvement.	Accounting for the project environment	95.355	1.735	4.17	0.420	7	
	PD11	Develop an efficient overall approach to the project that specifies the tools, equipment, resources, expertise, and implementation techniques.	Accounting for the complexity of the works	95.212	1.593	4.24	0.451	8	
	PD9	Provide possibilities for price adjustment and clearly define necessitating circumstances.	Providing clauses for project variations/price adjustments	94.846	1.227	4.33	0.541	9	
Theme 5: What strategies can the procurement function deploy to address tender price inflation?									
Procurement strategy	MD3	Engage consultants for technical assistance, price assessments, and project evaluation services.	Ensuring the presence & experience of the consultant	102.067	8.448	4.22	*0.015	1	MD3
	MD8	Identify and consolidate requirements and determine the cost-effective timeframe.	Standardizing Procurement timeframe	97.249	3.629	4.25	0.163	2	
	MD7	Develop a project management plan outlining exact courses of action and implementation initiatives.	Establishing project implementation methodology	94.823	1.203	4.26	0.548	3	
	MD4	Develop client project management assessments and project control tools.	Establishing technical & financial controls	94.720	1.101	4.29	0.577	4	
Theme 6: What strategies can the legal function deploy to address tender price inflation?									
Legal strategy	LD2	Provide mathematical descriptions of how changes in the project-item-related factors result in a particular rate.	Legislating rate analysis	99.755	6.136	4.00	*0.047		LD2
	LD3	Provide regulation for establishing a streamlined procurement structure, responsibility, and clear lines of authority.	Legislating procurement controls	97.169	3.550	4.14	0.169		
	LD6	Provide domesticated contract forms that respond to prevailing circumstances.	Domesticating contract type	94.801	1.181	4.14	0.554		
df =147 d. N=147									

*Statistically significant at $p<0.05$
The chi-square statistic is the difference in -2 log-likelihoods between the final and reduced models. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.
Cronbachs Alphas = 0.988