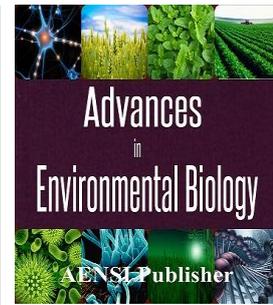




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Indicator Framework for Selection of Trade Specialist Subcontractors in Nigeria.

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ABSTRACT

A significant amount of construction work is let through subcontracting, thus selecting the right subcontractor essentially contributes to the project success. This paper presents an indicator framework for trade specialist subcontractor selection in Nigeria. Trade specialist subcontractors are those that offer trade services or specialized on specific trades such as concreting, brickwork/ blocklaying and carpentry work. They operate fully as autonomous companies providing their own equipment and materials which improve their productivity in their area of specialization and increase their clientele by servicing multiple clients at a time. The identified selection criteria were converted into semi-structured questionnaires and pre-tested in a pilot survey. A convenience sample of thirty respondents which comprises main contractors, clients and consultants were used. The results of Kendall coefficient of concordance (W) and Friedman's χ^2 statistical test of the opinions of the respondents showed that there were significant degrees of agreements among them. The paper concluded that the concepts of selection based on pre-qualification and tender stages could produce competent subcontractors and subsequent performance at construction stage.

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INTRODUCTION

Studies have confirmed that subcontractors execute a significant portion of construction work [1]; [2]; [3] and that the lowest bid price is usually the key determinant factor for their selection [4]; [5]. This sole reliance on subcontractors' bid proposal to make selection decisions are critiqued by researchers such as [6] and [7] because many defaults in the past have been due to subcontractors accepting jobs they are incapable of undertaking and good subcontractors being given inappropriate contracts. Researchers within Nigeria [8]; [9] found that there were no strong subcontract agreements in Nigeria and as such, merit had not been given chance during subcontractors' selection as there were no criteria to be used in the process. Also incompetent subcontractors which had been wrongly selected were found to have executed works that are characterized by problems in quality of work, poor workmanship and the use of substandard materials. These findings were observed to have contributed to building failure [10] and [11]. To avoid the negative consequences of building failure, subcontractors in Nigeria should be better selected based on a set of subjective criteria that will ensure competencies.

Methodology:

Identified selection criteria from the literature were converted into semi-structured questionnaires and pre-tested in a pilot survey. A convenience sample of thirty, drawn from three groups of respondents which comprises of ten main contractors, ten clients (government and corporate) and ten consultants who were builders, architects, engineers and quantity surveyors was used. The trade specialist subcontractors in focus were those engaged in brick/blocklaying, concreting and carpentry work. The ranking of the selection criteria by the respondents were estimated from the mean interval score (MIS) statistics and agreements among the groups were calculated using Kendall [11] formula. Friedman's χ^2 statistics was used to test Kendall's coefficient of concordance (W) for statistical significance. According to [12], when the sample size of judges (p) is small i.e. $p \leq 7$ then $\chi^2 = p(n-1)W$ and direct probability is obtained from a table of critical values. The rule of $p \leq 7$

applies in this case as the size of judges (p) = 3 and to test the significance, the Chi-square statistics was computed.

RESULTS AND DISCUSSION

(i) Agreements in the ranking of selection criteria:

The results of Kendall coefficient of concordance (W) and Friedman's χ^2 statistical test of the opinions of the respondents in Table 1 show that the prequalification criteria ($n=26$) and tender criteria ($n=19$) when $p = 3$ were respectively calculated as 54.47 and 37.803 and the critical values of χ^2 at a 95% confidence level were 38.885 and 30.144 from the table. There were significant degrees of agreements among the respondents since the calculated values were greater than those from the table of critical values. Hence, identified and adapted prequalification and tender criteria were considered to be appropriate for use in Nigeria.

Table 1: Coefficient of concordance and X^2 statistics for Selection Criteria

Selection Stages	Squared sum of ranks [$\sum(R)^2$]	Kendall coefficient [W]	X^2 statistics [$\chi^2 = p(n-1)W$]	X^2 critical able [χ^2 at 0.05]
Prequalification	52213	0.726	54.47	38.885
Tender	20688	0.70	37.803	30.144

(ii) Prequalification Criteria:

The criteria for ensuring that only competent trade specialist subcontractors are shortlisted for invitation to tender are analysed and presented in Table 2. The three most rated in this set were quality of work, technical and managerial competence and knowledge of site conditions. Perhaps the reported problem of quality of work and poor workmanship among the subcontractors which in many occasions contributed to building failure in Nigeria (Oloyede, Omoogun, & Akinjare, 2010 and Ayedun, Durodola, & Akinjare, 2012) could be responsible for the high emphasis on these criteria.

(iii) Tender Criteria:

Having satisfied the pre-qualification condition, a subcontractor should be shortlisted and eligible for invitation to tender. The influential criteria for assessing the suitability of the subcontractor for the award of the subcontract are analysed and presented in Table 3. The results indicated that the subcontractor's ability to submit bona fide tenders with minimal tagged items, evidence of adequate resources/capacity and the use of quality materials were the three most rated criteria. This finding is in align with the agitations of Arslan *et al.* (2008) and Mohammad (2009) that subcontractor be better selected using a set of subjective criteria rather than the sole reliance on bid proposal and will put a check on subcontractors accepting jobs they are incapable of undertaking.

Table 2: Subcontractors' prequalification criteria

Stakeholders' requirement from subcontractors	Main Contr		Client		Consultants	
	MIS	Rank	MIS	Rank	MIS	Rank
Quality of work:						
compliance with specification	3.6	2	4.1	1	4.6	1
compliance with instruction	4.0	1	4.0	2	4.6	1
Productivity records						
input records	3.4	6	3.8	5	4.4	5
output record	2.9	18	3.2	15	4.1	13
Technical and managerial competence						
experience in the job at hand	3.5	3	4.0	2	4.6	1
size/annual turnover	3.0	13	3.1	17	3.9	15
strength of workforce	3.5	3	3.8	5	4.4	5
Reputation and attitude						
past record of working relationship	3.4	6	3.6	8	4.3	7
reference from previous employer	2.8	19	2.9	19	3.7	18
reference from financier	3.3	9	3.6	8	4.3	7
Health and safety records						
presence of safety officer in the firm	2.4	23	2.3	23	3.6	21
up-to-date health and safety record	2.8	19	2.8	21	3.5	22
health and safety policy statement	3.0	13	3.5	12	4.2	11
Financial capacity						
ability to provide own attendance needs	2.5	21	2.9	19	3.7	18
possession of special tools & equipment	3.2	11	3.6	8	4.2	11
Current workload and commitment						
ability to mobiles on site when needed	3.4	6	3.8	5	4.3	7
Location of subcontractor & knowledge of project environment:						
awareness of local labour laws	3.0	13	3.0	18	3.9	15

knowledge of site conditions	3.5	3	4.0	2	4.5	4
patronage of local material suppliers	2.5	21	3.2	15	3.7	18
Competitiveness						
networking ability	2.3	25	2.2	24	3.4	24
level of connections in the industry	3.1	12	2.2	24	2.6	25
Compliance with statutory regulations						
gender equality	2.2	26	1.9	26	2.2	26
workman's compensation Act	3.0	13	3.3	13	3.8	17
compliance with tax regulations	3.3	9	3.6	8	4.3	7
Experience with the present contract form						
understand terms and conditions	3.0	13	3.3	13	4.0	14
Leadership qualities						
ability to manage own workforce	2.4	23	2.7	22	3.5	22

Source: Adapted from Jasper Mbachu (2008)

Table 3: Subcontractors' tender criteria

Stakeholders' requirement from subcontractors	Main Contr		Client		Consultants	
	MIS	Rank	MIS	Rank	MIS	Rank
Competitiveness of the tender price and constituent elements						
submit bonafide tenders minimal tagged items	4.9	1	4.7	1	4.4	3
reasonable discounts	2.6	15	3.2	15	3.0	18
Evidence of adequate resources/capacity;						
financial record	3.3	9	3.8	9	4.0	6
possession of necessary equipment	4.9	1	4.7	1	4.2	4
skilled workforce and managerial competency	3.5	7	2.9	18	3.9	9
Reputation and attitude;						
reference from previous employer(s)	4.0	6	3.8	9	4.2	4
reference from financier(s)	2.9	13	3.6	12	3.7	11
Bond/Insurance						
provision of necessary bond /insurance requirement	4.7	5	4.2	5	4.0	6
Efficient programming of subcontract work						
work programme fitting to main contractor's master programme	3.5	7	4.1	6	3.8	10
submission of risk analysis	2.5	16	3.4	14	3.6	12
prepared method statement	2.5	16	3.7	11	3.6	12
Well-articulated health and safety plan						
presence of safety officer in the firm	2.	18	4.0	8	3.3	16
up-to-date health and safety record	3.2	11	3.1	16	3.4	15
health and safety policy statement	2.8	14	2.9	18	1.8	19
Well-articulated construction methodology						
submission of detailed construction methodology	3.3	9	4.1	6	4.0	6
Standard of workmanship						
evidence of satisfaction of workmanship from previous employer(s)	3.2	11	3.5	13	3.5	14
Quality of materials						
use quality specified materials	4.9	1	4.3	2	4.5	2
use quantity specified materials	4.9	1	4.3	2	4.6	1
Readiness to mobilize to site immediately	1.0	19	3.0	17	3.2	17

Source: Adapted from Jasper Mbachu (2008)

Summary:

The proposed framework for selection of trade specialist subcontractors in Nigeria had been investigated through a pilot study using a set of subject criteria. On the basis of the analyses, ratings of 30 stakeholders, it could be concluded that the concepts of the two stage selection; pre-qualification and tender could produce competent subcontractors, provide realistic bases for tender invitation and award and subsequent performance at construction stage which invariably are expected to contribute positively in curbing the menace of building failure in Nigeria.

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