

Client and Construction Machinery Related Factors Influencing the Selection of Contract Procurement Method in KwaZulu Natal Province in South Africa

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Abstract

The study aims to find the adequate client and construction machinery related factor influencing the selection of contract procurement method in Kwazulu Natal province in South Africa. The study population consists of Architects, Project managers, Quantity surveyors, and Builders. Simple random sampling techniques were used to select respondents. All in all, sixty-five professionals were surveyed, and data was analyzed using descriptive statistics. The Cronbach alpha value were greater than 0.70. Findings for this study are: Client's emphasis on timely project delivery, low construction cost, type of client's funding, poor maintenance of tools and machinery, and difficulties in hiring construction tools and machinery are the client and construction machinery related factors influencing the selection of contract procurement method. The study recommends that amongst the factors to be considered for the selection of a contract procurement method, timely project delivery, low construction cost, type of client's funding, poor maintenance and difficulty in hiring construction tools and machinery should be foremost.

Keywords: Contract procurement, Machinery management, Procurement, Project delivery, Project management

1. Introduction

Project procurements are merely sub-projects that must be properly handled instead of being assigned to an independent body to purchase for the project. Certain procurements, large complexity developments, or developing something new that does not exist, according to the project's unique requirements, must be managed by the project team and backed by the professional procurement group (Fleming 2019). The procurement process is important in construction projects and its activities spans from identifying requirements from start to the closeout of project. Construction procurement processes are complex with different options and direction (Ruparathna and Hewage 2015). The level of experience that a client has and project delivery time is very important in choosing a procurement method in construction processes. A client who has been involved in lots of construction works would be willing to give more into ensuring that the project is successfully executed while a client who is new or has been involved in few projects would want most responsibility to be shouldered by the construction team (Plunkett 2021).

The identification of machinery required for the construction of a project is highly dependent on the complexity of the project. The machinery availability and possession of a company and the ability to operate and maintain these machinery to avoid breakdown is critical to the delivery of a project.

This study's objective is to investigate and identify client-related and construction machinery-related factors that influence the contract procurement methods

used in project delivery. The study intends to provide actionable insights into how to align these factors with procurement and project management strategies to improve resource management, client relationships, and operational efficiency.

2. Literature Review

2.1. Client related factor influencing the selection of contract procurement method in project delivery.

2.1.1. Client's experience in construction

Clients that has experience in construction are usually more aware of the hazards involved in building projects and may favour methods of procurement like design and build while less experienced clients on the other hand, might choose simpler, less risky options like Traditional Lump Sum contracts (Love *et al.* 2012).

2.1.2. Client's emphasis on low construction cost

Construction clients were noted to focus much more on price involved in the construction of project and a little on trust (Erik Eriksson and Laan 2007). Clients always uphold value for money principle. On the other hand, they prefer methods that offers costs certainty, competitive pricing and tendering and a lesser financial risk. This method encourages reduced prices through competition by allowing numerous contractors to submit bids (Ayodele 2011). Early contractor involvement is also another technique used by clients to reduce construction cost, Through the early involvement of contractors in design and cost estimates, customers can potentially find cost-saving options and improve budget accuracy (Tang, Shen and Cheng 2019).

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2.1.3. *Client's ability to make a decision*

Clients ability to make decision positively influence the choice of procurement method, particularly experienced clients. The client is to make a decision and develop a procurement strategy which includes several activities such as establishing the basis of selection of any procurement route, confirming the project objectives, undertaking market engagement, identifying responsibilities and identifying constraints (Al-Harhi, Soetanto and Edum-Fotwe 2014). Experienced clients in the construction industry wants to get more involved and make decisions. They could choose techniques of procurement like Integrated Project Delivery (IPD) or Construction Management which provides greater control over the design and construction phases while inexperienced clients may choose procurement approaches where the contractor assumes greater responsibility because they lack the information needed to make complex decisions (Masterman 2013).

2.1.4. *Client's contribution to design and construction*

The roles of clients have evolved over the years from that of a passive fund provider to an active participant and hands on manager in procurement systems (Al-Harhi, Soetanto and Edum-Fotwe 2014). At the design and specification stage it was noted that a detailed design of the construction project is produced mostly by the client and their consultant and the specification is seldom managed by the contractor (Erik Eriksson and Laan 2007). The higher constructability of design and environmental sustainability have been shown to have a greater influence on the selection of the most appropriate procurement route for off-site housebuilding as compared to those applicable to traditional construction (Agapiou 2020).

2.1.5. *Client's ability to brief*

The client's ability to provide comprehensive and explanatory information about the project which includes the scope of the project, objectives, quality expectation, outcome, deliverable, timeframe and the special features involved in the project would influence the selection of contract procurement method in project delivery (Al-Harhi, Soetanto and Edum-Fotwe 2014).

2.1.6 *Client's emphasis on timely project delivery*

Clients prefer a technique that helps with on-time project delivery such as construction management. This influences the procurement method coupled with the complexity of the project. Clients involves the construction manager early in the design phase and this lessens the chance of delays by streamlining the construction process and identifying possible problems (Love *et al.* 2014).

2.1.6. *Type of client's funding*

Projects funded privately through loans or investors, projects funded through public sources such as government budgets or grants may have distinct

procurement requirements. Transparency, accountability, and adherence to public procurement norms are frequently given top priority in publicly funded projects, which results in the use of procurement techniques like competitive dialogue or open tender. In contrast, privately funded enterprises might place greater emphasis on risk management, creativity, and efficiency in order to draw in lenders and investors. In these situations, procurement strategies that allow integrated project delivery and risk sharing, including Design-Build or Public-Private Partnerships (PPPs), may be favoured (El Sawalhi and El Agha 2017).

2.2. *Construction machinery related factor influencing the selection of contract procurement method in project delivery.*

2.2.1. *Poor maintenance of tools and machinery*

In order to prevent equipment from impeding work progress, it is advised that the state of the equipment be carefully examined before it is mobilized on site or contract awarded. Effective maintenance of tools and machine will eliminate breakdown and ensure the completion of project as scheduled resulting in opportunity for competitive advantage (Zeb, Qudoos and Hanif 2015).

2.2.2. *Difficulties in hiring construction tools & machinery*

Due to the high cost of purchase of tools and machineries, it makes it difficult for outright purchase of tools and machineries and reflecting it on company's profile and negatively influencing choice of procurement. Therefore, the hiring of plant equipment must be easily accessible, thereby positively the procurement method. In some cases, purchasing is more financially advantageous, while renting can be more cost-effective and pleasant. A contractor can acquire the use of construction equipment by purchasing, renting and renting equipment with the option of purchasing it at a later date (Asare 2022).

2.2.3. *Increase in hiring cost of construction machinery*

Increase in hiring cost of construction machinery is posing challenges because it influence the procurement method and will increase the bidding price in prospecting for contract. Therefore the construction team are left to manage contract with high cost of plant and equipment (Asare 2022).

2.2.4. *Inadequate skills of machinery operator*

Equipment operators often learn through trial and error, causing damage to the equipment. It is the organization's responsibility to ensure proper training for the operators. Due to new and advanced technologically developed tools and machines and with no trainer/training has adversely influenced contract procurement method. It has not afforded the choice of procurement method with the engagement of these new

tools and machinery for the delivery of project (Zeb, Qudoos and Hanif 2015).

2.2.5. *Insufficient number of machinery available on site*

Insufficient number of machinery available on site has influence the choice of procurement method for the delivery of a project. It suggests alternative methods. Before awarding a contract, it is recommended to establish tight qualifying criteria based on project requirements and ensure adequate equipment. The project should then be awarded to the contractor who meets the standards (Zeb, Qudoos and Hanif 2015).

2.2.6. *Damage to tools and machinery*

Damage to tools and machinery play an important role in the choice of project procurement method. This stems from the point view of easily available spare parts for replacement in cases of damage, in order to avoid delays of importation. To prevent equipment from impeding work progress, it is advised that the state of the equipment be carefully examined before it is mobilized on site. Damage to tools and machinery results in shortages of tools and machinery and adversely impacting the choice of contract procurement method and delivery of projects (Zhao, Zhang and Zhao 2013).

2.2.7. *Complexities in operation of machinery*

Complexity in the operation of machines leads to lack of skilled labour to operate these machines and limit the choice of selection of procurement method and negatively impact on project delivery. There is a dearth of understanding among industry specialists, and incompatibility with building components and machineries leads to greater additional expenditures and material handling costs (Waris *et al.* 2019).

2.2.8. *Absolute machinery used in construction operations*

Absolute machinery used in construction do not afford reliability of these machines. Constant breakdowns result and leading to difficulty regarding reliability. The non availability of spare parts of these absolute machines afford limited use of them. These constitutes problems and limitation in the procurement method.

Au-Yong, Ali and Ahmad (2016) proposes that maintenance management establish a spare parts management department to regularly update stocks.

3. Research Methodology

A questionnaire survey was conducted for this study. A total of sixty-five (65) questionnaires were administered to construction professionals (Architects, consultant Quantity surveyors, contracting Quantity surveyors, project managers, contractors and others) in KwaZulu Natal Province. Forty five (45) questionnaires were administered in person to the respondents, out of which thirty one (31) questionnaires were duly completed and retrieved.

The respondents in the study held different positions in various firms. The participants' firms are Contracting firms (19.61%), Architectural firms (11.76%), Project management firms (21.57%), Quantity surveying firms (9.80%), client (13.73%) and Engineering firms (17.47%). Most of the respondents have bachelor's degree qualification (45.1%), Honours (17.65%). The average years of experience of respondents is 11-15 years and most of the respondents work for either public or private organizations. This indicates that the information obtained is deemed reliable. A quantitative approach was adopted and the data was analyzed using descriptive analysis. Simple statistical tools such as the mean score and standard deviation were used for the statistical analysis of data.

4. Data Presentation and Analysis

Table 1 presents client related factor influencing the selection of contract procurement method in project delivery. Client's emphasis on timely project delivery with a mean score of 5.39 ranked as the most vital factor influencing the selection of contract procurement. The selection of contract procurement methods is influenced by a client's priority on timely project delivery, which is demonstrated by the preference for methods that give improved control, better coordination, efficient risk allocation, and performance incentives. Clients can more effectively control project deadlines and guarantee that their goals for on-time

Table 1: Client related factor influencing the selection of contract procurement method in project delivery

S/N	Factor	Mean score	Standard deviation	Rank
1	Client's emphasis on timely project delivery	5.39	0.190	1
2	Client's emphasis on low construction cost	4.63	0.078	2
3	Type of client's funding	3.93	0.024	3
4	Client's ability to brief	2.72	0.204	4
5	Client's ability to make a decision	2.48	0.239	5
6	Client's contribution to design and construction	2.37	0.255	6
7	Client's experience in construction	1.85	0.332	7

delivery are fulfilled by selecting the right procurement strategy.

Next to client's emphasis on timely project delivery is client's emphasis on low construction cost with an MS = 4.63. The selection of contract procurement methods is greatly influenced by a client's emphasis on low construction costs hereby making competitive bidding, cost certainty, effective resource management, and cooperative ways that reward cost savings to be prioritized. Through meticulous selection of the most suitable procurement strategy, clients can attain their economic goals while guaranteeing timely delivery and high-quality projects.

The least factor on this construct regarding client related factor that influence the selection of procurement method is client's experience in construction with an MS of 1.85. Even if a client's prior construction experience can offer some valuable insights, more important factors like advice from professional advisors, established procurement frameworks, cost and time factors often outweigh it. These components guarantee that the procurement technique chosen is in line with the objectives of the project and industry norms, hence making client's experience in construction the least important. The second to the least rated factor is client's contribution

construction or development projects, where time and budget constraints take precedence.

4.1. *Construction machinery related factor influencing the selection of contract procurement method in project delivery.*

Table 2 presents the construction machinery related factor influencing the selection of contract procurement method in project delivery. Poor maintenance of tools and machinery with a mean score of 4.54 has the highest rating. The selection of procurement techniques is influenced by poor maintenance of equipment and machinery, which emphasizes the importance of risk management, quality control, trustworthy contractor selection, cost control, time management, safety, and flexibility. In such cases, methods that take these considerations into account and offer ways to control the risks and difficulties brought on by inadequate maintenance are more likely to be chosen. Next to poor maintenance of tools and machinery is difficulties in hiring construction tools and machinery with an MS = 4.50. Contractors who have equipments of their own or who have partnership and easy means of getting equipments and machineries from rental companies are more trusted to carry out projects according to timeline schedule. Methods of procurement that enable careful screening and selection of these contractors can reduce the risks related to challenges in hiring equipment.

Table 2: Construction machinery related factor influencing the selection of contract procurement method in project delivery

S/N	Factor	Mean score	Standard deviation	Rank
1	Poor maintenance of tools and machinery	4.54	0.301	1
2	Difficulties in hiring construction tools and machinery	4.50	0.294	2
3	Increase in hiring cost of construction machinery	4.46	0.288	3
4	Inadequate skills of machinery operator	4.37	0.275	4
5	Insufficient number of machinery available onsite	4.30	0.265	5
6	Damage to tools and machinery	4.17	0.246	6
7	Absolute machinery used in construction operations	2.59	0.012	7
8	Complexities in operation of machinery	1.85	0.097	8

to design and construction with an MS 2.37. Clients seek the services of professional consultants who advise as regards which procurement method suits the project objective and gives value for money. Even though a client's input during construction can be insightful, it is usually surpassed by more important elements like project-specific requirements, established organizational policies, contractor input, risk management techniques, legal considerations, and a focus on project outcomes.

Table 1 indicates that client trust the contractor or project team to handle projects while focusing on external factors such as delivery and cost. The table most likely reflects priorities common to many

The least rated factor among construction machinery related factors influencing the selection of contract procurement method in project delivery is complexities in operation of machinery with an MS=1.85. Stakeholders and clients frequently prioritize strategic goals like timely completion, cost control, and quality, which might obscure issues unique to machines. Contractors, chosen for their technical know-how and experience, are frequently tasked with overseeing the complexity of machinery functioning. As a result, the client may place more importance on choosing qualified contractors than on the intricate workings of the machineries. The second to the least factor regarding construction machinery related factor influencing the selection of contract procurement

method in project delivery is absolute machinery used in construction operations with an MS = 2.59. Although the type of machinery utilized in construction operations is crucial for project execution, project scope, complexity, budget, risk management, compliance requirements, and overall project goals have a greater influence on the procurement methods selection process.

This construct reveals that construction projects face significant challenges in terms of equipment maintenance, availability, and costs, with less concern for machinery age and operational complexity. This suggests that improving these areas will result in more efficient and cost-effective operations.

5. Findings and Discussion

The study findings in relation to client related factors influencing the selection of contract procurement methods in project delivery are: clients emphasis on timely project delivery and low construction costs. This corroborates the findings of Williams *et al.* (2015) which found that drivers of client's satisfaction and relationship depends on timely project delivery and Janipha, Ahmad and Ismail (2015) findings which found that client's involvement in procurement influences the client's budget and impacts the quality of construction environment.

The findings of the study on machinery related factors influencing the selection of contract procurement method in project delivery that states that poor maintenance of tools and machinery and difficulties in hiring construction tools and machinery are factors to be considered in relation to construction portfolio as it affects smooth operation and delivery of projects aligns with the findings of Bengtsson and Kurdve (2016) that states that the life cycle cost of the equipment provides instructions for designing and specifying the equipment while taking into account operation, maintenance, tools and energy in procurement. The findings stress the

importance of timely decision-making, clear communication, and efficient procurement practices in ensuring the success of construction projects.

6. Conclusion and Further Research

This research adds to the body of knowledge in construction management by highlighting the importance of aligning client priorities with procurement and project management strategies. It provides actionable insights into improving resource management, client relationships, and operational efficiency.

From the client related factors, client's emphasis on timely project delivery, client's emphasis on low construction cost and type of client's funding are the clients related factors that most influences the selection of contract procurement method in project delivery. For the construction machinery related factor, poor maintenance of tools and machinery, difficulties in hiring construction tools and machinery and increase in hiring cost of construction machinery are the construction machinery related factor that most influences the selection of contract procurement method in project delivery.

It is recommended that client's emphasis on timely project delivery, client's emphasis on low construction cost, type of client's funding, poor maintenance and difficulties in hiring construction tools and machinery should be the primary factors considered in the selection of a procurement strategy relative to project delivery. The study contributes to both theoretical knowledge in construction management and practical strategies for more effective procurement and project delivery.

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