Evaluating Factors Affecting Transaction Costs of Contractors in Public Procurement in Nigeria: PLS-SEM Approach

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Abstract

The costs of transaction construction projects for contractors in public organization have been considered a necessary measure for the sustainability of contracting business. Studies on factors affecting owners and contractors transaction costs have used various techniques and methods to explain the relationships between particular variables. Unexpectedly, Structural Equation Modeling (SEM) has acquired very little concern in factors affecting contractors transaction costs studies. To address this limitation in the body of knowledge, the objective of this study was to apply the SEM approach and build a model that explained and identified the critical factors affecting transaction costs of contractors in bidding public sector organization projects. The study developed a quantitative approach using smart-PLS version 3.2.8. This study shed light on the views of different contracting firms' based on their experience in bidding public construction projects in Nigeria. Particularly, the study aimed to findout the relationships between eligibility documents, method of securing documents, and contract administration factors, and how these relate to transaction costs of contractors'. The findings of this study revealed that the R^2 value of the model was scored at 0.358, which meant that the three exogenous latent constructs collectively explained 35.8% of the variance in transaction costs. The Goodness-of-Fit of the model was 0.932. The eligibility document costs factor was the most important out of the three constructs. This study confirming that appropriate plans and costs control management methods as well as necessary amendment of the Act can be employ to insure minimal costs of bidding public sector projects. These findings might map out critical areas to pay attention for a new contracting firms and public organization on costs related problems that might occur in their transactions.

Keywords: Theory, Transaction Costs, Procurement Act 2007, Bidding, Public Organization

INTRODUCTION

In construction projects in Nigeria, clients undergo a procurement process to select a competent consultant and contractor to carry out the construction work using pre-determined selection criteria (Peter, Love, Davis & Edwards, 2008; McWhirt, Ahn, Jenniffer & Kelly, 2011; Ogunsanmi, 2013) or guidelines as stated by the public procurement Act 2007. The Act objectives are to provide the best value for money, economy, transparency, accountability and competition among bidders.

To ensure standard procurement, there is need to obtain economies of scale and reduce procurement costs. However, it must be noted that the Act has not taken into account the transaction costs incurred with participation in the tender processes due to the varied activities

undertaken by clients, consultants and contractors. It is a common fact that contractors devote considerable time and resources in determining the cost of construction and then assessing the price they will quote to the owner (Li, Arditi & Wang 2013). The client is interested mostly in the price quoted by contractors.

This price is the rate at which exchange will take place. Price to the contractor becomes a cost to the owner (Hillebrandt & Hughes, 2000). However, the actual cost of a construction project is not the only production cost. The cost of preparing a bidding document, eligibility documents, market survey, drawing up a contract condition, advertisements, information, communication, administrative aspects and dealing with any deviations from construction (Arbitration or Dispute resolution) are also important. In construction these cost are incurred by clients, consultant or contractors as the case may be.

These costs are known as transaction costs in the study of economic organizations (Coase, 1937). In transaction cost economics a transaction occurs when a goods, works or services is transferred across a technologically separable interface (Williamson, 1987). Similarly, in construction bidding using the PPA (2007) a services or goods are supplied to the client in return to a stated amount agreed by client.

However, it is not well established if the transaction costs factors affect contractors under the PPA 2007 as observed by Li *et.al* (2013). Various researchers have proven the existence of such cost in the construction industry and other areas of studies. These includes construction-related topics, project organization and governance (Piertoforte, 1997; Turner & Keegan, 2001; Winch, 2001; Muller & Turner, 2005; Jobin, 2008), Agriculture (Huo, 2015; Ferris 2005) and marketing and sub-contracting (Eccles, 1981; Gunarson & Levitt 1982; Reve & Levitt, 1984; Winch, 1989; Constantino, 2001).

Most of the aforementioned researchers on transaction costs indicated how stakeholders faced with challenges due to the costs incurred during transaction by both parties. These leads to higher cost of construction, less economic efficiency in the procurement chain system. For instance in the United Kingdom about 0.57% of the total project value was identified to be spending as the bid costs by the contractors whether they win or lose in a bidding processes (Hughes, 2016). This is against the fact that, such costs make a significant impact on the retained operating turnover for the construction firm or company.

Worthy of note in the construction transaction in Nigeria is that they offer various transaction costs factors (Lingard, Hughes & Chinyio, 1998; Enshassi, Mohamed & El-Karriri, 2010; Costantino, Pellegrion & Pietroforte, 2011; Li, Aridit, & Wang, 2012; Li *et.al*, 2013; Thomassen, Vassbo, Solheim-Kile & Lohne, 2016) in respects of their tax clearance, pension commission, industrial training fund, national social insurance, financial reporting council, interim report registration, and many documentary evidence. These can have significant effects on contractors' transaction costs during bidding. The aim of this study is to evaluate the factors affecting contractors' transaction costs in public procurement cycle. Factors considered in the study are those prequalification documents as in part IV S.16 (6) (a)-(f) of the PPA 2007.

Theoretical review

According to the American heritage dictionary of English language 4th edition (2000), theory is defined as a set of statements or principles devised to explain a group of facts or phenomena, especially one that has been repeatedly tested or is widely accepted and can be used to make predictions about natural phenomena. We reviews theoretical framework for analyzing transaction costs of contractors' construction project procurement in Nigeria. The challenge has been to identify appropriate theories for analyzing transaction costs in the context of construction industry due to the fact that, not many researchers have used this approach in the analysis of transaction costs in construction industry. However, this study has adopted this approach so as to gain appropriate explanation of transactions situation in construction projects procurements by contractors in Nigeria. This is a bottom-up approach compared to a survey approach which primarily is a top-down approach that has been used by many researchers in the subject of conflicts in construction industry.

Here, we discuss the linkage between theory, research, development and practice. Theory, research, development, and practice together compose an important cycle that allows ideas to be progressively refined as they evolve from concepts to practices and from practices to concepts (Swanson and Holton, 2005).

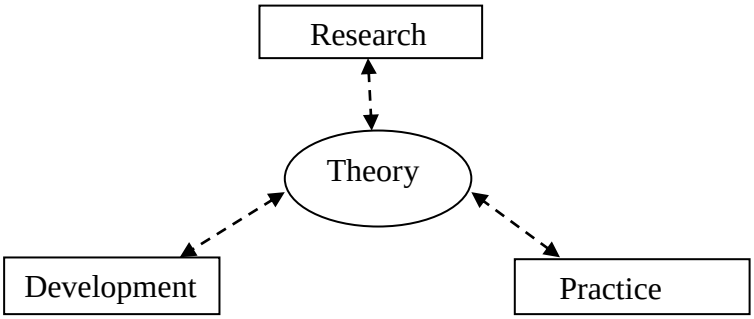

Figure 1: Theory – Research – Development – Practice Cycle.
Source: Swanson and Holton (2005) Cited by Ntiyakunze (2011 pp57)

Figure 1 shows the systematic application of research methods working to advance the knowledge by both the researchers and practitioners. The cycle illustrates the union of the four domains and the need for all domains to inform each other in order to enrich each other. What is important to note, is that any of the domains can serve as an appropriate starting point for knowledge generation. As one starting point of the cycle, research is undertaken to expand our professional knowledge base and frequently yields recommendations for development of new systems or the improvement of practice. Research can also proceed along the cycle to produce theory. Additional theories are needed for greater understanding of a wide range of human and organizational phenomena. Thus research serves a dual role in advancing knowledge and provides knowledge that can be directly applied to the improvement of practice, and it is used to develop core theories.

Swanson and Holton (2005) assert that, organizational development efforts offer a unique opportunity to enter the cycle. The demands of practice and the need for fundamental change establish the conditions for creating fundamentally new organizational models and methods. An organization intervention is viewed as a subsystem within a larger system. The subsystem and

system influence one another to the point that innovative and practical new developments often become bold starting points of activity and inquiry.

When starting with practice, there is a number of problems and challenges facing functioning organizations that can be identified. These challenges provide an inexhaustible source of researchable problems. Proceeding from practice to research or practice to development along the cycle traces the familiar path between the problems that continuously arise in organizations and the research and development efforts they stimulate. Each of the domains of the cycle serves to advance research in organizations and each can be a catalyst to inquiry and a source of verification.

In summary, the process of knowledge generation can begin at any point along the theory – research – development – practice cycle, and flow along the cycle is multidirectional. The researcher or practitioner can start at any point and proceed in any direction. Thus, each of the cycle's domains both informs and is informed by each of the domains.

However, in this study as in the case for most academic studies, the cycle starts with theory as it is used to guide and inform the processes of research, development, or practice. Reviewing the literature, which includes relevant theories identify the variables and relationships to be considered. The theory reviewed and used in the analysis of transaction costs in building projects in Nigeria is the transaction cost economics theory (TCE) which is discussed below.

Concept of Transaction Costs

Commons in 1931 introduced the idea that transactions form the basis of economic thinking. However, it is generally supposed that Roland Coase originated the term "transaction cost" when he used it in formulating a theoretical framework for determining when specific economic tasks would be performed by both the firm and the market. However, the term did not appear in his works till the 1970s. Though he is not the originator of the specific term, Coase deliberated the "costs of using the price mechanism" in his 1937 paper, The Nature of the Firm, thus introducing the concept (Jacobides, 2008).

Successively, he explored pricing mechanisms and found that there are costs that related to searching for relevant prices, negotiating, and making a contract (Coase 1992, Coase 1988, Coase 1960). However, Tibor Scitovsky (1940) introduced the label of 'transaction cost' into the economic vocabulary (Hardt 2006). It is obvious that Transaction Cost Economics long pre-existed its introduction into research in economics. It has lived very long, but very shortly as a discipline of science. That account of TCE theory started Oliver Williamson in the 1970s. It was in his 1979 paper (Transaction cost economics: the governance of contractual relations) that the term "Transaction Cost Economics" was first mentioned.

According to Yales and Hardcastle (2003) the TCE theory focus on contracting problems and, has been found suitable for analysis of complex and dynamic relationships like those found in building projects. The theory has five key elements; the governance structure, contractual incompletedeness and consequent ex post adjustments, asset specificity and monopoly power, opportunism and credible commitments.

Governance structure refers to organizational arrangements for undertaking the project. According to Williamson (2007), the difference in governance costs stems from the motivation, cognitive limitations and the moral character of the people involved. His assumption about people is that, people are bounded rationally and negatively opportunistic. For construction projects there are a number of arrangements by which a project can be procured. The arrangement chosen determines the degree of involvement and interaction among the participants and also has influence on the management of the project, including the associated costs that may arise. The theory advocates that transactors should select a governance structure and a procurement regulation that will give optimum costs for producing and transacting the building project.

Contractual incompletedeness and consequent ex –ante adjustment element refers to incomplete contracts that do not provide sufficient contingencies for events that may happen in the course of contract execution. According to Milgon and Roberts (1992), incomplete contracts may be caused by bounded rationality, uncertainty, and complexity of the project in hand. Such constraints in a construction project may include; limits of knowledge, costs, ability, experience, competence, and limited time. Asset specificity and monopoly power; The TCE theory generally assumes that the markets are competitive that is, there are many buyers and sellers, and that the transactions are controlled by market forces. However, this assumption is undermined when there is one or few buyers and sellers who tend to develop opportunistic behavior when transacting (Milgrom and Roberts, 1992). Williamson (1985) in Spraakman (1997) identified four types of asset specificity which are: site specificity, physical asset specificity, human asset specificity and dedicated assets.

This element refers to the need to cope with both contractual requirements and opportunism by adopting mixed or intermediate modes of governance, providing appropriate safeguards, assurances and mechanisms (the credible commitments) to ensure that, the parties have confidence in trading with each other, and the relationship does not fracture when different contingencies arise, but is maintained until the transaction is fully completed (Yates and Hardcastle, 2003). Building contracts, often provide incentives or disincentives that usually involve some type of severance payment or penalty for default, procedures and mechanisms for efficient resolution of disputes, introduction of trading regularities that support and signal the intention of ongoing and future relations - like serial tendering.

Procurement governance (procurement Act 2007)

Procurement governance, also called “regulation” (BPP 2007), “legal framework” (Jacob, 2010; Onyema, 2011), “Act” (Olusola, Oluwalosin & Agboola, 2016; Adeyemi, & Kashiwagi, 2014; Olayiwola & Oyegoke, 2009), “Policy (Muhammad, Adamu & Ladi, 2015; Kusi, Aggrey & Nyarku, 2014) or legal safeguards (Lui & Ngo, 2004), refers to the extent which public purchases or procurement is governed by a formal and written documents or law which explicitly stipulates the process in which public sector organization will procure goods, services and works with public funds (Onyema, 2011; Olusola *et.al*., 2016; Wasiu, 2017).

By describing each stage/process what to be done and functions. Procurement governance may reduce opportunism and safeguard clients (public organizations) (Williamson, 1985). Existing literature has considered it as an important framework to control waste of resources (EU, 2011,

Onyema, 2011; Muhammad *et.al.* 2015 and Olusola *et.al.* 2016). In recent research, it has been argued that procurement governance also plays important roles in the accountability, efficiency, transparency and value for money in public organizations (insisting due process, 2010; Ezeh, 2013; Jibrin et.al. 2014; Ogunsemi & Awodele, 2015).

Nevertheless, procurement governance is subject to several limitations. First, the Act or regulation may be incomplete. Because of human being bounded rationality. It is impossible to write a complete regulation that anticipate all possible events and clarifies the appropriate actions of each organization (Hart, 1988; Deakin and Wilkinson, 1998; Lewis and Rochrich, 2009; Williamson, 1979). An incomplete regulation is less legally binding because it contains fewer clauses and /or the clauses are not observable nor verifiable (Woolthius, 2005; Olusola et.al. 2016).

The lack of specific clauses may also bring ambiguity and leaves space for opportunistic behaviour (Luo, 2002). Thus, the safeguarding function of an incomplete regulation may be less effective. Moreover, incomplete regulation may not contain adequate contingency clauses and are more likely to be ineffective to regulate any public organization procurement unexpected situations. These constrain the flexibility of public sector procurement. Second, value for money may signal lack of strong regulatory framework, which is detrimental for corruption and money laundry (Onyekpere, 2009; Olusola *et al*. 2016).

Third, the application of law may be mismatched between public sector organizations due to the particular nature of each organization. Some organizations use procurement laws more rigidly while other organization use the law more flexibly. The mismatched of the law or regulation application between organizations may generate disagreement and degrade the aim of the Act. It is suggested that the rigid application of procurement laws may not only negatively impact the contracting business, but also leads to economic drain and less transfer of knowledge in the procurement field (DG, Budget Ofice, 2019).These limitations may affect the fully use of the public procurement Act 2007 in procuring goods, services and works to the public. The conceptual framework presenting the relationship between the exogenous observer construct and endogenous observer construct is exhibited in figure 2. Thus, transaction costs of contractors are affected by the five major constructs. The study hypotheses are as follows:

H_1: Eligibility documents factors has a significant effect on contractor's transaction costs.
H_2: Method of securing documents factors has a significant effect on contractor's transaction costs.
H_3: Contract administrations factor has a significant effect on contractor's transaction costs.

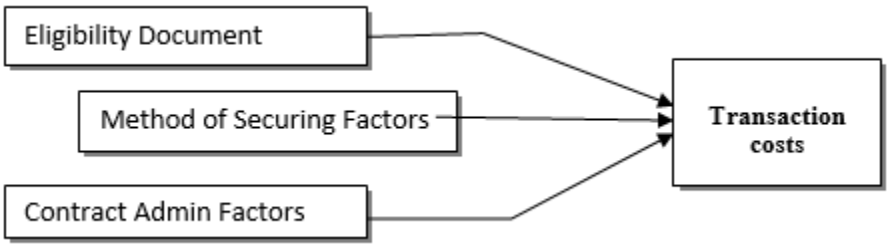

Figure 2: Conceptual model of the research

METHOD

We identify factors affecting contractors TCs as bid documents, contractor's behavior, asset specificity and transaction environment uncertainties on bidding process. A questionnaire was used to collect factual and perceptive responses and measure impacts or effects regarding the procurement guidelines that affect bid evaluation process, and TCs in Nigeria. Although, it has being argued that questionnaire is a widely used approach for descriptive and analytical surveys to find out the facts, opinions and views of respondents (Fellow & Liu, 1997; Naoum, 1998). Contracting firms were the respondents in this research. This comprised of contractors that are within some selected states of the North-West geographical zone of Nigeria (Kano, Sokoto and Kaduna) who are registered with the Bureau of Public Procurement database of contractors under the civil or building categorization/classification indicating their IRR (Interim Registration Report) number or ID, (143 Companies). Aim of this study is to evaluate the factors affecting contractors' transaction costs in public procurement cycle. Factors considered in the study are those prequalification documents as in part IV S.16 (6)(a)-(f) of the PPA 2007. This was obtained from the arrangements of the questionnaire structure. To determine the appropriate sample size for the study, total populations of 143 were sampled, considering the nature of the research and the tendency to reach all population through the addresses and projects sites of the respondents. Therefore, the sample sizes with a confidence level of 95 percent, acceptable margin error 5%, and response distribution 100% was assumed. These yield a sample size of 143 respondents. From 150 distributed questionnaires, 85 questionnaires were returned, equating to 56.67% response rate.

The study used structural equation modeling (PLS-SEM) techniques with the application of SPSS and SmartPLS-SEM software to analyze the relationship of factors in the conceptual framework. In this step, principal component analysis (PCA) is utilized. Items with loadings lower than 0.50 were omitted. The Cronbach's Alpha coefficients for all constructs were above 0.7 and the corrected items-total correlations are rather than 0.32, thus all measuring items were retained, and put into the final questionnaire to collect the information. Moreover, PLS-SEM is currently and selected within social sciences studies as a technique that is the best appropriate method for a multivariate analysis (Hair et.al, 2013; Peng & Lai, 2012).

Preliminary List of Factors

After a comprehensive and detailed literature review was conducted, the critical factors affecting the transaction of contractors are depicted in Table 1. The questionnaire was comprised of two sections. The first section consisted of the respondents' personal information, while section two consisted of the main part of the questionnaire. Section two was categorized into three groups in accordance with the nature of the factor: eligibility documents factor (EDF), Method of securing factor (MSF) and contract administration factor (CAF).

Table 1: The preliminary list of factors affecting transaction costs of contractors in construction bidding

Code	Factors
	Eligibility Document Factors
V1A	Cooperate Affairs Certificate
V1B	Tax Clearance certificate
V1C	Pension commission certificate
V1D	National social insurance certificate
V1E	Industrial training fund certificate
V1F	Interim Registration Report
V1G	Auditor Report
	Method of securing documents Factors
V1DA	Method used in obtaining documents
V1DB	Costs of processing document with relevant agencies
V1DC	Time taken to obtain the documents
V1DD	Sources of information on those documents
V1DE	Process of obtaining the documents
	Contract Administration Factors
V1EA	Monitoring & Controlling projects
V1EB	Costs of overhead for head office
V1EC	Time taken for contract negotiation
V1ED	Costs of litigation/Dispute resolution
V1EE	Interest rate on loan for project execution
V1EF	Costs incurred averagely in bidding (2015)
V1EF	Costs incurred averagely in bidding (2016)
V1EF	Costs incurred averagely in bidding (2017)
V1EG	Average number of bids participate in 2015
V1EG	Average number of bids participate in 2016
V1EG	Average number of bids participate in 2017
	Transaction Costs Factors
ITF2	Amount paid for Industrial training certificate IN 2016
ITF3	Amount paid for Industrial training certificate in 2017
NSITF2	Amount paid for national social insurance certificate in 2016
NSITF3	Amount paid for national social insurance certificate in 2017

RESULTS AND DISCUSSION

The simulation work in calculating the effect of the observed variables and their latent constructs on construction quality was drawn in smart-PLS version 3.2.8 (Ringle, Wende & Becker, 2018). PLS-SEM is mostly used for theory development in exploratory research (Bangbade, Kamarudden, Nawi Yusoff & Bin, 2018). Major applications of SEM contain path analysis, confirmatory factor analysis, second-order factor analysis, regression models, covariance structure models, and correlation structure models (Lin & Jeng, 2017). Moreover, SEM permits the analysis of the linear relationships between the latent constructs and manifest variables. It also has the ability to create accessible parameter estimates for the relationships between

unobserved variables. In general, SEM permits several relationships to be tested at once in a single model with various relationships instead of examining each relationship individually. The hypothesized structural model in Figure 3 was analyzed using Smart-PLS version 3.2.8, which has advantages over regression-based methods in evaluating several latent constructs with various manifest variables (Gefen, 2000). PLS contains a two-step procedure as recommended by Henseler *et al*. (2009), which involves the evaluation of the outer measurement model and evaluation of the inner structural model. Moreover, PLS-SEM is currently known and selected within social sciences studies as a technique that is the best appropriate method for a multivariate analysis (Hair et.al, 2013).

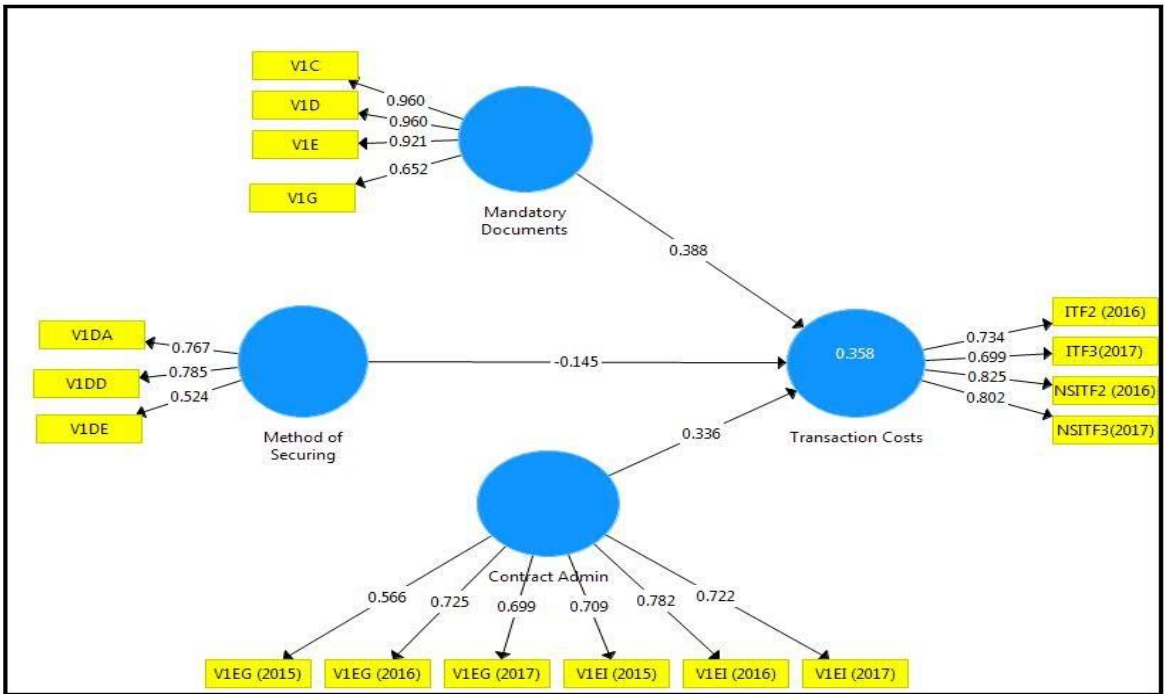

Figure 3: Hypotheses structural model of factors affecting contractors' transaction costs.

Explanation of target endogenous variable variance

The coefficient of determination measures the overall effect size and variance explained in the endogenous construct for the structural model and is thus a measure of the model's predictive accuracy. In this study, the inner path model was 0.358 for the transaction costs endogenous latent construct. This indicates that the three independent constructs substantially explain 35.8% of the variance in the transaction, meaning that about 35.8% of the change in the transaction costs of contractors was due to three latent constructs in the model. According to Adamu & Lawrence (2015), and Hair *et al*. (2013), an R^2 value of 0.25-0.64 is considered strong, an R^2value of 50 is regarded as moderate, and R^2 value of 0.01-0.04 is considered as weak. Hence, the R^2 value in this study was strong.

Outer measurement model evaluation

The outer measurement model is aimed to calculate the reliability, internal consistency, and validity of the observed variables (measured through the questionnaire) together with unobserved variables (Ho, 2013). Consistency evaluations are based on single observed and construct reliability tests whereas convergent and discriminant validity are used for the assessment of

validity [Hair, Sarstedt, Ringle & Mena, 2012). A single observed variable reliability describes the variance of an individual observed comparatively to an unobserved variable by evaluating the standardized outer loadings of the observed variables (Gotz, Liehr & Kraff, 2010). Observed variables with an outer loading of 0.5 or greater are believed to be greatly acceptable (Hair et.al, 2012), while the outer loading with a value less than 0.5 should be discarded (Chin, 1998). Notwithstanding this, for this study, the cut-off value accepted for the outer loading was 0.5.

Table 2: Construct Reliability and Validity

Main Construct	Item	Loading	Cronbach's Alpah	CR	AVE
Eligibility Documents	V1C	0.960			
	V1D	0.960	0.899	0.932	0.779
	V1E	0.921			
	V1G	0.652			
Method of Securing	V1DA	0.767			
	V1DD	0.758	0.500	0.739	0.540
	V1DE	0.524			
Contract Administration	V1EI5	0.709			
	V1EI6	0.782			
	V1EI7	0.722	0.800	0.854	0.520
	V1EG5	0.566			
	V1EG6	0.725			
	V1EG7	0.699			
Transaction Costs	ITF2	0.734			
	ITF3	0.699	0.766	0.850	0.587
	NSITF2	0.825			
	NSITF3	0.802			

From Table 2, the outer loadings ranged between 0.960 and 0.524. Cronbach's alpha and Composite Reliability (CR) were used for internal consistency evaluation in the construct reliability. Nevertheless, compared to the Cronbach's alpha, CR is believed to be a better assessment of internal consistency as it retains the standardized loadings of the observed variables .Although, the analysis of the Cronbach's alpha and CR value was the same. Table 2 shows that the Cronbach's alpha and CR for all constructs were greater than 0.50. Thus, the Cronbach's alpha and CR showed that the scales were reasonably reliable and indicated that all the latent construct values exceeded the minimum threshold level of 0.50. To verify the convergent validity of the variables, each latent construct's Average Variance Extracted (AVE) was calculated (Fornell & Larcker, 1998). The lowest 50% of the variance from the observed variable should be taken by the latent constructs in the model. Hence, this indicates that the AVE for all constructs should be above 0.5 (Hair et.al, 2012; Barclay, Thompson & dan Haggins, 1995). From Table 2, it is seen that all of the AVE values were more than 0.5, so convergent validity was confirmed for this study model. These results confirmed the convergent validity and good internal consistency of the measurement model.

Table 3: Discriminant Validity

	CAF	MDF	MSF	TCs
Contract Administration	0.703	-	-	-
Mandatory Documents	0.103	0.883	-	-
Method of Securing	-0.094	-0.337	0.702	-
Transaction Costs	0.389	0.471	-0.308	0.766

Table 3 shows the discriminant validity for the construct, it defines that the manifest variable in any construct is distinct from other constructs in the path model, where its cross-loading value in the latent variable is greater than that in any other constructs (Sarstedt, Ringle, Smith, Reams & Hair, 2014). The Fornell and Larcker criterion and cross-loadings were used to evaluate the discriminant validity (Fornell & Larcker, 1998). The suggested standard is that a construct should not show the same variance as any other construct that is more than its AVE value (Sarstedt, et.al, 2014). Table 3 shows the discriminant test of the model where the squared correlations were compared with the correlations from other latent constructs. Table 3 shows that all of the correlations were smaller relative to the squared root of average variance exerted along the diagonals, implying satisfactory discriminant validity. This proved that the observed variables in every construct indicated the given latent variable confirming the discriminant validity of the model, whereas, the cross-loading result of all observed variables was more than the inter-correlations of the construct of all the other observed variables in the model.
Therefore, these findings confirmed the cross-loadings assessment standards and provided acceptable validation for the discriminant validity of the measurement model. As a result, the suggested conceptual model was supposed to be acceptable, with confirmation of adequate reliability, convergent validity, and discriminant validity and the verification of the research model.

Estimation of Path Coefficients (β) and T-statistics

The path coefficients in the PLS and the standardized β coefficient in the regression analysis were similar. Through the β value, the significance of the hypothesis was tested. The β denoted the expected variation in the dependent construct for a unit variation in the independent construct(s). The β values of every path in the hypothesized model were computed, the greater the β value, the more the substantial effect on the endogenous latent constructs. However, the β value had to be verified for its significance level through the T-statistics test. The bootstrapping procedure was used to evaluate the significance of the hypothesis (Chin, 1998). To test the significance of the path coefficient and T-statistics values, a bootstrapping procedure using 500 subsamples with no sign changes was carried out for this study as presented in Table 4.

Table 4: Path Coefficient and T-Statistics

Hypothesized Path	Standardized β	T-Statistics	*P*-Value
Mandatory Documents ↔Transaction Cost	0.388	2.258	0.024
Contract Admin ↔ Transaction Costs	0.336	3.600	0.000
Method of securing ↔ Transaction Costs	-0.145	1.304	0.193

It was predicted in section 2.4.1 above that the eligibility documents factor (mandatory) would significantly influence transaction costs of contractors (H1). As predicted, the findings in Table 4

and Figure 3 confirmed that the eligibility documents factor significantly influenced transaction costs of contractors (β = 0.388, T = 2.258, p < 0.024). Hence, H1 was strongly supported. Furthermore, when observing the direct and positive influence of the contract administration factor on contractors TCs (H2), the findings from Table 4 and Figure 3 confirmed that the contract administration factor positively influenced contractors TCs (β = 0.336, T = 3.600 p < 0.000), and confirmed H2. The influence of the method of securing factor on contractors TCs was negative and not significant (β =-0.145, T = 1.304, p > 0.193), showing that H3 does not influence contractors TCs.

The greater the beta coefficient (β), the stronger the effect of an exogenous latent construct on the endogenous latent construct. Table 4 and Figure 3 showed that the eligibility document factor had the topmost path coefficient of β= 0.388 when compared to other β values in the model, which showed that it had a greater value of variance and high effect with regard to affecting the transaction costs of contractors. Whereas, the method of securing the document factor had the least effect on transaction costs with β= -0.145.

Measuring the Effect Size (f^2)

The f^2 is the degree of the impact of each exogenous latent construct on the endogenous latent construct. When an independent construct is deleted from the path model, it changes the value of the coefficient of determination (R^2) and defines whether the removed latent exogenous construct has a significant influence on the value of the latent endogenous construct. The f^2 values were 0.35 (strong effect), 0.15 (moderate effect), and 0.02 (weak effect) (Adamu & Lawrence, 2015). Table 5 shows the f^2 from the SEM calculations. As shown in Table 5, the effect size for eligibility document, contract administration and method of securing documents factor on transaction costs of contractor were 0.207, 0.173 and 0.029, respectively. Hence, from the SEM calculations,

Goodness-of-Fit Index

Goodness-of-Fit (GOF) is applied as an index for the complete model fit to verify that the model sufficiently explains the empirical data (Tenenhaus, Esposito, Chatelin & Lauro, 2016). The GOF values lie between 0 and 1, where values of 0.10 (small), 0.25 (medium), and 0.36 (large) indicate the global validation of the path model. A good model fit shows that a model is parsimonious and plausible (Henselar, Hubona & Ray, 2016). The GOF is calculated by using the geometric mean value of the average communality (AVE values) and the average R^2 value(s), and the GOF of the model is calculated by Equation (1) (Tenenhaus *et.al*, 2016).

$$\text{GOF} = \sqrt{(\overline{\text{Average}}\text{R2} * \text{Average Communality})} \quad (1)$$

It was calculated from Table 6 that the GOF index for this study model was measured as 0.932, which shows that empirical data fits the model satisfactory and has substantial predictive power in comparison with baseline values.

Table 6: Goodness-of –fit indexes calculation

Constructs	AVE	R^2
Eligibility document factors	0.779	
Contract administration factors	0.520	0.358
Method of securing documents	0.540	
Transaction costs factors	0.587	
Average values	2.426	0.358
AVE x R^2	0.869	
GOF = $(\sqrt{\boldsymbol{AVE} * \boldsymbol{R2}})$	0.932	

The Standardized Root Mean Square Residual (SRMR)

The SRMR is an index of the average of standardized residuals between the observed and the hypothesized covariance matrices (Chen, 2007). The SRMR is a measure of estimated model fit. When SRMR = <0.08, then the study model has a good fit (Hu & Bentler, 1998), with a lower SRMR being a better fit. Table 7 shows that this study model's SRMR was 0.03, which revealed that this study model had a good fit, whereas the Chi-Square was equal to 656.967 and NFI equal to 0.653 was also measured.

Table 7: Model fit summary

Estimated Model	
SRMR	0.03
d_ULS	2.462
d_ GI	2.468
Chi-Square	656.967
NFI	0.653

In accordance with the complete analysis of the measurement models and structural model, it was determined that both models were confirmed. Two of the hypotheses were statistically significant and hence were all accepted. The results of this study support a richer and accurate picture of the factors affecting the transaction costs of contractors. This will support the stakeholders in the industry a set of strategies to overcome the costs impacts.

DISCUSSION

The key contribution of this study was to empirically reveal the constructs that affected contractors' transaction costs under the public procurement Act 2007 using the PLS-SEM technique and a closer examination of the fundamental costs affecting constructs observed by contracting firms in Nigeria. PLS-SEM is a very effective technique for developing and analysis of complex models, and it also validates the complex model, and social science investigators should employed latest techniques to manage more complex model relationship of their current and future studies. The conceptual paths were tested using SEM based on the PLS technique. Moreover, the results of the study revealed that the eligibility document factor and contract administration factor had a significantly positive effect on contractors TCs (R= 0.358, p = 0.000), and a substantial GOF (GOF = 0.932). The final SEM results revealed that the eligibility document factor had the highest path coefficient (β = 0.388) with the overall affecting costs. Therefore, the owner and service provider (contractor) should pay more attention to eligibility document factors to minimize the costs of bidding and construction projects in public

organization. The contract administration factors was found to be the second utmost factor (β= 0.336) of the overall factors affecting costs.

Among the three essential costs influencing factors, the method of securing document factors (β= -0.145) was found to have a negative direct effect on the costs. The findings of this study showed that two out of three suggested hypotheses were supported, and the transaction costs of contractors was affected by the two constructs, i.e., eligibility document, and contract administration factors.

Furthermore, the results of this study recommend that the eligibility factor had a significant positive influence on contractors' transaction costs and that the costs of the bidding could be minimize by amending the Act section which mandate the provision of those eligibility document before a contractor can participate in public sector tendering (Sam, 2014). This was in line with Sam (2014), Rajeh (2014) and Hughes & Hillebrandit (2010) who found that there is high transaction costs in public sector construction bidding, which showed costs challenges that increase the costs of construction in the public in the short or long run. Equally, the findings of this study showed a statistically significant positive relationship between the contract administration factor and transaction costs. In order to achieve reasonable costs for bidding by contractor, the monitoring and controlling aspects should be technically know-how, with accuracy, conformance to standard, and complete information in supervision in construction projects as this can minimize the rework and waste during the project execution. Thus, indicating that incompetency and poor project management during the execution phase of a project leads to a costly construction project to contractors and Clients (Hughes, Hillebrandit, 2010). In addition to mitigate such costs of contract administration experience contractors should be award the contract during evaluation process (Ann, Yu & Shen, 2013). Consequently, if these costs were not mange properly they are capable of crippling growth in the local economy and unhealthy return on investment (Dalrymple *et al*., 2006; Laryea, 2008; DG, Budget office, 2019). The mandatory or eligibility document requirement request by all public sector organization, it is as a result of opportunism and uncertainty in the business environment (Li et.al 2013). But, such transaction characteristics can be minimize by not just introducing the eligibility documents evidence, also improve the procurement process and governance structure in the public sector.

CONCLUSION

The economic drain in the form of transaction costs problems in the Nigerian public sector organization procurement system are both worrisome and risky problems, influenced by many factors during the entire bidding process, which not only increase the project costs, but also reduce the economic growth of the construction industry as a whole. As costs will not increase by chance, we need strategies and sound framework to improve procurement system in public sector organization. Similar to sustainable economic growth, this process can be initiated by identifying costs problems. Cost is a cornerstone of contracting business in public sector organization due to huge amount spent in the name of bidding public projects under the PPA 2007. This study concluded that minimal costs of transaction and sustainability will be enhanced when contracting parties better understand the importance of the costs management system.

Previous literature discussing the factors affecting the costs of transaction construction projects by contractors used similar methodologies. The aim of this study was to present and introduce a

new methodology to analyze and examine the influence of key constructs on contractors TCs. An advanced multivariate analysis technique, PLS-SEM has been employed to perform the analysis. This comprehensive multivariate statistical assessment technique can test all of the relationships between latent and manifest variables in a model simultaneously, containing measurement and structural model assessment. The technique was chosen also because it has the ability for assessment of the psychometric properties of individual latent constructs. The most important constructs that affect the contractors TCs with their fundamental causes (observed variables) were identified.

A questionnaire survey was conducted with contracting firms' owners regarding factors affecting their transaction costs in bidding public projects where the researchers collected 85 valid questionnaires from contracting firms in the study area and used the latest statistical methods such as SEM. This study was performed to explore factors affecting contractors TCs in bidding public construction projects in Nigeria. Based on the responses of the survey, it was considered that the eligibility document costs factor was the topmost factor that led to increasing transaction costs of contractors as the paperwork is implemented on the actual work at this stage. This implies that public sector organizations and contractors (contracting firms) need to make particular plans and methods on how to reduce such transaction costs in the procurement cycle phases that affect the costs of construction projects at large.

The existence of opportunism, bounded rationality and information asymmetry in the procurement system will increase the cost of transaction of project during the tendering phase as well the lack of adherence to the public procurement Act (PPA 2007) in terms of costs to be paid by contractors and suppliers, which have caused problems in the procurement cycle. Mostly, the findings from this study indicated that most of the glitches occurring from high costs of bidding public projects were due to a self-interest among stakeholders, poor implementation of the PPA 2007 and the need for amendments of the Acts section to align with the current economic situation of the country. Moreover, these problems influenced the growth of the contracting business. Confusion and misunderstanding of the procurement Act and lack of procurement officers' issues led to a poor-implementation of the Act, which possibly increase the transaction costs. Furthermore, the lack of monitoring and controlling, costs of tender documents and interest rate of loan paid by contractors for project execution were a key determinant in accomplishing better contract administration in construction projects as client's (public sector organization) inability to examine the underlying challenges in the execution phase is extremely increasing to the costs of delivery projects.

This study model validated that factors affecting the transaction costs of contractors in public construction projects bidding were based on various constructs that are necessary to understand to minimize the costs of the bidding and its outcomes. The eligibility- and contract administration-related factors were observed to be the most dominant constructs. Therefore, the contractors and owners should pay more attention to these two constructs with a high beta coefficient as they were imperative constructs of the public projects that should be focused on. Moreover, the methods of securing those document factors were also found to have a moderate and negative effect on contractors TCs. In conclusion, the factors affecting contractors TC in bidding public sector organization projects in Nigeria were influenced by three constructs, and these constructs explained 35.8% of the variance in transaction costs with a significant

relationship explained by beta values and the GOF of the model was 0.932. A significant effect of the different transaction costs factors on the contractors' costs of bidding was also evaluated. The current study enhanced the expansion of research in the area of costs minimization and helped gain a better understanding of the lack of costs factors in construction projects bidding.

The findings from this study can provide decision making support for project contracting parties and policy-makers Bureau of public procurement (BPP) by amplification their understandings of the severe factors that affect the contractors bidding in construction projects in the public sector, confirming that appropriate plans and costs control management methods as well as necessary amendment of the Act can be employ to assure a minimal costs of bidding public sector projects. Through the suggested solutions, the contracting firms need to keep an eye on flaws and control the extent of costs incurred when bidding projects in PSO so that similar flaws may perhaps be avoided in future issues during the bidding.

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