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An Assessment of Material Management on Building Construction Sites

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Abstract
The paper considers the management of materials on building construction sites. In the study, method of material procurement practice on construction site, factors affecting material management on building construction site as well as causes wastages on construction sites were determined. The study further Suggest measures for effective material management in construction site. Data for the study was obtained through a structured questionnaire administered to respondents in ten different construction sites and head offices of the construction companies in charge of the sites in Minna metropolis Niger State. Findings reveal that, 31% of respondents organization procure materials for sites by head office provisions without site requisition, 64% of respondents organization procure materials for sites by head office provisions with site requisition and 5% of respondents organization procure materials for sites by through direct purchase by site manager or engineer. The respondent identified the following as the main causes of material wastage on building construction sites: Damage by mishandling, inadequate storage facilities on site, delay in material supply, inadequate supervision, poor site security, Weather and other natural occurrence, Rework, alteration of designs, over ordering of construction materials, theft and Vandalism. Based on the findings in the work, appropriate recommendations were being made for effective material management on building construction sites.
Key words: Building materials, Wastes, Managements, Construction Sites.

1. Introduction

Cost wise all constriction works depend on two factors, namely, cost of materials and cost of labour and According to Khyomesh (2011), 30 to 70 percent of project cost is consumed by material with about 30 to 40 percent of labor. But labour cost is nearly the same for good construction work as well as bad construction; therefore attention should mainly be directed to the cost of materials and management of materials.

Waste of construction materials on site refers to the difference between materials delivered to construction site and those that are actually used for the construction work (Onabule, 1991) hence from Onabule's specification it can be affirmed that construction waste are those materials supplied to site for construction and are not being used in the actual construction constituents. This supports Seeley (1997) views that not all materials delivered to construction sites are used for the purpose for which they are ordered. Furthermore, Formoso, Isatto, and Hirota (1999), defined waste as "any losses produced by activities that generate direct or indirect cost but do not add any value to the product". Rational management of material to avoid waste is an important consideration for reducing construction cost and construction duration. Therefore, there is a need for efficient materials management in order to control productivity and cost in construction projects. Hence the overall objectives of any on-site management activity should be directed to provide full-guard on construction materials and to perform efficient usage of such materials (Mohammed and Anumba 2006).

Material management is the process that coordinates planning assessing the requirement sourcing, purchasing, transporting, storing and controlling of materials, minimizing the wastage and optimizing the profitability by reducing cost of material. The goal of material management is to ensure that materials are available at their point of use when needed, the material management system attempts to ensure that the right quality and quantity of materials are appropriately selected, purchased, delivered, and handled on site in a timely manner and at a reasonable cost.

Most often contractors carry out project with little or no profit which is so due to procurement systems in which the lowest bidder is often awarded the contract. In trying to cope with lowest bid contract and at the same time avoid construction cost overruns contractors involves in the use of substandard elements, shoddy jobs through use of cheap inexperience labour which most often results in building collapse, abandoned projects, and liquidation of contractors. But researchers have continuously identified that efficient management of materials can result in substantial savings in project costs, (khyomesh, 2011; AbdulRahman and Alidrisyi, 1994). So with good construction material management construction cost overrun can be avoided profits can be made even with the lowest bid and the various bad practices by contractors can be avoided. It is against this background that this study is initiated for effective material management on construction sites.

2 .Objectives of the Study

1. determine method of material procurement practices on construction site
2. determine the causes of material wastage on building construction sites
3. identify the factors affecting effective material management on building construction site
4. suggest measures for effective material management on building construction site.

3. Research Methodology

Data for the study was collected via a structured questionnaire designed to assess the views of respondents on material management on building construction sites. Respondents were asked to rate their perceptions regarding the level of importance of these strategies on a four point Likert ordinal scale where 4 = Strongly Agree, 3 = Agree, 2 = Disagree and 1 = Strongly Disagree.

The study was carried out in Minna the Niger state capital. The questionnaires were administered to contractors in their head offices and their representatives on construction sites. A total of 10 different contractors with their respective construction sites were visited and 2 questionnaires each were administered at the head offices as well as at the construction sites making a total of 40 questionnaires being distributed. Hinkel et al (1998) however believes that the minimum sample size that allows normal distribution assumptions to be used rather than using a t-distribution is 30. Hence the sample size of 40 is justifiable.

Data obtained from the survey were analysed using simple percentages and Relative importance Index (RII) method. The Relative importance index (RII) was calculated using the formula: RII = ∑W÷A×N_ ($0 \leq RII \leq 1$) Where W= the weight assigned to each strategy by the respondents, A = Highest weight (which is 4 in this case), N = the total number of respondents. The limits of definition of RII were: 0< $RII \leq 0.25$ = Strongly Disagree, $0.25 < RII \leq 0.50$ = Disagree, $0.50 < RII \leq 0.75$ = Agree $0.75 < RII \leq 1.0$ = Strongly Agree. A rank ordering of these variables were then assigned based on the calculated RII.

4. Results and Interpretation

Table 1. Manner of Material Procurement Practice on Construction Site.

Response	Frequency	Percentage %
Head office provisions without site requisition 31%	10	27%
head office provisions with site requisition 64%	25	68%
direct purchase by site manager or engineer 5%	2	5%
Total	37	100%

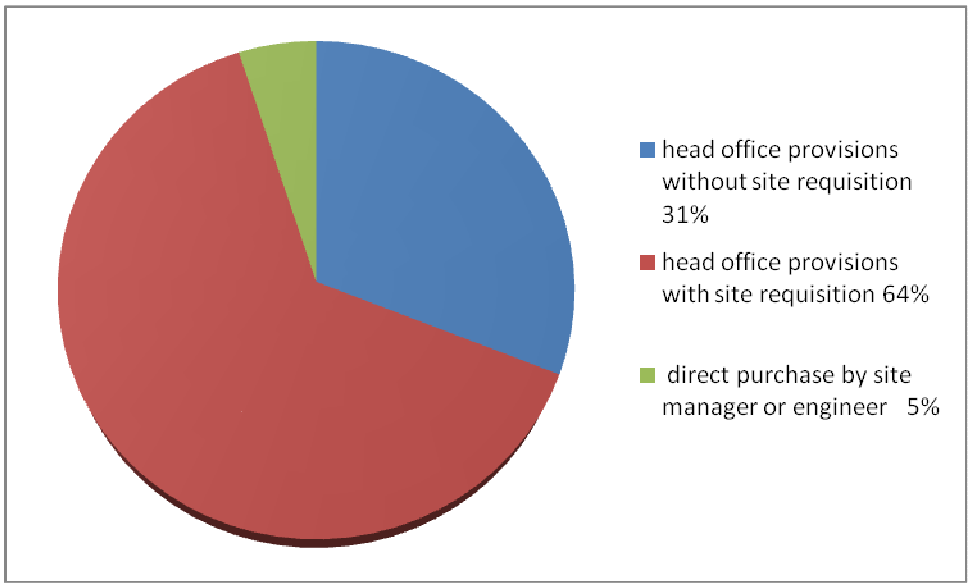

Figure 1. Manner of Material Procurement Practices on Construction Site.

Table 1 shows the method of material procurement practices on construction sites. Results shows that 31% of respondent's organization procures materials for construction sites by head office provisions without site

requisition, 64% of respondent's organization procure materials for construction sites by head office provisions with site requisition and 5% of respondent's organization procures materials for construction sites through direct purchase by site manager or engineer. The low percentage of 5% of methods of procurement of materials for construction sites by direct purchase by site manager or engineer is not surprising since such method is prone to challenges of accountability and corruption. This results also endorses procurement of materials for construction sites by head office provisions with site requisition as a better option than procurement without site requisition which might amount to over supplying or under supplying materials leading to wastage or delay as the case may be.

Table 2. Causes of Material Wastage on Building Construction Sites

S/NO	Causes of material wastage on building construction sites	4	3	2	1	RII	Rank Order
A	Damage by mishandling and re-work due to poor workmanship	23	8	5	1	0.86	1
B	Inadequate storage facilities on site,	12	15	10	-	0.76	4
C	Delay in material supply,	15	9	11	2	0.75	5
D	Inadequate supervision,	18	15	4	-	0.85	2
E	Poor site security,	14	17	6	-	0.80	3
F	Weather and other natural occurrence,	5	9	12	11	0.55	9
G	Alteration of designs,	7	11	18	1	0.66	7
H	Over ordering of construction materials,	12	7	10	8	0.66	7
I	Theft and Vandalism.	3	24	5	5	0.67	6

Table 2 gives the responses to the list of causes of material wastage on building construction sites. From the results the relative index for all the list of causes of material wastage on building construction sites were all greater than 0.5 which is an indication that respondents agree and strongly agree with the list of causes of material wastage on building construction sites, with damage by handling and rework due to poor workmanship, inadequate supervision and poor site security having higher relative index of 0.86, 0.85 and 0.8 and ranked 1st, 2nd and 3rd respectively. This implies that damage by handling and rework due to poor workmanship; inadequate supervision and poor site security are the main causes of material wastage on building construction sites

Table 3. Factors Affecting Effective Material Management on Building Construction Sites,

S/No	Factors Affecting effective Material Management On Sites	3	2	1		RII	Rank order
A	Design changes	19	8	10	-	0.81	2
B	Lack of proper work planning and scheduling	20	7	8	2	0.80	3
C	Inefficient workforce	22	8	6	1	0.85	1
D	Fraudulent practices / negligence and corrupt practices	15	9	13	-	0.76	4
E	Lack of security personnel	11	7	16	3	0.68	6
F	Waste on construction site	6	15	13	3	0.66	7
G	Storage facility	12	9	16	-	0.72	5

Table 3 shows the responses to the factors affecting effective material management on construction sites. From the results, inefficient workforce, design changes and lack of proper planning and scheduling are the factors ranked 1st, 2nd, and 3rd with relative index of 0.85, 0.81 and 0.80 respectively. Fraudulent practices/negligence and corrupt practices is ranked 4th with relative index of 0.76, while storage facility, lack of security personnel and waste on construction sites are ranked 5th, 6th, and 7th with relative index of 0.72, 0.68 and 0.66 respectively.

Table 4. Measures for Effective Material Management on Building Construction Site

S/No	Measures for effective material management on Building Construction Site	4	3	2	1	RII	Rank Order
1	Employment of skilled craftsmen and operators	24	11	2	-	0.86	1
2	Training of both management and other staff.	16	15	4	2	0.80	2
3	Employment of store keeper and security personnel	17	12	8	-	0.75	5
4	Procurement requisition to specify quality, quantity and delivery time	12	13	10	-	0.76	4
5	Ensuring proper planning and scheduling of building works	21	9	7	-	0.79	3
6	Introducing material management at the design stage	16	6	13	2	0.68	6
7	Attention to weather conditions	6	12	15	4	0.55	7

Table 4 gives the responses to the measures for effective material management on building construction site with employment of skilled craftsmen and operators and training of both management and other staff being the measures ranked 1st and 2nd with relative index of 0.86 and 0.8 respectively. Ensuring proper planning and scheduling of building works is ranked 3rd with relative index of 0.79 while Procurement requisition to specify quality, quantity and delivery time is ranked 4th with relative index of 0.76. Employment of store keeper and security personnel, introducing material management at the design stage and attention to weather conditions are ranked 5th, 6th, and 7th with relative index of 0.75, 0.68 and 0.55 respectively. The higher relative index values for employment of skilled craftsmen and operators and training of both management and other staff as measures for effective material management on building construction site supports earlier responds from table 3 where inefficient workforce was being identified as the main factor affecting material management on building construction sites.

5. Conclusion and Recommendations

The research has examined materials management on building construction sites. Findings shows that procurement of materials with requisition from site is more common with the contractors and its best practice of materials procurements for construction sites for effective materials management. The study also establish that the following: damage by mishandling and re-work due to poor workmanship, inadequate storage facilities on site, delay in material supply, inadequate supervision, poor site security, weather and other natural occurrence, alteration of designs, over ordering of construction materials, theft and vandalism are the causes of material wastage on building construction sites and the factors affecting effective material management on construction sites are as follows: design changes, lack of proper work planning and scheduling, inefficient workforce, fraudulent practices /negligence and corrupt practices, lack of security personnel, waste on construction site and lack of or inadequate storage facility. Furthermore, the research identifies the following as measures for effective material management on building construction site: employment of skilled craftsmen and operators, training of both management and other staff, employment of store keeper and security personnel; procurement requisition to specify quality, quantity and delivery time; ensuring proper planning and scheduling of building works, introducing material management at the design stage and consideration of weather conditions.

The study recommends that Contractor should make provisions for training and retraining of management and site personnel in order to improve their efficiency for effective material management and contractors should ensure the use of skilled craftsmen for their works and provide efficient supervision with professionals to ensure effective material management on building construction sites.

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