

**ASSESSMENT OF BUILDING CONSTRUCTION
PLANNING AND FOUNDATION WORK PRACTICES OF
CRAFTSMEN IN RURAL AREAS IN ZAMFARA STATE,
NIGERIA**

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Abstract

This study assessed the building construction planning and foundation work practices adopted by craftsmen in rural areas of Zamfara State, Nigeria. The descriptive survey research design was used for the study on a sample size of 322 master craftsmen comprising of 253 with educational qualification and 69 without educational qualification gotten with the aid of National Statistical Service Sample Size Calculator. A 20 item validated questionnaire with a Cronbach Alpha reliability of 0.84 was used for collecting data for the study. Mean and standard deviation was used to answer the research questions while t-test was used to test the null hypotheses at 0.05 level of significance. The findings of the study revealed that: the building construction planning and foundation work practices are not highly adopted by building master craftsmen in rural areas in Zamfara State. There was no significant difference between the mean responses of the respondents on the building construction practices adopted by building master craftsmen in rural areas. This implies that the incessant cases of building failures in rural areas could be attributed to the negligence towards adoption of standard building construction planning and foundation work practices in rural areas. It was recommended that there is urgent need for all categories of building craftsmen to highly adopt the building construction planning and foundation work practices stipulated by the standard building code to enhance the performance strength of buildings in rural areas as well as improve their planning and foundation work practices of craftsmen in rural areas of Zamfara State, Nigeria.

Introduction

Rural areas are large and isolated areas with low population density. Major activities that form the foundation for any economic development are carried out in rural areas. More than half of Nigeria population dwells in rural areas. They serve as the base for the production of Agricultural Products. The rural area is also one of the major sources of revenue generation for the country, and a principal market for domestic manufactures (Fagbenle & Oluwunmi, 2010). Despite the role of rural dwellers in nation building, these rural areas are not attractive to live in. There is the lack of the infrastructure which improves the quality of life and there are absence of potable water, electricity, good feeder roads and much higher rate of illiteracy.

The rural people in Zamfara State have low standard of living, unattractive and low quality building constructions. American Bureau of Census (ABC; 2014) classified a group of people living in a community having a population of not more than 2,500 people as rural, whereas in Nigeria, the Federal Office of Statistics (FOS; 2015) defined a community with less than 20,000 people as rural. According to Olagunjuet *al* (2013), rural areas can be easily identified by various criteria, apart from population. Such criteria include the level of infrastructural development, such as road networks, educational institutions, water supply, electricity, health facilities, and communication among others. Other criteria used include craftsmen performance in building construction occupation, housing, extent of community planning and attractive building construction. These buildings are predominantly constructed by craftsmen dwelling in the rural areas.

A Craftsman is a person that possesses skills in an established occupational area and can perform a task with some level of expertise. Building craftsmen perform various building construction operations in both urban and rural areas. Some of the craftsmen in rural areas are educated to a level of been able to read and write while others are not. There is the likelihood that their level of

education may influence their practices in the job as an educated craftsman can read and interpret building designs and regulations which may aid in improving his efficiency in his job. However the craftsman that is not educated may be practicing what is not appropriate due to lack of necessary knowledge and this is detrimental to the building construction industry as it could influence the quality of a building (Yoon & Kang, 2000).

A building is a relatively permanent enclosed construction over a plot of land having a roof and usually windows and often more than one level, used for any of a wide variety of activities, as living, entertaining, or manufacturing (Dimuna, 2010). Building construction activity is a major contributor to the nation's gross domestic product (GDP) and one of the biggest employers of labour particularly in rural areas. Building construction trades practices include: building construction planning practices, foundation work practices, block laying practices, concreting work practices, floors and floor covering practices as well as wall finishing practices. This study is however focused on the building construction planning practices and the foundation work practices in rural areas.

Building construction planning work in the rural areas consists of all the preparation carried out by the client (building owner) outline by the craftsmen before the commencement of the building project. Building construction planning work also consists of defining all the tasks that must be performed and laying them out in logical sequence necessary for the completion of the building project. Proper planning calls for effective co-ordination of the efforts of all the participants and identification of the tasks which are likely to help in the completion of the building project in time. If not done, it might lead to time and cost overrun of the building project. Building construction planning work is usually followed by foundation work.

Foundation as an indispensable integral structure of any building

construction carries deep implications with respect to the overall structure of a building. Foundation is the base that supports the weight of the entire house commonly made from concrete. It is a structure that transfers the weight of the building into the earth below and provides support for the intense weight above. It is vital that foundation work is done carefully (Okure, 2016). According to Emmitt and Gorse (2005), building regulation requires that the depth of a foundation should vary with the size of the building structure. It is in direct contact with soil and transmits load of super structure to soil. Generally, it is below the ground level. If some parts of the foundation are above ground level, they should also be covered with earth filling. There are different types of foundations such as shallow and deep foundations.

Small and medium homes are built upon shallow foundations whereas large construction buildings necessitate a deep foundations. Based on this assertion, there is certain factors to consider when laying a foundation. Building the foundation of a house is one of the most important tasks to be taken when building a house. Foundation can enhance the beauty of any building but if laid incorrectly it can cause the building to become unstable and liable to failure or collapse. Shallow foundations, often called footings are usually embedded about a meter or so into the soil (Okure, 2016). One common type is the spread footing which consists of strips or pads of concrete which extend below the frost line and transfer the weight from walls and columns to the soil or bedrock. Other common type of shallow foundation is the soil or bedrock, the slab-on grade foundation where the weight of the building is transferred to the soil through a concrete slab placed at the surface.

The use of shallow foundations has advantages and disadvantages. The advantages of shallow foundations are: It is cost effective hence affordable, there is no need of experts to provide labor for shallow foundations, materials used like concrete are easily available, and the construction

procedure is simple. The main disadvantage of using shallow foundation is limitation capacity in soil structure, Foundation is always subjected to torsion, moment and pullout. Settlement type is a major problem and the ground surface is sometimes irregular making the structures sloppy (Adebowale, Gambo, Ankeli & Daniel, 2016). A poorly constructed foundation on a wrong settlement type will lead to sudden earth movement that can cause foundation failure and consequently building collapse. Most of these building construction planning and foundation work practices are not adequately carried out especially by craftsmen in rural areas.

Assessment is the process of collecting useful information about an activity, programme, project or performance to make valid judgment. Jatto (2006) viewed assessment as a process of obtaining information about programme, student, project and person that could be useful for making decision. Assessment of the informal sector building construction craft practice involves the process of investigating the activities of the craftsmen to determine the level of craft practice adopted. It therefore becomes necessary to carry out an assessment practices of these craftsmen.

Research Questions

The following research questions were raised and answered.

- i. What are the building construction planning practices adopted by craftsmen in rural areas in Zamfara State?
- ii. What are the foundation work practices adopted by craftsmen in rural areas in Zamfara State?

Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance:

H01: There is no significant difference in the mean ratings of the master craftsmen with professional qualification and those without professional qualification on the building

construction planning practices adopted by craftsmen in rural areas in Zamfara State.

Ho2: There is no significant difference in the mean ratings of master craftsmen with professional qualification and those without professional qualification on the foundation work practices adopted by craftsmen in rural areas in Zamfara State.

Methodology

The descriptive survey research design was used for the study. The study was conducted in Zamfara State and covers nine local government areas that are located in rural areas on a target population of 2320 building construction master craftsmen in nine local government areas of Zamfara State excluding the major cities. The sampling technique used for this study is simple random sampling with the aid of National Statistical Service Sample Size Calculator. The population size of each local government was computed to give a total of 322 master craftsmen comprising of 253 master craftsmen with Educational Qualification and 69 Building Master Craftsmen without Educational Qualification. A 20 item questionnaire was used for collecting data for the study. The questionnaire was validated by three experts. Cronbach Alpha statistics was used to determine the reliability coefficient of the pilot tested instrument which was found to be

0.84. Data collected for this study were analyzed using mean, standard deviation and t-test statistics. Mean and standard deviation was used to answer the research questions while t-test was used to test the null hypotheses at 0.05 level of significance. All statistical analysis was done using the Statistical Package for the Social Sciences (SPSS) version 21. For the decision rule on the null hypotheses, if the t-probability value (Sig. 2-tailed) calculated by the computer is greater than 0.05, it means there is no significant difference, then the null hypothesis was upheld (accepted) but if the t-probability value (Sig. 2-tailed) is less than 0.05 then there is significant difference, therefore the null hypothesis is rejected. Decision on the research question items was based on Grand Mean (\bar{x}_A) with respect to the real limit of numbers on the five point rating scale used for the study {4.50 – 5.00 = Very Highly Adopted (VHA); 3.50 – 4.49 = Highly Adopted (HA); 2.50 – 3.49 = Moderately Adopted (MA); 1.50 – 2.49 = Lowly Adopted (LA) ; 0.5 – 1.49 = Not Adopted (NA).

Results

Research Questions One

What are the building construction planning practices adopted by craftsmen in rural areas in Zamfara State? Result that answered this research question is presented in Table 1.

Table 1: Mean ratings and Standard deviation of the Master Craftsmen with Educational Qualification (MCEQ) and those without Educational Qualification (MCWEQ) on the building construction planning practices adopted by craftsmen in rural areas in Zamfara State.N₁=253, N₂=69, Total N=322.

S/N	Items	\bar{x}_{\square_1}	\bar{x}_{\square_2}	\bar{x}_{\square_A}	SD ₁	SD ₂	SD _A	D
1	Determine suitable bearing capacity of the soil	1.16	1.10	1.13	0.37	0.30	0.34	NA
2	Interpret the building plan	1.93	1.93	1.93	0.32	0.26	0.29	LA
3	Identify tools for a given task	3.56	3.46	3.51	0.50	0.53	0.51	HA
4	Select equipment for the given task	3.39	3.39	3.39	0.64	0.65	0.64	MA
5	Prepare ground for a given task	2.63	2.62	2.63	0.48	0.49	0.49	MA
6	Select suitable materials for the given task	1.77	1.81	1.79	0.57	0.65	0.61	LA
7	Use correct specifications for given task	2.42	2.38	2.40	0.49	0.49	0.49	LA
8	Measure accurately the parameters of a plan	3.38	3.36	3.37	0.49	0.48	0.49	MA
9	Apply technical information on plan to practice	2.54	2.57	2.55	0.54	0.56	0.55	MA
10	Follow the various work stages correctly as design in a plan	2.56	2.58	2.57	0.53	0.53	0.53	MA
	Grand Mean	2.53	2.52	2.53				MA

Key: \bar{x}_{\square_1} = Mean of BMEQ; \bar{x}_{\square_2} = Mean of BMWEQ; \bar{x}_{\square_A} ; Average Mean of respondents; SD₁ = Standard Deviation of MCEQ, Standard Deviation of MCWEQ; Average Standard Deviation of respondents. NA= Not Adopted, LA = Lowly Adopted, HA= Highly Adopted, MA = Moderately Adopted. D = Decision.

Table 1 shows that the respondents highly adopted the building construction planning practice in item 3 with a mean score of 3.51. Items 4, 5, 8, 9 and 10 with mean ranges from 2.55 to 3.39 signify that the respondents moderately adopted these building construction planning practices in rural areas in Zamfara State. Items 2, 6 and 7 with means ranges from 1.79 to 2.40 is an indication that the respondents lowly or rarely adopted these building construction planning practices in rural areas in Zamfara State or adopted them to a low level. Item 1 with a mean of 1.13 signify that the respondents do not adopt the building construction planning practice in item 1. The grand mean of Master Craftsmen with Educational Qualification (MCEQ) are 2.53 which shows that the MCEQ moderately adopted the building construction planning

practices in rural areas in Zamfara State while Master Craftsmen Without Educational Qualification (MCWEQ) with grand mean of 2.52 also moderately adopted the building construction planning practices in rural areas in Zamfara State. The total grand mean is 2.53 meaning that these building construction planning practices are moderately adopted by both MCEQ and MCWEQ. The average standard deviation of the ten items ranged from 0.29 – 0.64. The standard deviation values indicate that the respondents were not too far from one another in their mean responses.

Research Question Two

What are the foundation work practices adopted by craftsmen in rural areas in Zamfara State?

Result that answered this research question is presented in Table 2.

Table 2 : Mean ratings and Standard deviation of the Master Craftsmen with Educational Qualification (MCEQ) and those without Educational Qualification (MCWEQ) on the foundation work practices adopted by craftsmen in rural areas in Zamfara State. N1=253,N2=69, Total N=322.

S/N	Items	\bar{x}_1	\bar{x}_2	\bar{x}_A	SD ₁	SD ₂	SD _A	D
1	Simple mixing operations are carried out	3.90	3.94	3.92	0.63	0.64	0.64	HA
2	Establish correctly the width of foundation trenches.	1.86	1.74	1.80	0.55	0.56	0.56	LA
3	Drive in pegs uniformly to determine thickness of foundation concrete	1.83	1.80	1.81	0.55	0.53	0.54	LA
4	Conduct the various site test on foundation materials.	1.87	1.80	1.83	0.53	0.53	0.53	LA
5	Place damp proof course at the right position in a foundation.	3.74	3.71	3.73	0.47	0.46	0.46	HA
6	Place according to specification, reinforcement for a foundation.	2.71	2.72	2.72	0.45	0.45	0.45	MA
7	Establish the depth of foundation in conformity to the building regulation	1.44	1.39	1.42	0.50	0.49	0.50	NA
8	Lay foundation to prevent unequal settlement	2.66	2.65	2.66	0.47	0.48	0.48	MA
9	Construct foundation that movement of the subsoil will not impair it.	1.44	1.49	1.47	0.50	0.50	0.50	NA
10	Determine specific depth of foundation column	2.76	2.78	2.77	0.59	0.62	0.60	MA
Grand Mean		2.42	2.40	2.41				LA

Table 2 shows that the respondents highly adopted the foundation work practices in item 1 and 5 with a means score ranges from 3.92 to 3.73. Items 6, 8 and 10 with mean ranges from 2.72 to 2.77 signify that the respondents moderately adopted these foundation work practices in rural areas. Items 2, 3 and 4 with means ranges from 1.80 to 1.83 is an indication that the respondents rarely adopted these foundation work practices in rural areas or adopted them to a low level. Item 7 and 9 with a means ranging from 1.42 to 1.47 signify that the respondents do not adopt these foundation work practices in rural areas. The grand mean of MCEQ is 2.42 which shows that the

MCEQ lowly or rarely adopted the foundation work practices in rural areas while MCWEQ with grand mean of 2.40 rarely adopted the foundation work practices in rural areas. The total grand mean of is 2.41 which is an indication that these foundation work practices are lowly or rarely adopted by both MCEQ and MCWEQ. The average standard deviation of the ten items ranged from 0.45 – 0.64. The standard deviation values indicated that the respondents were not too far from one another in their mean responses.

Testing of Research Hypotheses

Hypothesis One

Ho1: There is no significant difference in the mean ratings of the master craftsmen with professional qualification and those without

professional qualification on the building construction planning practices adopted by craftsmen in rural areas in Zamfara State.

Group	N	\bar{x}	SD	df	t-value	p-value, Sig. (2-tailed)	Alpha Level	Decision
BMEQ	253	2.53	0.163	320	0.602	0.548	0.05	Upheld(NS)
BMWEQ	69	2.52	0.161					

*Significant at $p \leq 0.05$.

Key: NS = Not Significant, p-value = probability value calculated by the computer, MCEQ = Building Master Craftsmen with Educational Qualification., MCWEQ = Building Master Craftsmen without Educational Qualification.

no significant difference in the mean ratings of the master craftsmen with professional qualification and those without professional qualification on the building construction planning practices adopted by craftsmen in rural areas in Zamfara State.

From Table 3, since the p-value, (0.548) is greater than 0.05, it is an indication that there is no significant difference in the mean responses of the two groups of respondents. Thus, the null hypothesis one was not rejected. This implies that, there is

Hypothesis Two

HO2: There is no significant difference in the mean ratings of master craftsmen with educational qualification and those without educational qualification on the foundation work practices adopted by craftsmen in rural areas in Zamfara State.

Table 4: t-test analysis of the mean ratings of master craftsmen with educational qualification and those without educational qualification on the foundation work practices adopted by craftsmen in rural areas in Zamfara State.

Group	N	\bar{x}	SD	df	t-value	p-value, Sig. (2-tailed)	Alpha Level	Decision
BMEQ	253	2.42	0.175	320	0.775	0.439	0.05	Upheld(NS)
BMWEQ	69	2.40	0.175					

From Table 4, since the p-value, Sig. (0.439) is greater than 0.05, it is an indication that there is no significant difference in the mean responses of the two groups of respondents. Thus, the null hypothesis two was not rejected. This implies that, there is no significant difference in the mean ratings of master craftsmen with educational qualification and those without educational qualification on the foundation work

practices adopted by craftsmen in rural areas in Zamfara State.

Findings of the Study

Based on the data collected and analyzed, the following findings emerged:

- i. Planning practices such as selection of equipment, preparation of ground; measuring accurately the parameters of a plan; application of technical

information in building construction as well as following the various work stages correctly as designed in building plan was moderately adopted by the respondents. Identification of tools for a given task is a construction planning practices that is highly adopted by the respondents. However, the respondents rarely adopted interpretation of building plan; selection of suitable materials for the given task as well as use of correct specifications for given task. The respondents did not adopt the construction planning practices that involves determination of suitable bearing capacity of the soil.

ii. Foundation work practices such as: simple mixing operations; as well as placing of damp proof course at the right position in a foundation was highly adopted. The respondents moderately adopted placing foundation according to specification, reinforcement for a foundation; laying foundation to prevent unequal settlement as well as determination of specific depth of foundation column. However, the respondents rarely adopted establishing correctly the width of foundation trenches; driving in pegs uniformly to determine thickness of foundation concretes as well as conducting the various site tests on foundation materials. The respondents do not adopt the foundation work practices of establishing the depth of foundation in conformity to the building regulation as well as construct foundation that movement of the subsoil will not impair it.

iii. There was no significant difference between the mean responses of the master craftsmen with professional qualification and those without professional qualification on the building construction planning

practices adopted by craftsmen in rural areas in Zamfara State.

iv. There was no significant difference between the mean responses of master craftsmen with professional qualification and those without professional qualification on the foundation work practices adopted by craftsmen in rural areas in Zamfara State.

Discussion of Findings

The result presented in Table 1 provided answer to research question one. The non-adoption of the construction planning practices that involves determination of suitable bearing capacity of the soil by the respondents is in agreement with the findings of Adebowale, Gambo, Ankeli and Daniel (2016) who in a study on building collapse in Nigeria revealed that, the none adoption of the construction planning practices that involves determination of suitable bearing capacity of the soil has been attributed to the high incidence of building failures and collapses in rural areas in Nigeria. Adebowale *et al* (2016) reiterated that the problem of non-adoption of standard building construction practices on several building construction sites in rural areas in Nigeria has become major issues of concern in the development of Nigeria rural areas.

This is because the frequencies of their occurrences and the magnitude of the losses in terms of lives and properties are now becoming very alarming. The low extent or rare adopting of interpretation of building plan; selection of suitable materials for the given task as well as rare use of correct specifications for given task is supported by Akinjogbin and Omotehinse (2011) who in a study of building construction planning practices revealed that, these factors are responsible for building sudden failures and collapse in both residential and industrial buildings in rural areas.

The findings on the rare adoption concerning interpretation of building plan; selection of suitable materials as well as rare

adoption of correct specifications for given task created several issues that affects the strict adherence to standard building construction practices in rural areas. This findings is in line with the view of Akinjogbin and Omotehinse (2011) who in a study of building construction planning practices revealed that the poor adherence to standard building construction practices has casts a defect on the competence of the nation's building community of professionals responsible for design and construction works at building sites in Nigeria. In the same vein, Akinjogbin and Omotehinse (2011) also suggested that building professionals such as building construction craftsmen should bear much of the blame alone. The non-adoption of building construction practice concerning interpretation of building plan has great structural effects on buildings constructed. Adebowale *et al*(2016), in the study revealed that most building construction craftsmen of building under construction derail from their approved plans relying more on imagination and fantasy. This practice has the tendency to alter the building specification from original plan.

The findings on hypothesis one presented in Table 3 revealed that, there was no significant difference between the mean responses of the master craftsmen with professional qualification and those without professional qualification on the building construction planning practices adopted by craftsmen in rural areas in Zamfara State.

The non-adoption of the foundation work practices concerning establishing the depth of foundation in conformity to the building regulation as well as constructing of foundation such that movement of the subsoil will not impair it has great impact on the quality and strength of foundations in building construction sites. The issue of non-adoption of foundation work practices was buttressed by Folagbade (2001) who in a study on building collapse unveiled that the approving rural development authorities are known to fail to checkmate compliance with approved foundation plans practices.

The moderate adoption of foundation work practices concerning establishing correctly the depth and width of foundation trenches could be as a result of construction workers intention to cut corners and maximize cost. This findings is in consonance with the findings of Ayininuola and Olalusi (2004) who in a study on the informal sector influence on building collapse, revealed that some building owners shun professionals in order to cut costs in preparing the actual foundation depth and structural requirements of the foundation soil. Similarly Fagbenle and Oluwunmi (2010) in a study found out in their study that actual foundation work practices are becoming difficult because the high cost of building materials has led greedy contractors with eyes on profits, to patronize substandard materials during foundation works.

These short-cut measures according to Ismayilov (2007), have contributed immensely to the occurrence of failed buildings in rural areas in Nigeria. This has greatly affected the quality of buildings erected in rural areas in Nigeria. Poor quality building structures also have negative effect on the life span of the building as well as the load bearing capacity of the structural members or walls. To buttress this, Windapo and Rotimi (2012) in a study on contemporary issues in building collapse and its implications for sustainable development rural development opined that the common of occurrence of non strict adoption of standard building foundation practices in building construction sites created the specific problems of providing adequate building structure. The resultant effect of this is the upsurge of various building projects from various contracting firms of doubtful competencies.

The findings on poor depth of foundation trenches was reiterated by Folagbade (2001) who in his findings on state of buildings in rural areas in Nigeria added that the Urban Development Control units (UDCU) in most states play a limited role as they lack the requisite number of staff with expertise to supervise the many

building foundation works in progress in several building sites concurrently across their areas of jurisdiction. The findings on hypothesis two presented in Table 4 revealed that, there was no significant difference between the mean responses of master craftsmen with educational qualification and those without educational qualification on the foundation work practices adopted by craftsmen in rural areas in Zamfara State.

Conclusion

Ensuring strict adherence and high adoption of the Standard Building Code of practice in the area of building construction planning practices and foundation work practices, is a vital factor in ensuring that residential and industrial buildings have adequate strength and are able to withstand the various loads imposed on them without sudden failure. However, the extent of adoption and adherence to the Standard Code of practice in the building construction planning practices and foundation work practices varies. This also has great influence on the strength of the buildings constructed. Based on the findings of the study, it was concluded that none of the building construction planning and foundation work practices was very highly adopted by the building craftsmen. It is therefore necessary to ensure strict and very high adoption of the Standard Building Code of practice in the area of building construction planning and foundation work practices to ensure that residential and industrial buildings have adequate strength to withstand the various loads imposed on them without failure.

Recommendations

Based on the findings from this study, the following recommendations are made:

i. The Nigeria Institute of Builders and other stakeholders in the building industries should organize public enlightenment campaigns for building construction craftsmen on the Standard Building Code of Practice necessary for adoption in

the area of building construction planning and foundation work practices. This will go a long way to influence craftsmen planning and foundation work practices on the job.

ii. The Ministry of Commerce, Trade and Industries should advise Zamfara State government on the need to set up monitoring team on residential and industrial building sites to ensure strict adherence and adoption of the Standard Building Code of Practice. This will reduce sudden building failures resulting from none adoption of the standard building construction planning and foundation work practices.

iii. The building construction craftsmen in the various local government areas in Zamfara State should cultivate positive building construction practices on building sites. This can be achieved by giving public orientation and awareness programme to building construction craftsmen on the dangers associated with not adopting the standard building code of practice in the area of building construction planning and foundation work practices.

iv. The building construction contractors in Zamfara State should encourage the building construction craftsmen working as employees on the need to always adopt the stipulated standard building code of practice on all building construction works on building sites.

v. Zamfara State Ministry of Works should organize retraining programmes that will help in ensuring strict adherence and adoption of the standard building code of practice in the area of building construction planning and foundation work practices.

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