Comparisons of Performance of Traditional And Labour-Only Procurement In Construction Projects In Nigeria

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Two procurement methods of Traditional and Labour-only are investigated and compared for performance. Labour-only procurement is recently thought to offer cheaper, better and quality projects than Traditional method for which this study is set to substantiate. Purpose of the study is to compare the two methods for performance, to find out which of the two methods is better in overall performance and also to model procurement performance. This study is a survey research that used structured questionnaires to collect data from clients, consultants and contractors in 120 recently completed construction projects that used both Traditional and Labour-only methods. Results indicate that there is no significant difference between the performances of both methods while Traditional procurement performs better than the Labour-only method. Relationship exists between client, designer, construction, procurement characteristics and overall performance of Labour-only and Traditional procurements. Implications of this study are for policy makers in government to develop their awareness on procurement performance for future projects; the proposed regression models support the procurement theory while practitioners and stakeholders should imbibe procurement performance for management of future projects. This study expands existing literature on construction procurement and it recommends Traditional procurement to clients, consultants and contractors for use in their housing projects. The regression models proposed are recommended for measuring procurement performance of completed projects. Awareness on procurement performance should be disseminated by professional bodies and other agencies involved in housing delivery for improvement of future projects.

Keywords: Performance, Traditional, Labour-only, Procurements, Nigeria

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INTRODUCTION

Different procurement methods have been in use for project delivery of much construction projects in Nigeria. Project delivery strategies that have been used include Traditional, Design and Build, Project Management, Direct Labour and Labour-only methods. Several studies confirm use of these methods in Nigeria. Noted in this direction are studies of Ogunsanmi et al. (2001); Ibiyemi et al. (2005); Babatunde et al. (2010); as well as Dada (2012). Traditional procurement has enjoyed patronage in Nigeria while Labour-only procurement only recently emerged because of the downturn of the Nigerian economy. Construction stakeholders and practitioners now prefer Labour-only method to Traditional method as Labour-only is believed to deliver cheaper, better and produce quality projects. An attempt to substantiate this opinion necessitates this research study. The aim of this study is to compare both methods for performance by using some comparative factors of time, speed of construction (area/week), cost overruns (time and cost) and satisfaction with quality of project. Objectives of the study are to investigate if performances of both methods are the same for these comparative factors, to find out which of the two methods is better in overall performance and also to construct models for evaluating procurement performances in housing projects. This study contributes to existing procurement performance literature in construction management and also the regression models evolving from this study will be of immense benefit to stakeholders and practitioners in for tracking performance of their future completed projects. This study is undertaken in Nigeria in a period of dwindling economy and is for all stakeholders in Nigeria and other developing countries to be aware of procurement performance and use it for future projects.

Procurement Methods used in Construction projects in Nigeria

Several procurement methods have been identified in literatures that are used for project delivery in Nigeria. In addition to the ones earlier recognized above some other discretionary procurement such as Direct-Labour, Alliancing, Partnering, and Joint ventures are used. Various studies in Nigeria such as Ogunsanmi et al. (2003), Ibiyemi et al. (2005), Ojo et al. (2006), Babatunde et al. (2010) and Dada (2012) equally confirmed the use of these methods for projects in the country. In this present study only two of the predominant methods are discussed as follows:

Traditional procurement method
Traditional procurement is a method of acquiring new units of housing in which the client commissions an Architect to design a project while other consultants are also selected to work with the Architect for overall design of the project. After the tendering process has been completed a building contractor is also selected to carry out the construction of the work on site with a contractual relationship with the client. This definition of Traditional procurement agrees with that of Franks (1990), Bennett (1992), Hutchinson and Putt (1992) and Masterman (1992). Similarly, other recent studies of Ojo et al. (2006), Construction Excellence (2012) and National Building Specification (2012) all further confirm

this definition. Variants of the Traditional procurement in use include sequential and accelerated methods. Traditional procurement has been in use in Nigeria for a long time and has dominated the construction scene for which majority of the projects in the country were procured. Studies of Ogunsanmi et al.(2003), Ibiyemi et al. (2005), Ojo et al. (2006), Babatunde et al. (2010) and Dada (2012) all documented the dominancy of the Traditional method in housing constructions in Nigeria. In particular, Ogunsanmi et al. (2003) explain that clients can easily understand the operations of the method as well their financial commitments towards their projects long before the design documentation are made. Ibiyemi et al. (2005) indicates that this method is not a suitable method for fast tracking projects because of its sequential nature and hence it is a disadvantage of this method. Ojo et al. (2006) suggests that this method involves the appointment of an Architect who designs the project, recommends all other consultants to the client and also sets up the management team for the project. It further emphasizes that this method is the most used all over the World until its shortcomings were noted in literature in the 1960s. However, Babatunde et al. (2010) indicates that separation of design, tendering process and construction phases in Traditional procurement should be viewed as separate tasks in which design must be completed before construction phase starts and hence classifies it as Design-Bid-Build system. Dada (2012) states that Traditional procurement has been used for project delivery in many countries of the World in which Nigeria is one and it mentions that it is used by both public and private sectors of the Nigerian economy. Traditional method is compared with Labour-only method for performance evaluation in Nigeria.

Labour-only procurement method
Continuous unhealthy state of the Nigerian economy since 1985 to date has made consultants and other stakeholders of the industry to search for new procurement methods that would give cheaper construction and satisfaction to the client in terms of cost, time and quality. This search results in new procurements of Direct Labour, Labour-only, Labour intensive, Labour-based, Equipment based, and Community based methods for which Labour-only method now has increased patronage in Nigeria. This method is now believed to offer cheaper, better and produce quality projects than Traditional method. Labour-only is a method of acquiring new units of housing in which the client commissions an Architect and other consultants for the project design. After the design documentations are completed the project may be tendered for by a main contractor or sub-contractors who are employed on basis of Labour-only to executive various aspects of the project to completion while the client purchases all the necessary building materials and other facilities for executing the project to completion. Past works of Ojimelukwe (1991) and Omotosho (1999) all confirm the use of the method.

Tournee et al (1995) as cited in Omotosho (1999) also state the use of this method not only in Nigeria but also in some other sub-Saharan countries of Uganda, Zimbabwe, Botswana, Kenya and South Africa where several projects had been procured through this method. Recent research efforts of Ogunsanmi et al. (2003), Samatania (2012), Babatunde et al. (2010) and Dada

(2012) confirm its use in Nigeria. This method is herewith compared with Traditional method for performance in housing projects in Nigeria.

Modeling Procurement Performance in construction projects

Awareness of most clients, stakeholders and construction practitioners on procurement performance has been very low (Ogunsanmi et al., 2001). This concept is just evolving as most clients have not been bothered about the performance of the procurement method used for constructing their projects. Once the project is practically completed and handed over it appears everything is well with the procurement method used for this project execution. Performance of this procurement method has never being a point of concern to most construction industry practitioners. Previous studies of Naoum (1991), Pinto and Slevin (1988), Alarcon and Ashley (1996), Masterman (1992) and McDermont (1999) show some concerns of procurement performance. Evidences from these earlier studies indicate that only few of these studies actually modeled procurement performance as most of them concentrated on modeling procurement process. Moreover, studies of Pinto and Slevin (1988), Alarcon and Ashley (1996), and Naoum (1991) were developed as schematic research models. Alarcon and Ashley (1996) also developed a theoretical General Performance model that used Cross Impact Analysis (CIA) for its evaluation.

Recent studies on procurement performance are also evidenced from Holt and Graves (2001), Alarcon and Serpell (2004), Ojo (2009) and Abdolalipour et al.

(2011). In the works of Holt and Graves (2001) benchmarking is considered as a non-financial assessment that provides performance improvement in public sector procurements. This study identifies a need for client having better ownership of project risk and opportunity. It also advocates feasible metrics for assessment at project and strategic levels of procurement. This study has not benchmarked any quantitative model for measuring procurement performance and hence it is not relevant to the proposed procurement performance modeling of this study.

Alarcon and Serpell (2004) examine a performance model that is based on benchmarking. This work involves designing and implementing project performance measurement system for some construction companies in Chile with the intention of improving the company's performances. This study is based on computer models with some empirical data that are used on expert systems to generate performance model. This work is essentially on project performance modeling that forms the basis for procurement performance. This work is relevant to this study as it has considered project performance from (i) actual cost/budgeted cost, (ii) actual man hours/ budgeted man hours, (iii) actual durations/planned duration, (iv) Labour and equipment productivity, (v) project profit, (vi) progress measurements and (vii) accident frequency rate. The study used these factors for assessing performance that are based on cost, time, productivity, profit and accident free issues. Such issues of time, cost, quality and satisfaction with use of project were considered for model building in this study. Similarly, the work of Ogunsanmi

et al. (2001) confirms that procurement performance can be predicted from project performance variables.

The study of Ojo (2009) on procurement performance involved developing some performance indices for different procurement methods in use in Nigeria against their selection criteria. The study defines performance as suitability of a procurement option in achieving selection criteria of speed, cost certainty, time certainty, price competition, quality, risk avoidance (time and cost slippage. Procurement performances were assessed using mean performance and standardized ratios. This study has not developed a quantitative research model for procurement performance in Nigeria.

Public Procurement Audit Seminar (2010) evolved a procurement performance model for auditing of procurement of government projects in Europe. This qualitative model examined procurement performance from meta, macro and micro levels and is useful for model building of this study. Abdolalipour et al. (2011) develops a balance scorecard for modeling procurement performance of Iranian oil Terminal Company. This balance scorecard has four perspectives of financial, customer, internal business process and learning and growth. It measures performance by considering intangible assets and some other variables. This study investigates performance of Iranian Oil Terminals Company (IOTC) was investigated from mission, customer and internal processes of the organization using TOPSIS methodology. This study is relevant as it has used factors such as internal process, mission, financial and customer characteristics that are also similar to client, designer, contractual,

procurement method and construction characteristics for the model building of this study.

RESEARCH METHODS

Literature review was conducted for the purpose of identifying a set of 34 hypothesized variables that were used for drawing the questionnaires for the study. In order to predict these relationships between client, designer, construction and contractual variables of a procurement system and procurement performance a multiple linear regression modeling was undertaken for the study that used procurement performance scores that were measured in the questionnaires as dependent variable with other independent variables to predict the performance of Traditional and Labour-only procurements.

Four sets of questionnaires were designed for clients, users of project, consultants and contractors who constitute the population of the study. Respondents must have just completed recent projects based on Traditional and Labour-only methods. The research area covers Lagos, Oyo, Ogun, Kwara, Anambra, Enugu, Delta, Abuja, Rivers and Abia states of Nigeria that are all located in the southern belt of the country. Sample for the study was selected using systematic sampling technique where projects recently completed in the research area were compiled. In all, 40 projects based on Labour-only and 55 projects based on Traditional method were identified and listed. From this list every third project was randomly selected. This resulted in a sample size of 64 projects out which 39 were Traditional projects while 25 were Labour-only projects. The

consultant/contractor sample consisted of 21 Architects, 17 Engineers, 17 Quantity Surveyors and 9 Building contractors who provided the 64 responses. In all, 120 questionnaires were sent to these various respondents out of which 64 responses were obtained from Architects, Engineers, Quantity Surveyors and Building Contractors that were used for the analysis of this study. Descriptive statistical tools such as graphs, percentages, mean as well as inferential tools such as T-test, Analysis of Variance, and Regression analysis were used for drawing inferences on possible differences and relationships between the variables of the study. T-test statistic was used to compare the differences between the two methods for some factors; One-way Analysis of Variance was used to compare the performances of both methods for several performance variables while the regression analysis was used to predict procurement performance from its predictors of client, designer, construction and contractual characteristics.

RESULTS AND DISCUSSIONS

Comparisons of Performance of Traditional and Labour-only methods
Table 1 presents the T-test results for comparing the mean unit cost, pre-construction time (design time), build-time, total project time, satisfaction with quality on project, cost and time overruns of Traditional and Labour-only methods. From the results in Table 1 it is shown for unit cost, pre- construction time, mean build time and mean total time that the calculated t-values (t cal = -0.91, -1.13, -0.57, -0.41) are quite lower than the tabulated value (t tab = 1.96) hence the results are not significant. This implies accepting the null hypothesis. This infers

that there is no significant difference in unit cost performance (N/m^{2,}), pre-construction time, mean build time and mean total time between both methods. This disproves the wide held believe that Labour-only is far cheaper than Traditional procurement. This also implies that there is no significant difference in the mean pre-construction time performance between both methods as pre-construction times for preparing both methods are not different from each other. Results also indicate no significant difference between the mean build times of both methods as the time it takes to build both methods are the same. Also these results equally suggest that there is no significant difference in the mean total time between

both methods as projects based on both methods can be built at the same total time.

Moreover, results from Table 1 indicate that for satisfaction with Quality on projects, time overruns and mean cost overruns the calculated t- values of mean satisfaction with quality on project, time overruns and mean cost overruns (t cal = 1.07, -0.01, -1.06) fall below the tabulated t- values (t tab = 1.96) hence, the results are not significant. This implies accepting the null hypothesis. This also infers that there is no significant difference between the mean satisfactions with quality on projects, time overruns and mean cost overruns for both methods. This implies that clients, consultants and other stakeholders using both methods are equally satisfied with quality on their projects, both procurement methods overrun their planned times by the same margin and hence are both characterized with time overruns. Both findings of Naoum (1991) and Babatunde, et al.

(2010) all agree that Traditional procurement can overrun its cost and time when used for construction projects.

Table 1: T-test results for comparing performance of Traditional and Labour-only procurements

Procurement performance factors	$T_{tab.}$	$T_{cal.}$	D.F	P-value	Sig.
Unit Cost (N/m^2)	-0.91	1.96	48	0.72	NS
Pre-const. Time (wks)	1.13	1.96	36	0.00	NS
Build-time (wks)	-0.57	1.96	48	0.13	NS
Total time (wks)	-0.41	1.96	36	0.00	NS
Satisfaction with Quality	1.07	1.96	46	0.19	NS
Time overrun (wks)	-0.01	1.96	40	0.02	NS
Cost overrun	-1.06	1.96	34	0.00	NS

Also these results indicate that there is no significant difference between performances of both procurements in terms of cost overrun. Both methods are equally characterized with the same margin of cost overruns. This implies that clients spend more than what they budgeted for in using any of the methods for procuring their projects.

Tables 2 and 3 present both the descriptive and inferential results of comparing the overall performances of both Traditional and Labour-only procurements in construction projects. Table 2 reveals that Traditional procurement records higher overall performance ($O_{tra} = 622$) than Labour-only method ($O_{loc} = 611$). This implies that Traditional procurement is better in overall performance than Labour-only procurement. The major areas of

difference are noted in speed of construction, overruns of time and cost, and satisfaction with quality on projects in which Traditional method records higher performance than Labour-only method.

Similarly, in Table 3 the results reveal that for comparing overall performance of both procurement methods the calculated F-value ($F_{cal.} = 11.50$) from Analysis of variance of procurement factors is quite higher than the tabulated F- value ($F_{tab.} = 3.79$) hence this result is significant. This infers that a significance difference exists between the overall performance of Traditional and Labour-only methods. This difference is accounted for by time and cost overruns as well as speed of construction. This involves accepting the alternative hypothesis which states that there is

Table 2: **Descriptive results of comparing overall performances of both Traditional and Labour-only procurements**

Performance Factors	Maximum Possible Scores	Overall Performance Scores	
		Labour-only (%)	Traditional (%)
Pre-const. time, build time	225	171(28)	171(27)
Speed (A/w)	75	63 (10)	67 (11)
Unit cost (N/m^2)	75	59 (10)	57 (9)
Time and cost overrun	150	114(19)	120 (19)
Satisfaction with Quality	75	61(10)	63 (10)
Satisfaction with use of project to date	75	53(9)	54 (9)

Satisfaction with cost	78	45 (7)	46 (8)
Satisfaction with time	75	45 (7)	44 (7)
Total	825	611(100)	622 (100)

a significant difference between the overall performance of Traditional and Labour-only procurements in use in construction projects. This also disproves the held believe that Labour-only is better, cheaper and gives quality projects than Traditional method as this result of significant difference corroborates with the descriptive results indicating that Traditional procurement is better in overall performance when speed of construction, overruns of time and cost and satisfaction with quality on projects are concerned.

Model Fitting results for Performance of Labour-only procurement

Tables 4 and 5 also present the model fitting results for performance of Labour-only procurement in construction projects using the stepwise selection method in regression analysis.

Table 3: Analysis of Variance of Overall performance of Labour-only and Traditional procurement

Source of variation	Sums of Squares	D.F	Mean Square	F_{cal}	F_{tab}
Procurement Method	7.56	1	7.56	2.21	5.59
Procurement Factors	27,533.64	7	3933.35	11.50	3.79
Residual	23.94	7	3.42		
Total	27,564.94	15			

Table 4: Model fitting results and stepwise selection for performance of Labour-only procurement

Independent variable	Coeff. B	Standard Error	T value	P value
Total time	1.974	0.242	8.151	0.000
Unit cost	1.205	0.263	4.571	0.000
Project use	1.485	0.316	4.700	0.000
cost overrun	0.802	0.255	3.145	0.005
Time Overrun	0.690	0.259	2.594	0.017
Constant	10.617	1.532	6.927	0.000

*where in the model the following short symbols will be used for Total time – Tot, Unit cost-Ucost, Project use-Puse, Cost overrun-Crun, Time overrun-Trun are used in the model.

Table 5: Analysis of Variance of the regression model for Labour-only procurement performance

Source of variation	Sums of Squares	D.F	Mean Square	$F_{cal.}$	F_{tab}	P value
Regression	160.55	5	31.11	24.20	2.74	0.00
Residual	25.20	19	1.32			
Multiple r=0.92	R^2=0.86	Adj. r^2=0.82				

Using the overall performance as dependent variable a five step regression analysis was completed for Labour-only performance and its independent variables. Table 4 shows that five independent variables are significantly contributing to overall performance of Labour-only procurement. The multiple correlation coefficient between the five predictors and overall performance of Labour-only procurement is 0.929 (r = 0.929). Together all these five predictors explain 86.43% (r^2 = 0.8643) of the variations in performance of Labour-only procurement. The regression coefficient signs for the five predictors are all positive indicating positive direction for the relationship between the predictors and the criterion variable. This also shows that linear relationship exists between these predictors and the criterion variable. In terms of the order of explanations of the variations in the overall performance the predictors with highest 't'value (t = 8.15) provides more explanations of the

variations in overall procurement performance.

Table 5 reveals that when all the five predictors are in the equation the regression model yields an F ratio of 24.20 which is highly significant at 5% significance level. Based on the above analyses, an evaluative multiple regression equation derived from the above results is given as:

$$P(p) = 1.974Tot + 1.205Ucost + 1.485Puse + 0.802Crun + 0.690Trun + 10.617$$
<div align="center">(Eq.1)</div>

From equation 1, 1.974Tot suggests that on the average an increase of 1.974 of the overall Labour-only procurement performance can be expected for each unit (week) increase in total time of the project when all other variables are held constant. From this analyzed variable above as well as from the other predictor variables there is a clear indication that as more time and expenses are incurred on Labour-only procurement the higher the overall performance of Labour-only procurement.

Model Fitting results for Performance of Traditional procurement

Tables 6 and 7 also present the model fitting results for performance of Traditional procurement in construction projects using the stepwise selection method in regression analysis.

Using the overall performance as dependent variable an eleven step regression analysis was completed for Traditional procurement

Table 6: Model fitting results and stepwise selection for performance of Traditional procurement

Independent Variable	Coefficient B	Standard Error	T Value	P value
Total Time	1.045	0.156	6.691	0.000
Time Overrun	1.034	0.095	10.885	0.000
Project use	1.090	0.103	10.565	0.000
Satisfaction	1.077	0.142	7.537	0.000
Time satisfaction	1.095	0.991	11.048	0.000
Unit Cost	1.156	0.941	12.285	0.000
Const Speed	0.998	0.134	7.407	0.000
Cost Satisfaction	1.211	0.142	8.562	0.000
Pre-Cost Time	1.017	0.112	9.008	0.000
Build Time	0.800	0.115	6.920	0.000
Cost Overrun	0.749	0.149	5.010	0.000
Quality Satisfaction	-0.599	0.582	-1.028	0.322
Constant				

*where in the model the following short symbols will be used for Total time-Tot, Time overrun-Trun,

Project use-Puse, Time satisfaction-Tsatis, Unit cost-Ucost, Construction speed-Cspeed, Cost satisfaction-Csatis, Pre-construction time-Pret, Build time-Btime, Cost overrun-Crun, Quality satisfaction-Qsatis

performance and its independent variables. Table 6 also reveals that all the eleven predictors contribute significantly to the overall performance of Traditional procurement. The multiple correlation coefficient between the eleven predictors and the overall performance of Traditional procurement is 0.9978(r=0.9978). The eleven predictors explain 99.78% (r^2= 0.9978) of the variations in performance of Traditional procurement. All the regression coefficients demonstrate positive signs. This is an indication of positive linear relationship between the predictors and the criterion variable. It also shows the direction and strength of

the relationship. The order of explanations of the variations in the overall performance as indicated by the highest t-value, (t =12.28) as this provides more explanations of the variations in overall performance of Traditional procurement.

Table 7 also reveals that when all the eleven predictors are in the equation, the regression model yields an F ratio of 266.46 which is highly significant at 5% significance level. Hence, base on the above analyses the evaluative multiple regression equation for overall performance of Traditional procurement is given as:

Table 7: Analysis of Variance of the regression model for Traditional procurement Performance

Source of variation	Sums of Squares	D.F	Mean Square	$F_{cal.}$	F_{tab}	P value
Regression	429.13	11	39.01	266.64	2.63	0.00
Residual	1.90	13	0.14			
Multiple R=0.99	R^2=0.99	Adj. R^2=0.99				

P(p) = 1.045Tot + 1.034Trun + 1.090Puse + 1.077Tsatis + 1.095Ucost + 1.156Cspeed + 0.998Csatis + 1.215Pret + 1.01Btime +0.800Crun +0.749Qsatis - 0.599
(Eq. 2)

From equation 2, 1.045Tot suggests that on the average an increase of 1.045 of the overall performance of Traditional procurement can be expected for each unit (week) increase in total time of the project when all the other variables are held constant. From the above analysis there is a clear indication that overall performance can be predicted from performance

variables in this study. There is also an indication that for every additional time spent on designing the project, building it, and more expenses incurred on it would result in increase in overall performance of Traditional procurement.

IMPLICATIONS OF THE STUDY FOR POLICY, THEORY AND PRACTICE

Implications of this study are three in the main. For policy makers in government, practitioners and stakeholders in Nigeria and other developing countries there is need for development of their awareness on procurement performance for future project Endeavour's. Also, the regression models proposed in this study gave evidences that support the conceptual procurement theory that performance of a procurement method can be predicted from client, designer, construction and contractual variables of a project. While for construction procurement practice there is strong need for practitioners and stakeholders henceforth to imbibe the concept of procurement performance for management of their future construction projects.

CONCLUSIONS

In view of the findings emanating from this study it can be concluded that Traditional procurement performs better than Labour-only method in construction projects investigated for this study. This is against the wide held opinion by stakeholders that Labour-only is cheaper, better and delivers quality projects to clients. The regression models designed demonstrate that procurement performance is related to client, designer, construction, contractual and procurement characteristics of a project. These models establish a framework with which procurement performance can be evaluated for recently completed construction projects. These regression models designed for evaluating performances of

these two procurement methods can offer quick and easy quantitative measure of performance than earlier models that were qualitatively based. This study strongly recommends Traditional procurement to clients, consultants and contractors for use in their future housing projects. The regression models proposed for evaluating performance of each of the procurement method are recommended for use of clients, consultants and contractors for evaluation of their future projects which can offer appreciable improvements in our building procurement process and also offer better management of our future projects. Awareness on procurement performance should be disseminated to professional bodies, housing associations and governmental agencies involved in housing delivery so as to monitor procurement performance of their future construction projects.

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