Journal of Construction Project Management and Innovation, 13(1): 19-44, 2023
DOI: 10.36615/jcpmi.v13i1.2401
ISSN 2223-7852

# Public Sector Contracting Model for Management of Construction Tender Price Volatility

**Moffat Tembo*[1], Charles Kahanji[2] and Erastus Misheng'u Mwanaumo[3]**

[1&2]Department of Civil and Environmental Engineering, University of Zambia, Zambia
[3]Department of Civil Engineering, College of Science, Engineering and Technology, University of South Africa

*Email: tembomoffat@yahoo.com

## ABSTRACT

Construction tender price volatility threatens desirable infrastructure push in the public sector. The damaging effects of escalating tender prices outweigh the socioeconomic benefits of such infrastructure. If not addressed, this harmful effect destroys construction sector productivity, causing it to lag behind other economic sectors, thereby decreasing its value in the national economy. Contractors use price to mitigate procurement and client-related risks at the tendering stage. The trend requires developing and implementing procurement strategies that consider price control implications at the project tendering phase, leading to the development of contract delivery models that inadequately address the impact and potential value of pricing in construction projects. This research focuses on implementing procurement strategies by developing a public sector contracting model considering price reduction implications at the project tendering phase. The study investigates pricing behaviours regarding implementing current contracting delivery models in Zambia and develops a conceptual model for managing tender price variability in the public construction sector. The study achieved this through a comprehensive literature review followed by semi-structured interviews with 14 purposively and snowball-sampled industry experts. The study utilises person-to-person interviews to collect data from interviewing 14 purposive identified respondents to attain relevant research results. The findings show that governments can maximise social gains from an infrastructure project by deriving accurate technical parameters and optimising procurement. The study identifies four pricing behaviours demonstrated by contractors during tendering: resistance, reactive, anticipatory, and Consultant-based. Consultant-based pricing was the least practised behaviour, whereas reactive was the most established among all behaviours. Emergent patterns for turnaround strategies include cost estimating and financing, mitigating external and internal interferences, providing incentives, providing training, and encouraging innovations. Others include revising legislation, contextualising procurement functions, improving project management practices, predicting market forces, and guaranteeing sustainability. The study further proposes the conceptual Negotiated Construction Approach (NCA) for public projects that summarises and weaves together identified strategies.

**Keywords:** Construction, contracting model, public sector, tender price

## 1. INTRODUCTION

Despite the spate of studies aimed at improving construction management practices in Zambia, difficulties still plague the construction industry (Zulu and Muleya, 2018; Zulu et al., 2022; Tembo et al., 2023a; Aigbavboa et al., 2018; Silwimba and Mwiya, 2017; Cheelo and Liebenthal, 2018; Chilongo and Mbetwa, 2017; Chiponde et al., 2017). Notable studies (particularly those by Zulu et al., 2022; Sibanyama et al., 2012; Tembo et al., 2023b) have identified challenges associated with implementing public projects. The public construction sector in Zambia formally exhibits relationships governed by contracts. However,

accompanying these relationships between the government and the contractors are informal practices that progress to characterise unforeseen project implementation difficulties.

Tender price variability profoundly influences the financial sustainability of the construction sector. Joukar (2016) and Tembo et al. (2023a) discussed the challenges associated with tender price variability in construction. Tembo et al. (2023a) demonstrates that the effects of the management of tender price volatility are across multiple fundamental dimensions, including the government, the contractors, the industry, the procurement, and the legal framework. Public sector project delivery does not realise how to use the synergies between procurement or contracting activities and existing market risks to manage the tender price. Therefore, public sector institutions use generic procurement and contracting strategies that do not reflect specific national responses to challenges regarding construction price volatility. These contracting strategies often lack precise specifications, reflecting national construction tender price difficulties, among other things. The study aims to develop a unique contracting model for public sector construction project procurement in which price and quality control are critical. This research, therefore, adds to the scientific knowledge, eventually informing management practice in the public construction sector and consequently providing strong empirical and theoretical support to tender price-oriented research. The study investigates factors affecting tender price determination in construction and current tender price controls in practice. The paper carries with it a particular focus on contractors' prices for construction at tendering and highlights influential risk-related factors.

The study predicates that contractors use price to mitigate procurement-related risks at the tendering stage. Further, this research focuses on implementing procurement strategies considering price reduction implications at the project tendering phase. Ignoring this construction attribute leads to the development of contract delivery models that inadequately address the impact and potential value of pricing in construction projects. Therefore, they fail to establish possible strategies to overcome tender pricing variability.

## 2. LITERATURE REVIEW

The construction sector uses construction cost or tender price indices to monitor price movements. This monitoring measures relative change over time in construction materials prices. Cruywagen (2014, p. 25) argues that several "factors influence the establishment and composition of the relevant tender price index." Such factors include the availability of data, selection of items to consider from the bills of quantities, selection of base year or period, choices of weights, and construction method. All these factors begin to affect the accuracy of the index. Once established, the index works as a deflator for construction prices. In a free market, the bidder presents an item price uniquely dependent on the construction technique (Cattell, et al., 2010). Through a literature review, this paper aims to identify better, more effective, and more informed scientific fundamentals for price management by contractors and clients.

### 2.1 Tender price inflation and volatility in Zambia

Zambia struggles with construction price inflation, hallmarked by a general increase in prices of works over time (Olabisi, 2022). Historic perceived increases in construction prices and project spending contribute to unsustainable infrastructure development costs in the country. While drivers of variable construction tender prices need further documentation and studying, impacts are already noticeable. Trapped in the government's push for development are citizens of whom too many question the benefits of, or who benefits from, undertaking these public projects. In addition, society is concerned about how a government affords such spending considering the complexity and diverse nature of the sector, making it challenging to address variable tender prices while encouraging infrastructure development

programs. Over nine years, Tembo et al. (2023b) identified and analysed tender pricing behaviours for upgrading roads to bituminous standards. They noted between 2012 and 2021, tender prices for periodic maintenance of feeder roads increased by an average of 49.7% per annum. For unpaved roads (periodic maintenance), construction tender prices increased by K1,461,018.8/km from K1,438,825.8/km in 2012 to K1,623,899.1/km in 2021, as shown in Figure 1.

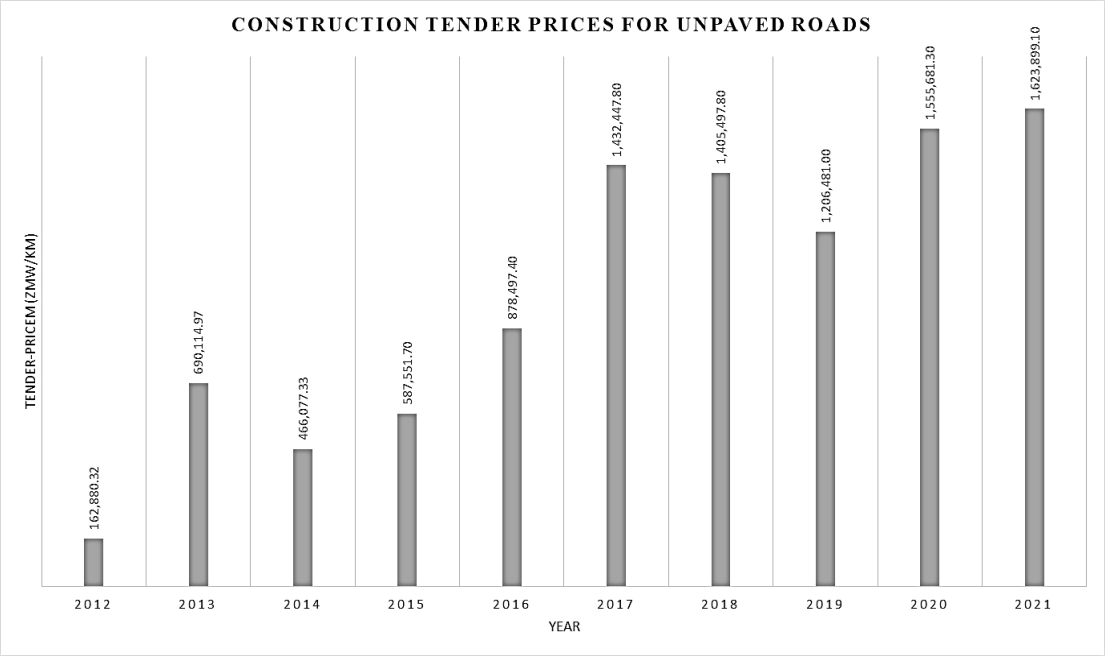


**Figure 1**: Construction tender prices for periodic maintenance of feeder roads (2012-2021) (adapted from Tembo et al. 2023b, p. 35)

### 2.2 Factors affecting tender price management

Tender price management is an essential consideration for bid success; however, complex pricing interrelationships make it much easier to generally express construction project success in terms of cost and budget variance (Yismalet & Patel, 2018). This trend, over time, has shifted the long-term focus to project cost management processes. In addition, research shows that project success depends on mitigating factors affecting tender pricing at the procurement stage. Aje et al. (2016) determined fifteen (15) factors that influenced the success rate of contractors in competitive bidding concerning tender price, which included material availability, labour productivity, and profit as the most significant. These factors highly influence construction tender price (at the tendering stage) and later significantly affect contractors' performance.

Construction projects face numerous unpredictable factors. Gudienė et al. (2013, p. 397) identified and classified these factors into seven influential groups: "external factors, institutional factors, project-related factors, project team management-related factors, project manager-related factors, client-related factors, and contractor-related factors." To investigate how these factors influenced the success of a construction project, they developed a conceptual model that grouped the project success factors. However, they did not perform a factor analysis to investigate the underlying relationships among the elements. Project price is not among the factors identified for a possible multi-criteria analysis of alternatives for selecting a successful project.

**Table 1:** Factors affecting tender price in construction

| Factor(s) | Postulation | Author |
|---|---|---|
| Nature of competition | Firms raise prices in competitive markets | Chalkidou, et al. (2020) |
| Inflation rate | The inflation rate helps predict the bid price | Oghenekevwe, et al. (2014) |
| Macroeconomic factors | Price volatility is dependent on macroeconomic factors | Alireza, et al. (2016) |
| Material cost | Construction prices are a function of many factors, including material costs | Gransberg and Kelly (2008), Al-Zarrad, et al. (2015), Tembo-Silungwe and Khatleli (2017), Ramanathan et al. (2012) |
| Profit margin | Adopting high prices has a direct and positive impact on profit margin | Toni et al. (2017) |
| Size of a construction company | Larger companies have a greater capacity to influence prices in the industry | Toni et al. (2017) |
| Reputation of client | Contractors inflate tender prices for clients reputed for delayed payments | Ye and Abdul-Rahman (2010) |
| Level of construction activity | A boom in construction activity is significantly associated with a general increase in construction prices | Cruywagen (2014) |
| Unbalanced bidding | The practice of unbalanced bidding comes as a possible added cost to the project | Skitmore and Cattell (2013) |
| | Unbalanced bidding contaminates the database of previous tenders that clients often use to establish and estimate the cost of a project | Molenaar, et al. (2011) |
| | Unbalanced bidding is a common practice by contractors in determining prices in construction | Cattell, et al. (2007) |
| Degree and level of competition | The level of competition has an impact on the bid price | Lawrence (2003) |
| Nature of construction work | The nature of construction is critical in the development of bid price | Lawrence (2003) |
| Number of competitors | The number of participants has a direct impact on the bidders' final price | Raventós and Zolezzi (2015) |
| Pricing policies | Pricing policy can influence the profitability of an organisation | Toni et al. (2017) |
| Experience in a construction company | Emerging contractors exhibit inadequacies in tender price estimation | Seeletse and Ladzani (2012) |
| Engineer's estimate | Benchmarking engineer's estimate during the evaluation of bids | Su et al. (2020) |
| Project quality level | The increase in price offered by the client encourages contractors to provide a better-quality product | Yu et al. (2013) |
| Direct cost drivers (Labor, equipment, plant, etc.) | Cost drivers are crucial in the compilation of tender price | Seeletse and Ladzani (2012) |
| 1. Reduced bureaucracy,<br>2. higher corruption rate,<br>3. poor business environment | It is hardly possible to construct lower prices with a higher corruption rate, high bureaucracy, and poor business environment | Grega and Nemec (2015) |
| Procurement method | The procurement method is a significant qualitative factor affecting project cost | Ali (2018) |
| Exchange rate volatility | The exchange rate is the leading indicator that influences the price of goods and services | Morina, et al. (2020) |
| Regulation and control | Price floor regulations have long-term effects on the structure of the market by creating endogenous barriers that can even lower prices | Carranza, et al. (2015) |
| Dependency on imported materials | Import tariffs have an almost immediate effect on prices | Amiti et al. (2019) |
| Interest rate | Changes in the interest rates affect macroeconomic variables such as price level | Li Suyuan and Khurshid (2015) |

| | | |
|---|---|---|
| Globalisation | The integration of world markets has general equilibrium implications on product's relative prices | Farahane and Heshmati (2020) |
| Location and control of the site | 1. Cost estimating is used more for project control than planning and evaluation<br>2. The project location is one of the significant factors affecting the accuracy of cost estimation | Akintoye and Fitzgerald (2000) |
| Tender duration | If the timeframe is inadequate, contractors will lack time to carry out a proper analysis of the project, thereby leading to contractors overpricing their tender to make up for unforeseen risks | Knowles (1997) |

Source: Authors' compilation

### 2.3 Risk-related factors during pricing in construction

Evaluating bids is through a variety of criteria, but the key shared among the criteria is the total bid price; usually, considerations are that choosing a bidder with the lowest price is most beneficial to the client (Jaśkowski & Czarnigowska, 2019). All while overlooking facts that the practice results in low quality of works, claims, disputes, time overruns, bid-rigging, increased costs, unrealistically low prices, and collusion. There are related factors in the pricing of each item in construction (Azizi & Aboelmagd, 2019). The main challenges to contractors come with identification methods by which the risk rate can be measured within an item price loading and achieving the highest profitability while accepting the most negligible risks (Azizi & Aboelmagd, 2019). Another concern when pricing for a bid is that the awarding of a construction contract depends on the total bid price. Especially without considering the variations in the item's unit price, a scenario in which contractors deliberately manipulate unit actors (Nikpour, et al., 2017). Olawale and Sun (2010) found that price inflation was one of the significant factors that affected cost control on a project. Furthermore, they argued that price fluctuation and inaccurate estimates were the top variables causing cost overruns on a project.

The ability to deploy strategies productively and effectively has a cost-decreasing impact. In the public-construction sector, developing and setting appropriate tender conditions following an in-depth investigation of how the factors affecting pricing mechanisms correlate enhance this ability. Table 1 show factors obtained through the literature review that affect bid pricing decision in the construction sector. When risk factors are uncertain on a project, contractors face the challenge or problem of deciding the bidding price for construction. The existing theoretical principles of project risk management lack more realistic considerations. This situation leads to unclearly allocated and unreasonably priced risks at the project onset (Zhang, et al., 2006). At the tendering stage, one of the main risks for consideration is the financial position of the client in such a manner as being unable to pay the contractor on time, A scenario often leading to project delays and wrong cost estimations (Naji & Ali, 2017). The failure of a construction firm to fully consider or estimate the risk event on a construction project could have a disastrous impact. Construction enterprises are conscious of this scenario, and due to a lack of appropriate knowledge on risk pricing and mitigation measures, they often subsequently overestimate their markups. This practice causes construction prices to escalate over time.

Laryea and 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. The argument is on efficient pricing for risk while encountering and estimating various contingencies. Contractors remain aware of the nature of the construction industry in which all competitors are "hungry for a job" such that if they were

to consider and price for all realistic contingencies, they would remain uncompetitive. Table 2 shows some risk factors contractors must contend with during bidding pricing.

**Table 2:** Risk-related factors during pricing in construction

| Risk factor(s) | Author |
|---|---|
| Value of liquidated damages | Towner and Baccarini (2012) |
| Clients' financial state | Naji and Ali (2017) |
| Project cost risk (range between 2.7% and 8.7% of project cost) | Xu (2014), Brokbals, et al. (2019) |
| Technical information or detailed specifications | Nketekete, et al. (2016) |
| Practical knowledge of the construction process | Akintoye and Fitzgerald (2000) |
| Contractor size | Dulaimi and Shan (2002) |
| Market competition | Laryea and Hughes (2008) |
| Contingency additions | Dada and Jagboro (2007) |
| Apportionment of contractual responsibilities | Al-Ajmi and Makinde (2018) |
| 1. Material availability<br>2. Labor productivity | Aje et al. (2016) |
| Project scope | Dziadosz et al. (2015) |

Source: Authors' compilation

### 2.4. Contracting delivery models in construction

Paek and Lee (1993) proposed a risk pricing method for analysing and pricing construction projects, which consisted of identifying risk factors and pricing for their consequences. They suggested using a fuzzy set approach to quantify the implications and directly incorporate them into the bid price. Their research developed a framework for assisting contractors in making valid estimations in uncertainty through their risk-pricing method. They adopted a fuzzy set theory to present a risk-based pricing algorithm and computer-based software. However, since the selection of risk factors is project-specific, the algorithm could not formulate generalisations. Therefore, it is advisable to price all risk elements whose consequences might fatally flaw the project identification during the tendering phase (Paek & Lee, 1993). However, Laryea and Hughes (2008) argued that most models and pricing methods are desk-based and lack knowledge of what contractors do during the bid pricing stage.

The dilemma with competitive bidding is that the bid price must be low enough to win the bid yet high enough to ensure the contractor's profitability and reasonably sufficient to guarantee the quality of work. That is when the cost estimation function becomes essential, as it is the basis for most contractors to build their tender price (Akintoye & Fitzgerald, 2000). It is equally imperative to note that the availability of funds influences the client's decision to award a contract, the contractor's price, as well as prices of other contractors. Excessively, the parties in construction view construction price through the understanding of and emphasis on project cost. Hence, related approaches to price control are cost control measures through contracting delivery models (Table 3). Clients resort to employing delivery models such as EPC to manage construction prices and are slightly more regular (Zhong, 2011).

### 2.5. Effects of a contracting model on cost level

Initiating procurement quality controls generates improved competitiveness from a price viewpoint through the value-added competencies of the procurement function. In construction, procurement quality controls allow for significantly high procurement performance, leading to the best possible price to meet the client's needs (Munyimi, 2019). However, procurement functions in the public face numerous challenges. Unique challenges include a significant lack of empirical research on the impact of public procurement systems on price or cost levels in the construction sector. However, Gray et al. (2020) argue that current procurement decisions are too focused on cost minimisation at the expense of stakeholder value. They propose a new approach known as "total value contribution" as an

extension of "total cost of ownership" methods that broaden the factors during a procurement exercise. They argued that putting value first through procurement would increase organisational outcomes. The effects of a contracting model in construction are summarised as follows (Gray et al., 2020; Munyimi, 2019)

i. Improved organisation outcome
ii. Improved firm interrelations
iii. Betterment of society
iv. Improved project performance
v. Improved value for money

**Table 3:** Contracting delivery models in construction

| Contracting model | Practice | Success factors | Cost control measure | Author(s) | Constraints |
|---|---|---|---|---|---|
| Engineering, procurement, and construction (EPC) model | The contractor takes control of engineering, procurement, and construction and takes full responsibility for the quality, safety, construction cost, and construction period | 1. Address time constraints in project delivery<br>2. Utilisation of contractors' design capabilities and technical experience<br>3. Single point responsibility | Preventive | Zhong (2011) | 1. Enhanced difficulties in client's control of project price due to reduced participation |
| Engineering, procurement, and construction management (EPCM) model | The contractor takes control of the designing and management of the project for the client on a reimbursable basis | 1. Pays on actual costs basis at pre-agreed rates<br>2. Multiple point responsibility | Organisational | Fentona, et al. (2016), Altemirova and Burenina (2021), Chattopadhyay and Mo (2010) | 1. The client bears responsibility for cost overruns and outturns<br>2. Not ideal if social and technical issues characterise the client |
| Project Management Contractor (PCM) model | The client engages a contractor or a project manager to assist with management aspects of the project delivery process | 1. Efficient project management<br>2. Efficient cost estimation strategies<br>3. Efficient knowledge-sharing management<br>4. Realistic correlation between cost and quality | Organisational | Tatum (1979), Golini, et al. (2017) | 1. It does not guarantee the overall price or quality of the project |
| Early Contractor Involvement (ECI) Model | Involves procuring a contractor in the preliminary design stage of the project | 1. Allows for contractors' contribution and influence on a major decision<br>2. Transfer of manageable risks to the contractor | Organisational | Wondimu, et al. (2016), Walker and B. Lloyd-Walker, (2012), Finnie, et al. (2018), Penn, et al. (2017), Opoku and | 1. Late consideration of price elements creates an opportunity for price manipulation in the second stage |

| | | | | | |
|---|---|---|---|---|---|
| | | 3. Enhanced understanding between client and owner | | Ibrahim-Adam (2018), Botha, et al. (2020), Lefebvre and McAuley (2019), Sanchez, et al. (2015), Botha and Scheepbouwer (2015) | 2. The approach focuses on establishing better relationships and increased understanding among parties<br>3. The contractor's interest in participating is dependent on compensation amounts |

Source: Authors' compilation

Initiating procurement quality controls generates improved competitiveness from a price viewpoint through the value-added competencies of the procurement function. In construction, procurement quality controls allow for significantly high procurement performance, leading to the best possible price to meet the client's needs (Munyimi, 2019). However, procurement functions in the public face numerous challenges (See Table 4). Unique challenges include a significant lack of empirical research on the impact of public procurement systems on price or cost levels in the construction sector. Gray et al. (2020) argue that current procurement decisions are too focused on cost minimisation at the expense of stakeholder value. They propose a new approach known as "total value contribution" (TVC) as an extension of "total cost of ownership" (TCO) methods that broaden the factors during a procurement exercise. They argued that putting value first through procurement would increase organisational outcomes.

**Table 4:** Challenges faced by public procurement

| Challenge(s) | Author |
|---|---|
| Failure to implement a procurement system | Fourie and Malan (2020) |
| Inadequate policy and lack of innovation | Uyarra and Flanagan (2009) |
| Inability to implement change management | Ateto et al. (2013), Mohamed (2016) |
| Poor organisational structures and processes | Tsuma and Kanda (2017) |
| • Poor procurement planning<br>• Lack of procurement competence | Onyango (2014), Musa, et al. (2014), Ambe and Badenhorst-Weiss (2012) |
| Inadequate specifications | Munyimi (2019) |
| Corruption | Eyo (2017), Ambe and Badenhorst-Weiss (2012) |
| • Excessive Bureaucracy<br>• Political interference | Boatemaa-Yeboah (2019), Sukasuka and Manase (2016), Musa, et al. (2014) |
| Inadequate or lack of ICT infrastructure | Riziki (2018), Modisakeng, et al. (2020), Maleki, et al. (2020) |
| Failure to ascertain value for money | Sukasuka and Manase (2016) |
| Poor organisational culture | Musa, et al. (2014), Kiama (2014) |
| Lack of project management skill | Kabanda, et al. (2019) |
| Poor resource allocation | Hamza et al. (2016) |
| Lack of transparency | Anane and Kwarteng (2019), Pooe, et al. (2015) |
| • Lack of training<br>• Lack of capacity<br>• Failure to comply with procurement policies | Pooe et al. (2015) |
| Procurement malpractices | Kedir and Ganfure (2020) |
| • Lack of knowledge<br>• Knowledge gap | Rais, et al. (2018), Ngunjiri (2019), Ambe and Badenhorst-Weiss (2012) |
| • Inadequate monitoring and evaluation<br>• Noncompliance with regulations | Ambe and Badenhorst-Weiss (2012) |

| | |
|---|---|
| • Over-decentralisation of a procurement system<br>• Lack of accountability | |
| • Instability generated by electoral cycles<br>• Lack of prioritisation | Delmonico et al. (2018) |
| • Tendency to maintain current practices<br>• Lack of long-term planning | Durdyev et al. (2018), Blanco-Portela, et al. (2018) |

Source: Authors' compilation

### 2.6. Conceptual framework

The literature shows that tender price volatility is influenced by a host of qualitative factors that include but are not limited to the construction price level, procurement strategy, project management practices, project-related risks, corruption, political interferences, adopted pricing models, stakeholder management strategies, political policy, and extant legislative framework (Zulu et al., 2022; Tembo et al., 2023b). Price volatility is propagated further by a situation in which contractors have become more informed than the client (government). Contractors have an exaggerated understanding of cost impacts that create information disproportionateness with clients (Tembo, et al., 2023a). Contractors skew unit prices and enhance profits by increasing the unit price of a quantity expected to go up and lowering the unit price of a portion expected to decrease. This predicament requires the government as a client to optimise trend detection using already developed models. However, this requires empirical studies that capture the magnitude of the problem in Zambia's context. Unit price contracting is widely used in Zambia's public construction sector. Unbalanced bidding is one potential pitfall of unit price contracting (Nyström, 2015). It manifests by the client/government paying too much for the final construction product. The research will use the frameworks (both abstract and theoretical) to ascertain its academic position and make the findings more appreciable as contributing to the body of knowledge. Figure 2 presents the conceptual framework guiding this research.

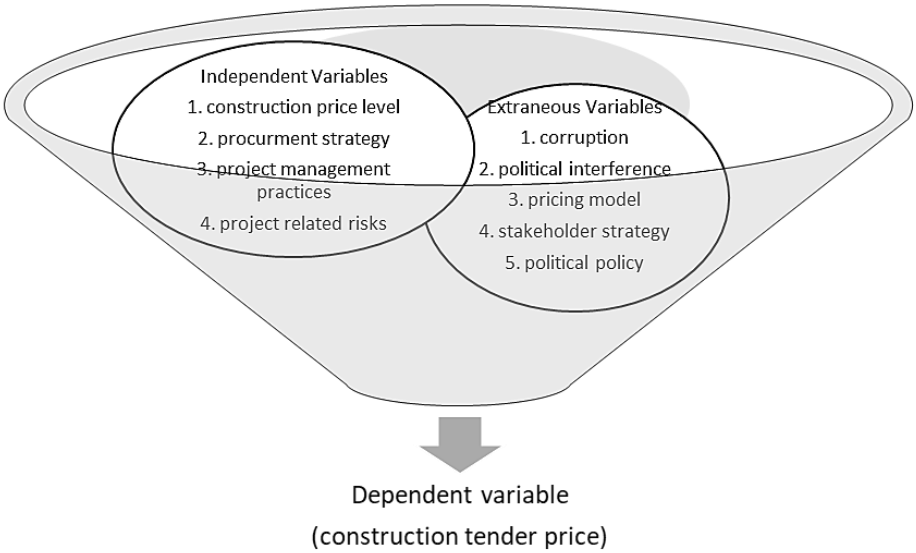


**Figure 2**: Conceptual Framework (Source: By the authors)

## 3. METHODOLOGY

The study concepts a novel public construction approach for making consistent mitigatory procurement decisions for tender price volatility. The study aims to investigate pricing behaviours regarding implementing current contracting delivery models in Zambia and

develop a conceptual model for managing tender price variability in the public construction sector. The study achieved this through a comprehensive literature review and semi-structured interviews with 14 industry experts.

### 3.1 Sampling and sample size

The study employed a purposive sampling method to identify possible interview participants (Martínez-Mesa et al., 2016). In addition, the research utilised snowball sampling in which existing respondents recruited or referred other respondents from among their professional acquaintances. The study ensured that the nominated subjects and the generated pool of participants exhibited traits similar to the purposively sampled ones. Table 5 shows the details of the interview participants. The study utilised person-to-person interviews to collect data from 14 interviewees identified respondents through purposive sampling for better insights and a more thorough investigation. It allowed information collection from the best-fit participants to attain relevant results for the research context. The adopted method presented the study with information-rich participants and cases regarding issues of central significance to the phenomena of inquiry. The study transcribed recorded interviews for coding and eventual analysis.

All respondents were construction project managers with a holistic understanding and experience regarding the construction sector and its various aspects. The selection of respondents reduced the selection bias while improving the representativeness of the sample categories. Among the respondents, one had a PhD, two had bachelor's degrees, and eleven had master's degrees. Practical research shows that a qualitative sample of twelve (12) interview participants was adequate to reach theoretical data saturation (Braun and Clarke, 2016; Boddy, 2016; Guest et al., 2006). The selection method for the inclusion of participants for research interviews defined the characteristics of potential participants in the study. The criteria ensured the participants were relevant enough to provide the necessary information to address research objectives. The requirements were as follows:

i. Age of the participant – All participants were required to be old enough to provide legal consent, typically above 18 years old.
ii. Professional past of the participant – The study considered relevant construction-sector details about participants' professional and personal lives. Ensured that participants were essentially actively practising professional aspects related to the construction sector
iii. Academic qualifications – The study verified participants' academic qualifications or educational background to ensure they had at least a bachelor's degree related to aspects of the construction sector.
iv. Active years of practice – The study included participants with at least ten years of practice within the construction sector. Therefore, the study evaluated people in the construction sector-related fields for more than ten years.
v. Management position of the participant - The participant owns a construction-sector-related company or has been in senior management for a period longer than five years

### 3.2 Data collection technique

The study adopted qualitative research that followed an exploratory design to understand decisions and opportunities regarding construction-tender price inflation. The technique allowed the study to focus the collection of data on a small number of respondents by asking questions through open-ended person-to-person interviews and observing the behaviour of respondents. This approach was essential in ensuring timely data collection and accuracy and gaining rich-preliminary insights. The exploratory research design was significant for the study to understand the phenomenon and define the problem precisely (Sreejesh, et al., 2014). The study deployed unstructured procedures for primary data collection, including in-depth

interviews and project procurement techniques. The discussions used direct techniques to obtain data on respondents' beliefs, feelings, and attitudes. The design assisted the study in probing for attitudinal and behavioural data encompassing all past, present, and future periods by turning respondents' answers into related detailed questions. The interviewing techniques utilised in this study included:

i. laddering – which allowed the study to discover meanings and psychological and emotional motives that affected the respondents' decision-making behaviours (Veludo-de-Oliveira, et al., 2006)
ii. hidden-test questioning – which focused on finding share-social values, personal beliefs, and attitudinal concerns (Buschle, et al., 2021)
iii. symbolic analysis – which utilised deductive reasoning to unravel symbolic meanings associated with construction-tender prices (Lune and Berg, 2017; Bengtsson, 2016)

The study utilises an ontology of a social world populated by human beings with thoughts, meanings, and interpretations. Thus, the study used interviews as an interpretive design to obtain respondents' experiences, inner thoughts, and feelings. The study assumed a realist ontological (inner-world focus) assumption of a physical world influenced by cause and effect (Berryman, 2019). The research believed in the existence of realities that affect construction tender price inflation and hence emphasised exploring circumstances related to what happened or what was happening to seek explanations. The study intends to predict what might happen in the future of construction following certain-specific interventions.

### *3.3* Data analysis

The descriptive data analysis utilised abductive and deductive reasoning through systematic, iterative searching and integrating data, as shown in the detailed research onion in Figure 3. The research attempted to describe the meaning of findings from the respondents' perspective and develop significant generalisations from a limited number of experts and specific experiences. The study attempted to explain specific factors, away from those in the broader economy, contributing to construction tender price volatility and underscore how such connections or relations occurred. To propose strategies for addressing construction tender price inflation demanded providing a factually accurate viewpoint of participants concerning the characteristics and nature of their relationships in the construction market. The study presented the findings as verbal accounts and narratives of lived experiences gathered through interviews. The study utilised thematic analysis of key informant interviews to extract impact mitigations and envisaged policy measures.

The positivist approach supported the research to achieve its objectives without the need to interfere with the study phenomena. In addition, it allowed the researchers to isolate the phenomena and ensured the repeatability of observations by manipulating variations within independent variables. The positivism philosophy was suitable for the study to allow for the generation of consistent and empirically established findings and to pursue an understanding and observation of a reality that consists of discrete occurrences by accepting that knowledge is derived from experience. The research denied any non-experienced theoretical notions through logical positivism, excluding value judgments for validity purposes. Consequently, through this philosophy, the study made the following assumptions (Kivunja & Kuyini, 2017):

i. Experience alone informed scientific knowledge.
ii. Direct application of methods of natural sciences to explain the social world.
iii. The subject matter of the study consisted of studying a reality external to itself.
iv. Expert normative statements had the status of knowledge.
v. Pursuance of technically practical knowledge.

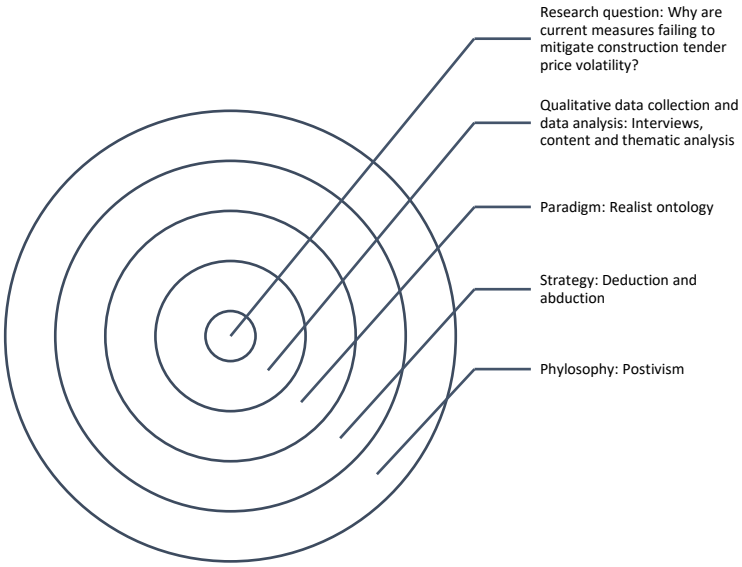


**Figure 3:** Research onion (Source: By the authors)

The study utilised a qualitative research design to answer the following research questions:

i. What strategies can the government use to address construction tender price inflation?
ii. How can we address construction tender price volatility in Zambia?

The study adopted qualitative research that followed an exploratory design to understand decisions and opportunities regarding construction tender price inflation. The technique allowed the study to focus the collection of data on a small number of respondents by asking questions through open-ended person-to-person interviews and observing the behaviour of respondents. This approach was essential in ensuring timely data collection and accuracy and gaining rich-preliminary insights.

**Table 5:** Participants for research interviews

| S/N | Description | Age | Academic qualification/Highest level of education | Experience (years of practice) | Area of Practice/Expertise | Recommended by |
|---|---|---|---|---|---|---|
| 1 | Purposive Participant 1 | 47 | Bachelor of Engineering (Civil and Environmental Engineering) | 22 | Civil engineering consultant | Researcher |
| 2 | Purposive Participant 2 | 40 | MSc Project Management | 18 | Contractor | Researcher |
| 3 | Purposive Participant 3 | 65 | MSc (Construction Management and Economics) | 40 | Quantity surveying and Construction management | Researcher |
| 4 | Purposive Participant 4 | 52 | Bachelor of Engineering (Civil and Environmental Engineering) | 27 | Civil Servant/Public Infrastructure-Based Institution | Researcher |
| 5 | Purposive Participant 5 | 42 | • MSc Business Management | 17 | Contractor | Researcher |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | • Bachelor of Engineering (Civil Engineering) | | | |
| 6 | Purposive Participant 6 | 39 | • MEng Construction Management<br>• BSc Architecture | 15 | Architectural consultant | Researcher |
| 7 | Purposive Participant 7 | 51 | • MSc Project Management<br>• BSc Building Science | 25 | Quantity surveying consultant | Researcher |
| 8 | Purposive Participant 8 | 63 | • MSc Architecture<br>• PGDip. Project management and Building Law<br>• BSc Architecture | 30 | Architectural consultant | Researcher |
| 9 | Purposive Participant 9 | 49 | • MSc Logistics and supply chain management<br>• BSc Procurement management<br>• Dip. Chartered Institute of Purchasing and Supply | 22 | Civil Servant/Public Infrastructure-Based Institution | Researcher |
| 10 | Snowballing Participant 1 | 50 | • Ph.D. (Transportation Economics)<br>• MEng Civil (Pavement and Transportation)<br>• BEng Civil and Environmental Engineering | 24 | Public project financing | Purposive Participant 1 |
| 11 | Snowballing Participant 2 | 56 | • MEng Civil (Pavement Design)<br>• BEng Civil and Environmental Engineering | 30 | Civil engineering consultant | Snowballing Participant 1 |
| 12 | Snowballing Participant 3 | 49 | • MEng Construction Management<br>• BEng Civil and Environmental Engineering | 25 | Civil engineering consultant | Snowballing Participant 2 |
| 13 | Snowballing Participant 4 | 49 | • MEng Project Management<br>• BEng Civil and Environmental Engineering | 22 | Contractor | Snowballing Participant 3 |
| 14 | Snowballing Participant 5 | 60 | • MSc Construction Management<br>• BSc Quantity Surveying | 35 | Quantity surveying consultant | Purposive Participant 7 |

## 4. FINDINGS

The study identifies four categories of pricing behaviours demonstrated by contractors during tendering, as shown in Table 6. These behaviours provide insights into construction tender-price inflation arising from industry and client-specific features. The pricing behaviours include resistance (PB1), reactive (PB2), anticipatory (PB3), and Consultant-

based (PB4). Consultant-based (PB4) pricing was the least practised behaviour, whereas reactive (PB2) was the most established among all behaviours.

**Table 6:** Pricing behaviors

| Bid pricing behaviour | Code | Features | Conditions for behaviour |
|---|---|---|---|
| Resistant | PB1 | 1. Ignoring nature and type of competition<br>2. Overlooking challenges<br>3. Contractor overconfidence | 1. Single sourcing or direct bidding of contractors<br>2. Pre-bidding qualifications<br>3. Lack of competition<br>4. Lack of experience<br>5. Subcontracting |
| Reactive | PB2 | 1. Strategies regarding inflationary problems<br>2. Sensitivitystartegies to stakeholder interference<br>3. Prediction strategies against exchange rate fluctuation<br>4. Reaction strategies to external stimuli<br>5. Time strategies against delayed or non-payments<br>6. Strategies against client instability<br>7. Expectation strategies for profit erosion<br>8. Strategies for frontloading | 1. The incompleteness of designs and tender documents<br>2. Poor or lack of information<br>3. Corruption<br>4. Project variations<br>5. Poor project management<br>6. Government financed projects<br>7. Profit maximisation |
| Anticipatory | PB3 | 1. Prediction strategies against exchange rate fluctuation<br>2. Client stability strategies<br>3. Strategies to gain competitive advantage<br>4. Innovation strategies | 1. Donor funded projects<br>2. Incentives |
| Consultant-based | PB4 | 1. Stakeholder engagement strategies of competent pricing consultants<br>2. Policy strategies<br>3. Deliberate information-seeking systems<br>4. Strategies for reflecting market rates | 1. Capacity building<br>2. Standardised specifications<br>3. Availability of historical data<br>4. Availability and uniformity of information |

Source: Authors' compilation

Table 7 describes the characteristics of Zambia's construction tender pricing structure. Observation indicates that the pricing structure consists of five factors: client characteristics, aspects of local firms, foreign firms, the procurement process, and the project itself. The highest frequency or percentage designates the most significant description for each factor. For example, describing client characteristics of utmost consideration in the pricing structure is failing to make timely payments (CC1) and poor project management practices (CC2). Whereas other characteristic descriptions most relevant to pricing structure include:

i. Characteristics of local firms - Difficulties in accessing local financing (LF1)
ii. Characteristics of foreign firms - Receive foreign government assistance (FF1)
iii. Characteristics of the procurement process - Lack detection mechanism for the most economical price (PP1) and,
iv. Characteristics of construction projects - Heavily affected by macroeconomic factors (CP1)

**Table 7:** Description of the pricing structure of Zambia's construction industry

| Industry characteristic | Interview quote describing the nature of the industry | Code | Frequency | Percentage | The local contractor pricing approach |
|---|---|---|---|---|---|
| 1. Client characteristics | Fails to make timely payments | CC1 | 12 | 18 | increase markup and frontload |
| | Embroiled with political interference | CC3 | 7 | 11 | increase markup |
| | Poor project management practices | CC2 | 12 | 18 | increase markup |
| | General preference for foreign firms | CC8 | 4 | 6 | artificially lower price |
| | Low appetite for infrastructure projects | CC4 | 7 | 11 | increase markup |
| | Prone to contract breaches | CC7 | 5 | 8 | increase markup |
| | No incentives for local contractors | CC6 | 6 | 9 | increase markup |
| | Corruption prone | CC5 | 7 | 11 | increase markup |
| | Lack of sector regulation mechanism | CC9 | 4 | 6 | increase markup |
| | Public projects lack economic benefits | CC10 | 2 | 3 | increase markup and frontload |
| | **Total** | | **66** | **100%** | |
| 2. Characteristics of local firms | Lack government support | LF5 | 5 | 11 | increase markup |
| | Heavily taxed | LF2 | 6 | 13 | increase markup |
| | Ill-equipped to compete effectively | LF6 | 5 | 11 | artificially lower price |
| | Poor development of cost estimates | LF4 | 4 | 9 | increase markup or artificially lower price |
| | Lack appropriate capacity | LF3 | 6 | 13 | artificially lower price |
| | Swamped by financial pressure | LF4 | 6 | 13 | increase markup and frontload |
| | The proliferation of unqualified and non-technical players | LF7 | 4 | 9 | increase markup |
| | Firms not growing to become competitive | LF8 | 4 | 9 | increase markup and frontload |
| | Difficulties in accessing local financing | LF1 | 7 | 15 | increase markup and frontload |
| | **Total** | | **47** | **100%** | |
| 3. Characteristics of foreign firms | Foreign government owned | FF3 | 7 | 19 | artificially lower price |
| | Receive foreign government assistance | FF1 | 10 | 28 | artificially lower price |
| | Have huge capital outlays | FF2 | 9 | 25 | artificially lower price |
| | Have tax and material rebates from their home country | FF5 | 4 | 11 | artificially lower price |
| | Higher efficiency than local contractors | FF6 | 6 | 17 | artificially lower price |
| | **Total** | | **36** | **100%** | |
| 4. Characteristics of procurement processes | Lack of preferential systems for targeting local firms | PP2 | 7 | 16 | artificially lower price |
| | Cannot detect collusion | PP8 | 3 | 7 | increase markup and frontload |

| | | | | | |
|---|---|---|---|---|---|
| | Lack of detection mechanism for a most economical price | PP1 | 8 | 18 | increase markup |
| | Not specialised in following construction principles | PP4 | 5 | 11 | increase markup |
| | Procurement provisions do not suit the local market | PP3 | 7 | 16 | increase markup and frontload |
| | Documents lack clarity and incomplete designs | PP5 | 5 | 11 | increase markup |
| | Lengthy procurement processes | PP7 | 4 | 9 | increase markup |
| | Not adequate for construction projects of complex technical nature | PP6 | 5 | 11 | increase markup |
| | **Total** | | **44** | **100%** | |
| 5. Characteristics of construction projects | Heavily dependent on imports | CP8 | 4 | 7 | increase markup |
| | Heavily affected by macroeconomic factors | CP1 | 11 | 19 | increase markup |
| | Embroiled with external pricing pressure | CP7 | 5 | 9 | increase markup |
| | High cost of inputs | CP2 | 8 | 14 | increase markup |
| | High-risk allocation | CP3 | 7 | 12 | increase markup and frontload |
| | Lack of adequate and practical price control mechanisms | CP5 | 6 | 11 | increase markup |
| | No basis for pricing | CP9 | 3 | 5 | Increase markup |
| | Reducing/reduced the number of projects | CP6 | 6 | 11 | increase markup |
| | Stalled projects | CP4 | 7 | 12 | increase markup |
| | **Total** | | **57** | **100%** | |

Source: Authors' compilation

Further, the study utilises a theoretical approach and a hierarchical analytical process to create thematic strategies reflecting relative significance and respondents' feelings. Table 7 shows the identified turnaround strategies and their respective groupings developed through synthesis criteria driven by importance considerations. The study scored one (1) every time a respondent mentioned a strategy as part of the turnaround framework. Emergent patterns for turnaround strategies include cost estimating and financing, mitigating external and internal interferences, providing incentives, providing training, and encouraging innovations. Others include revising legislation, contextualising procurement functions, improving project management practices, predicting market forces, and guaranteeing sustainability. Given these factors, Table 8 of the study identifies a possible range of nine both existent and non-existent strategies for mitigating construction tender-price inflation, including planning management practices, stakeholder management practices, capacity management practices, capacity building practices, legal-framework modernisation, procurement management practices, project management practices, management of macroeconomic indicators and sustainable-construction management practices. The study identifies nine key turnaround strategies for addressing construction tender-price inflation, grouped into six categories to include:

i. Planning management practices
ii. Stakeholder management practices
iii. Capacity management practices
iv. Capacity building practices

v. Legal-framework modernisation
vi. Procurement management practices
vii. Project management practices
viii. Management of macroeconomic indicators
ix. Sustainable-construction management practices

**Table 8:** Turnaround price management strategies

| S/N | Participant ID | Pattern | Key Strategy | Sub-Strategy |
|---|---|---|---|---|
| 1 | PS1<br>PS2<br>PS3<br>PS4<br>SS2<br>PS6<br>SS3<br>PS7<br>SS4<br>PS8<br>SS5<br>PS9 | Cost estimate and financing | Planning Management | • Government to plan and design execution of projects.<br>• Develop funding projections and ensure readily available funds<br>• Guarantee availability of project funding<br>• Control interest, value-related, and time-related costs<br>• Hire experienced consultants early enough in the project stages<br>• Develop well-informed cost estimates<br>• Avoid the "text-book" approach when developing price indices<br>• Ensure timely payment to contractors<br>• Prepare project plans with robust designs and costings<br>• Ensure that control systems like the e-GP and materials price index are realistic<br>• Develop models for rate build-up<br>• Utilise various professionals to develop cost norms and value engineering<br>• Produce indices timely |
| 2 | PS1<br>PS4<br>SS2<br>PS5<br>PS8<br>PS9 | Interference | Stakeholder Management | • Government to depoliticise procurement and construction process<br>• Mitigate against corruption<br>• Stabilise the cost of materials, exchange rate, and inflation on the market<br>• Stop harmful interference in project management processes<br>• Manage the type and extent of stakeholder involvement |
| 3 | PS1<br>SS1<br>SS2<br>SS3<br>PS8<br>SS5 | Incentives | Capacity management | • Develop preferential Treatment Methodologies<br>• Pay contractors for greater output<br>• Redress unfair competition practices<br>• Package contracts into small lots<br>• Earmark-specific work is to be for local contractors only<br>• Review single-sourcing or direct-bidding rules<br>• Introduce incentives in terms of taxes and statutory obligations<br>• Redress entry barriers into the industry<br>• Ensure that the shareholding of construction firms contains qualified allied professionals |
| 4 | SS1<br>SS2<br>PS6<br>SS3<br>PS8 | Training and innovation | Capacity Building | • Ensure that people in the sector receive training<br>• Support research and development<br>• Develop an apprenticeship board |

| | | | | |
|---|---|---|---|---|
| | | | | • Utilise high-value projects to train personnel |
| 5 | SS1<br>PS7<br>PS9 | Legislation | Legal-Framework Modernization | • Continuously review existing legislation<br>• Fully legislate the 20% subcontracting policy into law<br>• Timely produce regulations to guide the implementation of laws<br>• Review procurement policy |
| 6 | PS2<br>PS3<br>SS3<br>PS7<br>PS8<br>PS9 | Procurement function | Procurement Management | • Develop better mechanisms for pre-qualification criteria<br>• Allow contractors to state the margin of profit on the project<br>• Make procurement law more responsive to local needs<br>• Subscribe procurement function to best and better practices<br>• Cancel projects whose contractors manage without referencing their bidding documents<br>• Ensure to award to the correct contractor<br>• Establish a department or supreme organ to address all government procurement-related functions, including complaints, final-reporting, professional well-being of procurement officers, and appointment of officers |
| 7 | PS3<br>SS2<br>PS6<br>SS3<br>PS7<br>PS8 | Project practices | Project Management | • Develop project management skills<br>• Develop proper infrastructure governance mechanisms<br>• Develop principles that reflect the value of time<br>• Prevent deliberate government contract-breaches<br>• Develop standards for infrastructure project implementation<br>• Handle projects professionally<br>• Ensure that project key personnel are professionals<br>• Refer to the contents of the bidding document rather than concentrating on the general conditions of the contract alone |
| 8 | PS6<br>PS7 | Market forces | Management of macroeconomic indicators | • Regulate the market in terms of the cost of materials<br>• Stabilise inflation and exchange rate |
| 9 | PS5<br>PS7<br>SS4<br>PS8 | Sustainability | Sustainable construction Management | • Develop standards for facilities management<br>• Ensure global competition does not hinder the growth of local firms<br>• Optimise bulk procurement of imported materials<br>• Setup adequate and cost regulated material's producing plants<br>• Redress incursion of no-professionals into the construction industry |

Source: Authors' compilation

## 5. DISCUSSION

The study agrees with Joukar et al. (2017) regarding integrating strategies to manage tender price volatility in the construction sector. They found that risk management and incorporating price adjustment clauses were essential to mitigating tender price variability. The study further concurs with Weidman (2010) that price volatility harms the fundamental economic assumptions of a construction contract. The research by Tembo et al. (2023a) highlights the harmful impacts of tender price variability and inflation on the construction sector. They argue that tender price volatility causes an unpredictable business environment, reduces the number of public projects, reduces value for money, and compromises the quality of work. Like Joukar et al. (2017), the findings show the complexities of establishing adequate controls for managing construction tender pricing. Correspondingly, construction models present corrective, preventive, and organisational measures for cost control while lacking a predictive approach that can effectively begin to ensure advanced tender price control. The study agrees with Azizi and Aboelmagd (2019) that most research fails to establish a balance that improves profitability while reducing prices. Nový et al. (2016) argue that a precise determination of construction tender price is essential for project success. However, the process is tedious and insists on developing correct tools for pricing based on a specific situation.

The study further argues that attaining institutional goals is achievable by mitigating construction tender price inflation. Target goals in this implementation schedule include improving cost estimating and project financing, managing stakeholder interference, developing local-firm incentives, developing training programs and encouraging innovation, reviewing legislation, contextualising procurement function, improving project practices, stabilising market forces, and adopting sustainable construction practices. On the other hand, it shows that public institutions in developing countries like Zambia have failed to weave together pragmatic strategies for addressing public construction tender price inflation. The model proposes strategies and a guideline to assist the government in providing the needed support and contractors to develop consistent and logical tender prices. The model intends to prioritise tender price inflation management by enhancing strategies related to government and local contractor aspects.

The study also observes an application gap for construction regarding using price control incentive mechanisms. The findings further agree with Zhang and Jian-li (2016), who highlight the fundamental benefits of price-control incentives by developing an incentive-regulation model. The study findings show that governments can maximise social gains from an infrastructure project by deriving accurate technical parameters and optimising procurement. Figure 4 proposes the conceptual Negotiated Construction Approach (NCA) for public projects, summarising and weaving together identified strategies. The phasing of the vital system begins with the most critical:

i. Planning management (Engineering)– to be the first and most important strategy
ii. Capacity management – to be the second most important strategy
iii. Stakeholder management – to be the third most important strategy
iv. Procurement management– to be grouped as the fourth most crucial strategy
v. Project management – to be the fifth most important strategy
vi. Capacity building– to be grouped as the sixth most important strategy
vii. Modernising legal framework – to be the seventh most crucial strategy

A theoretical perspective of this study expands the current knowledge by providing valuable insights into the contractors' perception of the public construction sector, procurement methods, and client conditions. For instance, the study reveals that contractors increase price markups when there are difficulties in accessing local financing. It was also true when the client lacked a detection mechanism for the most economical price and was heavily affected by macroeconomic factors. Concerning the study area, the findings and

corresponding conceptualised model apply to the wider developing world, especially Africa, whose infrastructure development is heavily public sector oriented. The conceptual negotiated construction approach focuses on developing life-cycle prices and costings for best-value-for-money in the public sector. However, the model requires further validation to ascertain its applications in country-specific settings. The model covers the gap between the planning and execution of public construction projects by consolidating procurement risk assessment and contracting strategy development. The benefits of the contracting model include ensuring the best value for money, avoiding unjustifiable and unnecessary procurement, better allocation of public resources, enhanced communication, development of a live process with feedback mechanisms, and an understanding of tender price-associated risks.

More specifically, this research explores sector tender-pricing problems worthy of widespread public and political attention to influence sector-based policy. Therefore, this study focuses on identifying specific parameters for constructing a model for addressing the current and imminent critical tender-pricing issues in the Zambian public construction industry. Additionally, the research provides comprehensive possible future direction with pragmatic perspectives toward resolving interminable sector challenges. Tembo et al. (2023a) argue that tender price variableness is a pervasive problem, especially in public construction projects, since several internal and external factors are responsible for the trend. On that premise, this research further models a process that assists a government in predicting tender price patterns in advance. The model helps the public sector plan for the construction workload, improving the construction market's stability.

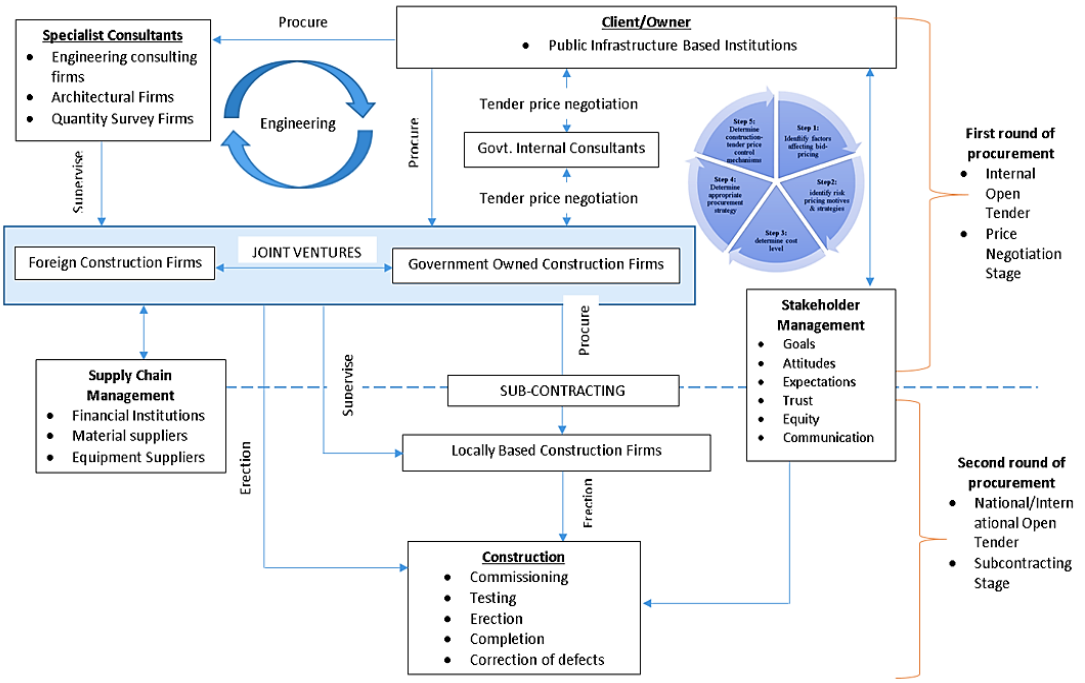


**Figure 4:** Conceptual negotiated construction approach for public projects (Wondimu et al., 2016; Walker and B. Lloyd-Walker, 2012; Finnie et al., 2018; Penn et al., 2017; Opoku and Ibrahim-Adam, 2018; Botha et al.,2020; Lefebvre and McAuley, 2019; Sanchez et al., 2015; Botha and Scheepbouwer, 2015)
(By the authors based on a literature review and research findings)

## 6. CONCLUSION

Contractors use price to mitigate procurement and client-related risks at the tendering stage. The trend requires developing and implementing procurement strategies that consider price control implications at the project tendering phase, leading to the development of contract delivery models that inadequately address the impact and potential value of pricing in construction projects. Therefore, strategies to overcome tender price volatility need a model that presents corrective, preventive, and organisational measures and a predictive approach to effectively ensure advanced tender price control. This study provides valuable knowledge and insights into the contractors' perception of the public construction sector, procurement methods, and client conditions. The study reveals that contractors increase price markups when there are difficulties in accessing local financing. It was also true when the client lacked a detection mechanism for the most economical price and was heavily affected by macroeconomic factors. The study further offers the conceptual negotiated construction approach that focuses on developing life-cycle costs and costings for the best value for money in the public sector. However, the model requires further validation to ascertain its applications in country-specific situations.

### 6.1 Practical implications

This study implies adding a novel contracting model to the ones shown in Table 3. The proposed contracting model specifies using a two-round procurement approach and establishing two classes of relationships between contractors and clients. The model also identifies the pre-conditions that contractors and clients must meet in the price negotiations and subcontracting stages. The model focuses on aligning the financial goals between the client and contractor through tender price negotiations. The model allows for the early elimination of adversarial relationships emanating from traditional contracting models. This contracting model is rooted in early price negotiation, thereby permitting exploring a concept of "preventative diplomacy" that is rarely applicable in construction.

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