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Assessment of materials management on building projects in Ondo State, Nigeria

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ABSTRACT

The control of materials on construction sites is handled carelessly by planning and purchasing departments, site supervisors and engineers as well as contractor's organization and this have been posing various problems to contractors in realizing reasonable profit margin. The research centered on the assessment of materials management on building projects in Ondo-State Nigeria. This study assessed the current practices of managing materials on building projects, the problems associated with materials management and measures for managing materials in building projects in Ondo state. The study was carried out through the administration of questionnaire to professionals in both consulting and contracting firms and data collected were analyzed using percentile and mean item score. The study reveals that purchasing of materials, material planning method and transportation of materials are the most common practices of materials Management. The most severe problem militating against materials management was lack of proper work planning and scheduling while other problems include inadequate cash flow to contractors due to delayed payments, burglary, theft and vandalism. The study recommends that management should improve their supervision on site, materials should be adequately handled when delivered, care should be given to materials handling process and more awareness should be given to the knowledge of materials management on building projects most especially on construction sites.

***Keywords*:** Material management; Current Practices; Building Projects; Ondo-State; Construction Professionals

1. INTRODUCTION

Construction material constitutes a major cost component in any construction project. The cost of materials may be 50% to 70% of the total construction cost depending on type of projects (Patil and Pataskar 2013, Gulghane and Khandve 2015). Donyavi and Flanagan (2009) observed that materials management has not received attention from researchers. These studies suggested that materials should be readily available at the points where they are needed so as to enhance the successful completion of the projects at the appropriate time. Several researchers provide different definitions for material management, therefore different definitions can be found in different references but Kanimozhi and Latha (2014), define materials management as a process for planning, executing and controlling field and office activities in construction. Zeb, Malik, Nauman, Hanif, and Amin (2015) also define material management as a procedure for executing, planning, and controlling site activities in the construction project(s). Donyavi and Flanagan (2009) divide material management into five categories namely, measurement and specification, procurement and purchasing process where the order is transmitted to the supplier, delivery to site and logistics of checking the order, off loading, and storing on site, administrative and financial process of payment and using the materials in production on the job site and removing the waste. Materials management system also attempt to insure 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.

Waste is one of the serious problems in construction industry, it refers to the variance between the estimated and actual consumption of an individual item. Donyavi and Flanagan (2009) observed that common problems associated with material management on construction site includes; failure to order on time which delays the projects, delivery at the wrong time which interrupts the work schedule, over ordering, wrong materials or error in direction of materials requiring re-work, theft of materials from delivery into production and double handling of materials because of inadequate material.

The benefits of materials management systems are significant and in order to make materials management on site effective for fast-track projects delivery, there is need for an integrated material handling process from the design stage to the usage of materials on sites (Kasim and Anumba, 2005). Therefore, the research assessed the practices used in material management and ways by which i dentified problems can be minimized on construction sites in Ondo State.

2. MATERIALS MANAGEMENT IN CONSTRUCTION PROJECTS

It is important to manage all materials from the design stage to the construction stage of the project as poor handling of construction materials affects the overall performance of construction projects in terms of time, budget (cost), quality and productivity. The wastage of materials should also be minimized during construction in order to avoid loss of profit for construction companies (Kasim and Anumba, 2005). John (2013) observed that the relevance of materials management to the total production operation cannot be overestimated; materials management activities actually start before the production begins by providing optimum materials required for production and its supply at the various production stages.

Forecasting of company's sales and purchasing of various materials required for production is needed at the planning stage. Purchasing, procurement of materials, transportation, storage, inventory control, quality control and inspection of materials, materials handling, packaging, warehouse planning, accounting, scrap, surplus and obsolete materials disposal, finished goods safety and care are the functions performed by materials management. The purpose of material management is to control the flow of materials effectively.

2.1. Importance of Materials Management to Construction Projects

Efficient management of materials plays a key role in the successful completion of a project. The cost represented by materials fluctuates and may comprise between 20-70% of the total project cost and sometimes more (Bernold and Treseler, 1991, Patil and Pataskar 2013, Gulghane and Khandve 2015,). Sustainable materials management can have numerous benefits. United state environmental protection agency report (2013) informed that these benefits can be group into: Environmental benefits, Economic benefit and Performance benefits

2.1.1 Environmental Benefits: This includes the conservation of natural resources, reduction of energy consumption, conservation of landfill space and reduction of environmental impacts across the life cycle by decreasing the demand for virgin products

2.1.2 Economic Benefit: It includes reduction in disposal costs and may reduce material hauling costs which leads to reducing overall project costs, reduction in purchasing costs since non-virgin materials are often less expensive than virgin resources, make contractors to be more competitive with their bids at reduced costs and it creates employment opportunities and economic activities in the reuse and recycling industries

2.1.3 Performance Benefits*:* This includes reclamation of materials, salvaged, and reused can perform as well as or better than virgin products in many applications, reduction in the overall costs of materials, better handling of materials, reduction in duplicated orders, materials will be on site when needed and in the quantities required, improvements in labour productivity, improvements in project schedule, quality control, better field material control, better relations with suppliers, reduction in materials surplus, reduce storage of materials on site, labour savings, stock reduction, purchase savings and better cash flow management.

Stukhart and Bell, (1987) conduct a study on twenty heavy construction sites and noted that in one of the project, a 6% reduction in craft labour costs occurred due to the improved availability of materials as needed on site. On another project, an 8% savings was recorded due to reduced delay for materials estimated, a comparison of two projects with and without a materials management system revealed a change in productivity from 1.92 man-hours per unit without a system to 1.14 man-hours per unit with a new system. Again, much of this difference can be attributed to the timely availability of materials, warehouse costs were found to decrease 50% on one project with the introduction of improved inventory management, representing a savings of $ 92,000. One project reporting a cash flow savings of $ 85,000 from improved materials management.

Vieira, Pasa, Borsa, Milan & Pandolfo (2011) observed that the importance attached to materials handling is a topic that frequently treated superficially by construction companies

and provisions should be made to handle and store the materials adequately when they are received, special attention should also be given to the flow of materials once they are procured from suppliers.

2. 2. The use of materials on construction site

Bailey and Farmer (2002) define materials as the goods purchased from sources out of the organization that are used to produce finished products. Chandler (2001) informed that the construction materials can be classified into different categories depending on their fabrication and in the way that they can handled on site and these include:

Bulk materials: These are materials that are delivered in mass and are deposited in a container.

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

Palleted material: These are bagged materials that are placed in pallets for delivery.

Packaged material: These are materials that are packaged together to prevent damage during transportation and deterioration when they are stored

Loose materials: These are materials that are partially fabricated and that should be handled individually. Building materials have an important role to play in this modern age of technology, although their most important use is in construction activities, no field of engineering is conceivable without their use and also, the building materials industry is an important contributor in our national economy as its output governs both the rate and the quality of construction work. Building materials are bought in standard length or lot quantities. Examples of such materials include pipes, wiring, and cables. They are more difficult to plan because of uncertainty in quantities needed. Engineered materials are specifically fabricated for a particular project or are manufactured to an industry specification in a shop away from the site. These materials are used for a particular purpose. This includes materials that require detailed engineering data while fabricated materials are materials that are assembled together to form a finished part or a more complicated part. Examples of such materials include steel beams with holes and beam seats. Other material includes cement, blocks/bricks, reinforcement bars and glass products.

2. 3. Material management practices

Materials management practices on building project are categorized practices to five processes Gulghane and Khandve (2015), planning, purchasing, transportation, handling and waste control. Ocheoha (2013), also identify practices such as just in time, Economic order quantity, warehousing management as part of materials management practices that should be taken serious and these practices are described in the next section.

2.3.1 Materials planning method: Khyomesh (2011) informed that the most commonly used basis for planning things out for the project is the Bill of Quantity prepared by the client. Companies may have two major levels in planning that is micro and macro level. Time, cost, material and labor are the four major types of planning undertaken on sites. The planning should be revised as frequently as possible in order to monitor whether work is progressing as planned. During the planning prices, detailing the project in terms of its outcome, team

members' roles and responsibilities, schedules, resources, scope and costs are needed. At the end of this phase, a project management plan is produced, which is a document that details how your project will be executed, monitored and controlled, and closed.
Burt (1996) observed that planning and programming of work should include strategies, tactics, and tools for managing the design and construction delivery processes and for controlling key factor to ensure the client receives a facility that matches their expectations and function as it is intended to function. Materials requirement planning is technique used to determine the quantity and timing requirements of dependent demand "materials used in the construction operation"

2.3.2 Purchasing of materials: The purchasing function is central to material management. Purchasing has the responsibility and the authority to commit project funds for materials, equipment, and services. This activity may be accomplished by the home office, the field, or a combination of both depending on the size and the scope of the project. The home office must maintain planning, procedural, and policy direction over the field operations in order to ensure consistent purchasing practices (Stukhart and Bell 2007). The term procurement encompasses a wide range of activities that includes purchasing of equipment, materials, labour and services required for construction and implementation of a project. The objective of procurement in materials management is to provide quality materials at the right time and place, and at an agreed budget. Procurement is also about organizing the purchasing of materials and issuing delivery schedules to suppliers and following-up, to make sure that suppliers deliver on time.

2.3.3 Transportation of materials: 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 transportation cost (Ahuja and Dozzi 1994). Good logistics involved the use of minimum of materials on site awaiting assembly, as well as being good for cash flow, this makes it easier to keep the site clean and tidy and reduces opportunities for slips trips and falls, an effective logistics team will also pay attention to the maintenance of plant and equipment. Transportation or traffic expertise aids the materials management team in handling numerous types of special loads from delicate electronics to massive modules. Knowledge of requirements, source and availability of this equipment may be critical to successful execution of the work, transport permitting requirements also must be considered early in the project (Bailey and Farmer, 2002).

2.3.4 Materials handling: Tompkins and White (1984) define effective material handling as using the right method, amount, material, place, time, sequence, position, condition, and cost. This involves handling, storing, and controlling of the construction materials. Handling of materials is the flow component that provides for their movement and placement. The importance of appropriate handling of materials is highlighted by the fact that they are expensive and engage critical decisions. Due to the frequency of handling materials there are quality considerations when designing a materials handling system. Material handling equipment selection is an important function as it can enhance the production process, provide effective utilization of manpower, increase production and improve system flexibility (Chan 2002). Sadiwala (2007), affirmed the following improvement of materials handling system

which are: Motion which implies that materials movement from one place to another should be handled efficiently to eliminate avoidable movements so as to minimize cost, Time which indicate that materials handling officer must ensure materials get to, or remove from production unit at the right time, Place that materials should be at the right place at the right time to enhance smooth operations, Quantity: which means that materials supply to, or remove from the right place should be according to operating unit demands and Space: which means efficient storage space is paramount to achieving the objectives of materials handling system and overall organization goals.

2.3.5 Material waste control: Stock control is classified as a technique devised to cover and ensure all items are available when required. Stock control can include raw materials, processed materials, and components for assembly, consumable stores, general stores, maintenance materials and spares, work in progress and finished products (Prabu, 1986). It is of great importance that the bulk of construction materials delivery requires proper management of stock control. Meanwhile, construction activities can generate an enormous amount of waste (Teo, 2001), it has been recognized as a major problem in the construction industry (Formoso, 2002). However, tighter materials planning can reduce waste and can directly contribute to profit-improvement and productivity. Reduction of waste can be done by practicing attitude towards Zero wastage, proper decisions at design stage, site management, proper standardization of construction materials, and codification of the same construction waste can also be reduced by using waste management system on project. The project activities are to be planned at every stage by every construction personnel, who are involved, in minimizing the overall waste generation at project (Thomas, 2013).

2.3.6 Just-in-time method (JIT): The acronym JIT has been highly visible since late 1980 have, as manufacturing attempted to meet competitive challenges by adopting newly emerging management theories and techniques, referred to as Lean production (Akintoye, 2005). Stock (2001), stated that Just in Time (JIT) manufacturing is described as a system that helps in making appropriate order of materials available to each operating unit at the right time in the right quantity. JIT is a systematic concept consisting of JIT purchasing, JIT transportation and JIT production. These three elements combine to create a material handling system that avoids waste and minimizes inventory investment. The technique has changed employees' belief, attitude, work habits and awareness of quality assurance. It is an operating management philosophy of continuous improvement in which non-value-adding activities (or wastes) are identified and removed for the purposes of reducing cost.
Ocheoha (2013), affirmed the objectives of JIT which is to reduce processing time, elimination of waste, have respect for people and cost minimization and these can be achieved if firms hold zero inventory; a system known as lean supply chain. The summary of the objectives of lean supply chain oriented organizations is to improve productivity by minimizing the cost of the quality product. The following factors can be considered for the required improvements: process and product design, using state-of-the art equipment and technology, holding zero inventory, reducing lead-time of supply of materials, reducing batch size, using pull production system, simplifying factory layout.

2.3.7 Economic order quantity of materials (EOQ): This determines the amount of orders that minimizes total variable costs required to order and hold inventory. The economic order

quantity (EOQ) refers to the order size that will result in the lowest total of ordering and carrying costs for an item of inventory. If a firm place unnecessary orders it will incur unneeded order costs. If a firm places too few order, it must maintain large stocks of goods and will have excessive carrying cost (Patil and Smita, 2013).
Adedayo, Ojo, and Obamiro, (2006) recommend the following assumptions of economic Order Quantity which are : deal with only one material whose demand is assumed to be and completely predetermined, demand remains constant over a period of time; Holding and ordering related costs per unit remain constant during the period of one year irrespective of the order quantity, No stock out is allowed and ordered materials arrive instantaneously and The lead time which is the time between ordering and receiving goods is instantaneous and is equal to 0, and all materials ordered are delivered.

2.3.8 Recovering and recycling of materials: Recycling is the process of collecting materials that are often considered trash and remanufactured tin to new products that can be resold or used again, construction recycling as the separation and recycling of recoverable waste materials generated during construction (Nathan, 2010, and Sadiwala (2007). Recovering simply refers to the process of retrieving the disposed or about to be disposed materials and make it ready for recycling. That is, removal of materials from the solid waste stream for sale, use, or reuse as raw materials (Monczka, 2002).

2.3.9 Warehousing management: Bowersox (1996), opine that warehousing can be defined as materials management that houses and stores materials (raw materials, parts, components, work-in-process and finished goods) temporarily or for sufficient period between the point of origin and place of consumption and provision of necessary managerial information about the conditions of stored materials. All organizations have a minimum level of inventory they keep for future operation whether they operate JIT or traditional delivery system. Where inventory is kept is typically referred to as warehouse. Although, in many logistical arrangements the role of warehouse is more properly viewed as a switching facility as contrasted to a storage facility, i.e. effective distribution systems should be designed not to hold inventory for an excessive length of time but there are times when inventory storage is economical. In the same vein, warehouse management means effective and efficient storage and provision of required materials to ensure smooth operations.

Monczka (2002), state that a centralized warehousing is a situation where all materials (raw materials, parts, components, and finished goods) are stored in a specific location where materials are received and delivered to required operating places. This method is most suitable for small organizations because one store can be sufficient for their operations.

Decentralized warehousing permits materials to be stored in different right places to facilitate production operations and provide quality customer services. Decentralization of warehouse is a common practice of large organizations that have different plants and product lines scattered over the country. Leenders (2002), identified the importance of warehousing to includes: reduction in transportation cost; warehousing and the associated inventory are added expenses, but they may be traded off with lower cost realized if JIT transportation is adopted; achieving smooth production-warehousing to some levels of inventories make materials available at all time for production process, hence, it helps to avoid stock-out of materials; coordination of supply and demand- firms that experience highly seasonal production and sales most times have problem in coordinating supply with demand of materials, warehouse

helps them to even out supply and demand of materials over a given period; enjoy quantity purchase discounts- availability of warehouse encourages bulk purchases at discounted prices and maintaining a reliable source of supply - companies that have where to store materials always purchase materials and have regular supplier(s).

2. 4. Problems associated with materials management in project

Kasim, Anumba and Dainty (2005), identifies improper construction materials management as a factor affecting the general performance of construction projects in respect to construction time, quality, cost and overall construction productivity. Rivas (2011), informed that late delivery of construction materials, unavailability of materials before commencement of construction work, and the long distance of materials from the work location is the principal causes of materials-related problems on construction sites. Kazak (2008) found that poor planning for construction materials and difficulties associated with site transportation as factors leading to a lack of construction materials on sites. Goodrum and Maloney (2009) recognized that waiting for transportation of materials and equipment on site as the most significant factor impinging on the productivity of construction workers.

Managing materials among sub-contractors is an issue almost on each construction site; materials are sometimes needed to be shifted from one place to another place on the site resulting additional cost of manpower and machinery (Anwar 2015). Pauline (2014) also informed that difficulty to store materials on site due to limited space is another problem in connection with material management; sometime machineries cannot be adjusted on site due to acute space or mismanagement of site activities. In construction projects especially high rise buildings insufficient space for the required material is a very common problem and to overcome this problem contractor and subcontractor may arrange an additional warehouse nearby that can cater for the required material (Narimah, 2008). Other problems identified in literature include: conflict among sub-contractors and difficulty to coordinate their materials, late delivery of ordered materials, cash flow problem to contractor due to delayed payments, rejection of materials due to non-compliance to specification and improper health and safety procedure should injuries occurred.

2. 5. Measures for managing materials in building project

In order to achieve good materials management on building project Calistus (2013), opine that the following areas have to be taken very seriously i.e. Training of management and other staff, Inventory control of materials on site, Ensuring proper planning, monitoring and control. Alwi, Hampson, and Mohammed (1999), recommend the following effective management of building projects which includes: Management, supervision and administration of sites, Provision of adequate storage of materials, Proper usage of materials, Materials schedule for the contract on hand, Materials delivery, Provision and accessibility site layout, Attention to weather conditions.

2.5.1 Training of both management and other staff: Vivian (2006), opine that it is necessary to provide education and training to encourage and promote the benefit in reuse, recycling and reduce the material consumption; however, cost saving for reuse and reduce the material consumption is difficult to measure, in which the material can be reuse and reduce the consumption for several times. Lingard (2000), observe that it is more effective to provide

training and education among staff, and involve employees' participation in implementing waste management and pointed out that employees' participation could only be effective with genuine support from management.

2.5.2 Inventory control of materials on site: Abdul-Rahman (1994) affirms that it involves taking note of the use and inventory of materials on site and recordings i.e. the loading and off-loading, transit and handling of materials. It is recommended that arrangements be made for materials to arrive on time. When a construction material is delivered to a site, it should be checked for damage, quantity, quality and specification.

Kapot (2010) stated that this involves physical control of materials, preservation of stores, minimization of obsolescence and damage through timely disposal and efficient handling, maintenance of stores records, proper location and stocking. Stores are also responsible for the physical verification of stocks and reconciling them with book figures. The inventory control covers aspects such as setting inventory levels, ABC analysis, fixing economical ordering quantities, setting safety stock levels, lead time analysis and reporting.

2.5.3 Ensuring proper planning, monitoring and control: Mohamed (2006) describe construction site management practice as the process of determining, analyzing, devising and organizing all resources necessary to undertake construction project. It also includes monitoring and controlling the planned actions towards successful project delivery. Some of the specific activities include the production of a Gantt-chart, network analyses, method statements, resource leveling, progress reports and exception reports.

The core element of planning is the establishment of a programme which reflects the planning process in relation to real time (Griffith and Watson, 2004), construction planning is the total process of determining the method, sequence, labour, plant, and equipment required to undertake a building project. All but the simplest tasks require planning in order to be accomplished with the best utilization of time and resources (Chimay, 2006)

2.5.4 Management, supervision and administration of sites: Supervision is the direction of people at work and management is the planning and control of the work process on construction site, supervision, management and administration of site are gradually spread over the earth because it is a more efficient way of accomplishing work (Alwi, et al, 1999). All work requires the coordination of effort; this is accomplished by giving workers assigned tasks and assigned time in which they are to accomplish these tasks, but instruction is not is not enough. A clear, specific instruction on what is to be done, monitor the worker in the course of their efforts.

Jimoh, (2012), this is the arrangement on construction sites that lends to effective information dissemination and exchange. Information such as correspondences, minutes, labour allocations, payroll, progress reporting, notices or claims, instruction, drawing register and technical information does flow among stakeholders, for processing and further actions during and after project construction.

2.5.5 Provision of adequate storage of materials: Kasim (2005), Material storage on site requires close attention in order to avoid waste, loss and any damage of materials which would affect the operation of the construction project. Proper material storage system must be designed to accommodate the loads of the materials to be stored; the sensitive environmental

needs for different materials to be permanently stored and preserved; the functional, efficiency and safety of the visiting public and operating personnel; and the protection of the materials from fire, water and man-made threat (Pat, 1991).There must be a proper storage facilities provided for materials on site, some materials are usually not stored in shed or locked up building, also double handling of materials because of improper or indecision about the proper storage facility constitute to waste. Old stock must be available for use after a fresh delivery is made and these materials must be placed in such a way that damage would not be done to it by human activities or traffic on site. Bagged materials such as cement should be stored in a place that is free from moisture.

2.5.6 Proper usage of materials: Phu and Cho (2014), describes usage of materials is the flow component that provides for their movement and placement. Material usage can be defined as the provision of proper handling techniques either manually or mechanically for the components held on site during construction process. Adequate care must be taken to prevent wastage when working with materials on construction project, the assembly of installation process involves the practical incorporated into the project of materials depending on how the skills of the workmen involved. Materials on job site at times may have had a little defect due to poor storage or poor quality on the part of the manufacturer.

2.5.7 Materials schedule for the contract on hand: Kelvin (2013), It has been established that preparation of a good materials schedule helps a long way in solving the problem of material handling on site. This is prepared at the contract stage of building contract by an estimator and also by the contractor in order to know accurately how much material to mobilize the site. This entails accurately detailed type, the size of materials and all other possible information regarding the required materials and the quantities and date on which it should be delivered. Materials schedules are valuable to buyer for ordering and also to site supervisor to ensure that materials when delivered are allocated or unloaded at or for the projects or building elements for which they are specified ordered productivity (Plunkett 1994). Project schedules should establish guidelines as to when and how the project should be executed, schedule requirements need to be communicated and properly managed throughout the entire project. The purpose of scheduling is to organize and allocates the resources of, equipment and labor with the construction projects tasks over a set period of time.

2.5.8 Provision and accessibility site layout: Construction site layout involves identifying, sizing, and placing temporary facilities within the boundaries of construction site (Heap, 2007). These temporary facilities range from simple lay down areas to warehouses, fabrication shops, maintenance shops, batch plant, and residence facilities. Required temporary facilities and their areas are depending in many factors including project type, scale, design, location, and organization of construction work. A detailed planning of the site layout and location of temporary facilities can enable the management to make considerable improvement by minimizing travel time, waiting time, and increasing worker morale by showing better and safer work environment.
Site layout involves the study, planning and organization of unused area of site around the proposed development to accommodate the contractor's construction equipment, materials and buildings for use in the execution of the construction works (Kwakye, 1991). One of the primary considerations for site layout is the need to keep the construction production

continuous by maintaining a means of access to the site and facilitate the adequate flow of traffic. Therefore material location is important when preparing a layout plan and this consideration would aid materials handling on construction project.

2.5.9 Attention to weather conditions: According to research Muhwezi (2012), severe weather conditions were ranked in the first positions as the most significant waste attributes on project in the respective categories, exposing materials to inclement weather such as steel bars which rust and may get damaged. Using research result conducted by (Wahab and Lawal, 2011). Adverse weather is considered one of the main factors causing delays and cost overruns on construction projects (Osama and Khaled, 2002).

3. RESEARCH METHOD

The methods used for this study includes extensive searching of relevant literatures relating to the study such as textbooks, magazines, journals, and the internet. The data were collected through the use of structured questionnaires and analyzed using percentile and mean item score. Data was obtained from both consulting and contracting Quantity surveyors, Engineers, Architects and Builders in Akure, Ondo State, Nigeria. The study population was gathered using a list of Consulting and Contracting Firms that registered with Ministry of Works and Ministry of Lands and Housing using random sampling of the described population for the study. The questionnaire was drawn on a 5-points likert scale. Questions were asked on the background information of the respondents such as years of working experience and the professional cadre of the respondents. Data were analyzed using tools like means and percentage. Out of one hundred and thirty-two (132) questionnaires administered, only One hundred (100) were considered suitable for analysis which represented a healthy return rate of seventy-six percent (76%). This rate is considered sufficient for the research, as posited by Moser and Katton (1999) that the result of a survey could be considered as biased when the return rate is less than 20-30%.

4. MAIN DISCUSSION

4. 1. Result

From the survey conducted on the background information of respondents, it was evident that 39% are from contracting organizations whist 61% are from consulting organizations, 35% are Builders, 23% are Quantity Surveyors, 20% are Architects and 22% are Engineers. About 13% of the respondents had Higher National Diploma (HND), 34% had Bachelor Degree (BSc/ B.Tech) as their highest academic qualification while 53% had Masters of Science or Technology (M.Sc./M.Tech). Professionally, 23% of the respondents are professional members of the Nigerian Institute of Quantity Surveyors (MNIQS), 35% are professional members of the Nigeria Institute of Builders (MNIOB), while 20% are professional members of Nigeria institute of Architects and 22% are members of Nigeria Society of Engineers. It was also evident that respondents had an average of 5years working experience in the construction industry and 32% have handle between 1-10 projects in the construction Industry, 38% had handled between 11-20 projects, 27% had handle between 21-

30 projects, 2% had handled between 31-40 projects while 1% had handled above 40 projects in the industry, and from the foregoing, it is evident that respondents for this study have sufficient experience to give opinions on the subject matter of this study.

Table 1. Level of awareness of materials management

Practices	Mean	Rank
Purchasing of materials	4.43	1
Material planning methods	4.43	1
Transportation of materials	4.33	3
Material handling	3.95	4
Inventory management	3.89	5
Warehousing management	3.84	6
Material waste control	2.82	7
Economic order quantity	2.81	8
Just in time method	2.77	9
Recovering and recycling of materials	2.31	10

From Table 1. it was observed that the respondents level of awareness on mate management methods were relatively high especially, Purchasing of materials methods w mean score of 4.33, Material planning methods with mean score of 4.33, Proper transportati methods with mean score of 4.33 and Material handling methods with mean score of 3.95 wh the awareness was relatively low on Recovering and recycling of materials method with me score of 2.31, Just in time method with mean score of 2.77, Economic order quantity meth with mean score of 2.81, and Material waste control with mean score of 2.82. From the going, the awareness on emerging methods of material management like Just in time (JIT) a Economic order quantity (EOQ) should be improved upon by practioners.

Table 2. Problems associated with materials management on building projects.

Problems	Mean	Rank
Lack of proper work planning and scheduling	4.02	1
Cash flow problems to contractor due to delayed payments	3.85	2
Burglary, theft and vandalism	3.80	3
Materials shortage during construction and suddenly alteration price of materials	3.75	4
Lack of coordination between contractor and supplier	3.72	5

Table 2. Problems associated with materials management on building projects Cont.

Problems	Mean	Rank
Negligence	3.71	6
Insufficient storage space	3.61	7
Late delivery of ordered materials	3.58	9
Incompetent material suppliers are selected for the projects	3.57	10
Site access problem	3.57	10
Difficulty in managing materials among subcontractors due to the limited storage space on site	3.54	12
Damage to materials during transportation to the site	3.54	12
Lack of security personnel	3.54	12
Health and safety procedures implementation on site	3.52	15
Hindrance to work progress due to improper stocking of materials	3.52	15
Difficulty in coordinating sub-contractors materials on site	3.46	17
Rejection of materials due to non-compliance to the specification	3.38	18
Conflict among sub-contractors due to acute space available for material	3.23	19
Accidents/ injury occurred at site	2.92	20

From Table 2, the study shows that Lack of proper work planning and scheduling was ranked as the highest Problem mitigating material management on building projects in Ondo state, Nigeria with mean score of 4.02 follow by problem of cash flow to contractor with mean score of 3.85, burglary, theft and vandalism with mean score of 3.80 in descending order while Accidents onsite with mean score of 2.92, conflict among contractors with mean score of 3.23 and rejection of materials due to compliance to specification with mean score of 3.38 do not constitute much problem to material management.

Table 3. Measures for managing building materials

Measures	Mean	Rank
Adequate management, supervision and proper administration of sites	4.69	1
Training of both management and other staff	4.68	2
Ensuring proper planning, monitoring and control	4.67	3

Taking inventory of materials on site	4.43	4
Proper usage of materials	4.41	5
Provision of adequate storage of materials	4.39	6
Proper delivery, handling and Employment of store keeper or security personnel	4.35	7
Provision and accessibility site layout	4.28	8
Materials schedule for the contract on hand	4.18	9
Attention to weather conditions	3.79	10

From the Table 3 above, the results reveal the measures for managing materials on building projects which are adequate management, supervision and proper administration of site with mean score of 4.69, Training of both management and other staff with mean core of 4.68 and attention to weather condition was ranked least by the respondent with mean score of 3.79.

5. CONCLUSION AND RECOMENDATION

Based on the findings from the question raised in this research, the following conclusions are drawn. The study shows that effective material management brings positive result in achieving early building project completion. The study agree with (Madhavi *et al*, 2013), that suggested the need for improving purchasing, transportation and introduction of new possibilities, like, purchase requisition slip, and transportation order respectively. The study also shows the importance of manage all materials from the design stage to the completion stage because poor management of construction materials affects the overall performance of construction projects in terms of time, cost, quality and productivity.

The study also revealed that, the most prevalent practices of materials management are purchasing of materials, material planning method, transportation of materials while the prevalent challenges are lack of proper work planning and scheduling, cash flow problems to contractors due to delayed payments and burglary, theft and vandalism are problems associated with materials management. This gives light to the fact that pre-planning is important in controlling the total project cost and effective material management (Gulghane, 2015).

For effective materials management, measures shown by the study include adequate management and supervision; it shows that administration of sites was the best in respect to conditions for achieving good materials management.

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