Drivers of Value for Money in Public Infrastructure Procurement in Owerri, Imo State, Nigeria

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Abstract - **Despite efforts to improve public procurement policies and guidelines in Nigeria, infrastructure delivery experiences several challenges that have hampered economic development, resulting in public infrastructure deficiency of value for money. Identifying drivers of value for money in public infrastructure procurement in Owerri, Imo State, Nigeria, is the aim of this study. The mixed-method research design was adopted for this study. Purposeful and snowball sampling techniques were utilized to determine the study respondents. Data collection was implemented using a survey questionnaire. From the systemic literature review, 14 drivers were identified. The dependability of the research instrument was conducted using the Kaiser-Meyer-Olkin (KMO) test of adequacy and Bartlett's Test of Sphericity. The data obtained from this study was subjected to descriptive statistics and factor analysis. The study findings identified public sector technical innovation and transfer, products and services meeting users' demand, efficient risk allocation, low project life cycle cost, and complementary advantages of public-private partnership as the most significant drivers of value for money in public infrastructure procurement. This study justifies an evident need to highlight and incorporate value-for-money drivers toward efficient and sustainable public infrastructure delivery.**

Keywords: Value for money, Drivers, Procurement, Public Infrastructure.

I. INTRODUCTION

Infrastructure is mostly procured to provide key developmental needs for a nation's economic and social growth. Direct investment in public infrastructure can enhance economic prosperity, and stability, as well as improve local and foreign trading capabilities. Good and adequate infrastructure improves competitiveness in attracting local and foreign investments as well as in bringing goods and services to the world marketplace [47]. On the contrary, inadequacies in public infrastructure can potentially hinder economic fortune and social welfare. [45] argued the existence of a bond between infrastructure development and economic fortune. [15] carried out an infrastructure assessment in Africa and found out that poverty eradication and underdevelopment in Africa are affected by the poor performance of infrastructure in these regions.

In Nigeria, the practice of public procurement is built on the Public Procurement Act (PPA) 2007, developed to create a balance of procurement in the public service to promote sustainability and thoughtful use of scarce materials. However, the attainment of its objective has been surrounded by several inadequacies [50].

Several policies have been implemented to complement existing infrastructure needs as part of the state urban renewal initiatives. In all these, value for money is the bedrock of these projects [36]. [6] stated that the traditional method of procurement is widely used for the procurement of public infrastructure in Nigeria. It has been criticized for its inability to deliver projects of the best value. [34] proved several public projects with poor performance and low value. An observation of this limitation can be seen in the scattered uncompleted and abandoned projects across the Imo State [19]. Achieving Value for Money (VFM) is a challenge in Owerri when it comes to government-funded developments, this is a result of the incessant statistics of project abandonment and the comparatively poor performance of municipal infrastructure which has been associated with transitions in government [13], poor project management practices [46], inadequate funding [33], as well as regulatory frameworks [37].

To ensure these projects are delivered to realize optimal VFM, the expertise of professionals/stakeholders should be engaged at all phases of the project. Every phase of the project must be executed to attain value, which necessitates the involvement of multiple stakeholders and project participants [27]. Additionally, "optimal whole life cost", "innovation", "fit for purpose", and "compliance on time" has been identified to improve the value for money potentials of

infrastructure [22]. Given the aforementioned, it is imperative to comprehend the pertinent theories about public infrastructure procurement and ascertain the drivers that enhance vfm. In light of this, it is imperative to conduct a thorough evaluation of the body of research on vfm in public infrastructure procurement. A thorough analysis of vfm in public infrastructure procurement was conducted, leading to the identification of various drivers that influence vfm in public infrastructure procurement in Owerri, Imo State, Nigeria. This study further highlighted relevant suggestions for enhancing public procurement, which guides the action of experts and stakeholders in the acquisition of public infrastructure.

II. LITERATURE REVIEW

2.1 Value for Money in Public Procurement

The concept of allocating prices and profits to the cost of acquisition forms the foundation of Value for Money (VFM) [29]. VFM serves as the cornerstone for efficient public sector procurement, as highlighted by [24]. It entails the achievement of intended procurement objectives at the optimal price possible, based on a fair assessment of relevant fiscal and non-fiscal variables, rather than necessarily the lowest price [1]. VFM lends credence to the theory that resources procured from competitive marketplaces and utilized more judiciously yield superior results [31]. Given the sensitive nature of public procurement, [30] emphasize the necessity for discretion at all levels of government in exercising judgment. Instead of focusing solely on the lowest price, a holistic evaluation of a product or service's lifecycle costs should be undertaken to determine its value [1]. As most rural local authorities operate with limited resources at their disposal, ensuring VFM in their procurement activities is crucial for optimizing the utilization of these scarce resources [24].

2.2 Drivers of Value for Money in Public Infrastructure Procurement

For the success of public infrastructure, certain factors contribute to the efficient delivery of its objectives. These factors are classified as drivers. Through a survey of different government organizations, [5] acknowledged several drivers as possessing significant impact on project deliverables. To drive value addition in public procurement, [48] identified a transparent and fair bidding process as essential for fostering contractor competition, leading to more competitive pricing and better value for money. Further research by [26] adopted a life cycle costing approach, which considers the initial construction costs as well as future maintenance, operation, and disposal costs, as responsible for making informed decisions and better value for money over the long term.

The complex and dynamic nature of public infrastructural projects exposes them to different levels of risk at various stages of the project. To evade project delay and abandonment, adequate risk allocation and management strategies are essential [12]. Further to this, there is a great concern for innovative technologies in infrastructure projects. According to [41], encouraging innovation and the adoption of novel technologies in infrastructure projects can lead to improved efficiency, sustainability, and cost-effectiveness, ultimately driving better vfm. The implementation of innovation involves the engagement of diverse stakeholders, effective stakeholder engagement throughout the procurement process can help identify and address potential issues early on, reducing costs and delays, and ultimately contributing to better value for money [49]. Similar factors have been the subject of additional research on VFM drivers. [32] used a case study approach to identify price certainty, and timely delivery, amongst others, as the essential elements that increase VFM in public procurement.

Going further, other researchers acknowledged VFM drivers in the aspect of nontraditional, asserting meaningful conclusions. Analysis of current research suggests that project deliverables can be enhanced in several measures. [11] has identified skills, behaviors, and transparency, among others, as significant drivers of value for money.

Table 1: Value for money drivers in public infrastructure procurement

S/N	VFM Drivers	Sources
1	Public sector technical innovation and transfer	[41]
2	Skills and expertise of the public sector	[32],[28]
3	The perceptions and acceptance of stakeholders	[4]
4	Low project life cycle cost	[26]
5	Improve buildability and maintainability	[16]
6	Optimal use of asset/facility and better service delivery	[16]
7	Service delivery at the agreed-upon price to the public sector	[8], [28]
8	Service delivery on time or in advance	[32],[4]
9	Product or service meeting users' demand	[28]
10	Complementary advantages of public-private partnerships	[44]
11	Efficient risk allocation	[12]
12	The long-term nature of the contract	[28]
13	Nature of financial innovation	[4],[42]
14	Performance-based payment mechanism	[20],[28]

III. RESEARCH METHODOLOGY

A mixed-method research methodology was used in this study which enhanced the researcher's capacity to collect and analyze relevant data towards achieving the research aim. This is supported by [9], who posited that a mixed-method research methodology is essential to understanding a research problem. The purposive and snowball sampling technique was utilized for the determination of the study respondents. Survey questionnaires were used for data collection. This procedure is supported by the research of [7]. Following the research aim,

sixty-three (63) questionnaires were issued, while fifty-four (54) were returned well-filled, accounting for 85.70% of distributed questionnaires. [14], it is ideal to set certain factors that identify a good informant from a bad informant. In consideration of this, the study adopted the following criteria:

i. Respondents ought to have sound knowledge and experience in the study area.
ii. Ought to have been involved in public procurement functions for infrastructural advancement.
iii. Have at least 5 years of professional experience.

The obtained data was examined using frequencies, percentages, Mean Scores, and Standard deviation. Background data of respondents were synthesized using frequencies and percentages. The Statistical Package for Social Sciences (SPSS, version 20) was used to perform additional quantitative analysis of the data. The SPSS was used for analyzing the research findings and determining their relationship among variables. The mean score analyses were used to rank respondents' ratings of variables. With a hypothesized mean score of 3.0, the variables obtained were greater than 3.0 and thus deemed significant for this research by one-sample t-test analysis at a 95% certainty level [25]. Afterward, factor analysis was carried out on the identified 14 variables obtained from the literature. Factor analysis is employed to reduce the quantity of examined variables into logical sub-factors [43].

IV. RESULTS AND DISCUSSIONS

4.1 Respondents' background information

As seen in Table 2, 29.63% of respondents are quantity surveyors, 14.81% are project managers, 9.23% are financial analysts, 14.81% are procurement specialists, 7.41% are policy analysts, 11.11% are economists while 9.26% of respondents belong to the academic sector. The respondents belong to the consulting, contracting, and educational sectors. 9.25% belong to the education sector, 48.15% belong to the contracting category and 42.60% belong to the consulting category. 40 professionals/stakeholders possess (5-10 years) of practice experience which accounts for 74.07% of total respondents. 14 professionals/stakeholders possess (11-15 years) practice experience accounting for 25.93% of the total response for this category. 70.37% of respondents belong to a professional body while 29.63% are yet to associate with a professional body. 27.80% are probationer members, 46.28% are corporate members and 25.92% have attained the fellow position. 25.93% of respondents hold a first degree (B.Tech/B.Sc), 59.25% possess MSc/MBA degrees, and 14.82% possess a PhD degree. No category of respondents possess a diploma degree as their highest academic

qualification. The findings in this portion show that the respondents met the established criteria.

Table 2: Background data of respondents

Variables	Category	Frequency	Percentage
Profession of respondents	Quantity surveyors	16	29.63
	Project managers	8	14.81
	Financial analysts	5	9.23
	Procurement specialists	8	14.81
	Policy analysts	4	7.41
	Economics	6	11.11
	Academicians	5	9.26
	Auditors	2	3.70
	Total	54	100
Type of organization	Consulting	23	42.60
	Contracting	26	48.15
	Education	5	9.25
	Total	54	100
Years of industry experience	5 - 10	40	74.07
	11 – 15	14	25.93
	Total	54	100
Membership of professional body	Yes	38	70.37
	No	16	29.63
	Total	54	100
Professional membership status	Probationer	15	27.80
	Corporate member	25	46.28
	Fellow	14	25.92
	Total	54	100
Highest academic qualification	B.Tech/B.Sc	14	25.93
	MSc/MBA	32	59.25
	PhD	8	14.82
	Total	54	100

Table 3: Mean analysis of Drivers of value for money of public infrastructure procurement

Drivers	Mean	Std. deviation	Analysis N
Public sector technical innovation and transfer	4.50	.607	54
Skills and expertise of the public sector	4.43	.602	54
The perceptions and acceptance of stakeholders	4.39	.627	54
Low project life cycle cost	4.43	.570	54
Improve buildability and maintainability	4.44	.604	54
Optimal use of asset/facility and better service delivery	4.43	.716	54
Service delivery at the agreed-upon price to the public sector	4.48	.693	54
Service delivery on time or in advance	4.61	.596	54
Product or service meeting users' demand	4.48	.693	54
Complementary advantages of public-private partnerships	4.35	.756	54
Efficient risk allocation	4.44	.664	54
The long-term nature of the contract	4.41	.714	54
Nature of financial innovation	4.41	.714	54
Performance-based payment mechanism	4.46	.665	54

4.2 Initial consideration

The consistency of factor analysis is reliant on the sample size. Ten (10) is the lowest consideration, according to [10]. Regardless of sample size, the KMO test is appropriate for assessing the dependability of the variables under investigation. A variable around 1 indicates the sample's

proficiency, with a value range of 0 to 1 [23]. Following the research protocol of [38] who used a smaller sample size, 54 people made up the sample, and the KMO value was 0.624. An identity matrix represents the primary correlation when using a null hypothesis from Bartlett's test.

A p-value greater than 0.05 indicates that there is a discernible degree of correlation between the variables. Bartlett's test is confirmed to be significant and appropriate for factor analysis with a $p < 0.001$ value. According to [2], the commonality is used for these variables to determine how closely they are related. A variable is suitable for the factor if its extraction figure is greater than 0.5. Components to be established can be extracted, as shown in Table 5, depending on eigenvalues. Kaiser's advice can be used to examine the components from Table 5 that need to be established based on the eigenvalues; these components must have an eigenvalue greater than or equal to 1.00. About 70% of the variables have been clarified based on the components that were extracted.

Table 4: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.624
Bartlett's Test of Sphericity	Approx. Chi-Square	281.200
	df.	91
	Sig.	.000

Table 5: Total variance explored

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.346	23.900	23.900	2.680	19.139	19.139
2	2.934	20.956	44.856	2.481	17.724	36.864
3	1.342	9.588	54.443	1.813	12.953	49.817
4	1.272	9.082	63.526	1.547	11.048	60.865
5	1.011	7.220	70.745	1.383	9.881	70.745
6	.969	6.918	77.663			
7	.707	5.052	82.715			
8	.616	4.402	87.117			
9	.466	3.332	90.449			
10	.387	2.762	93.211			
11	.359	2.565	95.776			
12	.272	1.946	97.722			
13	.224	1.599	99.321			
14	.095	.679	100.000			

Extraction Method: Principal Component Analysis

From Table 6, the six components equal 70% of the entire variance. The entire variance shown by the respective extracted component is as follows: the first major component (Component 1) represented 19.139% of the total variance, the second major component (Component 2) represented 17.724%, and Component Three represented 12.953%, while component 4, and 5 represented 11.048%, and 9.881% respectively, of the total variance (Table 5). For a data set to justify the cumulative proportion of variance modalities,

summed components should justify at most, 50% of the total variation. Given this, 70.745% of the total extracted components were derived.

Table 6: Rotated Component Matrix

Variable/Driver	Factor loading				
	1	2	3	4	5
Procurement method and stakeholder engagement					
Efficient risk allocation	.832				
Optimal use of asset/facility and better service delivery	.789				
The perceptions and acceptance of stakeholders	.697				
Complementary advantages of public-private partnership	.630				
Service delivery on time/ in advance	.561				
Public sector skills and competency					
Skills and expertise of the public sector		.888			
Improved buildability and maintainability		.879			
Product or service meeting users' demand		.494			
Financial framework					
Performance-based payment mechanism			.871		
Nature of financial innovation			.746		
Efficiency and contract duration					
Service delivery at the agreed-upon price to the public sector				.771	
The long-term nature of the contract				.756	
Project cost and technicality					
Low project life cycle cost					.804
Public sector technical innovation and transfer					.616

Extraction Method: Principal Component Analysis

4.3 Data interpretation

4.3.1 Component one: Procurement method and stakeholder engagement

Efficient risk allocation, optimal use of asset/facility and better service delivery, the perceptions and acceptance of stakeholders, and the complementary advantages of public-private partnership characterize component one. To maximize value for money in public infrastructure procurement, risks must be assigned to the party most qualified to manage them—a process known as effective risk allocation [40]. Cost reductions, enhanced project performance, and improved service delivery are all possible outcomes of an ideal risk distribution system [3]. On the other hand, inefficient risk distribution can lead to higher expenses, longer wait times, and disagreements [3]. The complexity of public infrastructure has increased over time, making effective use of available resources and assets necessary to guarantee improved service delivery to end users. Value for money is mostly determined by how well these resources are used and by how well services are provided [16]. It is therefore necessary to ensure that the procurement approach utilized meets project goals. [35] observed that the ongoing decline of Nigeria's economy has led to increased use of alternative, discretionary procurement methods. The adequate engagement of stakeholders is seen as a great driver towards attaining VFM. To provide appropriate value for money, this approach includes stakeholders' assessments of procurement needs. Thus, stakeholder

participation is essential [4]. To elaborate, [18] the private sector contributes operational effectiveness, innovation, and access to private financing, while the public sector offers funding support, regulatory monitoring, and policy advice. Using these complimentary benefits can result in more cost-effective projects and better project outcomes [44].

4.3.2 Component Two: Public Sector Skills and Competency

Lack of experience in the public sector can lead to suboptimal project outcomes and lower vfm [28]. To achieve vfm in public infrastructure procurement projects, which frequently require the design, building, and maintenance of infrastructure assets over an extended period, it is critical to supply goods and services that satisfy user demands [16]. Public satisfaction, utilization, and return on investment can all be increased by comprehending and incorporating user needs into project design and delivery [28]. To ensure the attainment of vfm in public infrastructure procurement, public sector skills and competency should be carefully analyzed and put in place.

4.3.3 Component Three: Financial Framework

The very nature of public infrastructure is such that it demands a robust funding framework. Infrastructure financing can take the form of internal investments or external direct investments [42]. One essential component of public infrastructure procurement that can maximize value for money is performance-based payment schemes. These methods encourage the private sector to provide high-quality services and efficiently manage assets by tying payments to predetermined performance goals [18]. To ensure accountability and value for money, failure to reach performance targets may result in payment deductions or penalties [20]. Value for money can be improved by financial innovations including risk-sharing plans and project financing models. However complicated financial arrangements can also raise transaction costs and hazards, which could reduce value for the money [21]. In Nigeria, the three arms of government share responsibility in funding of urban infrastructure projects. The nature of financial innovation and performance-based payment mechanisms characterize the financial framework.

4.3.4 Component four: Efficiency and contract duration

Component four encompasses the delivery of services to the public sector at the contractually agreed-upon price and the duration of the agreement. A key component of attaining value for money in projects is providing services at the predetermined cost [39]. Strong payment procedures, risk-reduction plans, and efficient contract administration can all contribute to ensuring that services are provided at the agreed-

upon cost. Better value for money can be achieved for long-term contracts by enabling effective lifecycle costing, asset optimization, and the realization of long-term benefits. But it also brings with it dangers associated with evolving conditions, obsolescence of technology, and renegotiation of contract terms [18].

4.3.5 Component five: Project cost and technicality

Low project life cycle cost and the public sector technical innovation and transfer make up component five. Amongst others, achieving low project lifecycle costs is a major factor influencing value for money in public infrastructure projects. Throughout a project, the participation of the private sector can result in innovations and efficiencies that lower construction, operation, and maintenance costs [41]. Lower lifecycle costs can also be achieved through efficient risk allocation, asset optimization, and performance-based payment systems [12]. New technology, procedures, or best practices may be introduced by private-sector partners to improve public-sector capacities. The public sector can guarantee that these innovations are beneficial to it through efficient methods for knowledge transfer and capacity building [17].

V. CONCLUSION

This paper is focused on identifying the drivers of vfm in public infrastructure procurement in Owerri, Imo State, Nigeria. Although this study may have been executed in Owerri, its findings are useful in other sectors of the economy with similar construction environments. The study identified public sector technical innovation and transfer, products and services meeting users' demand, efficient risk allocation, low project life cycle cost, and complementary advantages of public-private partnership as the most substantial drivers of value for money. Utilizing these drivers in combination with strong frameworks for public-private partnerships, capacity-building initiatives, stakeholder engagement procedures, all-encompassing risk assessment, and management plans, life cycle costing techniques, and encouraging cooperation and information exchange, public sector organizations will be able to optimize costs, meet user demands, deliver projects more effectively, and increase user satisfaction.

To improve public sector technical innovation and technology adoption, the recommendations call for the establishment of a strong framework that clearly outlines roles, responsibilities, and risk-sharing mechanisms amongst stakeholders. Training and retraining of professionals on innovative construction techniques is recommended as the construction environment is dynamic. This paper equally recommends continuous review of existing policies, such as the Public Procurement Act of 2007, as it has the efficiency to

improve government-financed projects. Going further, collaboration among stakeholders, including policymakers, government agencies, and the public, is crucial for achieving transparency and efficiency in public infrastructure procurement. Conclusively, further research is needed as this study is limited to Owerri.

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