INFLUENCE OF TRUST ATTRIBUTES IN SUBCONTRACTORS' SELECTION IN SOUTHWESTERN NIGERIA

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Abstract

Trust has an important role in project and construction management industry, the success of the project will depend upon many factors in which trust is crucial because it enhance the relationship between client and employee, it increases the productivity and helps to maintain qualities of work done during the construction stage. This study aims to conceptualise the trust attributes influencing the decisions of main contractor, clients and consultants in the selection of trade specialist subcontractors in southwestern Nigeria. Toward this aim, sixteen trust attributes were identified, grouped into four clusters and developed into a questionnaire. The study finds that the trust attributes in the integrity and operation clusters were the most influencing attributes in the selection process. Perhaps the reported problem of the use of incompetent subcontractors which on several occasions had contributed to building failure in Nigeria could be responsible for the high emphasis on these clusters. 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.

Keywords: Influence; Trust; Subcontractors; Selection; Southwestern Nigeria.

Introduction:

Over the past few years, studies have confirmed that subcontractors execute a significant portion of the construction work, e.g. (Arditi & Chotibhongs, 2005; Wang & Liu 2005; Ng *et al*. 2008a and 2008b). According to Hoban & Francis (2003), 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 for construction contract, it is common that the lowest bid price is usually the key determinant factor (Mbachu, 2008; Jarkas, 2013). However, Fagbenle *et al*. (2011), found that this sole reliance on subcontractors' bid proposal to make selection decisions have been the norm in Nigeria and also asserted that the practice had contributed to jobs being awarded to incompetent subcontractors. However, the use of incompetent subcontractors had contributed to building failure that had occurred many times in Nigeria (Oloyede, Omoogun, & Akinjare, 2010; and Ayedun, Durodola, & Akinjare 2012). Studies of Mbachu (2008) and Doloi *et al*. (2011) suggested that the selection of subcontractors should not be based solely on bid price,

but rather, other criteria should play an influencing role in the process to arrive at reasonable construction team members.

Subcontractor Selection Process

Several approaches exist for subcontractor selection in the construction industry, studies on the subject reported that one main factor to consider in the selection of the subcontractor is based on lowest tender (Latham, 1994; Hartmann *et al.* 2009; El-Mashaleh 2013). However, Kumaraswamy & Matthews (2000) find 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

Further studies added that performance of relevant previous projects, financial capacity, completion of job within time, prompt payment to labour, quality of production, standard of workmanship, quality of materials used, compliance with site safety requirements, compliance with contract and collaboration with other subcontractors are also paramount factors to be considered in the selection of subcontractors (Ko, Cheng, & Wu, 2007; Ng et al., 2008a & 2008b; Arslan et al., 2008, Mbachu, 2008).

Although many researchers and industry practitioners have been proposing different methods and procedures for contractor selection, Doloi *et al.* (2011) observed that most of them have shortcomings in drawing a clear link between the selection criteria and the project success leading to a win-win situation for all parties. Mbachu (2008) opined that the optimal selection of subcontractors on the basis of overall ability to perform, rather than on the tender price alone, is crucial to a sustainable project. While all these studies identified the selection criteria for the engagement of subcontractors, there is none that considered trust attributes of the subcontractor to be engaged during the selection process and no literature has explored its influence in the overall construction project success in Nigeria.

Trust influence in construction project success

Trust is an essential requirement which makes initial human interaction possible (Romahn and Hartman 1999), it can be regarded as the glue that fosters cooperation among organizations and an essential lubricant that helps to complete the project smoothly (McDermott, Khalfan, & Swan, 2005). The reports of Latham (1994) and Egan

(1998) highlighted trust 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 on successful management of construction and engineering works (McDermott, Khalfan, & Swan, 2005; Lau and Rowlinson, 2009 & 2011; Pinto, Slevin & English, 2009 and Chow, Cheung & Chan, 2012). Although, the success of the project will depend upon many factors, but selecting a subcontractor with good trust attributes to handle subcontracted portion of work is crucial as this will enhance the relationship with client and employee, helps in developing harmonious business relationships among the construction team members, increases the productivity and above all, enhances the quality of construction product (Chow, Cheung & Chan, 2012).

Research Methodology

The research methodology encompasses the rationale and the philosophical assumptions that underlie a particular study (Dainty, 2008). 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, analysing and interpreting data (Panas & Pantouvakis, 2011).

To identify trust attributes influencing selection of subcontractors, a systematic literature review was conducted and experts' opinion from the field was also gathered. Sixteen attributes were identified, developed into a structured – close-ended- questionnaire and was used to collect data using the survey method. The attributes were grouped into four clusters and are presented in Table I. The target population included 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 Influencing Selection of Subcontractors and related cluster

No	Attributes	Related cluster
1.	ranks on a list of top subcontractors in the southwestern Nigeria	Engagement
2.	treat employees well	Engagement
3.	places quality ahead of profit	Engagement
4.	delivers consistently in return for stakeholder financial input	Engagement
5.	has ethical construction practice	Integrity
6.	communicate frequently and honestly on work progress	Integrity
7.	transparent and open practices on materials used	Integrity
8.	listen to and act promptly on main contractor instruction	Integrity
9.	has qualified and experience workers	Operations
10.	take responsible actions to address technical issues on site	Operations
11.	uses the innovation of new construction methods or ideas	Operations
12.	works to protect and improve a safe environment.	Operations

13. offers high quality product and service	Product & Service
14. address society's needs (e.g erects street or location post)	Product & Service
15. creates programmes that positively impact the local community	Product & Service
16. partners with NGOs, government and 3rd parties on societal needs	Product & Service

Sample Size

The formula shown in equation 1 (Al-Sediary, 1994) 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.

$$\text{Sample size} \quad \eta = \frac{n^1}{[1 + (n^1/N)]} \quad \quad (1)$$

Where: $n^1 = S^2/V^2$; $\quad$ N = total estimated population;

S = Maximum standard deviation in population at a confidence level of 95%,

$S^2 = (p) * (1-p) = (0.5) * (0.5) = 0.25$; $\quad$ V = Standard error of the sampling distribution = 0.05

p = value of the population proportion which is being estimated.

Since the value of p is unknown, Sincich et al. (2001) suggest a conservative value of 0.50 be used so that a sample size that is at least as large as required be obtained. Using a 95% confidence level, i.e. 5% significance level, the sample size of the population was approximated as follows: main contractor = 91; and consultants = 90 while the sample representative of the clients was taken at random.

Reliability and Validity Test

Construction engineering and management research must be verified, validated and reliable to achieve the highest level of quality (Lucko and Rojas, 2010). Validity and reliability according to Mendenhall, Beaver and Beaver (2012) are important aspects of research instruments and they must be considered to ensure that accurate results are obtained. Lucko and Rojas (2010) observed that validation of the research methodology and its results is a fundamental element of the process of scholarly endeavour. Kothari (2004), also noted that validity is one of the concepts used to determine how good is an answer provided by research and it refers to the extent at which an instrument measures what actually it is supposed to measure.

In order to establish a reasonable validity of the instrument used in this research, the instrument was pre-tested in a pilot survey which was conducted on samples of the respondents. The questionnaire was distributed to 30 respondents which comprises of 10 main contractors, 10 clients representatives (government and corporate bodies) and 10 consultants (builders, quantity surveyors, architects and engineers) for assessment and feedback.

The aim of this test according to Jarkas (2013) was fourfold:

i.   to assess the clarity, comprehensibility, interpretation, and appropriateness of the questions provided in capturing the trust attributes which will enhance the relationship between main contractors and subcontractor and to ensure quality work are done by the selected subcontractor;

ii. to test the range adequacy of response choices;

iii. to assess the internal consistency of the questionnaire; and

iv. to determine the efficiency, with which the respondents complete the questionnaires.

The 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 field. There were minor comments, which were mainly related to some contextual interpretations of few questions 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 (Lucko and Rojas, 2009; Taylor and Jaselskis, 2009). 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 (Jarkas, 2013). The internal consistency of the questionnaire was tested by computing the "Cronbach's α" of the sets returned using equation (2):

$$\alpha = \frac{n}{n-1}\left(1 - \frac{\Sigma V_i}{V_{test}}\right) \qquad (2)$$

where: n is the number of questions; V_i is the variance of scores on each question; and V_{test} is the total variance of the overall scores. Doloi *et al.* (2011), noted that the higher the coefficient score or as the coefficient tends towards 1 the more reliable the generated scale is. Although, Nunnaly (1978) indicated that a value of 0.70 is an acceptable reliability coefficient; however, Jarkas (2013) noted that lower thresholds are commonly encountered in the

literature. Cronbach's α for the sample group of respondents was calculated by the use of Statistical Package for the Social Sciences (SPSS V21) software and a coefficient value of **0.936** was obtained, which indicates an acceptable measure of questionnaire reliability by all respondents.

Agreement among Rankers and Test of significance

Kendall's coefficient of concordance for ranks (W) was used to calculate agreements among the groups of the rankers of the 16 attributes being identified (Kendall, 1946).

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

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

p = number of groups of rankers;   T = correction factor required for tieing 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 & Castellan (1985), the χ^2 probability are not to be calculated in the usual way when the sample size 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; thus, using Table 2 and equation 3, W = **0.884**, the statistical significance χ^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 from the critical table.

Table 2: Respondents' Mean score and Ranks of the Influence of Trust Attributes in Subcontractors Selection

Trust Attributes	MC Mean	MC Rank	CL Mean	CL Rank	CS Mean	CS Rank	$\Sigma(R)$	$[\Sigma(R)]^2$
ranks on a list of top subcontractors in the southwestern Nigeria	3.03	**10**	2.74	**11**	3.38	**8**	29	841
treat employees well	3.45	**7**	3.30	**7**	3.51	**7**	21	441
places quality ahead of profit	2.71	**12**	2.75	**11**	2.55	**12**	35	1225
delivers consistently in return for stakeholder financial input	2.39	**13**	2.21	**13**	2.52	**13**	39	1521
has ethical construction practice	3.53	**5**	3.39	**5**	3.55	**6**	16	256
communicate frequently and honestly on work progress	3.69	**3**	3.49	**3**	3.92	**1**	7	49
transparent and open practices on materials used	3.34	**8**	3.20	**8**	3.38	**8**	24	576
listen to and act promptly on main contractor instruction	3.71	**3**	3.51	**3**	3.92	**1**	7	49
has qualified and experience workers	4.03	**1**	4.02	**1**	3.85	**3**	5	25
take responsible actions to address technical issues on site	3.19	**9**	3.08	**9**	3.29	**10**	28	784
uses the innovation of new construction methods or ideas	2.82	**11**	2.82	**10**	2.65	**11**	32	1024
works to protect and improve a safe environment.	3.74	**2**	3.50	**2**	3.85	**3**	7	49
offers high quality product and service	3.53	**5**	3.36	**6**	3.58	**5**	16	256
address society's needs (e.g erects street or location post)	2.14	**14**	2.16	**14**	2.09	**14**	42	1764
creates programmes that positively impact the local community	2.01	**15**	2.16	**14**	1.71	**15**	44	1936
partners with NGOs, government and 3rd parties on societal needs	1.76	**16**	1.85	**16**	1.63	**16**	48	2304
					Total = $[\Sigma(R)]^2$	**=**		**13100**

Source: Field Survey 2014

Note: MC = Main Contractor; CL = Client; CS = Consultant

Relative Importance Index

The data collected were further analysed using the "relative importance index" (RII) technique (Kometa et al., 1994; Kumaraswamy and Chan, 1997). The RII for each attribute surveyed was calculated by the formula shown in equation (4):

$$RII = \frac{5(n5) + 4(n4) + 3(n3) + 2(n2) + n1}{5(n1 + n2 + n3 + n4 + n5)} \qquad (4)$$

Where: n1; n2; n3; n4; and n5, 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 higher the RII value, the stronger the perceived influence of the attributes in the selection decision. The cumulative RII perceived by all respondents for each attribute was determined to establish the overall ranks of the trust attributes influencing the decisions of main contractors, clients and consultants in the selection of subcontractors in the study area. On the other hand, 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; the higher the cumulative average value, the stronger the influence of the attribute (Sambasivan and Soon, 2007; Jarkas, 2013).

Data Presentation

The perceived influence of the 16 trust attributes influencing selection decisions 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:

(1) has qualified and experienced workers (operation);

(2) works to protect and improve a safe environment (operation);

(3) listen to and act promptly on main contractor instruction (integrity);

(4) communicate frequently and honestly on work progress (integrity);

(5) has ethical construction practice (integrity);

(6) offers high quality product and service (product & service);

(7) treat employees well (engagement);

(8) transparent and open practices on materials used (integrity);

(9) take responsible actions to address technical issues on site (operation); and

(10) ranks on a list of top subcontractors in the southwestern Nigeria. (engagement)

These attributes were mainly from the integrity and operation clusters with an overall RII of 0.71 and 0.68 ranked 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 help to reduce the problem of building failure especially in Nigeria as the selected subcontractors for the construction work will be those who are uncompromising, predictably consistent, committed with sincerity and truthfulness to the practice and; has qualified and experienced workers, works to protect and improve a safe environment, listen to and act promptly on main contractor instruction, communicate frequently and honestly on work progress with transparent and open practices on materials used, has ethical construction practice, offers high quality product and service, treat employees well, take responsible actions to address technical issues on site and ranks on a list of top subcontractors in the southwestern Nigeria.

Table 3: Relative Importance Indices and Ranks of Trust Attributes Influencing Selection of Subcontractors in Southwestern Nigeria

Trust Attributes	MC		CL		CS		Overall		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	Operations
works to protect and improve a safe environment.	0.75	2	0.71	2	0.77	3	0.74	2	Operations
listen to and act promptly on main contractor instruction	0.74	3	0.70	3	0.78	1	0.74	2	Integrity
communicate frequently and honestly on work progress	0.74	3	0.70	3	0.78	1	0.74	2	Integrity
has ethical construction practice	0.71	5	0.68	5	0.71	6	0.70	5	Integrity
offers high quality product and service	0.71	5	0.67	6	0.72	5	0.70	5	Product& Service
treat employees well	0.69	7	0.66	7	0.70	7	0.68	7	Engagement
transparent and open practices on 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	Operations
ranks on a list of top subcontractors in the southwestern Nigeria	0.61	10	0.55	11	0.68	8	0.61	10	Engagement
uses the innovation of new construction methods or ideas	0.56	11	0.56	10	0.53	11	0.55	11	Operations
places quality ahead of profit	0.54	12	0.55	11	0.51	12	0.53	12	Engagement
delivers consistently in return for stakeholder financial input	0.48	13	0.44	13	0.50	13	0.47	13	Engagement
address society's needs (e.g erects street or location post)	0.43	14	0.43	14	0.42	14	0.43	14	Product& Service
creates programmes that positively impact the local community	0.40	15	0.43	14	0.34	15	0.39	15	Product& Service
partners with NGOs, government and 3rd parties on societal needs	0.35	16	0.37	16	0.33	16	0.35	16	Product& Service

Source: Field Survey 2014

Note: MC = Main Contractor;   CL = Client;   CS = Consultants

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

Cluster	MC		CL		CS		Overall	
	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 & Service	0.47	4	0.48	4	0.45	4	0.47	**4**

Source: Field Survey 2014

Note: MC = Main Contractor;   CL = Client;   CS = Consultants

Conclusions and Recommendations

Subcontractors vicariously help main contractors to fulfil 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 are the requirements of trustworthiness during 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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