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RESEARCH ARTICLE

EVALUATION OF CONSTRUCTION MATERIALS ON PROJECT SITES IN FEDERAL CAPITAL TERRITORY, F.C.T, ABUJA

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ABSTRACT

Assessment of building construction material on building sites is a function that critically contributes to the achievement of the project goals. Poor construction materials in construction projects sites has many issues which contribute to it such as: wastage of construction materials, and improper handling on site. This work aims to consider the evaluation of construction materials on project sites. Questionnaires from field survey, interview and site observation were the source of data collected. Descriptive statistics including frequency and mean index score method was used for the study. The study reveals that most problems such as conditions of weather, management of excess materials as well as low response from company to site were identified with mean value above the average mean of 3.32. The study also indicated that most wastage, such as: change in design, improper scheduling of work plan, and lack of supervision in usage of materials observed with mean value above the average mean of 3.37. From the results of the study, it was concluded that, most activities on management of construction materials which are challenging that has to do with wastage in building construction project sites and management of construction material, were identified in the study area. Thus, the study recommends that the consultants, contractors, clients and other professionals that work in the building construction industry should upgrade their commitment toward staff training as well as developing the necessary skills needed in the industry.

KEYWORDS

Evaluation, Construction, Materials, F.C.T, Abuja

1. INTRODUCTION

Effective management of all resources are requires for a successful completion of projects. For most of construction project, the total cost for any equipment and construction materials as well as labor cost, are always higher than the total cost for engineering design, it is obvious that construction materials cost are always almost half of project cost. Mandalay, (2014), reported that about 30% to 70% of project cost is been accounted for by building construction materials with just about 30% to 40% of labor. Assessment of building construction material on building sites is a function that critically contributes to the achievement of the project goals. As building projects progresses in scale and complexity, assessment of construction material is highly needed to really to use them. It is also the process that includes assessing the requirement sourcing, planning, transporting, purchasing, receiving and inspection, handling, storing, and controlling of construction materials. The available at the site or point of use when needed and the right quantity and quality of construction materials to be appropriately selected, purchased, delivered, and handled on time and at a reasonable cost goal of every building construction material.

Also the goal of assessing the building construction material is to ensure that construction materials are considered as a vital assessment to achieve better productivity and profit, which should be translated into decrease in cost and successful finishing with best quality. It is for sure that assessment of building construction material practices could raise efficiency in operations and decrease the total costs. Hence, the need for special attention in assessing the building construction material to achieved the successful finishing of every project operation with ease (Mandalay, 2014). Nigerian building construction sector which plays an important role in the economic development of the country, has contributed half of the total stock of fixed capital investment in the Nigerian economy (Wahab, 2010). The cost of construction materials may be 50% to 70% of the total construction expenditure depending on the type of construction project, (Arijeloye & Akinradewo, 2016; Albert, 2014; Patel & Vyas, 2011).

One of the most critical challenges in the Nigerian building construction industry that presents much impacts on the efficiency in the industry as well as implication to the environment are construction waste on sites (Muleya & Kamalondo, 2017). The sources of waste include surplus stencils or nails, incorrect materials, unused materials, excess concrete materials as a result of fractures or deformations, packages of construction materials or parts due to lack of proper preservation or storage of construction materials and part deliver at the construction site (Albert & Shakantu, 2017). Others includes: erroneous cuttings, poor materials handling, resulting in breakage; lack of proper or faulty equipment, increasing quantities of waste; delaying in finishing the project; poor storage facilities, making it unease to coordinate the storage requirements for the other subcontractors; poor workmanship, inaccurate measurements, leading to poor accounting for materials and impacting negatively on the quality standard set up by management (Aziz & Hafez, 2013).

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A critical challenge that seriously affects the performance of building construction projects is the improper handling of construction materials during site activities. The inappropriate handling and management of building construction materials on construction sites has the potential to severely reduce the project performance. The scope of this work was focused on the building of constraints due to construction materials management on building construction projects sites. In light of the above, there was a clear need for the assessment of building construction material on site and present the most difficult issue and wastages that would enable remedial measures to be taken in other to minimize the improper construction materials management on site.

2. Material and Methods

2.1 The Study Area

Location and Extent

The F.C.T. (Abuja) is situated in the middle belt also known as guinea savannah region of Nigeria. It lies on latitudes 8°25' and 9°20' North of the equator; and longitudes 6°45' and 7°30' East of the Greenwich meridian (Jiriko *et al.,* 2015). The capital city Abuja is situated within the vast Abuja Municipal Area Council. The territory is at present consist of six (6) area councils, namely Kwali, Gwagwalada, Abaji, Abuja Municipal Area Council (AMAC), Bwari, and Kuje,. AMAC is the study area which consists of eleven (11) wards, namely: Garki, City Centre, Gwarimpa, , Karshi, Jiwa Kabusa, Gwagwa, Nyanya, Orozo, Wuse, and Karu,. The study was generally carried out in the 11 wards within AMAC, however, only ten (10) of the projects within the geographical area meet the purposive sampling requirement.

The climate of Abuja exhibits same characteristics with those of the middle belt of Nigeria due to its position. It is located in the zone of transition between the wet southern region and the dry northern part of the country. The annual rainfall of about 1632mm is usually recorded in the study area. The rains are usually heavy often combined both lightning and thunder (Jiriko *et al.,* 2015). The highest temperature in F.C.T. is about 37°C which are usually recorded during the dry season. This period is between the months of November and March. A contributory factor to this event is the fact that at this time in the year, the skies over the F.C.T. are cloudless and in-coming sunlight is unobstructed. The lowest temperatures of about 17°C are usually recorded in the wet season between the months of July and October when the cloudy skies help to shut out most of the in-coming sunlight (Jiriko *et al.*, 2015).

The humidity of Abuja increases to 50% in the rainy season and decreases to about 2% in the dry season. This difference is as a result of the fact that the humidity of Abuja and the entire country is highly influenced by the activities of the north east and south west trade winds. The humidity are usually high when the moisture laden southwest trade winds prevail and decreased considerably when the dry northeast trade winds begin to blow over the country.

2.2 Methods

Survey research approach was adopted for this research; the choice of this research design is premised on the nature of the main research objectives. Since the populations of the study were all the ongoing building construction projects, a total sample size of hundred (100) was adopted and used for the study. From the population of the study, a sample of ten (10) building projects that meet the criteria was selected, with a value of above one hundred million (100 M) Naira using purposive non-probability sampling techniques. The data were sourced from ten both public and private construction project sites within Abuja, Nigeria, with a project value of above one hundred million (100 M) Naira.

Based upon a review of current literature and research objectives, structured questionnaire was prepared and self-administered to the various respondents in the study area. To check internal reliability of the questionnaire it is essential to do so as to achieve accurate result (Creswell 2003). The less variation observes on the instrument in repeated measurements of an attribute, the greater its reliability (Creswell 2003). Cronbach's Coefficient Alpha was used to check reliability of the questionnaire. The usual range of Cronbach's coefficient alpha value are between 0.0 and + 1.0, and the greater the values the greater the degree of internal consistency (Creswell 2003). The equation used to analyze Cronbach's Coefficient Alpha is shown in equation 1

$$a = \frac{k_r}{1+(k-1)_r} \quad (1)$$

Where

K is activities (variables) in the scale

r is the average of the inter-item correlations.

The statistical analysis used for this study was the Mean index score. In order to determine the degree of identified problems associated with building construction project sites, the following classification of the ratings based on the Likert Scaling were used as shown in table 1 (Majidn,1997; Aminudin, 2006).

Table 1: Presents the Likert Scaling.

Degree of Identified Problems or Wastages	Mean Score Range
Very highly	4.50 – 5.00
Highly	3.50 – 4.50
Moderately	2.50 – 3.50
Less	1.50 – 2.50
None	1.00 – 1.50

2.3 Data Analysis

The collected data from the questionnaires were analyzed by the use of inferential and descriptive statistical methods. These includes: Frequency distribution, and Mean or average Index Score. In order to presents the result, the study make use of Microsoft Excel and Statistical Package for the Social Sciences (SPSS).

3. Results and Discussion

3.1 The bio data of the Respondents

Sum of 87 questionnaires were returned from the survey accounting for 87% response rate, this is from the one hundred (100) questionnaires that were administered to the clients, contractors, consultants, and other civil engineer professionals. From the survey results indicates that, 36 questionnaires from the 40 questionnaires was return by the contractors, 30 questionnaires from the 35 questionnaires was return by the consultants, 12 questionnaires from the 15 questionnaires was return by the clients or owners of buildings and 9 from the 10 questionnaires was return by the other civil engineer professionals constituting 41.4%, 34.5 %, 13.8% and 10.3 % responses respectively from the total questionnaire that were sent to respondents and returned. Table presents the bio data of all the respondents during the interview.

Table 2: present the bio data of the respondents

Age of Respondents (Years)	**Percentage of Respondent (%)**
18-25	21
26-35	68
36-45	11
Academic Qualification of Respondents	
Diploma	9.2
Bachelor Degree	64.4
36-45	26.4
Years of Experience of Respondents	
Less than 5	47.1
6-10	32.2
11-15	20.7
Over 16	00
Position of Respondents in the Organization	
Managing Directors	2.3
Project Managers	8.0
Office Engineers	21.8
Site Engineers	17.2
Resident Engineers	33.3
Quantity Surveyors	2.3
Others like Forman, Supervisors and Project Inspectors	14.9
Classification of Firms in the Construction Business	
Private Organization	47.1
Governmental/ Public Organization	32.2
Share Companies	16.1
Other Firms	4.6

From table 2 the result indicates that the age group between 26 to 35 years constitutes the highest percentage of 68% of the people interviewed. The least group was 36 to 45 which constitute 11% of the respondents. This implies that the majority of the respondents are in their active age of life which will enable participates well their various chosen occupation. The analysis of the academic qualification of the respondents show that the majority of the respondents hold bachelor degree accounting for 64.4%, with least being the respondents with diploma holders accounting for just 9.2%. The results imply that the majority of the respondents' interviews are bachelor degree holders who are just at the middle of academic requirement. The analysis of work experience of the respondents reveals that majority of the respondents has working experience of less than five (5) years consisting of 47.1%; 32.2% of the respondents has between 6 to 10 years working experience. However, 20.7% of the respondent has more than 10 years working experience.

The analysis of position of the respondents in the company shows that the majority of the respondents are resident engineers consisting of 33.3%. However, managing director and quantity surveyors were the least with just 2.3% of the people interviewed. According to the analysis of the classification of firms in the building construction business, private firm account for the most consisting of 47.1%, while government or public firms account for 32.2% with other films accounting for the least with only 4.6%. The implication of this is that majority of the building construction site are owned by private individuals whose goal will be to make maximum profit not minding the quality of work done.

3.2 Problems in Building Construction Project sites

This part examined the problems associated with building construction project sites. Table 3 presents the various problems that are associated with building construction project site in FCT. Abuja.

Table 3: Identified problems associated with building construction project sites

Factors Related to the Problems	N	Mean	Std.	Ranking
Condition of the Weather	87	3.93	0.915	1
Management of excess materials in the site	87	3.81	1.016	2
Slow responses by the company to site in submittals	87	3.74	1.057	3
Delaying of projects due to slow delivery of materials	87	3.67	1.250	4
Shortage of materials during construction	87	3.66	1.269	5
Defects as a result of improper skill in the use of material	87	3.60	1.456	6
Improper selection of specific materials for contracts	87	3.60	1.268	7
Sudden change in price of materials	87	3.59	1.186	8
Not following the systematic control in Usage of materials	87	3.57	1.176	9
Increase of price of materials in the market	87	3.55	1.207	10
Too much of inventory material	87	3.55	1.226	11
Poor selection of material	87	3.33	1.395	12
Wrong dimension and quantities of material delivered	87	3.31	1.442	13
Receiving the materials early before usage	87	3.30	1.193	14
Disturbance as a result of poor materials	87	3.25	1.145	15
Lack of effective control of storage	87	3.23	1.143	16
Lack of proper selection of material	87	3.21	1.181	17
Unavailable required quantity of material	87	2.98	1.313	18
Receiving wrong material type	87	2.93	1.480	19
High cost of transportation of materials	87	2.88	1.060	20
Inaccurate material from drawing to design	87	2.87	1.322	21
Wrong delivery of materials	87	2.86	1.320	22
Material quality increase in storage	87	2.81	0.906	23
Destruction of materials in shipping	87	2.78	1.111	24
Theft, vandalism, and burglary	87	2.61	1.265	25
Mean Average		3.32		

The 25 items which are among the identifies problems associated with building construction project sites were presented in Table 3, the mean index score of the respondent's level of responses and the ranking of the items identified were also presented.

From table 3, it was observed that the mean response ratings for almost half of the respondents' were above mean average score of 3.32. Out of the total of 25 items listed as above, about 23 items had a standard deviation value greater than 1.0. This implies that, almost all of the respondents, had differences in the rating of their level of problems identified of each items while only two (2) had a standard deviation value below 1.0 meaning that the respondent share the same ideas about their respondents' ratings.

Observing the result of the survey, the common items identified as highly occurred problems associated with building construction project sites in the respondents organizations are: Condition of the Weather with a of mean = 3.93, Management of excess materials in the site with a mean = 3.81), Slow responses by the company to site in submittals with a mean = 3.74, Delaying of projects due to slow delivery of materials with a mean = 3.67, Shortage of materials during construction with a mean = 3.66, Defects as a result of improper skill in the use of material and Improper selection of specific materials for contracts with a mean = 3.60), Sudden change in price of materials with a mean = 3.59, Not following the systematic control in Usage of materials with a mean = 3.57, Increase of price of materials in the market and Too much of inventory material with a mean = 3.55. The result further shows that, identified problem related Poor selection of material with a mean = 3.33 is also above the average value of 3.32. The moderately identified problem activities related to building construction shows Wrong dimension and quantities of material delivered with a mean = 3.31, Receiving the materials early before usage with a mean = 3.30, Disturbance as a result of poor materials with a mean = 3.25, Lack of effective control of storage with a mean = 3.23.

Others includes Lack of proper selection of material with a mean = 3.21, with a mean = 2.98, while Receiving wrong material type with a mean = 2.93, High cost of transportation of materials with a mean = 2.88, Inaccurate material from drawing to design with a mean = 2.86, Material quality increase in storage with a mean = 2.81, Destruction of materials in shipping with a mean = 2.78 and Theft, vandalism, and burglary were the least rated with a mean = 2.61. From the findings presented above, it shows that, problem of construction materials management activities on building construction projects sites in Abuja appears to be quite high. This

implies that with high rate of identifies problems in the building construction projects; it means higher cost of construction with decrease in profit. So in other to maximum the profit a lot need to be done to reduce these problems to the barest minimum.

3.3 Wastage in Building Construction sites

Table 4 provides a range of identified wastages in building construction sites and the mean index score of the respondents' level of identifying wastages.

Table 4: identified wastages in building construction project sites

Identified wastages in building construction sites	N	Mean	Std.	Ranking
Change in design	87	3.95	1.005	1
Improper planning and scheduling of work	87	3.79	1.308	2
Inadequate supervision during the usage of material	87	3.79	1.062	3
Lack of coordination of teamwork in the site	87	3.69	1.263	4
Repeat of work as a result of poor quality and mistakes	87	3.66	1.265	5
Error in ordering of materials	87	3.54	1.997	6
Lack of adequate care during transportation	87	3.53	1.131	7
Delay during supply of materials to the site	87	3.49	1.378	8
Inadequate security on site	87	3.46	1.395	9
Inadequate supervision and poor control in storage	87	3.44	1.309	10
Poor storage facility	87	3.42	1.255	11
Lack of proper cutting equipment	87	3.40	1.340	12
Inadequate places for storage of materials	87	3.39	1.918	13
Wrong utilization of materials	87	3.32	1.116	14
High rate of material movement	87	3.27	1.071	15
Lack of skill in material utilization	87	3.27	1.093	16
Poor quality of the materials	87	3.27	1.332	17
Poor utilization of temporary materials	87	3.19	1.006	18
Delaying in inspection and testing of materials	87	3.19	1.018	19
Lack of specification in drawing design	87	3.17	1.386	20
Wrong or poor regulation in material usage	87	3.11	1.391	21
Shortage of materials on site	87	3.10	1.388	22
Damages done due to weather effect	87	3.09	1.233	23
Defects as a result of manufactured error	87	3.00	1.281	24
Existence of unwanted materials on site	87	2.96	1.386	25
Mean Average		3.37		

From the table 4 the study revealed that almost half of the identify wastages by the firms were less than the average (average mean score of 3.37). From the 25 items listed as above, about 22 items had a standard deviation value more than 1.0. This implies that, almost all of the respondents, had differences in the rating of their level of identified wastages of construction materials in their activities while a minority of three had a standard deviation value that are below 1.0 assuming some level of similarity among the respondents' ratings.

Observing the result further, it shows that the highest wastages in building construction sites was change in design with a mean = 3.95, Improper planning and scheduling of work and Inadequate supervision during the usage of material with a mean = 3.79, Lack of coordination of teamwork in the site with a mean = 3.69, Repeat of work as a result of poor quality and mistakes with a mean = 3.66, Error in ordering of materials with a mean = 3.54 and Lack of adequate care during transportation with a mean = 3.53. The analysis further shows that, Delay during supply of materials to the site with a mean = 3.49, Inadequate security on site with a mean = 3.46, Inadequate supervision and poor control in storage with a mean = 3.44.

Poor storage facility with a mean = 3.42 and Lack of proper cutting equipment with a mean = 3.40 are above average and identified as moderate in building construction project sides. Other moderately identified wastages in building construction project sites are, Inadequate places for storage of materials with a mean = 3.39. Others includes: Wrong utilization of materials with a mean = 3.32, High rate of material movement, Lack of skill in material utilization, and Poor quality of the materials with a mean = 3.27, Poor utilization of temporary materials and delaying in inspection and testing of materials with a mean = 3.19, Lack of specification in drawing design with a mean = 3.17, Wrong or poor regulation in material usage with a mean = 3.11, Shortage of materials on site with a mean = 3.10, Damages done due to weather effect with a mean = 3.09 and Defects as a result of manufactured error with a mean = 3.00. However, Existence of unwanted materials on site with a mean = 2.96 was the least identified wastages in building construction project sites.

The general implication of the above finding indicate that there are high rate of wastages identify in the building construction project site, with direct implication of reducing the profit of the contractors or increase of bill for the site owners. In other to maxim the profit and meet all the standard specification, there is an urgent need to reduce the above mention wastages in building construction project site.

4. Conclusion and Recommendation

The study concludes that change in design, Improper planning and scheduling of work, inadequate supervision during the usage of material, lack of coordination of teamwork in the site, repeat of work as a result of poor quality and mistakes error in ordering of materials, as well as lack of adequate care during transportation. While, delay during supply of materials to the site, inadequate security on site, inadequate supervision and poor control in storage, Poor storage facility, lack of proper cutting equipment, inadequate places for storage of materials were the least rated. However, changes in design was the most highly identified wastages while Lack of proper work planning and scheduling and inadequate supervision in usage of materials were highly identified wastages in building construction project sites.

The following recommendations are proposed from the findings and conclusions drawn from the study.

- The consultants, contractors, clients and other professionals that work in the building construction industry should upgrade their

commitment toward staff training as well as developing the necessary skills needed in the industry.

- The department of construction materials management should assist the organization in managing the production activities, this will assist in selling, marketing, promotion as well as controlling of all types of building construction materials for its efficient quantity, and effective quality.

REFERENCES

Albert, I. 2014. Assessment of professional's perception on materials management practices on construction sites in selected states in Nigeria. Unpublished Masters dissertation. Zaria: Ahmadu Bello University.

Albert, I. & Shakantu, W. 2017. An investigation of materials management on sustainable construction in Nigeria. International Journal of Innovative Research in Technology, Basic and Applied Sciences, 4(1), pp. 8-17.

Arijeloye, B.T. & Akinradewo, F.O. 2016. Assessment of materials management on building projects in Ondo State, Nigeria. World Scientific News, vol. 55, pp.168-185.

Aziz, R.F. & Hafez, S.M. 2013. Applying lean thinking in construction and performance improvement. Alexandria Engineering Journal, 52(4), pp. 679- 695. https://doi.org/10.1016/j.aej.2013.04.008

Cresswell, J.W. 2003. Qualitative inquiry and research design. Thousand Oaks, CA: Sage

Dale, B.G., Van Der Wiele, T. & Van Iwaarden, J. 2007. Managing quality. New York: John Wiley & Sons.

Jiriko, G.K., Dung-Gwom, J.Y. and Wapwera, S.D. 2005.The Evaluation of Abuja as a 'Smart City' A Prognosis. Department of Urban and Regional Planning, Faculty of Environmental Sciences, University of Jos, Nigeria

Magalhaes, F.C. 2014. The Problem of Non-compliant Concrete and its Influence on the Reliability of Reinforced Concrete Columns. Doctoral Thesis. Universidade Federal do Rio Grande do Sul, Brazil

Muleya, F. & Kamalondo, H. 2017. An investigation of waste management practices in the Zambian construction industry. Journal of Building Construction and Planning Research, 5(1), pp. 1-13. https://doi.org/10.4236/jbcpr.2017.51001

Patel, K.V. & Vyas, C.M. 2011. Construction materials management on project sites. In: National Conference on Recent Trends in Engineering & Technology (NCRTET – 2011), 13-14 May, Anand, Gujarat, India: BVM Engineering College, Vallabh Vidyanagar, pp. 1-5.

Wahab, A.B. 2010. Stress management among artisans in construction industry in Nigeria. Global Journal of Researches in Engineering, 10(1), pp. 93-103.

Walker, P. 1999. Bond Characteristics of Earth Block Masonry, Journal of Materials in Civil Engineering, 11(3), pg. 249-256.