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EVALUATION OF PROCUREMENT IN PUBLIC BUILDING CONSTRUCTION PROJECTS DELIVERY

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Abstract: The paper looked at procurement alternatives as essential cost saving measure in construction contracts, and the essence of contractual options in Nigeria as a developing Nation. A statistical scenario herein is drawn based on the responses of key independent professionals who are most concerned with building construction contract procurements in respect to key critical variable factors to rationale procurement. The respective agreements, and otherwise their dichotomy to these variable critical factors, were analyzed and discussed. The scenario, like in a consensus decision making problems using fuzzy elements, is also based on their ranked ordinal data through structured questionnaire. This can be adopted and used to test the efficacy of procurement systems for local councils, state and federal government project execution in Nigeria, using Kendall's tau coefficient of concordance, and chi-square ($\mathbf{x}^2$). From the analysis it is found that the Kendall's coefficient is 0.0032 and chi square test yielded 5.472 at 0.05 significant levels indicating no significance to null hypothesis. Analyzing such responses to rationale procurement in construction very important, as contract procurement has become the focus of International agencies for projects financing, good leaders, and policy makers in the less developed countries. The identified

contentious areas when rectified would facilitate immensely in plugging sources of fund leakages, and wastage. Further step can be taken using veritable structured questionnaire to obtain responses of employee in both the private and public sector, with the view of ascertaining whether the right procedures are adopted in projects execution. The need for the exigency of locking horns with inefficiency and leakages in our procurement system is necessary, and some remedial measures are suggested.

Keywords: Construction activities, Critical variable factors, Chi-square, Concordance, Magnitude of agreement

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INTRODUCTION

Construction intrinsically is so pervasive, that it ramifies all facets of developmental plans by both the public and private sector of our economy. It is an essential regulator of the economy; construction component takes up 60 – 65 percent of total budgetary expenditures. Many state governments go to a greater length at stressing this, where it is made mandatory that the ratio of recurrent and capital expenditures be ranged between 1.75 to 2.50, and this is reinforced by legislative provisions in some states, (Lawal, 2016). In consideration to this sensitization derive on procurement reforms it has become very imperative, governments recognize the essence, of due process on construction contracts delivery. Many Construction contracts in the three Tiers of our public sector fail due to flagrant flaunting or wrong application of procurement procedure, Gidado, (1996) [1], Ogunsamni & Bamisile, (1998) [2], thought up to 1.5tr Naira can be saved when rationale project procurement procedure is used. A rationale construction procurement should entail the selection and commissioning of consultants or/and constructors to design and

construct a facility for the attainment of a good construction contract. Frank, (1998) [3] was quick to point out that Universal selection of particular option depends on the client, though it should also nevertheless respect the gravities of public and project financial donor outcry in all ramifications. Particularly when the public sector is the client; contrary to general believe that projects is akin to milking cows but entirely, where else it should be dependent on user needs, function and economy. Selection should be based on best of choiced alternatives available to eliminate the creation of a 'precarious condition' in contracts, either by commission or omission which can lead to attendant poor quality of works, contract failure in the short and long run. Notwithstanding this requirement due process of procurement has continued to be discarded without fear, or conscience, as contract awards has today become essential vehicle of corruption in Nigeria Aminu, (1998).

While worthy of emphasizing in our construction sector is the attainment of good construction contracts through rationale procurement procedure which would facilitate National development, by attaining quality infrastructure, avoiding wastages through encouraged resource saving

Contractual Options

The essence of different contractual options is to meet the conditions for creating a good construction contract, through which the needs of the client are met. This is to form the objective of any client, whether the public, or private sector and basis for reciprocating the service providers. These options have different effects in furthering the clients'

aims at meeting his needs, though these aims are at variant they are best served by various set of contractual arrangements. The client would categorically states what he wants, when, where how, and within the provision of his budgetary constraints. The precise details are usually worked out by professionals either in the employment of the clients with capacity to undertake such jobs, or consultants employed by the client over short service period. And, this consultant is usually an employee of the client under very special arrangements.

Selecting a particular option may be influenced by:

a) Satisfaction of function.
b) Achievement of economy, and
c) Control of programmed time mainly.

Frank, (1998), Gidado, (1996), Turner, (1998), and Kavaragh, (1978) have identified various procurement options for governments and private clients in project execution.

These broadly include:

a) Traditional system
b) Design and build
c) Management contract

Choiced Alternatives for Construction Project Delivery

Choice of any particular delivery system must have been made from the onset of the project, though little or inadequate consideration is usually given to the many types of possible contractual structures readily available for any particular project. In fact there are always many number of procurement methods which might be suitable for any particular project. The choice of a procurement method for construction project however according to Timothy, (2004), will usually depend on factors such as:

a) The need for strict cost control;
b) The expertise of the likely tenderers;
c) The budget consideration.

James, (1984), cited Vitruvius as having presented the essential performance requirements of a construction project to be solidity, convenience and, beauty. Under the heading of convenience, built within a given time, economy would certainly be added. According to Frank, (1998), selecting the most appropriate procurement method is largely a matter of determining which of the performance requirement heads the client's list of priorities. For practical purposes the requirements may be listed as:

a) Technical complexity
b) Aesthetic/prestige
c) Time of Essence
d) Exceptional size or complexity involving input from numerous resources and/or users requirements.

In table 3.1 an attempt has been made to give ratings to each of the requirements listed above.

Table 3.1: Rating for the alternative procurement systems

Performance requirements	Traditional	Management for fee	Package deal	Design & Build	Separate contract	Project management
(a) Technical complexity	4	3	3	4	4	4
(b) Aesthetic/prestige	4	3	4	3	3	3
(c) Economy	3	4	4	4	4	4
(d) Time of essence	1	4	4	4	4	4
(e) Exceptional size or complexity	2	4	3	4	3	5
Total	14	18	15	19	18	20

Source: Frank (1998)

Ratings have been given on a 1–5 scale, with '1' indicating the minimum and '5' indicating maximum capacity to meet the requirement. The ratings at the Vitruvius' assessment of 'satisfaction' as cited in James, (1984), it is assumed that the competence of the personnel involved is similar in all instances, and it is only the systems that are being compared. However, this has to be taken with extreme caution, because persons with utter deficiency of knowledge, skill, and dexterity, are often than not saddled with projects far away beyond their competence. Lapses in this facet are prevalent, both in the private and public sector of our economy, but less common in the private sector. Which is a very costly trend and not good for professionalism and National development. Money that could have been used for vital development efforts are in these cases wastefully utilized and professionalism is dragged aground.

Comparison and Prediction

Each procurement system has been developed to meet particular client's needs. There

is no universal system though, if one seeks the system which best meets the client's performance requirements in broad terms, the ratings discussed above might provide a guide for the ranking. However the systems may be listed as follows:

Table 3.2 Procurement systems ranking.

Systems	Rankings
1st (Best) project management.	20
2nd Design and Build.	19
3rd (Equal) separate contracts and management fee.	18
4th Package Deal.	15
5th Traditional Method.	14

Source: Frank, (1998)

In making such a ranking, one must however remember that no system can be all things to all men, so the ratings are only subjective. Predictions are difficult to make without a detailed analysis of the factors which are likely to affect the client's needs, and these analysis are beyond the scope of this paper.

Statistical Scenario

The efficacy of construction procurement is tested using statistical instruments by running a veritable scenario that can be drawn on responses to a prevailing list of critical variable factors for rationale procurement. These responses are as ordinal data, the score of independent professionals who are most concerned with procurement such as

independent Architects, Builder/Engineers, and Quantity surveyors. As carried out in this paper these are analyzed using the Kendall's tau (τ) coefficient of concordance on these factors.

The Kendall's tau (τ) coefficient of concordance was first used to measure responses by Kendall, on the extent of agreement and disagreement between judges in their relative ordering of all possible variable factors in a system, Since then, it has established a reliable stronghold in scientific data analysis.

Table 4.1: Architects responses to questionnaire (NT = 26) [independent professionals]

S/N	Variable Factor	Response			
		Ya	Na	P.A (%)	P.Da (%)
1	Contract was procured through competitive	0	26	0	100
2	Contract was procured through selective tenders.	24	2	92	8
3	Contract was procured through negotiation	0	26	0	100
4	Award was made through Tenders Board	15	11	58.6	42
5	Contract was selected without tendering for the job.	2	24	8	92
6	Is there any functional Tenders Board?	10	16	38	62
7	Contracts was executed within specified duration was delayed.	23	3	88	12
8	Contract was delayed	15	11	58	42
9	Bid from contractors was evaluated and recommended by professionals in the organization.	2	24	8	92
10	Lapses of professional in the construction procurement exist, flouting procurement practice and moral ethics.	25	1	96	4
11	Procurement was based on directive from top management.	18	8	69	31
12	A project was properly costed.	0	26	0	100
13	Projects was awarded before BOQ is produced	15	11	58	42
14	Projects was awarded based on contractors	26	0	100	0

	estimates				
15	Project was awarded based on BOQ/estimates	11	15	42	58
16	Traditional method of tendering is discarded.	26	0	100	0
17	Award was made before other specifications are effected to avoid delay.	24	2	92	8
18	Contract sum varied before completion.	21	5	81	19
19	Is tenders board properly staffed with the right professionals manning it.	25	1	96	4

Author's computations

Note:

Ya = Agreement by Architects

Na = Disagreement by Architects

Pa = Percentage Agreement by Architects

P.Da = Percentage disagreement by Architects

Table 4.2: Builders/Engineers responses (NT = 45) [independent professionals]

S/N	Variable Factor	Response			
		Yb/e	Nb/e	PAb/e (%)	PDb/e (%)
1	Contract was procured through competitive	2	43	93	7
2	Contract was procured through selective tenders.	43	2	96	4
3	Contract was procured through negotiation	10	35	22	78
4	Award was made through Tenders Board	36	9	80	20
5	Contract was selected without tendering for the job.	20	25	44	56
6	Is there any functional Tenders Board?	10	35	22	78
7	Contracts was executed within specified duration was delayed.	20	25	44	56
8	Contract was delayed	9	36	20	80
9	Bid from contractors was evaluated and recommended by professionals in the organization.	10	35	22	78
10	Lapses of professional in the construction procurement exist, flouting procurement practice and moral ethics.	42	3	93	7
11	Procurement was based on directive from top management.	42	3	93	7
12	Projects are properly costed.	10	35	22	78
13	Projects was awarded before BOQ is produced	25	20	56	44
14	Projects was awarded based on contractors estimates	43	2	96	4
15	Project was awarded based on BOQ/estimates	20	25	44	56
16	Traditional method of tendering is discarded.	42	3	93	7
17	Award was made before other specifications are effected to avoid delay.	21	24	47	53
18	Contract sum varied before completion.	38	7	84	16
19	Is tenders board properly staffed with the right construction professionals in various fields.	45	0	100	0

Author's computations

Note:

Yb/e = Agreement by Builders/Engineers

Nb/e = Disagreement by Builders/Engineers

PAB/e = Percentage Agreement by Builders/Engineers

P.Db/e = Disagreement for Builders/Engineers

Table 4.3: Quantity Surveyors responses to questionnaire (NT = 24)

[Independent professionals]

S/N	Variable Factor	Response			
		Yqs	Nqs	PAqs (%)	PDqs (%)
1	Contract was procured through competitive	22	2	92	8
2	Contract was procured through selective tenders.	24	0	100	0
3	Contract was procured through negotiation	2	22	8	92
4	Award was made through Tenders Board	20	4	83	17
5	Contract was selected without tendering for the job.	0	24	0	100
6	Is there any functional Tenders Board?	12	12	50	50
7	Contracts was executed within specified duration was delayed.	12	12	50	50
8	Contract was delayed	2	22	8	92
9	Bid from contractors was evaluated and recommended by professionals in the organization.	2	22	8	92
10	Lapses of professional in the construction procurement exist, flouting procurement practice and moral ethics.	23	1	96	4
11	Procurement was based on directive from top management.	19	5	79	21
12	Projects are properly costed.	23	1	96	4
13	Projects was awarded before BOQ is produced	10	14	42	58
14	Projects was awarded based on contractors estimates	14	10	58	42
15	Project was awarded based on BOQ/estimates	11	13	46	54
16	Traditional method of tendering is discarded.	0	24	0	100
17	Award was made before other specifications are	12	24	0	100

	effected to avoid delay.				
18	Contract sum varied before completion.	8	17	33	67
19	Is tenders board properly staffed with the right professionals manning it.	0	24	0	100

Author's computations

Note: Y_{qs} = Agreement by Quantity Surveyors

N_{qs} = Disagreement by Quantity Surveyors

$P.A_{qs}$ = Percentage Agreement by Quantity Surveyors

$P.D_{qs}$ = Disagreement for Quantity Surveyor

Table 4.4. Total number of independent professionals agreeing on the variable

- factors
- Magnitude of agreement and percentage magnitude of agreement
- Standard deviation
- Square of deviation

S/N	Variable Factor	Architects Agreement	Builders/ Engineers agreement	Quantity Surveyor Agreement	Total Number	Magnitude of agreement	Percentage magnitude of dichotomy	Standard deviation	Square of deviation
		Y_a	$Y_{b/e}$	Y_{qs}	Y_t	Y_m	P_{ym}	S	S^2
1	Contract was procured through competitive tender	0	2	22	24	1.26	74	14.70	216.10
2	Contract was procured through selective tenders	24	43	24	91	*4.79	0	33.15	1098.92
3	Contract was procured through negotiation	0	10	2	12	0.63	87	6.71	44.49
4	Award was made through tender Board	15	36	20	71	3.74	22	26.76	716.10
5	Contractor was selected without	2	20	10	32	1.68	65	14.23	202.49

	tendering for the job								
6	Is there any functional Tenders Board?	10	10	0	20	1.05	78	8.95	80.10
7	Contracts are executed within specified duration and agreed initial terms.	23	20	12	55	2.89	40	19.75	390.10
8	Contract was delayed	15	9	12	36	1.89	61	12.70	161.29
9	Bid from contractors was evaluated and recommended by professionals in the organization	2	10	2	14	0.74	85	6.67	44.49
10	Lapses of professional in the construction procurement exist, flouting procurement practice and moral ethics.	25	42	23	90	4.74	1	32.65	1066.02
11	Procurement was based on directive from top management	18	42	19	79	0.37	92	34.58	1195.78
12	Projects was properly costed	0	10	23	33	1.74	64	16.17	261.47
13	Projects are awarded before BOQ is produced.	15	25	10	50	2.63	45	18.77	352.31
14	Projects was awarded based on contractors estimates	26	43	14	81	4.26	11	33.15	1098.92

15	Project was awarded based on BOQ/estimates	11	20	11	42	2.21	54	15.31	234.40
16	Traditional method of tendering is discarded	26	42	0	68	3.58	25	31.56	996.03
17	Award was made before other specification are effected to avoid delay	24	21	12	67	3.53	26	19.95	398.00
18	Contract sum varied before completion	21	38	8	67	3.53	26	27.51	756.80
19	Is tenders Board properly staffed with the right professionals manning it.	25	45	0	70	3.68	23	32.90	1082.41
									10396.62

Author's computations.

Note:

Ya = Agreement for Architects

YB/e = Agreement for Builders/Engineers

Yqs = Agreement for Quantity Surveyors

YT = Ya + YB/e + Yqs

Ym = Magnitude of Agreement

Pym = Percentage Magnitude of Dichotomy

S = Standard Deviation

S^2 = Square of Deviation

Tables 4.1, 4.2, 4.3, and 4.4 are the analyzed responses for independent Architects, Builders/Engineers and Quantity surveyors respectively. If need be, responses can be obtained

from professionals in different employment (government, private organizations, large public sector, or parastatals), then it is compared using t-test or chi square to establish difference in their respective mean responses.

Significance level of 0.05 is used for both the t distribution and chi square distribution at establishing contentious areas in pursuits of rationale procurement and enhancing public savings.

Analysis

(%) PAP = $\frac{Y_p}{N_p} x100$

= percentage magnitude of agreement

% PD_P = $\frac{n_p}{N_p} x100$

= percentage magnitude of disagreement

Np = Number of professionals that disagree on the variables.

Yp = Number of professional that agree with variable factors.

$Y_T = Y_a + Y_{b/e} + Y_{qs}$

Ym = $\frac{Y_T}{N}$

N = Total number of variable factors, critical to a rationale procurement

$PY_m = \frac{Y_{max} - Y_{min}}{Y_{max}} x100$ =

Percentage magnitude of Dichotomy

Y_{max} = Maximum observed magnitude

Y_{min} = Magnitude of agreement on variables

i, = 1, 2, 3, 4, --- n

For Kendall's tau (τ) coefficient

τ = Kendall's tau coefficient of concordance

S = Sum of squares of standard deviations.

A = Total number of professionals that responded to the variable factors

N = No. of professional that responded of particular procession

And,

$$Y_K = \sum_{i=1}^{nk} \frac{Y_{ik}}{nk}$$

So that

$$s = \sqrt{\frac{\sum_{i=1}^{i} . \sum_{i=k}^{nk} (Y_{ik} - Y_k)^2}{nk - 1}}$$

The results are as tabulated

Scenario Discussion

Although a lot can be deduced from the result of the drawn scenario, limitations saddles considerations of the fundamentals only. For table 4.4, lower value of Pym (percentage dichotomy) relates to perfect agreement, and high value indicates sharper disagreement or dichotomy on the variable factors. There is slight disagreement that contractors are selected without tendering for the job with 0 – 44% range of agreement. Indicative of standard methods being adhered to with deviation, it is agreed that traditional method should not be discarded. With Pym of 3.58 it is found out that contracts are not by negotiation, and that awards are made through the Tenders Board, with 58.6 agreements.

This is quite ostensible though, because it was found out that the Tenders Board is not functional as it is supposed to be with staff not drawn from relevant cadres. The Architect, nearly agree that projects are not well costed, Builders/Engineers agree that projects are properly costed, with over ruling verdict by the Quantity surveyors' agreement of within 96%, thus projects are well costed.

There is an aggregate agreement that lapses exist on part of staff employed in preparation of contract

documents with 96%, 93% and 96% for the Architects, Builders/Engineers and Quantity surveyors respectively. It is agreed that contracts are procured through competitive selective tendering and sometimes contracts are delayed deliberately causing escalations from the anticipated estimates.

In this manner using the Kendall's concordance, contractual situations can be tested to establish the contentious areas for federal, state, the local public service, and determine ways of enhancing their procurements stance. From the run test statistical characteristics and level of significance established Kendall's coefficient of 0.0032 and chi-square (x^2)test yielding 5.472, at significant level of 10% to 5% $P \leq 0.05$ which means there is no significance for a Null hypothesis (H_o).

Conclusion/Recommendation

From the run test following the right procurement in construction procurement is essential for our National development and gray areas are identified which necessary for facilitating judicious use of resources. A lot more have to be done as well over 1.5trn Naira could be saved annually following the right procurement options. Tests runs can be conducted to test the efficiency of any procurement procedure under various circumstances so that sources of leakages in construction contracts are effectively be plugged. Therefore government at all levels should be ready in facilitating it in the following ways:

1. There is the need for an enabling legal framework that would be a leap beyond rhetoric for due

process at all the tiers of government and clear roles for various professionals clearly defined and reinforced.

2. The National construction policy be examined, and with all commitments professionalized the sector with enabling environment for its effective regulation.
3. It is necessary for government to peg the cost of contract assignment, if transfers cannot be avoided it must not exceed to five percent (5%) of the cost less taxes and contingency so that quality of work is not unjustly tradeoff.
4. All relevant laws establishing regulatory professional bodies should be made enforceable with more severe penalties to curtail wrong doings. There must not be professional cross carpeting as their scope, duties, and capacity is regulated within the provision of their respective professional bodies as recognized by relevant laws.

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