Quality Control Compliance as an Environmental Response to Sustainability in the Nigerian Construction Industry

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Abstract

The concept of sustainability has become integral to the environmental dialect within the building construction industry. At present, providing an avenue by which the construction industry can meet its sustainability obligations has remained a topical issue globally. An environmentally oriented movement toward sustainability in building construction, however, still hinges on the traditional principles of cost, quality, and performance. This paper x-rays the unethical performance traits evident in the construction industry in Nigeria and the project delivery practices by indigenous firms that significantly influence the quality and thus the sustainability of construction output. Issues associated with quality control compliance are statistically analysed to determine existing trends. Multivariate analysis is deployed to measure the degree to which quality control parameters explain the participation level of indigenous local contractors in executing government projects. The study mathematically expresses the relationship between quality control adherence and indigenous participation in the execution of government contracts. The statistical analysis shows that the five quality control independent variables (internal organizational factor; the level of enlightenment; adequacy of designs; conducting of relevant tests and supervisory adherence) explain 47% of the variation in the level of indigenous participation. Poor quality control associated with the execution of contracts by indigenous construction companies in Nigeria may thus partly account for the low level of indigenous participation evident in the construction industry.

Keywords: Construction industry, Ethics, Indigenization, Local content, Projects, Quality control.

Contents

Contribution of this paper to the literature
The study statistically explores the cause-effect relationship between the level of quality control by indigenous contracting firms in Nigeria and their level of participation in public projects. This is against the backdrop of the paucity of empirical literature, whereby most studies only report descriptive outcomes on the variables.

1. Introduction

There have been repeated calls for increased "local content" i.e., indigenous participation in the construction of capital projects in Nigeria, against the backdrop of foreign firms' domination of the construction sector. Two major concerns involving project delivery by indigenous construction firms however can be identified; one is the quality of construction output in the industry [1]. One is the quality of construction projects executed by local construction firms in Nigeria as evidenced by the several reported cases of premature building failure [2, 3]. The other is the widespread notion that unethical performance plagues indigenous construction companies in Nigeria [4].

Quality assurance epitomizes the confidence that construction works adhere to the design requirements of durability, safety, and functionality as well as serviceability, economy, and aesthetics Okereke [5]; Lakshmi [6]; Adekeye, et al. [7]. Abdulkareem and Adeoti [1] study reveals that the primary measures of quality control carried out on building sites in Nigeria are owners and unskilled supervision; supervision by skilled technical personnel and supervision by professional consultants. Abdulkareem and Adeoti [1] study however showed that the majority of construction projects in Nigeria are supervised by the building owners, and in some cases, semi-skilled or unskilled personnel are engaged to carry out the supervision [3, 4, 8]. In these instances, adherence to quality standards is not ensured, and the supervisors lack the technical and professional capacity to control quality. Non-adherence to drawings and material specifications is often the case and the contractors stand to gain financial benefits. Only a handful of individual construction projects are supervised by skilled professionals [6, 9]. Supervision by professionals is mostly found on Government projects, where they serve as consultants to the government, by reporting and evaluating the progress of works at regular intervals. Previous research has evaluated compliance with government regulatory policies, the perception of professionals, and barriers to adherence to Quality Control [2, 8, 10, 11].

Ethical issues have however plagued the performance of government projects in different parts of the world Rodriguez, et al. [12]; Bowen, et al. [13]; Rose-Ackerman [14]; Sichombo, et al. [15]. Wasserman [16] asserted that ethics encompasses the thought, dialectal, cognitive processes, and decisions that dictate the choices made by people in their daily lives concerning their effect on the well-being of others. This definition aptly captures the Nigerian scenario as there appears to be a twisted and astonishingly flexible value system in the general acceptance level of what is regarded as ethical. Bribery and corruption which is rife in the system of governance and organizational setup, both in private and public holdings seem to constitute an acceptable standard of conduct amongst Nigerians [7]. As such, genuine outcry against perceived misappropriation of public funds allocated to various sectors of the economy and for infrastructural development are "swept under the rug" by the powers that be. The "Share the National Cake" mentality is thus a major obstacle in the wheel of progress as to the level of economic growth and development that the country has the potential to achieve [17]. The impact of this value system is far-reaching in its effect, as it has pervaded across all facets of human endeavor and trickled down along generational lines. Unethical and corrupt practices in the country popularly tagged the "Nigerian Factor" have negatively affected the construction industry and the level of quality assurance in Nigeria. From the professionals who are the custodian of the confidential information, to the contractors and even hired labour on-site, corruption has eaten deep into the fabric of industry practice in Nigeria. Professionals whose major obligation is to ensure that the successful contractor is capable of offering good quality output at the lowest tender figure may disregard integrity and the ethics of their profession in return for financial gains.

2. Method of Study

A survey of construction professionals was carried out the assess the nature of quality control practices in Port Harcourt Metropolis. This is similar to the study by Opara and Uche [10]. The study considered the current volume and spread of major construction projects in the country. Data for this purpose was obtained from pre-coded questionnaires that were administered to a random selection of building professionals as contained from the listing of professionals and registered contractors in the study area. The key objective of the data analysis was to measure the degree to which quality control parameters explain the level of participation of indigenous contractors in the execution of government projects. The study administered well-structured and sectioned questionnaires which were distributed online. These were based on a representative sample of 292 respondents made up of Consultants, Clients, Contractors, and allied professionals in various locations as shown in Table 1.

Table 1. Distribution of respondents.

Types of respondents	No
Consultants	26
Client and client representative	31
Contractors	72
Other professionals	122
Total	251

The response rate to distributed questionnaires however was 86% with a total of 251 returned. Most of the respondents were registered in one or more professional bodies with a significant number of years of working experience. The analysis explored two sets of variables for the study, targeted at extracting quality control measures adopted by respondents and project procurement processes and activities that were mostly associated with unethical and corrupt practices. The basic sequence of the analytical strategy that was adopted to obtain

relevant and objective results from data collated during fieldwork is as follows: The analysis begins by examining existing quality control measures adhered to by respondents in their respective locations and a quantitative value obtained for the qualitative adequacy of these measures in determining industry output. in terms of the percentage frequency distribution. The Qualitative Adequacy Value (QAV) for the study location was obtained based on the product of the arithmetic mean of the qualitative index that would be assigned to these variables on a 3-point rating scale and the frequency of pre-coded responses as a percentage of the cumulative. Criteria for determining adequacy were based on a predetermined interval classification of computed QAVs, the maximum value of the index being 1.0. The assessment of the variables was done based on the mean weighted scores to obtain the overall rating for the level of adherence to quality control. As a final step in this phase, a multi-variate multiple classification analysis (MCA) [18] was then deployed to explain the level of indigenous participation in government construction contracts as extracted from questionnaire responses, relative to the number of major government contracts executed. MCA is a bivariate response of regression analysis technique that predicts the dependent variable based on membership/categories of the independent predictor variables. MCA can be mathematically expressed as:

$$Y_{ij\ldots n} = Y + a_i + b_j + \ldots\ldots\ldots e_{ij}\ldots\ldots_n \tag{1}$$

Where $Y_{ij\ldots n}$ = The score (on the dependent variable) of individual n who falls in the category of j of predictor B

Y = Grand mean of the dependent variable

a_i = The "effect" of membership in the ith category of predictor A

b_j = The "effect" of membership in the jth category of predictor B

$e_{ij\ldots n}$ = Error term for this individual

Three sets of coefficients are generated via Multiple Classification Analysis: eta/**eta²**, beta/ **beta²**, and multiple correlation coefficient r-squared (r^2).

Eta/eta²: Eta values are indicative of the predictor ability of the specified categories in explaining the variation triggered in the dependent variable. Eta as a correlation ratio is thus indicative of the percentage of the total sum of squares that is explained by the predictor variable.

Beta/beta²: Similar to the eta statistics, the **Beta/beta²** represents the explanatory capacity of the predictor variables but is computed using the adjusted as opposed to the raw means. Beta statistics thus reflect the degree of explanation provided by the predictor variable to account for the variation in the dependent variable after adjustments have been made for the combined effects of other predictor variables.

Multiple Correlation Coefficient (r-squared): The multiple correlation coefficient provides an aggregated explanation of the amount of variation in the dependent variable as collectively accounted for by the predictor variables. This technique will be used to analyse generated data collated from responses to structured questionnaires to develop a multivariate model mathematically displaying expression for the association between the degree of quality control adherence and the extent of indigenous participation in the execution of government contracts as indicated by responses as to the number of major government projects executed/participated in by respondents.

3. Results and Findings

Table 2 is a breakdown of the acceptability criteria used in rating the level of compliance with quality control.

Table 2. Quality control compliance criteria rating for acceptability.

Percentage	Rating
81% – 100%	Excellent
66% – 80%	Very Good
51% – 65%	Good
36% – 50%	Fair
0% – 35%	Poor

Table 3 is a summary of the questionnaire responses provided by the respondents on the quality control measures adopted.

Table 4 shows the number of major government/public projects executed by the sampled indigenous contractors.

The weighted values of these responses were thus analysed using MCA to produce a multiple regression model for the level of indigenous participation. Table 5 shows the results of the MCA indicating the quality control compliance variables in accounting for the variation in indigenous participation.

Table 5 shows that taken together, the five quality control independent variables (internal organizational factor; the level of enlightenment; adequacy of designs; conducting of relevant tests, and supervisory adherence) explain 47% of the variance reported in the level of indigenous participation. As the findings show, 41.2% of the respondents were of the view that the level of quality control adherence is fair. However, the majority of the respondents (53.3%) were not of this view. Pointers to specific areas of poor-quality control are evident in the response pattern.

Table 3. Analysis of questionnaire responses on Construction Industry Quality control measures.

S/No Items	Yes %	No %	No response %
1. Internal organizational factor			
a. Observance of Q.C in the company	52.0	38.8	9.2
b. Record keeping of quality control results	46.8	48.0	5.2
c. Presence of communication between quality control professionals and management	71.6	7.4	11.0
2. Level of Enlightenment			
a. Enlightenment of tradesmen	35.2	60.8	4.0
b. Suppliers and Contractors are aware of Q.C provision in the project.	22.8	70.8	6.4
3. Adequacy of Designs			
2. Adherence at the design stage	56.4	42.0	1.61
3. Adequate Specification and detailing of elements	92.4	4.0	3.6
4. Conduction of relevant tests			
a. Conduction of geotechnical analysis for foundation	4.0	78.0	18.0
b. Conduction of Concrete tests	36.0	53.2	10.8
c. Conduction of Aggregate tests	20.8	69.6	9.6
d. Conduction of Cement tests	2.8	97. 2	0.0
e. Reinforcement strength tests as to Q.C	64.0	32.0	4.0
5. Supervisory Adherence			
a. Project supervisors normally insist on quality control of materials	62.4	34.0	3.6
b. Town Planning and relevant agencies are involved in Q.C compliance	14.0	78.8	7.2
c. Adequate checks by the project owner's representative for defective work before approval of payment	36.9	53.7	9.5
Mean %	41.2	53.3	5.5
Rating	Fair		

Table 4. Number of major government/public projects executed by respondents.

Number of Government Projects executed	% of respondents	Average No of years of working Experience
0 − 5	45	7
6 -10	17	16
11 − 15	23	12
15 − 20	9	13
< 20	6	22

Table 5. Explanatory variation in the level of indigenous participation in the execution of government contracts.

S/No	Explanatory Variables	Eta	Beta
1	Internal organizational factor	0.25	0.20 (4)
2	Level of Enlightenment	0.23	0.17 (5)
3	Adequacy of Designs	0.36	0.50 (1)
4	Conducting relevant tests	0.22	0.41 (2)
5	Supervisory Adherence	0.10	0.24 (3)
	$r^2 = 0.47$		

4. Conclusion

This study has highlighted Issues of quality control related to indigenous construction companies as an explanation for the low level of indigenous participation in government projects. This is also considered to be closely linked to ethical issues which plague the Nigerian construction industry, and which have been a cause for public concern. As the study reiterates, in the Nigerian scenario there appears to be a twisted and astonishingly flexible value system in the general acceptance level of what is regarded as ethical. Bribery and corruption which is rife in the system of governance and organizational setup, both in private and public holdings seem to constitute an acceptable standard of conduct amongst Nigerians. As such, the genuine outcry against perceived misappropriation of public funds allocated to various sectors of the economy and for infrastructural development are "swept under the rug" by the powers that be. The "Share the National Cake" mentality is thus a major obstacle in the wheel of progress as to the level of economic growth and development that the country has the potential to achieve. The impact of this value system is far-reaching in its effect, as it has pervaded across all facets of human endeavor and trickled down along generational lines. Unethical and corrupt practices in the country popularly tagged the "Nigerian Factor" has negatively affected the construction industry and the level of quality assurance in Nigeria. From the professionals who are the custodian of the confidential information, to the contractors and even hired labour on-site, corruption has eaten deep into the fabric of industry practice in Nigeria. Nonetheless, quality control issues such as the level of enlightenment; internal organizational factors; adequacy of designs; supervisory adherence, and conducting of relevant tests have been empirically shown to affect the level of indigenous participation in government projects. Tackling these issues alongside the underlying ethical menace which pervades the construction industry will create a more sustainable backdrop for ensuring quality control in public projects. Against this backdrop, the following recommendations are preferred:

- New laws should be promulgated with more stringent measures to curb ethical corrosion.
- One-man construction companies should be banned, and rigorous background checks should be carried out to ascertain the competence of contractors.
- E-contracting along with the providing of necessary performance bonds should be promoted to ensure a higher level of transparency in public project procurement.

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