EVALUATION OF BUILDING MATERIAL MANAGEMENT STRATEGY ON BUILDING CONSTRUCTION SITE IN BENUE STATE

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Abstract

This research assesses the impact of building material management strategy on building construction site in Benue State. About four active sites were studies in this research work. A descriptive research design was employed to carry out the study in which three objectives and three research questions were developed to guide the study. A total of sixty-five (65) questionnaires were distributed to selected construction companies in Makurdi area of Benue State, and sixty-three (63) questionnaires were returned and were used for the data analysis. Quantitative statistical tools which involve frequency distribution table, Percentages and Mean item score were used to analyze the data. The study reveals that the causes of materials mismanagement in construction sites includes among others improper site planning and organization, lack of security measures, poor site communication, poor quality control and checking, poor procurement and material scheduling and poor stock control and storage techniques which leads to delays in project delivery, increased disputes, low construction quality

effective through building materials. The approaches highlighted includes a realistic design and modular co-ordination of dimension that take into consideration the size of the material available in the market, material management strategies that will ensure that the materials purchased are correctly incorporated into the works and a substitution of imported materials with locally sourced materials that will perform the same function without adversely affecting the values of the building.

According to Mezue, (2015), the documented procedures or strategies for controlling material on construction sites include site planning and organization, materials scheduling and procurement, stock control and storage techniques, materials movement and handling, quality control and checking; good security measures, site communication; education, checking, incentives schemes and good supervision. Furthermore, Omotosho, (2016) opined that material control covers design, specification procurement, material loading and offloading as well as material transportation from the vendors to the construction sites. Material management occur at every stage of project execution and must be properly done in order to minimize material wastes so that cost of construction can be effective managed. The following stages of project execution are periods which specific levels of management should be given to materials, during planning and the designing; during material delivering and storage; during construction activities; as well as after practical completion of project and before handing over. These stages are used as a factor to describe and assess material management in all phase of execution.

Statement of Research Problem

Management of materials over the years has been a great problem to most construction companies. In the construction of projects, there is always every tendency of mismanagement of materials by construction companies (Abdul-Rahman & Alidrisyi, 2017). As the size of the construction contract increases, the scale of activities concerning construction materials management also increases.

Research Questions

The following research questions were stated to guide the study.

1. What are the causes of material mismanagement on building construction sites?
2. What are the effects of material mismanagement on building construction sites?
3. What are the various strategies for materials management on building construction sites?

LITERATURE REVIEW

Concept of Material

Building materials are a very significant construction input in the construction of building projects. The Webster's dictionary defines materials, as "the element, constituents, or substance of which some things, is composted or can be made." Ballof (2012) defines materials as the physical materials that are purchased and used to produce the final products but are: not final product. Bailey and Famer (2013) identified materials as the goods purchased from sources out of the organization that are used to produce finished products. Stukhart (2014) define material as the items that are used to produce products and which include raw materials, parts, supplies and equipment items. Chandler (2012) states that construction materials can be classified into different categories depending on site. He classified the material into five categories, which include:

Bulk materials: these are materials manufactured to standards and are purchased in quantity. They are bought in standard length or lot quantities. Examples of such materials are pipes, wire and cables; they are more difficult to plan because of uncertainty in quantities needed. Bulk materials are materials that are delivered in mass and deposited in Container.

Bagged materials: there are materials delivered in bags for ease of handling and controlled use.

Palliated materials: place in pallet for delivery.

Packaged materials: these are construction materials packaged together to prevent damage during loading, transportation and offloading.

including the construction of building projects needs to be properly managed if the project is to be successfully executed and delivered.

Material management is concerned with the planning identification, procuring, storage, receiving and distribution of materials. The purpose of material management is to ensure that the right materials are in the right place, in the right quantity when required.

According to Stukhart, (2014) the responsibility of one department (i.e., material management department) is for the flow of materials from the time the materials are ordered, received and stored until they are needed. Ballot (2015) defines material management as the process of planning, acquiring, storing, moving and controlling materials to effectively use facilities personnel, resources and capital.

Tersine and Campbell (2012) define material management as the process to provide the right materials at the right place at the right time in order to maintain the desired, level of production at minimum cost. The purpose of material management is therefore to control and maintain the standard flow of material during construction.

As opined by Beekman-love (2013) a material management structure should be organized in such a way that it allows for integral planning and coordination of the flow of materials, in order to use the resources in an optimal way and to minimize Cost. Chandler (2012) states that material management strategies should be implemented to plan, control, coordinate, order, check deliveries, warehousing. It is also very important in controlling the use of materials and paying for materials to ensure that materials are always available on sites. He further added that these activities should be interrelated. Ammer (2014) defines material management as the process in which construction companies acquire the materials that are needed in order to achieve their objectives and goals. This process usually begins with the requisition of materials from the suppliers until the materials are used or incorporated into a product.

a fast track or very tight time schedule. sufficient time for obtaining the necessary materials must be allowed. In some cases, more expensive suppliers may be employed to save time.

Materials management is also a problem at the organizational level if central purchasing and inventory control is used for certain materials. In this case, the various projects undertaken by the organization would represent requests to the control-purchasing unit. In turn, this would maintain inventories of standard materials to reduce the delay in providing materials or to obtain lower costs due to bulk purchasing, Cavinato (2011). Materials ordering problems should be minimized through the use of computer based systems to ensure the consistency and completeness of the purchasing process. In the manufacturing, the use of automated materials requirement planning systems, the master production schedule, inventory records and product component lists are merged together and used to determine what material must be ordered, when they should be ordered and how much of each of them should be ordered. The projected demand for each material in each period is subtracted from the available inventory. When the inventory becomes too low, a lower order is recommended. For materials that are non-standard or not kept in inventory, the calculation is even simpler as no inventory must be considered. With a materials requirement system, much of detailed record keeping is automated and project managers are alerted to purchasing requirements (Stukhart, 2014).

Building Material Mismanagement on Construction Sites

The failures of building material manager to implement the various activities required towards effective material management and delivery is one of the major sources of Material mismanagement on building construction sites. Saron and Antneh (2016) identified some factors to be directly connected to causes of poor material management construction site.

poor requisition, poor inventory method and wrong delivery emanating from early or late delivery. This is capable of stopping progress of the work and thereby creating labour and equipment redundancy thereby causing cost and time overrun.

Excessive Paper Work

Delay created by excessive paper work during construction stage is capable of causing extension of time in a construction project, Dechasa Haile (2013). Time spent in analysis and production of paper works when analysis method of inventory is in use will always abrupt work progress. This can cause delivery problems and damages as a result of double handling.

Poor Communication and Misuse of Specification

Qualitative communication link is required to exist between the management, material department, construction team and supplier Stukhart, (2014). When this communication link is faulty or ineffective, problems may arise from the different department and an attempt to correct such may take time thereby leading to management. Problems associated with poor communication include: Wrong delivery, wrong ordering, labour and equipment, receiving of low quality material.

Misuse of specification by the materials/procurement unit has severally created problems of low-quality materials being used on construction projects. These cases always draggle down to demolition of already built partition resulting to waste of labor, material and costs of reconstruction.

Inappropriate Material Procurement and Delivery

Some overlapping and re-handling in the procurement process is unavoidable, but it should be minimized to ensure timely delivery of the materials in good condition, Christ (2015). Most a times the owner may initiate the procurement procedure even before the selection of a contractor. This early procurement some times lead to excessive materials being delivered on site and requires re-handling in order to create space for the main construction to come in place. Late delivery to site is another

offer better pay. Thus poor and non-suitable workmanship contribute to the increase of material wastages. Problem may occur due to Poor workmanship during construction stage and lack of proper supervision. Under supervision, the following steps should be properly implemented during production stage and right on vibration.

Poor Security Measures

Issue related to poor security in construction site includes; theft and vandalism, Christ (2015). Inadequate supervision around the site premises compromises the security of materials on site. Materials can be stolen from and within the site. Unrestricted access to the site store by labourers can lead to loss of items from store, even with security personnel patrolling the site.

In situations where there is no adequate holding in site boundaries, an external body can cause theft and vandalism to materials kept on the site premises. Losses resulting from these incidents can lead to excessive expenditure on replacements, as well as delays in project progress due to procurement and repair of damaged items caused by vandalism

Effects of Building Material Mismanagement on Construction Site

Mismanagement of material on construction site has been identified to have negative impact on any construction project, Stukhart (2014). The major impacts of material management identified include: Cost overrun, delay on project completion time (time overrun), ineffective resource utilization, environment impact.

Cost Overrun

According to Dechasa (2013), it is believed that poor handling of materials and wastages affects the expected project cost planned by the employer and contractor. Sadhan, (2015) also inserted that many projects experience schedule slippages and cost overrun due to poor management material. A

Environmental Impact

Wastage due to material handling easily affect surrounding environment through pollution. The impact of construction operations on natural conservation cumulatively and collectively in most situation is a disturbance of sensitive habit and spaces by water pollution. In addition, where large amount of waste are generated, loss of grassland can result from the need for landfill sites.

Strategies for Managing Building Materials on Construction Sites

In order to achieve proper/Efficient/Effective management of materials on construction projects, some strategies must be adopted. The strategies are effective from acquisition site on wards, ensuring that the desired quality standards are achieved. According to Omotosho (2016), Ojimelekwu and Agbo (2015) the documented strategies for managing materials on construction sites include:

Site planning and organization, Material schedule and procurement, Material movement and handling, Stock control and storage techniques, Quality control and checking, Good supervision, Site communication, Education and incentives schemes.

Site Planning and Organization

The control process to building construction materials therefore must commence from planning stage with the establishment of quality and standard factor which remains the management problems that affect the effective management of materials on site, Nwosu (2000). Construction site planning and organization is a fundamental and challenging activity in the management of materials on site. Careful site planning and organization controls cost and creates orderly, sequence for material ordering, thereby enabling the manager to;

Establish the programme of work; Control all other activities as concerns material management.

Stukhart (2014) states that there is a need for an appropriate

movement and placement. The importance of appropriate handling of materials is highlighted by the fact that they are expensive and engage critical decision. Due to the frequency of handling materials, Materials and selection of suitable equipment is an important function process, provide effective utilization of manpower, increase production and improve flexibility.

Stock Control and Storage techniques

According to Chan (2002) material storage on site requires close attention in order to avoid waste, loss and any damages of materials, which would affect the operatives of the construction project. Problems always arise during materials supply because of improper storage and protection facilities, Canter's (2015), previous studies have identified that building materials often require a large storage capacity which is rarely available on site Oseghele et al, (2021) however, Stukhart (2014) suggested there are few considerations to be taken in the planning of the storage space such as timing of the initial buy and historical information and experience.

Materials management or site should seek to reduce loss of profit due to theft, damage and wastage as well running out of stock. It is also important to ensure that the right quality and quantity of materials, installing equipment are appropriately specified in a timely manner, obtained at a reasonable cost and are available when needed, Bell and sturakhart (2014).

Quality Control and Checking

According to Anumba et al' (2013) the European construction institutes, total productivity management report, Eol (2016) "Material delivery to site demands the introduction of a careful developed system of monitoring and control as early as possible". The bulk of construction material delivery requires proper management of stock and control. Stock control is a technique devised to cover and ensure that all items are available when required and can include raw materials, processed materials, and compound for assembly, consumable

code for each category of the job. To control costs associated with change orders, ask the contractors to submit a thorough breakdown of their rate, which should include hourly labor rates, materials rate, tools, equipment, overhead, taxes, and project. This will help the project to review the cost more easily.

Transportation:
The movement of equipment, materials, and personnel to the job site represents a unique and specialization element of materials management. Experienced traffic personnel can have a positive impact on the execution of the project while minimizing the transportation cost, Ahuja and Dozzi (2015). Special consideration is required in setting terms, thereby determination the proper point for transfer of materials ownership and liability. The prime contract, especially insurance clause, may have a direct impact to the purchasing terms and conditions concerning transportation.

Research Methodology
Thus, this chapter deals with the research area, population of the study, research design, sampling method and sample size, type of data, research instrument, procedure of data collection and method of data analysis.

Research Design
A research design is a comprehensive data collection plan whose purpose is to answer research questions and test hypothesis. The research design used for this study is descriptive; this involves the administration of questionnaire, interview and reporting accordingly.

Research Area
This study work was carried out at Makurdi Area of Benue State with emphasis on selected construction firms.

Population of the Study
The population of this study is made up of construction

manner to remove ambiguities from data analysis. It deals with the analysis of response rate, presentation of collection data, and analysis of data discussion.

Analysis Of Response Rate

Data is defined as qualitative information while analysis is the breaking down and ordering of such information. Questionnaire was used in the collection of data. A total of sixty-five **(65)** questionnaires were distributed to construction professionals in Makurdi Area of Benue State, and sixty-three **(63)** questionnaires were returned and were used for the data analysis.

Research Question One: What are the various the causes of material mismanagement on construction sites?

Table 1: Causes of Material Mismanagement on Construction Sites.

S/n	Identified Strategies	Mean Item Score	Ranking
1.	Site planning and organization	92%	1st
2.	Good security measures	92%	1st
3.	Site communication	92%	1st
4.	Quality control and checking	92%	1st
5.	Materials scheduling and procurement	91%	2nd
6.	Materials movement and handling	91%	2nd
7.	Good supervision	90%	3rd
8.	Stock control and storage techniques	89%	4th
9.	Education and incentives schemes	78%	5th

Source: Field Survey, 2024

From the above, it is reserved that strategies ranked between "1-3" were confirmed by the respondents as most frequently utilized for material management on construction sites, owing

The Table above shows the analysis of factors identified as impact of strict compliance by construction firms with standard material control strategies on building project delivery from the respondent's points of view. The analysis revealed that the most important factors identified and confirmed by the respondents as impact of strict compliance by construction firms with standard material management strategies includes minimized delays, less disputes, project abandonment avoided as much as possible. High construction quality and productivity time overrun minimized, cost overrun minimized, increase in contractor's profit margin and reduction in contractor's overhead cost. This will contribute in small measure to reducing material shortage and wastages, and would also go a long way in minimizing delays and disputes. The analysis revealed that the factors identified and confirmed by the respondents are highly important based on the seventy indexes of which is very close to one another, and are also above 70% meaning "agreed" on the 5-point rating interval of scale used. Hence, this implies that all the factors involved are agreed to be important and confirmed as impact of stock compliance by construction firms with standard material management strategies on building project delivery. The ranking only shows that factors are more important than others.

Research Question Three: What are the various strategies for materials management on construction sites?

construction quality and productivity, increase in financial risks on the contractor's firms and even project abandonment.

iii. Also, the study discovers proper storage facilities, better handling of materials, quality control of materials, adequate site planning and good relationship with suppliers as some of the strategies employed on site for effective material management.

Conclusion

This study provided enough research from which reliable opinion and conclusion could be drawn. From the analysis of investigation carried out and finding made' the study revealed that though, all construction firms acknowledge the need for material management on site, but it is carried out to a reasonable extent only on large construction sites and by large construction firms, hence, stick compliance with standard material management strategies is maintained only by large construction firms. However, it was concluded that the recognition of material management and implementation of the strategies involved by building construction firms would minimize delays dispute, avoid project abandonment as much as possible, achieve effective project monitoring and control, high construction quality and productivity as well as minimize cost and time overrun in construction process as much as possible. It also enhances profitability of the contractor's organization in the Nigeria building construction industry. This is achieved through the adoption and implementation of well-articulated and cost-effective material management strategies that can guarantee increased productivity. Hence, tasks are compiled within planned duration, cost and quality.

Recommendations

To fully leverage the benefits of material management strategy on construction projects site in Benue state, the following recommendations are made:

i. Material management should be practiced on all sites

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