

Assessment of Procurement Methods for Road Construction Projects in Akwa Ibom State of Nigeria

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Abstract— selecting an appropriate procurement strategy is crucial to the successful completion of the project because it establishes the general model and structure of the obligations of the project participants in a contract. However, road infrastructure projects in Akwa-Ibom encounter numerous difficulties and complex performance challenges that are primarily caused by a specific procurement approach rather than the project's requirements and evaluation. This study assessed the commonly adopted procurement methods in the construction of road projects in Akwa-Ibom state and the factors affecting the selection of a procurement strategy in the construction of road projects. An extensive literature review of procurement systems was conducted. The study adopted a descriptive survey design and data were collected using a questionnaire from 150 purposively respondents from ministries, agencies, and institutions saddled with the procurement responsibilities within the state. Data were analyzed descriptively using mean and the factors were ranked according to their relative importance index (RII). The result from the study revealed that traditional and design and build procurement systems are the most used procurement option for new road construction and outsourcing system for the maintenance of existing roads. Project completion within the stipulated time, quality of work, technical complexity/competency of the contractor, and others were revealed to be the influencing factors for the choice of a procurement system. The study recommends that government procuring units should give proper consideration to project requirements and need peculiarities in choosing the best procurement strategy to be deployed as no single procurement strategy is the best.

Keywords— Road construction, procurement, procurement system.

I. INTRODUCTION

In the Architecture, Engineering, and Construction (AEC) sector, procurement methods offer a way to bring together different service providers (construction actors) for the procurement and construction of infrastructure projects like roads and bridges, to name a few. They also allow for the identification and satisfaction of clients' top priorities. Making the appropriate choice of procurement system at the inception would immediately and significantly increase the likelihood of successful project delivery with the satisfaction of all parties and stakeholders concerned.

Studies in the literature have reported cases of poor project performance as a result of the choice of procurement methods. The choice of procurement system for infrastructural projects should eliminate problems like schedule delay, shoddy workmanship, cost overrun, conflicts and disputes, outright abandonment of projects, and systematic corruption in infrastructure construction procurement most especially road projects in Nigeria. These problems have been further aggravated by (Odeck, 2004; Cantarelli, van Wee, Molin, and Flyvbjerg, 2012); (Lo, Fung, and Tung, 2006; Doan and Menyah, 2013).

Many efforts and works have been done to improve the performance of infrastructural projects, however, still face a similar problem. Design and build procurement method; a method where design and construction services are packaged

together has become an alternative procurement system that is widely adopted to overcome most problems rendered by traditional procurement systems (wan Ismail, 2000; Adnan, Bachik, Supardi, and Mariani, 2012; Adnan, Jusoff and Salim, 2008). One of the aspects to put more into addressing this problem is the adoption of correct or appropriate procurement methods for infrastructural projects. This idea is not new and has been heightened by practitioners in decades ago for instance Hazmi and Mc Caffer (2000); Ambrose and Tucker (1999); Rajeh, Tookey, and Rotimi (2015) argued that the adoption of an appropriate procurement system is the most important driver that leads to better construction project performance and has the higher possibility of eliminating the prevalent problem. Al-Hazmi and Mc Caffer (2000) for a project to be successful, the procurement method must address the technicality of the project alongside the client's needs. To do this effectively, according to the Cooperative Research Centre for Construction Innovation (2008), prior to selecting a procurement method, clients and their advisors must comprehend the characteristics of various procurement systems and selection methods

It is based on this theoretical understanding that this study has decided to fill the gap in the literature by assessing procurement methods for road infrastructural projects being adopted by procuring entities in Akwa Ibom State, Nigeria with interest in their adoption of various procurement methods available and factors consider being crucial in choosing a procurement method.

II. LITERATURE REVIEW

A. Construction Procurement Method

According to Mathonsi and Thwala (2012), "Procurement method" is a modern phrase that many professionals and academics in the construction industry recognize by other names, including project approach, procurement systems, procurement delivery techniques, or project delivery systems. Masterman (2002) argues that there is a need to accept that contemporary procurement methods can now embrace not only design and construction but also financing, operating, facilities management, etc. The following explanations of procurement methods are the most accurate.

1. It is an organizational structure adopted by the client for the implementation and at times eventual operation of a project,
2. It is a key means through which the clients create the pre-conditions for the achievement of project-specific objectives,
3. A procurement method (sometimes known as procurement system) "is an organizational system that assigns specific responsibilities and authorities to people and organizations, and defines the various elements in the construction of a project

Need for an Alternative Procurement System

The construction sector has undergone significant development throughout time. The increase in size and complexity of construction projects, financial challenges, political and social considerations, and information technology are just some of the changes that have been taking place. According to Ogunsanmi (2013), the persistent decline in Nigeria's economy has encouraged the adoption of various discretionary procurement techniques. This is in a bid to achieve construction projects within the tight budget of clients.

These changes had led to the development of alternative procurement systems other than the famous traditional ones.

B. Types of Procurement Methods

To satisfy the needs of clients, numerous techniques for procuring construction projects are available. Deciding on what procurement method to use for a given project is a difficult and challenging task as the client's objectives and priorities need to be married to the selected method so the project can be procured successfully (Davis, Love, and Baccarini, 2008). The decision as to which procurement method to be adopted should be made early as possible and underpinned by the client's requirement.

Traditional Procurement System

Mathonsi and Thwala, (2012) stated that this method is called "traditional" because it has been in existence for a long time and has been the only choice available for most clients of the construction industry for many years. Using this method, the client agrees with the design consultant (an architect or engineer) to carry out the design work and prepare contract documents. Following the completion of this phase, the contractor is then appointed based on the owner's criteria and the owner enters into a contract with the successful contractor for the assembly of the project elements. In essence, the client is under two contractual obligations; the design professional and the contractor. There are three types of contracts under the traditional procurement method

1. *Lump sum contracts*: where the contract sum is determined before construction starts and the contractor agrees to execute the project in return for an agreed sum.

2. *Measurement contracts*: in which, upon completion and subsequent re-measurement to a specified requirement, the contract sum is accurately known. The contractor agrees to execute the job which cannot be entirely measured before tendering.

3. *Cost reimbursement*: The contractor undertakes to carry out an indeterminate amount of work on the basis that they are paid the prime or actual cost of labor, plant, and materials. The contractor also receives a predetermined price to cover administration, expenses, and profit. Hybrids of the cost reimbursement contracts include a Cost-plus percentage fee, Cost-plus fixed fee, and Cost-plus fluctuating fee.

Design and Construct Procurement (Integrated)

The design and construct procurement approach is described by Masterman (1992) as "An arrangement where one contracting organization accepts sole responsibility, typically on a lump sum fixed price basis, for the bespoke design and construction of a client's project". Mathonsi and Thwala, (2012) stated that this method is a system where one organization, usually but not exclusively the contractor, takes responsibility for the design and construction of the project, in theory at least.

With a design and construct procurement method, it is possible to ensure a quicker start on site, and the close integration of design and construction can result in more effective programming. Time, however, is needed by the client's consultants to prepare an adequate set of requirements, and time is needed to compare and evaluate the schemes from competing tenderers. Any modifications made by the client after a contract has been signed may be costly.

According to the CIOB research from 2010, the design-and-build method is well-liked by clients because the contractor bears the majority of the risk and the procedure is reasonably simple. – The project is specified to be designed (at least in part) and constructed by the same contractor, which, in theory, allows for greater communication.

Management-Based procurement method (Packaged)

According to Larmour (2011), this strategy is used to describe procurement in which a contractor provides managerial services. According to Davis, et al. (2008), there are various categories of management procurement forms, such as management contracting, construction management, and design and management. These procurement techniques differ in a few minor ways; In a management contract, the contractor offers management services to oversee and plan all site activities while competitively subleasing work to qualified contractors. The client engages into separate contracts with the construction manager, designers, and trade contractors in construction management. Program savings and greater client control over the quality of the design are typically linked with construction management, but less cost certainty.

Similar to management contracting is design and management strategy. In a design and management contract, the contractor is paid and responsible for both the design team and the works contractors (Davis, et al., 2008). The typical design and management forms include A project design and

management organization, or "contractor," develops and manages the work, typically for a fee, and completes the project by using works contractors as its subcontractors for construction. Project designer/managers function as the client's agent, designing and managing the work while soliciting subcontract offers from construction companies. These companies then all enter into direct contracts with the client.

Public-private partnership procurement method "PPPP"

According to Larmour (2011), the public-private partnership (PPP) procurement method entails two or more organizations cooperating to improve performance by deciding on shared goals, creating a plan for resolving any disagreements, committing to continuous improvement, tracking results, and sharing successes and setbacks. Joint ventures and framework agreements are two examples.

This approach is thought to be the "most efficient way to undertake all types of construction work, including new buildings and infrastructure, alterations, refurbishment, and maintenance," according to the CIOB study (2010). Although short-term (project-specific) partnering has also proven to be very advantageous on individual projects, long-term (strategic) partnering commitments highlight the real benefits of the procurement method. With this technique of procurement, the client establishes a framework for the overall management of the project within which he or she is free to choose the best procurement system out of those found in the other three ways. In addition, numerous governments are turning to the funding and expertise of the private sector to provide infrastructure for their citizens as a result of economic difficulties in the supply of infrastructure among developing nations. The Public Private Partnership (PPP) method of procurement is therefore created (Awodele, 2012). According to Babatunde et al. (2010), PPP is an effort by the government to tap into the vast private resources through diversification and allowing private individuals to provide fundamental social and infrastructure services.

Direct Labor procurement method

One of the many procurement methods used to accomplish construction projects is direct labor procurement (Adegoke, 2011). It is a strategy used by clients or developers to coordinate the delivery of projects, create designs, schedule and secure resources, and build projects with "in-house" personnel (Idoro, 2012). Due to the fact that the client's personnel executes the project delivery processes and activities as opposed to the contractor's staff, the direct labor procurement method is frequently referred to as being "in-house." According to Idoro (2007), it is extensively utilized for governmental projects. According to Ojo (2009), the direct labor procurement method is a system in which the client hires tradesmen directly to carry out projects by either using internal staff to design and construct or directly engaging operatives to construct.

C. Factors Affecting the Selection of Procurement Method

The many aspects affecting the choice of procurement methods in the construction industry are presented by Maizon et al. in 2006. Time, controllable variation, complexity, quality level, price certainty, competition, responsibility division, risk avoidance, price completion, government policy, and client familiarity with a procurement method are the selection criteria

that are identified as the most frequent criteria influencing the choice of procurement method.

Shiyamini et al. (2008) made sure that the selection criteria had been concentrated at the macro level by focusing on the selection criteria in terms of client requirements, project characteristics, and the external environment. Nine major factors from the client's requirements were found through factor analysis, including risk management, time availability, predictability, pricing certainty, price competition, accountability, and flexibility for adjustments, quality of work, responsibility, and parties' involvement and familiarity. According to Thomas et al. (2002), one important factor that could affect the selection of a procurement system is the need for speed and time certainty in the construction industry. The requirement to finish a project more quickly than other projects of a similar kind, complexity, and size is referred to as speed. In particular for large or important projects scheduled for a specific occasion or event, time certainty is the guarantee that a project will be finished on or before a specified day and time. Pricing certainty, according to Maizon et al. (2006), is related to the firm price for the project's overall construction cost that was achieved at the outset of the project. Before committing to a project, clients prefer to know a definite cost for it. This enables them to have an approximate estimate so that the project cost can be kept within the financial budget. Thus the certainty of the price for acquiring a project may to a large extent influence the choice of procurement method.

III. RESEARCH METHODOLOGY

The research adopted a descriptive survey design and was conducted in the Akwa-Ibom State of Nigeria. The choice of the state was due to the handful of road construction work going on in the urban and rural areas of the state. The population for this study was drawn from registered construction professionals practicing and working in various government organizations saddled with procurement responsibilities within the study area.

The study adopted purposive sampling techniques and a sample size of 150 professionals. To achieve the aim of this paper, an extensive scholarly literature review was performed together with a survey questionnaire and interview to serve as the method of data collection. Structured questionnaires and interviews served as the instruments for the data collection from a range of respondents. The instruments for the data collection were subjected to validity and reliability test. The instruments were self-administered directly and by online post to the participants across the study area.

The quantitative data made use of varieties of statistical procedures to analyze the data. Two statistical procedures were used in analyzing the data: descriptive statistics and inferential statistics. Descriptive statistics used for analyzing the data generated in section A of the questionnaire (background information) were frequencies, percentages and inferential statistics used for analyzing data generated from section B of the questionnaire were relative importance index and were used for ranking, and the results presented in the form of tables. The data analysis was facilitated by the use of a statistical package for the social sciences (SPSS) software.

IV. FINDINGS AND DISCUSSIONS

TABLE 1: Questionnaire administration and response rate

Questionnaire	frequency	Percentage (%)
Number received	120	80
Number not received	30	20
Total	150	100

Survey data from the research field (2021)

Table 1 shows that a total number of 150 copies of the questionnaire were distributed to the target respondents based on purposive sampling. Out of the 150 copies of the questionnaire distributed, 120 were completed and returned which corresponds to a response rate of 80%. The response rate was high because professional colleagues supported the researcher in distributing and returning the questionnaire. Some studies carried out in the field of construction cost management and Supply Chain Management had relatively average and high response rates. For instance, Oludara, Okunola, and Oluseye (2018); Obi and Arif (2017); Chigara, Moyo, and Mudzengere (2013); and Abeselom (2008) had response rates of 54%, 57.83%, 73%, and 73.91% respectively. All these cited works affirm the response rate adequacy for this study.

Background Information of Respondents

Table 2 shows the socio-economic characteristics of the respondents used for this study. The characteristics include their places of work, years of experience, age, academic qualification, etc.

TABLE 2: Respondents Bio-Data

Category		Frequency	Percent (%)
Gender	Female	39	30
	Male	91	70
	Total	130	100
Professional Experience	1-5yrs	16	12.3
	6-10yrs	31	23.8
	11-15yrs	40	30.8
	16-20yrs	25	19.2
	20yrs and above.	18	13.8
	Total	130	100
	Average	26	
Highest Academic Qualifications	HND/ND	39	30
	B.Sc./PGD	48	36.9
	M.Sc./M.Tech.	30	23
	Ph.D.	14	10.8
	Total	130	100
Profession	Engineer (NSE)	42	32.3
	Architect (NIA)	25	19.2
	Quantity Surveyor (NIQS)	29	22.3
	Builder (NIOB)	18	13.8
	Others	16	12.3
	Total	130	100
Type of Organization	Ministry	29	22.3
	Agency/corporation	39	30
	Institution	40	30.8
	Local Government	22	16.9
	Total	130	100

Survey data from the research field (2021)

The result in Table 2 shows that majority of respondents were male (91) representing a percentage of 70% compared to the female 39 representing a percentage of (30%). The years of professional experience of respondents in the procurement of

construction projects, specifically reveals that 16.0% of the respondents have 1-5 years of experience, 31.0% have 6-10 years of experience, 40.0% have 11-15 years of experience, and 25.0% have 16-20 years of experience whereas 18.0% have over 20 years of experience. It also shows that the respondents are qualified and knowledgeable to respond to the questions with 48.0% B.Sc. holders, 39% Higher National Diploma, and 30.0% Master’s holders respectively. All of the respondents are members of their professional bodies. Engineers and Quantity Surveying are the most represented profession with a percentage score of 42 and 29 respectively. Generally, the respondents are all working in government establishments with 40.0% of the sample in Institutions, 39.0% working in agencies and corporations, and 29.0% in ministries.

TABLE 3: The commonly adopted procurement method in the construction of road projects in Akwa Ibom State

Procurement Routes	SD %	D %	N %	A %	SA %	M	Rank
Traditional Method	2.4	2	6.3	42.1	47.2	4.3	1
Management contract	3.1	5.9	23.9	42	25.1	3.8	5
Design and construct (Build)	4.7	0.4	8.6	53.7	32.7	4.09	3
Public private partnership (PPP)	3.1	3	13.1	39.1	41.7	4.21	2
Direct Labor	7.1	8.7	21.7	37.4	21.1	2.65	6
Construction Management	4.1	4.7	18.9	38.1	37	3.9	4

Survey data from the research field (2021)

Key: SD=Strongly Disagree, D=Disagree, N=Neutral, A=Agree, SA=Strongly Agree, M=Mean,

Table 3 shows in analyzing the procurement method frequently adopted for the procurement of road infrastructures in Akwa Ibom State. A list of procurement options was presented to the respondents working in different organizations responsible for overseeing and delivering road projects. The respondents were asked to rate on a scale of 1 to 5, the extent to which they agree to the usage of the procurement options for the acquisition of road projects.

From the analysis, it can be seen that the procurement routes have a mean value of 2.5 and above. This means that these 6 procurement routes have a considerable amount of usage. However, the methods of procurement most adopted based on the mean ranking are the traditional method and public-private procurement (PPP) with an overall mean value of 4.3 and 4.2 respectively. Design and construction (Build) ranked 3rd while construction management and management contracting ranked 4th and 5th respectively. These results affirm Ogunsanmi *et al.* (2003) disposition that the traditional method (design-bid-build) has been in use in Nigeria for decades and has dominated the construction industry. Interestingly, PPP an emerging procurement method has been adopted to address the infrastructural deficit in Nigeria. This method provides the platform for government to collaborate with individuals and private sectors to procure new roads for the citizenry (Awodele, 2012). The result of the PPP procurement route indicated that road projects in the state are provided by individual and private sectors.

Direct labor procurement from the study; the result shows that the procurement method is ranked 6th with an overall mean

of 2.65. This indicates low usage of direct labor on new projects. This finding correlates with the view of Adenuga and Dosumu (2012) that direct labor routes are mainly adopted for maintenance projects.

TABLE 4: Factors Influencing Selection of a Particular Procurement Route.

Influencing Factor	SD	D	N	A	SA	M	RANK
Project completion at estimated time and speed	17.1	17.5	13.1	32.9	20	3.21	2
Quality assurance (need to satisfy client expectation)	15.6	18.5	20.4	26.9	18.5	3.14	3
cost related (need to complete the project within the budgeted cost)	15.3	18.2	19.5	28	16	3.09	4
Risk related (avoidance /allocation)	25.1	22.2	17.5	22.5	12.7	2.76	10
Project characteristics	21.8	19.3	18.2	25.1	15.6	2.93	8
Flexibility (Ability to make change)	21.5	14.9	12.7	34.5	16.4	3.07	5
Technical complexity of the construction	15.6	13.8	18.5	33.1	18.9	3.26	1
Availability of finance (financial arrangements)	19.3	20	17.1	23.6	20	3.05	6
Dispute and Resolution	26.1	24.1	15.2	19.2	10.8	2.45	11
Government policy	25.1	16.4	20	24.4	14.2	2.86	9
Familiarity (with procurement methods)	22.2	14.9	17.8	29.5	15.6	3.01	7

Survey data from the research field (2021)

From the result in table 4, it can be seen that the technical complexity and competence of the contractor to handle client requirements is essential with an overall mean of 3.26, and is rated the most significant factor influencing the choice of procurement method for road construction in the state. The majority of the client will go for the procurement method that will allow them to objectively assess the competency of the contractor who is to execute the project. It is also no surprise that project completion time and speed of work during the design and construction stage, quality assurance (i.e. need to achieve value for money), and cost related (i.e. ability to deliver the project within the budgeted cost) were rated 2nd, 3rd and 4th with a mean score of 3.21, 3.14, and 3.09 respectively. Factors like risk-related and dispute and resolution with mean scores of 2.76 and 2.45 were rated as least significant in the choice of procurement method.

V. CONCLUSION AND RECOMMENDATIONS

Through identifying the degree of adoption of various procurement routes and examining the factors that influence the selection of procurement techniques for road projects, this research examined the procurement methods for road construction projects in Akwa Ibom State. The study's conclusion is that the traditional procurement method is the one most frequently used in the state to undertake road projects. Additionally, it was mentioned that the public-private partnership approach is thought to be used by well-meaning people and the private sector in collaboration with the state government to offer road construction in rural and urban districts. The technical complexity and contractor's ability to meet the client's requirement and whose design construction skills can be depended upon to satisfy and assure quality work are other key elements identified by the study as influencing the choice of a procurement method.

In order to choose a contractor who can effectively deliver the project to the client's needs of quality, cost, and time, the study advises government procuring agencies and organizations to pay careful thought to their choice of procurement technique

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