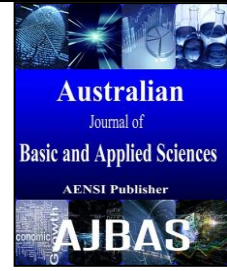




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Relative Importance of Trust Attributes in Subcontractors Selection in Nigeria

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ABSTRACT

The success of construction project depends upon many factors in which trust is crucial, a review of subcontractor selection reveals weakness in the process as it focused on the tender and lowest bid abilities alone. This paper presents a relative importance of trust attributes which attempt to improve the subcontractor selection processes. Towards this aim, 16 trust attributes thought to potentially influence subcontractor selection were identified from the literature and grouped into 4 clusters, namely: engagement, integrity, operation and product and service. Based on these attributes, a structured questionnaire survey was designed using a Likert-type scale and administered to main contractors, clients and consultants in the southwestern Nigeria. The result shows that trust attributes in the integrity and operation clusters are the most influencing in the selection process as the two clusters ranked 1 and 2 with overall relative importance index (RII) of .71 and .69 respectively. Perhaps the reported instances of the use of incompetent subcontractor contributing to building collapse in Nigeria could be responsible for the high emphasis placed on the two clusters by the respondents. The study concluded that one of the prevailing values that should influence the selection of subcontractors are the requirements of trustworthiness in the construction operation and the need for integrity in collaborating. This will encourage parties to adopt higher technical standards, and achieve improved ethical performance in all their dealings which in turn has the potential to produce an improvement in the ethical climate of the construction industry.

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INTRODUCTION

Several studies have confirmed that subcontractors execute a significant portion of construction work (Abbasianjahromi, H., 2013; Hartmann, A., 2009). According to Hoban and Francis (2010), subcontractors are specialist hired by the main contractor to perform specific tasks on a project as part of the overall contract. During the subcontractor selection, it is common that the lowest bid price is usually the key determinant factor (Mbachu, J., 2008; Jarkas, A.M., 2013). This practice of sole reliance on subcontractors' bid proposal to make selection have been the norm in Nigeria (Fagbenle, O.I., 2011). However, Kumaraswamy and Matthews (2000) argued that such practice was naive as bitter experiences have shown that the lowest tender may have originated from inaccurate estimating, inadequate risk provisions, deliberate decisions to use substandard resources, and/or even "smart" pricing strategies aimed at generating claims for extra payments through contractual loopholes. Fagbenle (2011) also found that the practice had contributed to jobs being awarded to

incompetent subcontractors in Nigeria, while further researches within Nigeria reported that the use of incompetent subcontractors had contributed to building collapses within Nigeria (Ede, A.N., 2013; Ayedun, C., 2011). According to Mbachu (2008), Hartmann, Ling (2009) and Arslan, Kivrak (2008), the selection of subcontractors should not be based solely on bid price, but rather, other criteria such as trust should play an influencing role in the process to arrive at reasonable construction team members. Latham (1994) and Egan (1998), highlighted trust in their reports as a major factor leading to the success or failure of construction projects and over the past years, considerable literature had also emerged on the impact of trust in successful management of construction and engineering works (McDermott, P., 2005; Pinto, J.K., 2009). Trust is an essential requirement which makes initial human interaction possible (Romahn, E. and F. Hartman, 1999), and it can also be regarded as the glue that fosters cooperation among organizations and an essential lubricant that helps to complete the project smoothly. Although, several studies have identified potentially the selection criteria for the engagement of

subcontractors, but gaps still exists in the literature as none of these studies considered trust attributes of the subcontractor to be engaged during the selection process and no research has been conducted to explore its influence in the overall construction project success in Nigeria.

Research Methodology:

The choice of research strategy drastically influences the specification of the research methods that are deployed for investigating a problem and determines the research design, namely the framework for collecting, analyzing and interpreting

data (Panas, A. and J. Pantouvakis, 2011). To identify trust attributes influencing selection of subcontractors, a systematic literature review was conducted and experts' opinion from the industry was also collected. Sixteen trust attributes were identified, developed into a structured questionnaire and used to collect data using a survey method. The attributes were grouped into four clusters and are presented in Table 1. The target population is the main contractors who registered with the State Ministry of Works, the consultants who registered with the State tender's Board and clients representatives of government and corporate bodies.

Table 1: Trust attributes towards selection of subcontractors and related cluster.

Trust Attributes	Related Clusters
ranks on a list of top subcontractors in the southwestern Nigeria	Engagement
listen to and act promptly on instructions given by main contractor	Engagement
attentiveness and activeness of subcontractor in site meetings	Engagement
works to protect and improve safe environment	Engagement
communicate frequently and honestly on the work progress	Integrity
has transparent and open practices on the materials used	Integrity
support the main contractor over defects liability period	Integrity
support the main contractor for follow up after the defects liability period	Integrity
offers high quality products or services	Product and Service
treat employees well	Product and Service
places quality ahead of profits	Product and Service
delivers consistently in returns for stakeholders financial input	Product and Service
has qualified and experienced workers	Operations
has ethical construction practice	Operations
is an innovation of new construction methods or ideas	Operations
take responsible actions to address technical issues on site	Operations

Sample Size:

The formula shown in equation 1 was used to obtain the statistically representative sample of the population. The population consists of a total of nine hundred and seventy-four (974) main contractors and eight hundred and thirty-seven (837) consultants who registered with various government bodies.

Yamane's formula:
$$n = \frac{N}{1+N(e)^2}$$

equ (1)

Where;

n = the sample size, N = the population size, and e = the acceptable sampling error limit or level of precision taken as $\pm 10\%$.

Using the Yamane's formula, the sample size of the population was calculated as follows: main contractor = 91; and consultants = 90 while the sample size of the clients was assumed to be 100.

Reliability and Validity Test:

Validity and reliability according to Mendenhall, Beaver (2012) are important aspects of research instruments and they must be considered to ensure that accurate results are obtained. In order to establish a reasonable validity of the instrument used in this research, the instrument was pre-tested in a pilot survey using samples of the respondents. Method of face validity was used to carry out the content validity of the research instrument. This was achieved by showing the samples of the

questionnaires to senior academic colleagues and professional experts in the industry. There were minor comments, which were suggestions to replace some variables and almost all of the respondents' feedback was positive and their contributions brought some significant improvement to the instrument. The internal reliability, which focuses on the consistency within a measured instrument was checked and its coefficient was calculated using Cronbach's alpha (α) test (DeVellis, R.F., 2003; Nunnally, J.C., 1978). The α coefficient ranges in value from 0 to 1, and is used to describe the reliability of factors extracted from dichotomous, multi-point formatted or ordinal rating scale questionnaires. According to Nunnally (1978) and DeVellis (2003), the higher the coefficient score or as the coefficient tends towards 1 the more reliable the generated scale is but Jarkas argued that lower thresholds are commonly encountered in the literature. However, DeVellis (2003), indicated that a value of 0.70 is an acceptable reliability coefficient. Cronbach's α for the sample group of respondents was calculated and a coefficient value of 0.936 was obtained, which indicates an acceptable reliability.

Agreement among Rankers and Test of significance:

Kendall's coefficient of concordance for ranks (W) was used to calculate agreements among the

three groups of the respondents using Kendall and Smith (1939) formula.

$$\text{Kendall's coefficient of concordance: } W = \frac{12S^2 - 3p^2n(n+1)}{p^2(n^3 - n) - pT} \quad \text{equ (2)}$$

Where: $S = \sum R_i^2$ = sum-of-square statistic over the row sums of ranks R_i

p = number of groups of rankers; T = correction factor required for tying ranks

n = number attributes considered as influencing subcontractor selection

Friedman's chi-square (χ^2) statistics are normally used to test the Kendall's coefficient of concordance (W) for statistical significance and according to Siegel and Castellan (1988), the χ^2 probability are not

to be calculated in the usual way when the size of the group of judges is small i.e. $p \leq 7$; instead, the χ^2 is computed as: $\chi^2 = p(n-1)W$ and compared with the direct probability obtained from the table of critical values. The rule of $p \leq 7$ applies in this case, as, $p = 3$ (i.e., main contractor, clients and consultants). Thus, using Table 2 and equation 2, $W = 0.884$, the statistical significance $\chi^2 = 39.777$ and the direct probability from the critical table at 95 % confidence level, i.e. χ^2 (Critical table) = 26.296 for the number of attributes considered, i.e. $n = 16$. The result implies a significant agreement among the groups of the respondents since the calculated χ^2 is greater than the value obtained from the critical table.

Table 2: Respondents' mean score and ranks of the influence of trust attributes in subcontractors selection.

Trust Attributes	Main Contractor		Client		Consultant		$\Sigma(R)$	$[\Sigma(R)]^2$	
	Mean	Rank	Mean	Rank	Mean	Rank			
ranks on a list of top subcontractors in the southwestern Nigeria	3.03	10	2.74	11	3.38	8	29	841	
listen to and act promptly on main contractor's instructions	3.45	7	3.30	7	3.51	7	21	441	
attentiveness and activeness of subcontractor in site meetings	2.71	12	2.75	11	2.55	12	35	1225	
has ethical construction practice	2.39	13	2.21	13	2.52	13	39	1521	
communicate frequently and honestly on the work progress	3.69	3	3.49	3	3.92	1	7	49	
has transparent and open practices on the materials used	3.34	8	3.20	8	3.38	8	24	576	
willingness to support the main contractor over defects liability period	3.71	3	3.51	3	3.92	1	7	49	
willingness to support the main contractor for follow up after the defects liability period	3.53	5	3.39	5	3.55	6	16	256	
offers high quality products or services	3.53	5	3.36	6	3.58	5	16	256	
treat employees well	2.14	14	2.16	14	2.09	14	42	1764	
places quality ahead of profits	2.01	15	2.16	14	1.71	15	44	1936	
delivers consistently in returns for stakeholders financial input	1.76	16	1.85	16	1.63	16	48	2304	
has qualified and experienced workers	4.03	1	4.02	1	3.85	3	5	25	
works to protect and improve safe environment	3.74	2	3.50	2	3.85	3	7	49	
is an innovation of new construction methods or ideas	2.82	11	2.82	10	2.65	11	32	1024	
take responsible actions to address technical issues on site	3.19	9	3.08	9	3.29	10	28	784	
Total =		$[\Sigma(R)]^2 = 13100$							

Relative Importance Index

The data collected were further analyzed using the "relative importance index" (RII) technique [6]. The RII for each attribute surveyed was calculated by the formula:

$$\text{RII} = \frac{5(n_5) + 4(n_4) + 3(n_3) + 2(n_2) + n_1}{5(n_1 + n_2 + n_3 + n_4 + n_5)}$$

Where: n_1 ; n_2 ; n_3 ; n_4 ; and n_5 , are the number of respondents who selected: 1, for *not at all*; 2, for *rarely*; 3, for *to an average extent*; 4, for *to some extent*; and 5, for *to a great extent*, for each factor shown on the questionnaire, respectively. The RII, was also used to determine the rank of each attributes explored and cross-compare the relative importance perceived by each category of the respondents. The cumulative RII perceived by all respondents for each attribute was determined to establish the overall

ranks while the rank for each of the four clusters, as perceived by, main contractors, client and consultants, was established by quantifying the average value of the relative importance indices for all the attributes categorized under, whereas, the overall ranks for the attributes were assigned based on the cumulative average RII discerned by all respondents.

RESULTS AND DISCUSSION

The perceived influence of the 16 trust attributes towards the selection of subcontractors in Southwestern Nigeria is determined. The relative importance indices, ranks according to the respondents and the overall ranks are presented and discussed. Table 3 presents the quantified relative importance indices for the trust attributes influencing

the decisions in the selection of subcontractors, the corresponding ranks achieved, as discerned by, the main contractors, clients, consultants, and the overall ranks established based on the collective perception of all respondents. Based on the overall perceived importance of the trust attributes that were investigated, the ten most important attributes influencing the selection decisions of the main contractors, clients and consultants in the southwestern Nigeria are the following:

- i. has qualified and experienced workers (operation);
- ii. works to protect and improve safe environment (operation);
- iii. willingness to support the main contractor over defect liability period (integrity);

- iv. communicate frequently and honestly on work progress (integrity);
- v. willingness to support the main contractor for follow up after the defect liability period (integrity);
- vi. offers high quality product and service (product & service);
- vii. listen to and act promptly on main contractor instruction (engagement);
- viii. transparent and open practices on materials used (integrity);
- ix. take responsible actions to address technical issues on site (operation); and
- x. ranks on a list of top subcontractors in the southwestern Nigeria. (engagement)

Table 3: Relative importance indices and overall ranks of trust attributes influencing selection of subcontractors.

Trust Attributes	Main contractor RII Rank		Client RII Rank		Consultant RII Rank		Overall RII Rank		Related Cluster
	RII	Rank	RII	Rank	RII	Rank	RII	Rank	
has qualified and experienced workers	0.81	1	0.80	1	0.77	3	0.79	1	Operation
works to protect and improve safe environment	0.75	2	0.71	2	0.77	3	0.74	2	Operation
willingness to support the main contractor over defects liability period	0.74	3	0.70	3	0.78	1	0.74	2	Integrity
communicate frequently and honestly on the work progress	0.74	3	0.70	3	0.78	1	0.74	2	Integrity
willingness to support the main contractor for follow up after the defects liability period	0.71	5	0.68	5	0.71	6	0.70	5	Integrity
offers high quality products or services	0.71	5	0.67	6	0.72	5	0.70	5	Product & Service
listen to and act promptly on main contractor's instructions	0.69	7	0.66	7	0.70	7	0.68	7	Engagement
transparent and open practices on the materials used	0.67	8	0.64	8	0.68	8	0.66	8	Integrity
take responsible actions to address technical issues on site	0.64	9	0.62	9	0.66	10	0.64	9	Operation
ranks on a list of top subcontractors in the southwestern Nigeria	0.61	10	0.55	11	0.68	8	0.61	10	Engagement
is an innovation of new construction methods or ideas	0.56	11	0.56	10	0.53	11	0.55	11	Operation
attentiveness and activeness of subcontractor in site meetings	0.54	12	0.55	11	0.51	12	0.53	12	Engagement
has ethical construction practice	0.48	13	0.44	13	0.50	13	0.47	13	Engagement
treat employees well	0.43	14	0.43	14	0.42	14	0.43	14	Product & Service
places quality ahead of profits	0.40	15	0.43	14	0.34	15	0.39	15	Product & Service
delivers consistently in returns for stakeholders financial input	0.35	16	0.37	16	0.33	16	0.35	16	Product & Service

Table 4: Cluster average relative importance indices and ranks according the respondents.

Cluster	Main contractor		Client		Consultant		Overall Ranking	
	Avg. RII	Rank	Avg. RII	Rank	Avg. RII	Rank	Avg. RII	Rank
Engagement	0.60	3	0.55	3	0.60	3	0.58	3
Integrity	0.71	1	0.68	1	0.74	1	0.71	1
Operation	0.69	2	0.67	2	0.68	2	0.68	2
Product and Service	0.47	4	0.48	4	0.45	4	0.47	4

These attributes were mainly from the integrity and operation clusters with an overall RII of 0.71 and 0.69 ranking as 1 and 2 respectively from Table 4. This indicates which aspects trust attributes are required of subcontractors in Nigeria and the level of trust that needs to be developed in the industry. The implication of this finding will guide the stakeholders

during subcontractor selection, the reported cases of building collapse will be reduced in Nigeria as the selected subcontractors for the construction work will be those with integrity and operationally capable of the task.

Conclusions:

Subcontractors vicariously help main contractors to fulfill their contracts by providing products and services that meet project specifications which the main contractors are ultimately responsible for. On the other hand, subcontractors who produce poor quality may cause irreparable damage to the construction end products and as such, complaints to be lodged against the main contractor's reputation. Therefore, one of the prevailing values that should influence their selection during the award of subcontract works are the requirements of trustworthiness during construction operation and the need for integrity in collaborating. This will encourage parties to adopt higher technical standards, and achieve improved ethical performance in all their dealings which in turn has the potential to produce an improvement in the ethical climate of the construction industry.

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