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Assessment of Awareness and Compliance to Government Regulation Policy Aspect on Quality Control of Building Projects in the Nigerian Construction Industry

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ABSTRACT
It has been observed that the quality of most buildings especially public, building in Nigeria is unsatisfactory, a situation that has been of great concern to both government and the professional bodies in the construction sector. Thus, in answer to the clarion calls, this study adopted the field survey research approach to collect necessary data, structured questionnaire was administered to about 900 respondents selected on the basis of stratified sample size. Data collected from the field survey and from oral interview were analysed using appropriate statistical tools. Among the major findings was the identification and ranking in order of preponderance the critical variables in quality control in building production as well as the existence of government and institutional regulatory policies on quality control. Of interest was the research finding on the co-relationship between the level of awareness of these policies and the availability of relevant professionals in the study area. However, it was established that the level of awareness of these regulatory policies was not synonymous to the level of compliance and implementation, hence the high incidence of poor quality work resulting occasionally to collapsed building.

KEYWORDS: *building, compliance, awareness, regulatory, professionals, quality, control, government.*

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I. INTRODUCTION

Building regulations are a set of minimum requirement and basic performance standards designed to secure the health, safety and welfare of people in and around building and to conserve fuel and energy. The building regulations are supported by separate documents which correspond to the different areas covered by the regulations.

The federal government of Nigeria national building code (2006), is the policy document protecting the building industry in Nigeria. The code recognizes the input of the professionals in the building industry; architecture, building, engineering, urban and regional planning, estate surveying and land surveying including representatives of federal ministries of environment, health, fire service, housing and urban development, standard organization of Nigeria, relevant non governmental organizations and state representatives. Section 1.22 of the national building code sets minimum standards, on building pre-design, design, construction and post-construction stages with a view to ensuring quality, safety and proficiency in the building industry.

Under the terms of the building act 1984 of the United Kingdom, local authorities are responsible for ensuring that any building work being completed conforms to the requirement of the associated building regulation (Tricker and Algar 2006). The have the authority to:

1. Make you take down or rework or rebuild anything that contravenes a regulation
2. Make you complete alterations so that your work complies with the building regulations
3. Employ a third party (and then send you the bill) to take down and rebuild non conforming buildings or parts of buildings.

The building act 1984 consists of five parts namely:

(i) The building regulations
(ii) Supervision of building work etc then by a local authority.
(iii) Other provision about buildings
(iv) General
(v) Supplementary

Bamisile (2004) states that the physical development control laws differ from state to state, creating more confusion among the construction professionals as well as the general public. He argued further that Nigeria operates a British system in most situations that one of the Functions of the Standard Organization of Nigeria (SON) is to produce codes and standards For Nigeria. Confusion will definitely arise between the

National Building code and the codes of practice produced by SON. It is very important that these terms, when used in Nigeria should be clearly defined to avoid perpetuating the confusion that is prevailing. A clear distinction should be made in the British standard code of practice (Bs) and the Nigerian code of practice (NCP) in the reinforced concrete design by the relevant authorities in planning system.

The purpose of the planning system is to protect the environment as well as public amenities and facilities. Planning permission is the single biggest hurdle for anyone who has acquired land on which to build a house or wants to extend or carry out either building works on property. The current set of approved documents in Imo state through the Owerri Capital City Development Authority (OCDA) include:

(i) Architectural drawing
(ii) Structural drawings and calculations
(iii) Mechanical engineering drawing
(iv) Electrical engineering drawing
(v) Site investigation report
(vi) Soil analysis report
(vii) Letter of structural fitness

Part of the authority's duty is to make regular checks to ensure that all building work being completed is in conformance with the approved plan and the building regulations.

Despite all the efforts of the planning and control authorities, section 1.1 of the national building code states that the need to evolve a national building code arose from the existing conditions of the cities and built environment

1. Planlessness of our towns and cities;
2. Incessant collapse of buildings; fire infernos, built environment abuses and other disasters.
3. Dearth of referenced design standards for professionals
4. Use of non-professionals
5. Use of untested product and materials and ;
6. Lack of adequate regulations and sanctions against offenders.

The objective of this research paper is to identify the regulatory policies as highlighted in the national building code and rank the level of awareness by the professionals in the building industry in each state of the south east Nigeria.

II. METHODOLOGY

Administration of Questionnaire

A survey research was adopted in this research work. The mix method approach was adopted and data for the study was generated through questionnaire, personal interview and observation. Questionnaire was administered to respondents on person to person basis with the help of research assistants. This enhanced the rate of return and secured other advantages of the method. 900 copies of the questionnaire were distributed in the South east states of Nigeria namely: Abia, Anambra, Ebonyi, Enugu and Imo states. The major actors in population include Architects, Engineers, Builders, Quantity Surveyors, Contractors, Clients and Financiacier of public building projects.

Scaled questions were used in the assessment of awareness and implementation of regulatory policies. Respondents were required to thick the degree of awareness and implementation of government regulatory policies on building project.

The assessment of the variables were carried out using the likert 5 point weighting as follows strongly agree as 2, agree as 1, undecided as 0, disagree -1 and strongly disagree as -2. Respondents were required to tick the variables according to the degree of implementation and the level of awareness of the variables.

Data Analysis Techniques

The mean score (index) was used to establish the level of importance attached to each of the variable. Two – tailed t-test at n-1 degrees of freedom was used to assess the awareness level of the government regulatory policy and the implementation level. The variables were subjected to a regression analysis and analysis of variance model.

Mean score numerical values were assigned to each of the statement that describes the variable being investigated in order to measure the intensity of agreement by the respondents. The mean score for each item was determined from the scores and the number or frequency of responses for each score. The mean score (M.S) is mathematically represented as:

$$\text{Mean score (M.S)} = \frac{\sum aixi}{N} \; (-2 \leq MS \leq 2)$$

Where
MS is the mean score
ai – the respective weighting of the factors (2,1,0, -1 and -2)
xi – the number of respondent for each weighting
N – the total number of respondents
∑ – capital Greek sigma which means summation, that is the sum of.
The weighted average formula was used in assessing respondent ranking of importance. The weighted average for each of the variables was obtained from the sum of the product of the proportion of the responses received from each group compared to the total number of receipts (n/N) and the corresponding mean score of that group in respect of individual variable. The weighted average is given as:

$$WA = \sum \left[\left(\frac{n}{N}\right) x\, MS\right] \; -2 \leq WA \leq 2$$

The decision rule will depend on whether the computed value of the test statistic t at 95 percent level of significance is greater than or less than the critical value. Thus the null hypotheses Ho will be rejected if $t_{cal} > t_{tab}$ Simple Regression Analysis: The basic relationship between the independent variable, represented by x and the dependent variable represented by y is expressed in a mathematical equation given as:

$Y = a + bx$
where
Y – is the dependent variable is quantity being predicted.
x – the independent variable
a – the value of y when x = 0 ie the intercept of the line with y– axis
b – the slope or gradient. It estimates the rate of change in y for a unit change in x.
It is positive for direct and negative for inverse relationships. It represents the regression line of y on x when graphed.
The mathematical relationships for the determination of the parameters 'a' and 'b' in the regression equation is given as

$$b = \frac{\sum xy}{\sum x^2}$$

$$a = \bar{y} - b\bar{x}$$

The correlation r is determined by

$$r = b\sqrt{\frac{\sum x^2}{\sum y^2}}$$

The regression analysis function of the SPSS was employed. The significance of the awareness and compliance on government regulatory policy was tested at 5 percent level of significance.

Analysis of Variance (Anova)
The calculated F-value was used for finding out the significance of difference between the two variances by comparing it with the table value of F. If the F – calculated is greater than F – tabulated, it will be concluded that there are no significant difference between the sample means.
The decision rule was

- If the probability (P-value) of the test statistic is greater than critical value, reject H_0 and accept H_1
- If the probability of the test statistic (P-value) is less than critical value, accept H_0 and reject H_1

Evaluation of Results: The results were evaluated using coefficient of correlation, r; the coefficient of determination, r^2 and the analysis of variance F – using the SPSS.

Results and Discussions
The information in Table 1 shows that 730 responded to the questionnaire out of the 900 questionnaire distributed thus representing 81.1 persent rate of return.

Table 1: Spread of Respondents

Profession	**Number**	**Percentage**
Architect	195	26.7
Builder	104	14.3
Civil engineer	185	25.3
Contractor	84	11.5
Project manager	55	7.5
Quantity surveyor	107	14.7
Total	730	100

Source: Author's Fieldwork (2012)

The first hypothesis to be tested is the level of awareness of government regulatory policies on quality control of public building projects is significantly high in south status of Nigeria.

To test this hypothesis, the indices of the level of awareness of government regulatory policies on quality control of public buildings project is shown in Table 2 indicating the preponderance of the variables. The ranking of the awareness level of the variables by the 730 respondents not withstanding, the data were subjected to two tail test at n - 1 i.e.729 degree of freedom. The process involved in the computation of the t-statistic are shown in the Tables 4and 5.

It is observed that for each of the 24 variablesthe computed t-statistic is greater than the critical value at 95 percent significance level which is 1.645. The inference is that the null hypothesis is rejected. It is therefore concluded that the level of awareness of government regulatory policies on quality control of building projects in the south-east states of Nigeria is significantly high.

The second hypothesis states that there is no correlation between compliance to government regulatory policies and the level of awareness of government regulatory policies on quality control of building projects in south-east states of Nigeria.

It has been established that the stakeholders in the building industry in the south-east states of Nigeria have a high level of awareness of government regulatory policies on quality control of building project, Opara (2015). However, having a high level of awareness is one issue while compliance or implementation of government regulatory policies on quality control of building project can be another as shown in the data of Tables 2 and 3.

Table 2: Index of Awareness (Preponderance) to Government Regulatory Policies on Quality Control of Building Projects.

		n=730	
Variable	**Regulation policy**	**Mean**	**Rank**
X1	Existence of adequate and sanctions against policy offenders	0.70	15
X2	Existence of national building code for built environment professionals.	1.25	8
X3	Preparation of quality control checklist and approval system for building project monitoring.	0.61	23
X4	Use of professionals in building design and construction.	0.91	12
X5	Development agencies and relevant agencies involvement in Quality control	1.48	4
X6	Use of standard materials and component in building production	1.47	5
X7	Detailed drawing and material specification in Nigeria industry standards	0.95	11
X8	Detailed drawing and material specification in applicable standards	1.87	1
X9	Detailed drawing and material specification in appropriate standards	0.65	17
X10	Use of qualified laboratory personals in quality control	1.19	10
X11	Recognition of quality policy as input in quality control	0.64	18
X12	Supervisors having idea of the procedures and concept of quality control	1.38	6
X13	Carrying out regularly quality control audit by third party	0.64	19
X14	Available of quality manual for building material	1.52	3
X15	Standard exist for receiving testing and accepting building materials	0.62	21
X16	Procedures exist for retrieving non conformance	0.63	20
X17	Process in place for detecting the causes of non- conformance so as to prevent reoccurrence	0.62	21
X18	Instructions on the importance of quality control usually passed to workers at the conception stage of the project	0.56	24
X19	Reporting of quality control test properly handled by the authorities concerned	0.69	16
X20	Keeping adequate quality control process and results	0.85	14
X21	Sampling and testing of materials	1.21	9
X22	Suppliers and sub-contractors aware of quality provision in the project	1.32	7
X23	Standard building production methodology in accordance with national building code and international best practice	1.63	2
X24	Inspections and testing carried out before project delivery	0.89	13

Source: Analysis of Author's Fieldwork

Table 3: Index of Compliance (Preponderance) to Government Regulatory Policies on Quality Control of Building Projects.

Variable	**Regulation policy**	**Mean**	**Rank**
X1	Existence of adequate and sanctions against policy offenders	0.52	19
X2	Existence of national building code for built environment professionals.	0.7945	7
X3	Preparation of quality control checklist and approval system for building project monitoring.	0.425	22
X4	Use of professionals in building design and construction.	0.7397	8
X5	Development agencies and relevant agencies involvement in Quality control	0.7973	6
X6	Use of standard materials and component in building production	0.7274	9
X7	Detailed drawing and material specification in Nigeria industry standards	0.7260	10
X8	Detailed drawing and material specification in applicable standards	0.8562	5
X9	Detailed drawing and material specification in appropriate standards	0.6534	13
X10	Use of qualified laboratory personals in quality control	0.8699	4
X11	Recognition of quality policy as input in quality control	0.603	16
X12	Supervisors having idea of the procedures and concept of quality control	0.6630	12
X13	Carrying out regularly quality control audit by third party	0.493	20
X14	Available of quality manual for building material	0.4301	21
X15	Standard exist for receiving testing and accepting building materials	0.0548	18
X16	Procedures exist for retrieving non conformance	0.0575	17
X17	Process in place for detecting the causes of non- conformance so as to prevent reoccurrence	0.0411	23
X18	Instructions on the importance of quality control usually passed to workers at the conception stage of the project	0.0342	24
X19	Reporting of quality control test properly handled by the authorities concerned	0.6384	14
X20	Keeping adequate quality control process and results	0.6315	15
X21	Sampling and testing of materials	0.8781	3
X22	Suppliers and sub-contractors aware of quality provision in the project	1.0589	1
X23	Standard building production methodology in accordance with national building code and international best practice	1.0110	2
X24	Inspections and testing carried out before project delivery	0.6781	11

Source: Analysis of Author's Fieldwork

This situation necessitates the need to probe the relationship between the level of awareness and compliance/implementation of government regulatory policies on quality control of building projects in the south-east states of Nigeria.

To do this, it is hypothesized, in the null, that there is no correlation (significant relationship) between compliance/implementation of government regulatory policies and the level of awareness of government regulatory policies on quality control of building projects in the south-east states of Nigeria.

The data in Tables 2 and 3 were processed to give Tables 4 and 5.

Table 4: One-Sample Statistics of Compliance to Quality Control Regulatory Policies

	N	Mean	Std. Deviation	Std. Error Mean
X1	730	.5452	1.05084	.03889
X2	730	.7945	1.18123	.04372
X3	730	.0425	1.06682	.03948
X4	730	.7397	1.01196	.03745
X5	730	.7973	1.20811	.04471
X6	730	.7274	1.35008	.04997
X7	730	.7260	.97514	.03609
X8	730	.8562	1.64467	.06087
X9	730	.6534	1.01248	.03747
X10	730	.8699	1.16100	.04297
X11	730	.0603	1.07174	.03967
X12	730	.6630	.99870	.03696
X13	730	.0493	1.06588	.03945
X14	730	.4301	1.23558	.04573
X15	730	.0548	1.06819	.03954
X16	730	.0575	1.07061	.03963
X17	730	.0411	1.00121	.03706
X18	730	.0342	1.00625	.03724
X19	730	.6384	1.08899	.04031
X20	730	.6315	1.06823	.03954
X21	730	.8781	1.23181	.04559
X22	730	1.0589	.98303	.03638

X23	730	1.0110	1.30206	.04819
X24	730	.6781	1.12908	.04179

Source: Author's Analysis from field work

Table 5: One-Sample Test of Compliance to Quality Control Regulatory Policies

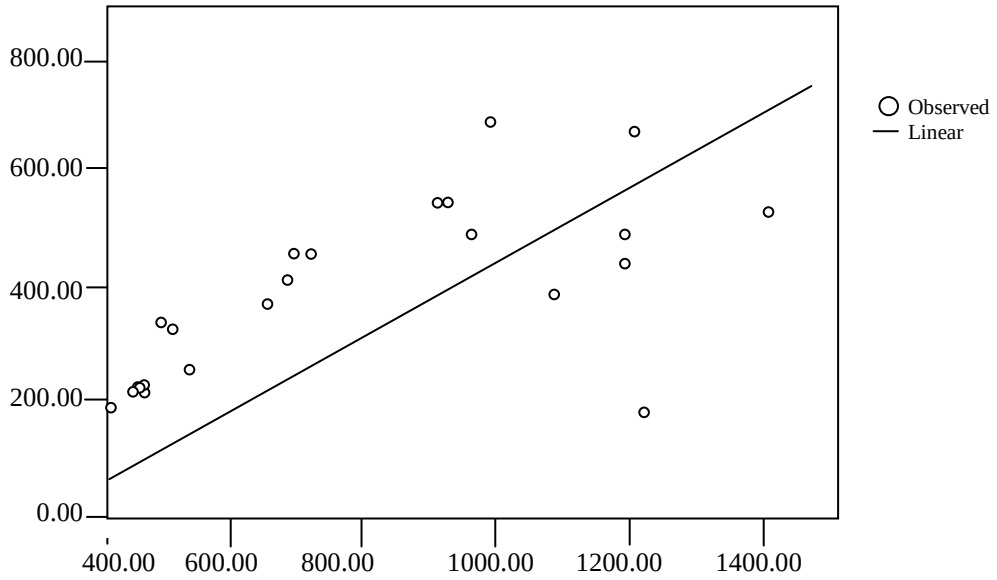
	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
X1	14.018	729	.000	.54521	.4688	.6216
X2	18.173	729	.000	.79452	.7087	.8804
X3	1.075	729	.283	.04247	.0351	.1200
X4	19.750	729	.000	.73973	.6662	.8133
X5	17.830	729	.000	.79726	.7095	.8850
X6	14.557	729	.000	.72740	.6293	.8255
X7	20.116	729	.000	.72603	.6552	.7969
X8	14.065	729	.000	.85616	.7367	.9757
X9	17.437	729	.000	.65342	.5799	.7270
X10	20.243	729	.000	.86986	.7855	.9542
X11	1.520	729	.129	.06027	.0176	.1381
X12	17.937	729	.000	.66301	.5904	.7356
X13	1.250	729	.212	.04932	.0281	.1268
X14	9.406	729	.000	.43014	.3404	.5199
X15	1.386	729	.166	.05479	.0228	.1324
X16	1.452	729	.147	.05753	.0203	.1353
X17	1.109	729	.268	.04110	.0317	.1138
X18	.920	729	.358	.03425	.0389	.1074
X19	15.838	729	.000	.63836	.5592	.7175
X20	15.973	729	.000	.63151	.5539	.7091
X21	19.260	729	.000	.87808	.7886	.9676
X22	29.104	729	.000	1.05890	.9875	1.1303
X23	20.978	729	.000	1.01096	.9163	1.1056
X24	16.226	729	.000	.67808	.5960	.7601

Source: Author's Analysis from field work

Using the data in Table 3 and Table 4 to run a regression analysis and using Pearson's Product Moment Correlation Coefficient model with building quality control policy implementation as the dependent variable and building quality control policy awareness as the independent variable, the resultant statistics shows that the regression coefficient, Pearson's r, is 0.725. This signifies high positive relationship. This means that increase in awareness brings about increase in the level of compliance to and implementation of government regulatory policies on quality control of building projects in the study area. The computer output of the regression analysis and other statistics are captured in Table 5.

The coefficient of determination, r^2, derived from Pearson's r is 0.525. This means that 52:5 percent of the level of implementation of compliance to government regulatory policies on quality control of building projects in the study area is a function of the level of awareness. The inference is that there is a residual of 47.5 percent. This means that other contributory variables, besides awareness, account for or contribute 47.5 percent of why the practitioners in building projects in the south-east states of Nigeria comply with or implement government regulatory policies on quality control. The residual of 47.5 percent is indicative that awareness is the principal variable while at the same time acts as a pointer for further and future research to identify the variable(s) that makes up the 47.5 percent.

A relationship between two variables or sets of variables can be established in a mathematical model in the form of y= f(x), that is, y is a function of x where y is the dependent variable while x is the independent variable. In this study, the level of compliance to or implementation of government regulatory policies on quality control is the dependent variable with the level of awareness of government regulatory policies on quality control as the independent variable. The mathematical model resolved into a linear equation of the form y = mx + c, where m is the coefficient of x and c, a constant, is the intercept of the line of best fit on the y-axis on the Cartesian Plane. To back up the analysis, the data are plotted as a scatter diagram shown in Figure 1.



Scatter Diagram of Building Quality Control Policy Awareness

Fig 1: Graph of the, line of best fit in the Relationship levels of awareness and implementation of regulatory policies on quality control management

The trend in Fig 1 is indicative of a linear function defined mathematically as $y = 0.637x - 73.49$. The graph makes an acute angle with the positive direction of the x - axis signifying positive association between awareness and implementation. This confirms the earlier result from regression analysis. The interpretation still remains that increase in awareness of government regulatory policies induces corresponding increase in the implementation of such policies on quality control of public building projects in the south-east states of Nigeria.

The findings in the foregoing analyses are so reassuring that one would like to ascertain their reliability or authenticity. To do this, a null hypothesis that states that the results are not reliable is set up. Using the values of regression coefficient and the coefficient of determination shown in Table 5 - Building Quality Control Implementation Linear Model Summary, substituting the data to the student 't' model defined by

$$t = r\sqrt{\frac{n-2}{1-r^2}} \qquad \text{at n-2 degrees of freedom (df)}$$

Table 6: Building Quality Control Policy Implementation Linear Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.725	.525	.504	180.148

The Independent variable is Building Quality Control Policy Awareness.

Source: Author's Analysis

The students' t - statistic was found to be 28.383. Testing at 95 and 99 percent confidence limits at 728 degrees of freedom, the critical values are 1.645 and 2.326 respectively. Since at these levels of confidence, the t-statistic is greater than the critical values, the null hypothesis is rejected. It is therefore safe to affirm that the results are reliable and therefore authentic.

The findings so far are interesting and compelling enough to warrant further probe. A model that readily comes to mind is the analysis of variance (ANOVA). A null hypothesis that states that, there is no significant variation and/or difference between the level of awareness and implementation of government regulatory policies on quality control on public building projects in the south-east states of Nigeria is posited. The computerized output of the summary of the ANOVA computations is shown in Table 7.

Table 7: Anova For Building Quality Control Policy

	Sum of Square	df	Mean Square	F	Sig.
Regression	790405.256	1	790405.256	24.355	.000
Residual	713972.577	22	32453.299		
Total	1504377.833	23			

The Independent variable is Building Quality Control Policy Awareness.
Source: Author's Analysis

The analysis of variance statistic (computed) is 24.355. The critical value at 95 percent significance level at 1 over 22 degrees of freedom that is, $F(0.05)_{1/22}$ is 4.30 and at 99 percent confidence limit 7.95, that is at $F(0.01)_{1/22}$. Since the analysis of variance statistic, 24.355, is greater than the critical values, 4.30 and 7.95, at 95 and
99 percent levels of significance, the null hypothesis is rejected. It is therefore affirmed that, there is significant variation and/or difference between the levels of awareness and compliance in the implementation of government regulatory policies on quality control on building projects in South East states of Nigeria. The implication of this finding is that, for the stakeholders in public building projects in the South-East states to beef up the level of compliance in the implementation of government regulatory policies, they should endeavour to raise the degree of awareness. All the statistical analysis explored so far are all pointing in the direction of this conclusion.

III. FINDINGS

1. The level of awareness of government regulatory policies on quality control of building projects in the south –east states of Nigeria is significant high
2. 52.5 percent of the level of compliance to government regulatory policies is a function of the level of awareness
3. The residual of 47.5 percent affecting compliance to government regulatory policy on quality control need to be investigated
4. An increase in the awareness of government regulatory policies induces corresponding increase in the compliance of the policies.

IV. RECOMMENDATIONS

1. Stakeholders in building projects in the south-east states of Nigeria should beef up the level of compliance of government regulatory policies on quality control.
2. All the core building professional bodies and the Federal, State and Local government regulatory agencies should increase the level of awareness of regulatory policies on quality control especially with respect to the items with low awareness indices.
3. Efforts should be made by the Nigerian Standard Organization (SON) and the built environment professional bodies to establish authentic standard relevant and appropriate to local conditions in all aspects of building production.
4. The supervision of building project should insist on full compliance of relevant codes and standards in accordance with international best practices in order to reduce or eliminate the incidence of failed building projects including building collapse.

V. CONCLUSION

The evaluation of government regulatory policies on quality control of building project shows that more awareness level to government regulatory policy aspect is a panacea for executing quality building projects. Apart from awareness to the regulatory policy, more investigation needs to be carried out in search of the 47.5 percent contributing variable to non-compliance to the government regulatory aspect on quality control.

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